PUEY UNGPHAKORN INSTITUTE
FOR ECONOMIC RESEARCH

# Consumption Inequality, Life-Cycle Risk Sharing and the COVID-19 Crisis in a Developing Economy: Evidence from Thailand, Indonesia and Vietnam

by

Mutita Ariyavutikul, Minchung Hsu, Trang Le, Trisukon Sawatrukkiat

May 2026

Discussion Paper

No. 251

# Consumption Inequality, Life-Cycle Risk Sharing and the COVID-19 Crisis in a Developing Economy: Evidence from Thailand, Indonesia and Vietnam

Mutita Ariyavutikul* Minchung Hsu† Trang Le‡ Trisukon Sawatrukkiat§¶

**Abstract**

This paper examines life-cycle patterns of earnings and consumption inequality in a developing economy, focusing on employment informality, risk sharing, and the impacts of the COVID-19 pandemic. Using household survey data from Thailand, with robustness checks for Indonesia and Vietnam, we find that in Thailand both earnings and consumption inequality rise with age during prime working years, and earnings inequality continues to increase after retirement. Inequality patterns differ by employment status: formal-worker-headed households show limited risk sharing at younger ages, while informal-worker-headed households display flatter consumption-inequality profiles, with consumption inequality generally below earnings inequality. During the COVID-19 period, overall inequality declined, but consumption inequality increased among younger households. Finally, a standard life-cycle

*Puey Ungphakorn Institute for Economic Research (PIER), Bangkok, Thailand, and National Graduate Institute for Policy Studies (GRIPS), Tokyo, Japan.

†Corresponding author. National Graduate Institute for Policy Studies (GRIPS), Tokyo, Japan.

‡University of New South Wales, Sydney, Australia.

§Bank of Thailand, Bangkok, Thailand.

¶Minchung Hsu expresses gratitude for the financial support received from JSPS Kakenhi Grant Number (C)21K01439, the Nomura Foundation and GRIPS Policy Research Center during the period of conducting this project.

model calibrated to match earnings inequality fails to replicate the observed age profile of consumption inequality, suggesting that key developing-economy features, such as informal insurance mechanisms, are not fully captured.

*Keywords*: Life-cycle inequality, risk sharing, informal employment, developing economy, COVID-19 crisis

# 1 Introduction

Understanding how inequality evolves over the life cycle is essential for assessing household welfare and the extent of risk sharing. Although life-cycle inequality has been widely examined in developed economies, evidence from developing countries, where informality is pervasive and formal insurance mechanisms are limited, remains scarce. This paper addresses this gap by studying how earnings and consumption inequality change with age in a developing-economy context and by using the age profile of consumption inequality to infer households' ability to insure against earnings risk. We use Thailand as our primary case and draw on household survey data from Indonesia and Vietnam for robustness checks. We further compare life-cycle inequality patterns by formal and informal employment status. In addition, given the substantial impact of the prolonged COVID-19 pandemic since 2020, we examine whether earnings and consumption inequality changed during this period. Finally, to gain structural insights from our empirical findings, we employ a standard life-cycle model and compare the model-predicted age profile of consumption inequality with the empirical evidence. The analysis can also inform the development of more realistic and nuanced economic models that better capture the dynamics of economic inequality and risk-sharing mechanisms in a developing-economy context.

As discussed in Storesletten, Telmer, and Yaron (2004), in the absence of risk-sharing (i.e. no insurance) in an economy, consumption inequality will mimic earnings inequality over age. Conversely, in a complete market that provides full insurance, consumption inequality will remain constant over age. Their study, based on Panel Study of Income Dynamics (PSID) and Consumer Expenditure Survey (CEX) in the US, found that: 1) inequality in earnings and

consumption increases substantially up to age 60 and then declines; 2) the increase in consumption inequality is less than the increase in earnings inequality. These results imply that U.S. households have access to partial insurance against income risk, lying between the extremes of no insurance and full insurance.

De Nardi, Fella, and Paz-Pardo (2020) also conducted a similar investigation using updated CEX data and find a comparable pattern.[1] Related studies have been also conducted in other developed countries. For instance, Blundell and Etheridge (2010) analyzed inequality dynamics in the UK, and Brzozowski et al. (2010) documented similar life-cycle inequality patterns in Canada.

Research on inequality in developing economies documents wide variation in income inequality across countries and over time (UNDP, 2015; Makhlouf, 2023). A large share of this work investigates channels driving income inequality. Key factors include persistent urban–rural and regional gaps, especially during urbanization and structural change (Lipton and Eastwood, 2004; Zhong et al., 2022); shifting returns to skills associated with sectoral reallocation and trade integration (Benjamin, Brandt, & McCaig, 2017); and the dual role of informality in both limiting access to formal insurance and providing employment opportunities (Dell'Anno, 2021; IMF, 2021). The literature also stresses that redistribution capacity is often limited, though targeted policies can reduce inequality (World Bank, 2016), and that fiscal policy and fiscal stance matter for inequality, particularly under heightened uncertainty (Kebalo and Zouri, 2024). However, most studies emphasize income inequality and cross-sectional patterns.

Relatively few studies jointly examine income and consumption inequality in developing-country contexts. For example, Binelli and Attanasio (2010) study Mexico and Gorodnichenko et al. (2010) study Russia. Related work assesses risk-sharing ability by linking consumption movements to income fluctuations;

[1] Various studies have shown that inequality increases as individuals age. Deaton and Paxson (1994) investigated consumption and income inequality within the same cohort across three different countries: the US, UK, and Taiwan. They found that within-cohort inequality increases with age. Storesletten, Telmer, and Yaron (2004) examined why consumption inequality increases with age and found that individual-specific earnings shocks can explain the increasing pattern. Blundell, Pistaferri, and Preston (2008) proposed that changes in the persistence of income shocks can explain income inequality in the US.

for instance, Attanasio and Szekely (2004) for Mexico and Madeira (2023) for Chile find evidence of partial risk sharing. Their empirical tests reject both perfect insurance and financial autarky. A complementary line of research uses detailed household data in rural villages to study informal insurance, including Townsend (1994) for rural India; Townsend (1995), Kinnan and Townsend (2012), and Kinnan et al. (2024) for rural Thailand; and De Magalhães and Santaeulàlia-Llopis (2018) for rural Malawi. While these studies provide valuable evidence on risk sharing in developing countries, they do not offer systematic and harmonized life-cycle evidence on how income and consumption inequality evolve with age in developing economies. Consequently, this dimension remains less well understood than in the developed-country literature.

This study aims to fill this gap by applying a life-cycle framework to examine earnings and consumption inequality in developing economies with large informal sectors. Specifically, we ask the following questions. First, what are the patterns of earnings and consumption inequalities over age in developing economies? Are these patterns consistent with those found in developed countries like the United States, or do they diverge due to distinct labor market structures? Second, do these life-cycle patterns differ by the household head's employment sector, particularly between formal and informal workers?

In addition, taking into account the substantial impact of the prolonged COVID-19 pandemic since 2020, we also investigate whether there have been any changes in earnings and consumption inequality during the COVID-19 crisis. Various policy interventions like lockdowns, border controls, and social distancing measures were implemented to curb the spread of the virus. These measures, while necessary for public health, had a differentiated impact across various socioeconomic groups. They may create or exacerbate inequalities by limiting mobility, disrupting supply chains, and affecting employment opportunities. Lockdowns, for example, disproportionately affected workers in service industries who could not work remotely, while border controls impacted sectors dependent on cross-border trade or labor. However, many governments also significantly expanded social welfare programs during this period, which may have served to reduce inequalities. The overall impact is therefore uncertain. Blundell et al. (2022) investigated the effects of the COVID-19 pandemic on inequalities

in various aspects within the UK. They found that the pandemic exacerbated inequalities in several dimensions, such as education and mental health, while disposable income inequality decreased due to the expanded welfare system. Our study will primarily focus on consumption and earnings inequality in developing economies.

To answer the research questions outlined in our study, we use Thailand as our primary case for analysis and will utilize Thai Household Socio-Economic Survey (SES) to examine the patterns of earnings and consumption inequality over age. Thailand is a good choice because the SES provides relatively reliable estimates of both consumption and income, including home-produced goods (see Townsend, 1995a, 1995b, 2016). It is nationally representative, fielded regularly, and has large sample sizes (roughly 42,000–55,000 households per wave). In addition, the 2021 wave was available when we conducted the analysis, allowing us to (i) estimate baseline age profiles using the pre-COVID waves (2011–2019) and (ii) assess COVID-period changes using the 2021 wave, while maintaining a consistent measurement framework. Thailand is an upper-middle-income developing country and has a relatively large formal sector (roughly 40% of total employment), which enables meaningful comparisons between formal and informal workers within the same empirical design.

We also use household survey data from Indonesia(another upper-middle-income developing country in Southeast Asia) and Vietnam (a lower-middle-income developing country in Southeast Asia) for robustness checks. Both provide widely used household datasets (IFLS for Indonesia and VHLSS for Vietnam) with reliable measures of income and consumption that can be implemented in parallel with our framework. For example, Mani et al. (2018) and Yamada (2016) use the IFLS to study health, employment, and labor market outcomes in Indonesia, while McCaig et al. (2015, 2018) use the VHLSS to study informal employment, globalization, and labor allocation in Vietnam.[2]

[2]Other developing countries in Southeast Asia, such as Malaysia and the Philippines, may also have suitable household survey data for conducting similar analyses. For example, Malaysia's Department of Statistics conducts the Household Income and Expenditure Survey, and the Philippine Statistics Authority conducts the Family Income and Expenditure Survey. However, incorporating these datasets would require additional authorization procedures and compliance with data-use conditions, and would also require careful checks of their comparability with our analysis design. Given

Following the methodology in Deaton and Paxson (1994) and Storesletten et al. (2004), we use a regression to remove cohort effects and estimate the patterns of earnings and consumption inequality (measured by the variances of log household earnings and consumption) across different age groups and household head's employment sectors (specifically, formal and informal sectors).

Our analysis finds that the patterns of inequality in Thailand largely resemble those observed in the U.S. during the prime working years, with both earnings and consumption inequality increasing with age. However, unlike the U.S., where earnings inequality declines after retirement, earnings inequality in Thailand continues to rise beyond the retirement age.

We also find meaningful differences between households headed by formal and informal workers. For formal-worker-headed households, while the overall inequality trends broadly align with U.S. patterns, consumption inequality among younger households is not consistently lower than earnings inequality, suggesting limited risk-sharing capacity. In contrast, households headed by informal workers exhibit a flatter age profile of consumption inequality, with consumption inequality generally remaining below earnings inequality. This pattern suggests a relatively higher degree of risk sharing, despite the absence of formal employment protections and government-provided welfare. This somewhat unexpected finding points to the need for further investigation into informal risk-sharing mechanisms in developing economies. Furthermore, our study also finds a significant increase in consumption inequality during the COVID-19 pandemic among younger households, despite a general decrease in both earnings and consumption inequality across the broader population during the pandemic period.

To gain structural insights from our empirical analysis, we employ a standard life-cycle model and compare the model-predicted age profile of consumption inequality with the empirical evidence. We show that although the earnings shocks in the model are calibrated to match the observed pattern of earnings inequality, the resulting consumption inequality diverges from the empirical pattern. The model understates consumption inequality for younger households

the scope of the current paper, we therefore focus on Thailand as the primary case and use Indonesia and Vietnam for robustness checks.

and largely overstates its increase for older households. This suggests that some factors important in a developing-economy context, such as endowment heterogeneity and informal insurance mechanisms, are not captured in the standard model, pointing to the need for structural frameworks that incorporate these features more explicitly.

The rest of the paper is organized as follows. Section 2 provides background information on social protection systems and labor informality in our target developing countries. Section 3 introduces the theoretical life-cycle framework. Section 4 describes the methodology and data sources used in our study, including the approach for measuring and analyzing inequalities. Section 5 presents the main findings on earnings and consumption inequality over the life cycle. Section 6 examines the impact of the COVID-19 crisis on these inequalities. Section 7 compares the model predictions with the data and discusses the implications for structural analyses. Section 8 concludes by summarizing the key findings and their implications for understanding risk sharing and economic inequality in developing economies.

# 2 Labor Informality and Social Protection Systems

Understanding the structure and coverage of social protection systems in developing economies is important, especially when analyzing consumption and earnings inequalities between formal and informal workers. This section provides an overview of the social security frameworks in Thailand, Indonesia, and Vietnam, highlighting the distinctions in coverage and benefits between formal and informal employment sectors. According to the International Labour Organization (ILO), informal workers are those non-registered workers who are not, in law or in practice, subject to national labor legislation, income taxation, social protection, or entitlement to employment benefits such as paid leave, severance pay, or advance notice of dismissal.[3] A comparative understanding of how formal and informal workers are treated within each country's social protection system may provide useful context for interpreting observed differences

[3] See International Labour Organization (2018). *Women and Men in the Informal Economy: A Statistical Picture* (3rd edition). Geneva: ILO.

in consumption and earnings inequality.

## Thailand

Thailand maintains a structured but segmented social protection system that offers significantly different coverage for formal and informal workers. Formal sector workers are mandatorily enrolled under Article 33 of the Social Security Act, which provides a wide range of benefits, including pensions, health insurance, occupational accident insurance, and unemployment insurance. These programs are financed through tripartite contributions from employees, employers, and the government. The pension scheme under Article 33 is a defined benefit plan, while health services are covered comprehensively under the same regulation, including inpatient and outpatient care at designated hospitals.

Government employees participate in a separate scheme under the Government Pension Fund (GPF), which also provides retirement and health benefits. Coverage under these formal mechanisms ensures relatively stable income protection and access to healthcare for workers in registered employment.

Informal workers, on the other hand, are excluded from mandatory coverage but may voluntarily enroll under Article 40 or Article 39 of the Social Security Act. Article 40 allows self-employed individuals to contribute to a limited benefits package, which includes basic pension support and a modest health insurance component (e.g., fixed daily cash benefits for hospitalization). Article 39 enables workers who previously contributed under Article 33 to continue making contributions after leaving formal employment, preserving partial access to benefits. However, these voluntary programs exclude coverage for occupational accidents and unemployment, and their benefits are more limited in scope and generosity.

In addition to SSO-based schemes, informal workers may access the Universal Coverage Scheme (UCS), a tax-funded public health program that offers free or highly subsidized medical services (only by public hospitals). However, UCS does not provide income replacement or pension benefits. Participation in voluntary schemes among informal workers remains low, leaving many without adequate social protection.

## Indonesia

Indonesia operates a multi-tiered social protection system that includes contributory social insurance, tax-financed social assistance, and targeted support for vulnerable groups. The formal system is administered by two main institutions: BPJS Ketenagakerjaan (BPJS-TK) for employment-related benefits and BPJS Kesehatan (BPJS-K) for health insurance. For more detailed information, one can refer to the report by Tsuruga, Brimblecombe, and Landry (ILO, 2023).

Formal wage workers employed in medium and large enterprises are mandatorily covered by a set of benefits, including employment injury insurance (JKK), death benefits (JKm), old-age savings (JHT, a defined contribution scheme), pensions (JP, a defined benefit scheme), and unemployment insurance (JKP). These programs are financed through employer and employee contributions. For example, JHT requires a combined contribution of 5.7% of insurable earnings (3.7% from employers and 2% from employees), while JP requires 2% from employers and 1% from employees. Health insurance contributions for the national JKN scheme amount to 5% of wages, with 4% paid by the employer and 1% by the employee.

In contrast, informal and non-wage workers are not mandatorily enrolled and face more limited access to social insurance. While they can voluntarily participate in JHT, JKK, and JKm, they are not eligible for pension (JP) or unemployment (JKP) benefits. Their contribution rates are typically flat or tiered based on income; for instance, health insurance under JKN for informal workers costs between IDR 42,000 and IDR 150,000 per month depending on the hospital class, and voluntary pension participation is currently not offered.

Indonesia has made significant improvement in expanding health insurance coverage since 2014, particularly through the PBI-JKN program, which provides subsidized enrollment for nearly 97 million individuals. This expansion has played a key role in improving access to healthcare for informal workers and the general population. However, our empirical analysis is based on data up to 2014, and thus may not fully reflect the post-2014 improvements in healthcare coverage.

To complement social insurance, Indonesia provides several tax-financed assistance programs targeted at the poor. These include the Program Keluarga

Harapan (PKH), a conditional cash transfer scheme; BPNT-Sembako, a food assistance program; and the Program Indonesia Pintar (PIP), a cash transfer for poor students. While these programs are broad in reach, they focus primarily on the poor and not necessarily on informal workers as a distinct group.

Despite these multiple tiers of support, a significant share of informal workers in Indonesia remain without comprehensive social protection. Voluntary enrollment rates are low, and benefit exclusions, particularly for pensions and unemployment, leave many workers more vulnerable to shocks. Although reforms are underway to expand pension coverage (JP) to all employees by 2029, challenges remain in enforcement, affordability, and inclusion.

## Vietnam

Vietnam operates a dual social insurance framework that differentiates formal from informal employment. Formal workers are mandatorily covered by a comprehensive set of benefits, including pensions, occupational accident insurance, unemployment insurance, and health insurance. These are funded through payroll contributions and provide income protection, medical access, and retirement security. The pension system is contributory and requires a minimum number of years to qualify for benefits.

Informal workers are permitted to voluntarily participate in the pension and health insurance systems, but they are excluded from occupational accident and unemployment insurance. While the legal framework allows for voluntary enrollment, actual participation among informal workers is low, largely due to affordability concerns and limited outreach. Moreover, those who do participate typically receive more limited benefits compared to formal workers. This limited access increases informal workers' exposure to income and health shocks, reinforcing reliance on household- or community-based coping mechanisms.

## Labor Formality and Social Protection

In all three countries, formal workers benefit from more comprehensive and mandatory coverage through social insurance systems, while informal workers face restricted access, lower benefits, or no eligibility at all. Voluntary schemes

exist but suffer from low enrollment due to affordability and information barriers. These structural differences are expected to contribute to inequalities in risk exposure and economic resilience between employment sectors and may be important to understanding the observed disparities in earnings and consumption inequality, particularly during economic disruptions like the COVID-19 pandemic.

However, as mentioned in the introduction, our empirical analysis indicates that households relying on informal employment demonstrate a capacity for risk sharing and consumption smoothing comparable to (or even better than) that of formal-worker-headed households.[4]

# 3 Theoretical Background

In the literature seeking to understand risk-sharing mechanisms over the life cycle, structural life-cycle models are typically employed to analyze how households respond to idiosyncratic income shocks (e.g. Storesletten et al., 2004, Kaplan, 2012, and De Nardi et al., 2020). This section provides a theoretical framework linking the life-cycle patterns of earnings and consumption inequality to the underlying structure of risks and insurance in the economy.

We outline a standard life-cycle model with incomplete markets in which households face idiosyncratic labor income risk and can save in a single risk-free asset subject to a borrowing constraint , similar to Storesletten et al. (2004) and De Nardi et al. (2020). Each household chooses consumption and savings to maximize expected lifetime utility given the stochastic income process and the intertemporal budget constraint. We compare the model's predicted life-cycle pattern of consumption inequality with our empirical findings to guide further research on risk sharing and inequality in developing economies.

[4]This may indicate that informal networks and community-based mechanisms play a significant role in mitigating economic shocks, effectively compensating for the absence of formal insurance structures in developing economies. We will discuss this point later. Ambrus, Mobius, and Szeidl (2014) demonstrates a theoretical framework that social networks can serve as collateral to enforce informal insurance, facilitating substantial risk-sharing among community members.

## 3.1 A Standard Life-Cycle Model

The model economy is populated by $J$ overlapping generations, each generation consisting of a continuum of agents. Lifetimes are uncertain. An agent (representing a household, as in the data) enters the economy at age $j = 1$ (corresponding to age 21 for the household head in the data) and exits with certainty at terminal age $J$ (which corresponds to age 75 in the context of our target developing countries). Preferences are identical across agents.

Agents choose consumption ($c$) and asset holdings carried to the next period ($a'$) to maximize their lifetime value ($V(\cdot)$), while facing several uncertainties over their lifetime, including earnings uncertainty (or labor productivity shocks), and mortality risk (with survival probability $\psi_j$ from $j$ to $j+1$).

The maximization problem of an agent (household) at age $j$ can be expressed in a recursive form as follows:

$$V(a,z,j|\gamma) = \max_{c,a'} \Big\{ u(c) + \beta \left[ \psi_j \mathbf{E}\big(V(a',z',j+1|\gamma)\big) \right] \Big\}. \tag{1}$$

s.t.

$$c + a' = y + (1+r)a + TR$$
$$\ln(y) = \gamma + z + w_j$$
$$z = z_j^p + z_j^{tr}, \quad c > 0, \quad a' \geq \underline{a}$$
$$TR = \max\{\underline{c} - [y + (1+r)a - \underline{a}],\ 0\}$$

where $V(\cdot)$ is the value function, which is a function of state variables, including current asset holdings ($a$), age ($j$), earnings shock ($z$); $\beta$ is the time discount factor and $\psi_j$ is a probability of surviving from age $j$ to age $j+1$; $a'$ is the assets carried to the next period; $\mathbf{E}(\cdot)$ is an expectation operator regarding the earnings uncertainty or productivity shocks in the next period ($z'$), and mortality risk (with a survival probability $\psi$). $u(c)$ is the period consumption utility function, which is assumed to have a constant relative risk aversion (CRRA) form: $u(c) = \frac{c^{1-\mu_c}}{1-\mu_c}$ with a risk aversion parameter $\mu_c$.

In the budget constraint, $y$ denotes the household earnings, which are exogenous and characterized by three components – a fixed effect $\gamma$ determined when entering the economy ($\gamma \sim \mathcal{N}(0, \sigma_\gamma^2)$), a stochastic shock process $z$ (a combination of a persistent shock, $z^p$ and a transitory shock $z^{tr}$), and an age-specific

efficiency $w_j$. The persistent shock $z^p$ is assumed to follow an AR(1) process and the transitory shock $z^{tr}$ follows a normal distribution:

$$z_j^p = \rho z_{j-1}^p + \varepsilon^p, \quad \varepsilon^p \sim \mathcal{N}(0, \sigma_p^2), \quad z^{tr} \sim \mathcal{N}(0, \sigma_{tr}^2).$$

Because markets are incomplete, $\underline{a}$ represents the borrowing constraint. Transfers $TR$ represent public or community-provided social insurance designed to ensure that each household can at least achieve the minimum consumption level $\underline{c}$. Specifically, $TR > 0$ if the household cannot afford $\underline{c}$ even after drawing down assets and borrowing up to the limit, i.e., when $\underline{c} - [y + (1+r)a - \underline{a}] > 0$.

At the terminal age $J$, the household's optimization problem becomes:

$$V(a, z, J|\gamma) = \max_{c, a'} u(c) \tag{2}$$

s.t.

$$\begin{aligned} c + a' &= y + (1+r)a + TR \\ \ln(y) &= \gamma + z + w_j \\ c > 0, &\quad a' \geq 0 \\ TR &= \max\{\underline{c} - [y + (1+r)a],\ 0\} \end{aligned} \tag{3}$$

At this stage, borrowing is not allowed ($a' \geq 0$) since households cannot repay debts beyond their lifetime.

In this economy, saving serves as the primary form of self-insurance against idiosyncratic income shocks. Transfers $TR$ (with $\underline{c}$) represent the level of social insurance provided by the government or community, which enhances households' ability to share risk. Borrowing is also a tool to insure against the short-term income shocks for consumption smoothing. In economies without well-developed social insurance and financial systems, the consumption floor $\underline{c}$ and borrowing constraint $\underline{a}$ are often set to zero, meaning that households rely solely on savings to smooth consumption.

## 3.2 Implications for Risk Sharing and Consumption Inequality

Because income shocks are typically persistent, earnings inequality tends to increase with age as households accumulate heterogeneous realizations of shocks.

In the model, this process is governed by the persistence parameter $\rho$ in the stochastic income process.

In the absence of any risk-sharing mechanisms (i.e., when neither insurance nor saving is available), consumption inequality mirrors earnings inequality over the life cycle, as individuals are unable to smooth consumption and must consume what they earn each period. Conversely, in a complete market that provides full insurance, idiosyncratic income shocks are perfectly pooled, and consumption inequality remains constant across age cohorts.

Between these two extremes lies the empirically relevant case of incomplete markets, where saving (asset holdings $a$), borrowing (subject to the constraint $\underline{a}$), and limited access to formal insurance (represented by the consumption floor $\underline{c}$) allow for only partial risk sharing. In such an environment, consumption inequality gradually increases with age as households experience cumulative idiosyncratic shocks that cannot be fully smoothed. The degree to which consumption inequality diverges from earnings inequality thus serves as an empirical indicator of the extent of risk sharing in the economy.

We use the above model to conduct simple simulations that illustrate how earnings and consumption inequalities evolve under different degrees of insurance. For illustration, we have agents ex-ante identical in the model and adopt the parameter values used by Storesletten et al. (2004): $\mu = 2$, $\sigma_\gamma^2 = 0.21$, $\rho = 0.99$, $\sigma_p^2 = 0.0161$, and $\sigma_{tr}^2 = 0.0630$. In all scenarios, the earnings shocks are identical, such that the patterns of earnings inequality are the same across simulations; only the degree of insurance differs, allowing us to isolate how consumption inequality responds to varying levels of risk sharing.

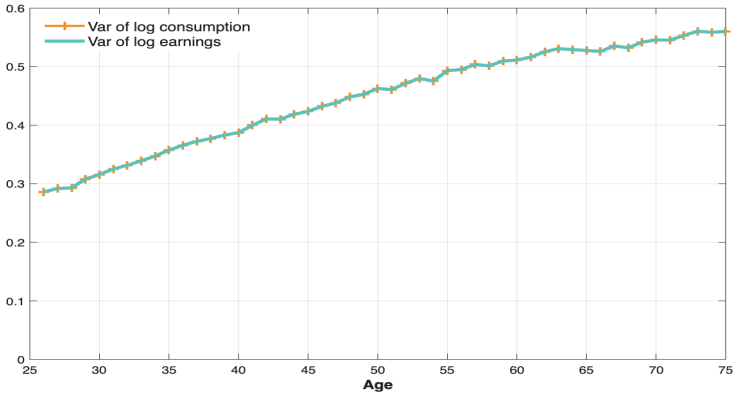
Panel (a) of Figure 1 depicts the no-insurance case, in which neither saving nor borrowing is allowed (i.e., asset holdings $a$ are forced to be zero in all periods). In this scenario, households consume exactly what they earn each period, and thus the pattern of consumption inequality (measured by the variance of log consumption by age) closely mimics that of earnings inequality (measured by the variance of log earnings).

Panel (b) shows the full-insurance case, in which ex-ante identical households can trade a contingent asset that guarantees a constant level of consumption equal to expected earnings. Because shocks are purely idiosyncratic and

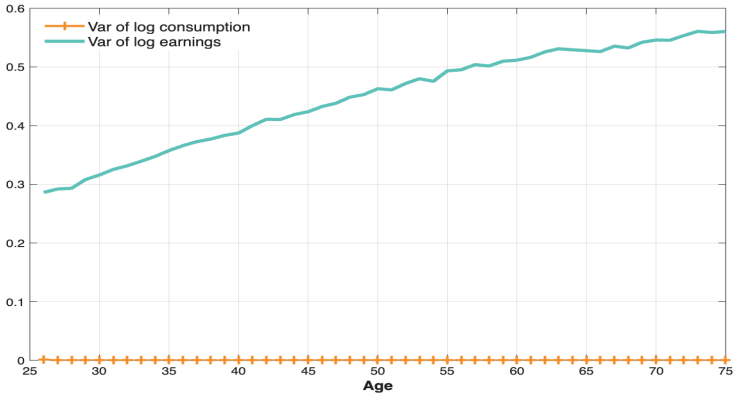
symmetric, households can perfectly insure against income fluctuations. As a result, consumption remains constant regardless of income uncertainty, and the variance of log consumption is zero at all ages.

Panel (c) presents the partial-insurance case, where households face idiosyncratic earnings shocks and become increasingly heterogeneous over time. They can smooth consumption partially through savings, limited borrowing, and the social safety net represented by the consumption floor. For illustration, we set the borrowing constraint $\underline{a}$ at $-10\%$ of average earnings and the consumption floor $\underline{c}$ at 10% of average earnings, reflecting a modest level of financial access and social insurance. In this scenario, households are able to smooth consumption to some extent; consumption inequality still increases with age but remains below earnings inequality.

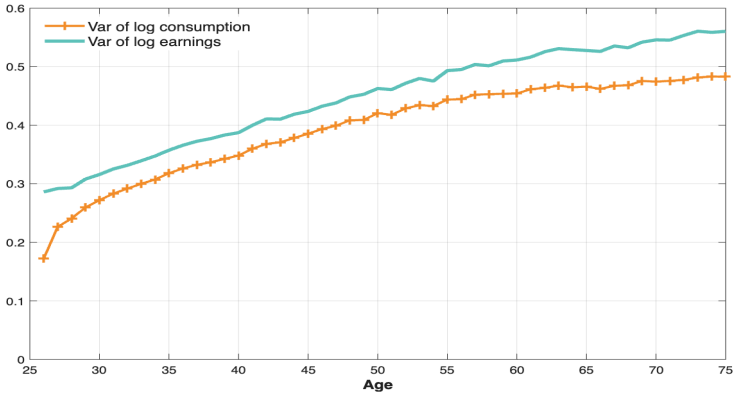
Overall, these cases imply that the extent of divergence between earnings and consumption inequality over the life cycle reflects the degree of risk sharing available to households. Economies with underdeveloped financial markets or limited social protection (typical characteristics of many developing countries) are therefore expected to exhibit consumption-inequality profiles resembling the no-insurance or low-insurance cases. Nevertheless, the actual degree of risk sharing is ultimately an empirical question, which we address in the following analysis.




(a) No Insurance




(b) Full Insurance




(c) Partial Insurance

Figure 1: Variances of log household earnings/consumption with various insurance levels (examples for illustration)

# 4 Data and Empirical Strategy

## 4.1 Data

For our main analysis, we use data from the Thai Household Socio-Economic Survey (SES), a repeated cross-sectional and nationally representative survey conducted biennially by Thailand's National Statistical Office (NSO) between 2011 and 2021. The survey sample expanded over time, covering approximately 42,000 households in the earlier years and around 55,000 households in more recent waves. To study baseline inequality patterns, we focus on the 2011–2019 surveys, isolating the pre-COVID period. The 2021 survey is then used to assess the effects of the COVID-19 pandemic on household earnings and consumption inequality. For robustness, we complement the Thai analysis with data from Indonesia and Vietnam, two developing economies where informal employment accounts for over 70% of total employment. Specifically, we use the Indonesia Family Life Survey (IFLS), covering 83% of the Indonesian population and spanning three waves from 2000 to 2014, and the nationally representative Vietnam Household Living Standards Surveys (VHLSS) from 2010 to 2018, collected at two-year intervals.

The primary objective of our research is to estimate patterns of earnings and consumption inequality across different age groups. We follow the approach employed by Deaton and Paxson (1994), who were pioneers in investigating this subject in the literature, and Storesletten et al. (2004) to estimate inequalities with removing cohort effects. We further investigate the age patterns of inequality by household heads' employment types (formal and informal). To be consistent for comparison, we use the same measure of inequality for consumption and earnings.

## 4.2 Sample Selection and Measurement

We select only households headed by males aged between 26 and 75 years. The lower bound of age 26 is chosen to ensure that individuals have typically completed their formal education and entered the labor market. This also allows for a sufficient number of observations within each age group to estimate inequality

measures more precisely. Observations are limited for household heads younger than age 26 or older than age 75. Additionally, to mitigate potential bias caused by outliers, we exclude the top and bottom 1% of earners from our analysis.

Our measure of household earnings includes: (1) monetary labor income, such as pre-tax wages and salaries (including overtime, bonuses, and employee welfare), net profits from businesses for self-employed individuals, and net farming profits; (2) in-kind compensation, like goods, beverages, and services; and (3) other sources of revenue, such as educational scholarships, inheritances, gifts, and proceeds from various types of insurance, as well as other miscellaneous sources like lottery winnings, commissions, and gambling.

Regarding household consumption measurement, we follow Deaton and Paxson (1994) and Storesletten et al. (2004), focusing solely on non-durable and non-medical consumption. All households' expenditures reported in the survey, which are for non-durable and non-medical goods and services, are included. All values of expenditures are adjusted to the 2019 price level using the Headline Consumer Price Index (HCPI). Negative values of earnings and consumption are excluded from the sample to prevent the distortion for misreports.

In the context of developing economies, we classify observations into formal-worker and informal-worker households using harmonized but country-specific definitions based on institutional coverage. The classification we use is consistent with definitions employed by the ILO, and is also based on the information available in the respective household surveys:

- In **Thailand**, household heads are classified as formal workers if they are enrolled under *Article 33 of the Social Security Act* (i.e., they possess a social security card) or are public servants covered by civil service pension and welfare schemes. Those who do not meet either criterion are considered informal.

- In **Indonesia**, household heads are classified as formal workers if they are enrolled in *BPJS-TK* for employment-related benefits and *BPJS Kesehatan* for health insurance, or employed in the public sector with civil servant benefits. Those not receiving employer- or state-provided medical or employment-related benefits are informal.

- In **Vietnam**, household heads are classified as formal workers if they are enrolled in the *mandatory social insurance system*, which includes employer contributions for pensions, health insurance, and unemployment insurance. Individuals lacking this coverage or employer/government-provided welfare are considered informal.

In all three countries, retirees are considered formal if they receive public or employer-based pension benefits.

Tables 1 to 5 provide basic descriptive statistics for households in Thailand, Indonesia, and Vietnam in our sample, summarizing household head's characteristics, including age, education, and employment status, and household location, income and consumption levels. Several key patterns are observed. First, informal employment remains prevalent: 59% of Thai heads were informal workers during 2011–2019, increasing to 67% in 2021; similar patterns are observed in Indonesia (79%) and Vietnam (77%).

Second, household heads with formal employment tend to have higher educational attainment than those with informal employment. For example, in Thailand during 2011–2019, 30% of formal-sector household heads had a college degree or higher, compared to only 4% among informal-sector household heads. Similar patterns are observed in both Indonesia and Vietnam.

Third, educational attainment improves across birth cohorts: in Thailand, the share of household heads with below high school education declines steadily across cohorts, from 84% for those born in 1951–1960 to 61% for the 1971–1980 cohort. Over the same period, the share with college education or higher increases from 9% to 21%, indicating an overall trend toward higher educational attainment among younger generations. Indonesia displays a comparable pattern of educational improvement across cohorts. In Vietnam, however, the shift in education levels across birth cohorts is more limited. The share of household heads with below high school education remains high across all groups, falling only slightly from 77.9% to 73.0%, while the proportion with college education increases modestly from 9.4% to 9.6%.

Fourth, households with heads having formal jobs consistently have higher household earnings. For example, in Thailand, households with formal-worker heads earned on average 407,995 THB/year, compared to 250,626 THB/year for

Table 1: Descriptive Statistics of Sample Households (Thailand)

| | 2011 - 2019 (Benchmark) | 2021 (COVID period) |
|---|---|---|
| Age of head (distribution) | | |
| 26-30 | 6% | 5% |
| 31-40 | 21% | 17% |
| 41-50 | 31% | 26% |
| 51-60 | 29% | 31% |
| 61-75 | 14% | 22% |
| Education of head (distribution) | | |
| Low | 71% | 69% |
| Middle | 14% | 15% |
| High | 15% | 16% |
| Employment status of head (distribution) | | |
| Formal | 41% | 33% |
| Informal | 59% | 67% |
| Location of households (distribution) | | |
| Urban | 42% | 46% |
| Rural | 58% | 54% |
| Annual earnings (THB/year) | | |
| Mean | 315,786 | 320,352 |
| Std | 401,805 | 477,420 |
| Annual consumption* (THB/year) | | |
| Mean | 102,417 | 156,344 |
| Std | 83,042 | 120,439 |
| Number of family members | | |
| Mean | 3.07 | 2.85 |
| Std | 1.51 | 1.50 |
| Number of Children (age 15 and below) | | |
| Mean | 0.60 | 0.47 |
| Std | 0.85 | 0.78 |
| Number of Elderly (age 60 and above) | | |
| Mean | 0.33 | 0.47 |
| Std | 0.65 | 0.75 |

Note: Low: Below high school; Middle: High school graduates; High: College and above. *consumption does not include durable and medical expenditures.

Table 2: Descriptive Statistics of Thai Households (by Head's Employment)

| | 2011 - 2019 | | 2021 (COVID period) | |
|---|---|---|---|---|
| | Formal-worker head | Informal-worker head | Formal-worker head | Informal-worker head |
| Age of head (distribution) | | | | |
| 26-30 | 10% | 4 % | 8% | 4% |
| 31-40 | 28% | 16 % | 26% | 12% |
| 41-50 | 31% | 30 % | 30% | 24% |
| 51-60 | 25% | 31 % | 26% | 33% |
| 61-75 | 7% | 19 % | 9% | 27% |
| Education of head (distribution) | | | | |
| Low | 50% | 87% | 42% | 82% |
| Middle | 21% | 9% | 22% | 12% |
| High | 30% | 4% | 36% | 6% |
| Location of households (distribution) | | | | |
| Urban | 59% | 30% | 64% | 37% |
| Rural | 41% | 70% | 36% | 63% |
| Annual earnings (THB/year) | | | | |
| Mean | 407,995 | 250,626 | 454,249 | 254,492 |
| Std | 424,973 | 371,022 | 404,770 | 496,285 |
| Annual consumption (THB/year) | | | | |
| Mean | 129,256 | 83,451 | 218,664 | 131,929 |
| Std | 96,745 | 65,470 | 142,057 | 100,820 |
| Number of family members | | | | |
| Mean | 2.69 | 3.34 | 2.49 | 3.03 |
| Std | 1.41 | 1.52 | 1.36 | 1.54 |
| Number of Children (age 15 and below) | | | | |
| Mean | 0.44 | 0.71 | 0.34 | 0.53 |
| Std | 0.75 | 0.90 | 0.66 | 0.83 |
| Number of Elderly (age 60 and above) | | | | |
| Mean | 0.20 | 0.42 | 0.26 | 0.57 |
| Std | 0.52 | 0.71 | 0.60 | 0.80 |

Note: Low: Below high school; Middle: High school graduates; High: College and above

*consumption does not include durable and medical expenditures.

Table 3: Descriptive Statistics of Sample Households by Birth Cohort
(Thailand, 2011–2019)

| | Household head born in | | |
|---|---|---|---|
| | 1951–1960 | 1961–1970 | 1971–1980 |
| **Education of head** | | | |
| Low | 84% | 71% | 61% |
| Middle | 7% | 14% | 18% |
| High | 9% | 15% | 21% |
| **Employment status of head** | | | |
| Formal | 27% | 39% | 52% |
| Informal | 73% | 61% | 48% |
| **Location of household** | | | |
| Urban | 33% | 40% | 49% |
| Rural | 67% | 60% | 51% |
| **Annual earnings (THB/year)** | | | |
| Mean | 318,581 | 346,792 | 339,935 |
| Std | 498,520 | 405,516 | 408,425 |
| **Annual consumption** | | | |
| Mean | 100,682 | 112,044 | 109,872 |
| Std | 84,847 | 90,011 | 84,958 |
| **Number of family members** | | | |
| Mean | 3.35 | 3.22 | 2.99 |
| Std | 1.59 | 1.44 | 1.41 |
| **Number of children** | | | |
| Mean | 0.58 | 0.58 | 0.78 |
| Std | 0.86 | 0.81 | 0.91 |
| **Number of elderly** | | | |
| Mean | 0.45 | 0.10 | 0.09 |
| Std | 0.68 | 0.34 | 0.33 |

Table 4: Descriptive Statistics of Sample Households (Indonesia)

| | All | By head's employment | | By head's birth year | | |
|---|---|---|---|---|---|---|
| | | Formal-worker | Informal-worker | 1951–60 | 1961–70 | 1971–80 |
| **Age of head** | | | | | | |
| 26–30 | 14.40% | 16.60% | 13.79% | – | – | – |
| 31–40 | 35.71% | 38.50% | 34.95% | – | – | – |
| 41–50 | 28.48% | 28.22% | 28.56% | – | – | – |
| 51–64 | 21.41% | 16.67% | 22.70% | – | – | – |
| **Education of head** | | | | | | |
| Low | 59.88% | 23.97% | 69.69% | 78.72% | 74.55% | 56.05% |
| Middle | 28.47% | 47.15% | 23.37% | 13.47% | 16.34% | 30.62% |
| High | 11.65% | 28.89% | 6.94% | 7.81% | 9.11% | 13.33% |
| **Employment status of head** | | | | | | |
| Formal | 21.48% | – | – | 18.03% | 19.48% | 21.91% |
| Informal | 78.52% | – | – | 81.97% | 80.52% | 78.09% |
| **Location of household** | | | | | | |
| Urban | 54.60% | 73.93% | 49.31% | 47.49% | 52.24% | 53.70% |
| Rural | 45.40% | 26.07% | 50.69% | 52.51% | 47.76% | 46.30% |
| **Annual earnings** | | | | | | |
| Mean | 30,164 | 45,291 | 26,027 | 27,424 | 34,508 | 30,523 |
| Std | 29,862 | 33,783 | 27,274 | 27,485 | 32,947 | 30,243 |
| **Annual consumption** | | | | | | |
| Mean | 13,072 | 19,341 | 11,358 | 10,177 | 12,477 | 13,120 |
| Std | 12,463 | 14,870 | 11,121 | 10,333 | 12,383 | 12,740 |
| **Number of family members** | | | | | | |
| Mean | 4.18 | 4.03 | 4.22 | 4.64 | 4.57 | 4.38 |

Note: Low: Below high school; Middle: High school graduates; High: College and above
*consumption does not include durable and medical expenditures.

Table 5: Descriptive Statistics of Sample Households (Vietnam)

| | All | By head's employment | | By head's birth year | | |
|---|---|---|---|---|---|---|
| | | Formal-worker | Informal-worker | 1951–60 | 1961–70 | 1971–80 |
| **Age of head** | | | | | | |
| 26–30 | 4.66% | 5.22% | 4.50% | – | – | – |
| 31–40 | 24.49% | 24.66% | 24.44% | – | – | – |
| 41–50 | 34.81% | 28.91% | 36.58% | – | – | – |
| 51–64 | 36.04% | 41.21% | 34.48% | – | – | – |
| **Education of head** | | | | | | |
| Low | 75.36% | 36.75% | 86.99% | 77.93% | 76.21% | 73.00% |
| Middle | 15.72% | 29.88% | 11.46% | 12.67% | 16.15% | 17.42% |
| High | 8.92% | 33.37% | 1.56% | 9.39% | 7.64% | 9.58% |
| **Employment status of head** | | | | | | |
| Formal | 23.16% | – | – | 20.97% | 19.30% | 30.47% |
| Informal | 76.84% | – | – | 79.03% | 80.70% | 69.53% |
| **Location of household** | | | | | | |
| Urban | 30.04% | 57.02% | 21.90% | 27.51% | 30.72% | 36.03% |
| Rural | 69.96% | 42.98% | 78.10% | 72.49% | 69.28% | 63.97% |
| **Annual earnings** | | | | | | |
| Mean | 55,575 | 90,280 | 45,113 | 54,447 | 56,132 | 58,007 |
| Std | 42,514 | 45,510 | 35,432 | 41,175 | 42,809 | 45,272 |
| **Annual consumption** | | | | | | |
| Mean | 14,855 | 19,779 | 13,371 | 14,108 | 15,806 | 15,977 |
| Std | 9,902 | 10,742 | 9,128 | 9,325 | 10,248 | 10,385 |
| **Number of family members** | | | | | | |
| Mean | 4.11 | 3.75 | 4.21 | 4.18 | 4.11 | 4.06 |

Note: Low: Below high school; Middle: High school graduates; High: College and above
*consumption does not include durable and medical expenditures.

households with informal-worker heads during 2011–2019. In addition, households with formal-worker heads are more likely to live in urban areas (59% versus 30%). Similar patterns are also observed in Indonesia and Vietnam.

## 4.3 Methodology

Following the methodology in Deaton and Paxson (1994) and Storesletten et al. (2004), we compute the variance of log household earnings and the variance of log household consumption with removing cohort effects by dummy-variable regressions. A 'cohort' is defined as that all households with a head of a given age born in the same year. Therefore, the measures of cross-sectional dispersion are net of dispersion which is unique to a given cohort.

In Deaton and Paxson (1994) and Storesletten et al. (2004), they assume that the deviation of log household earnings or consumption can be decomposed to age and cohort effects. They use a regression of raw variances on age and cohort dummies to recover the age and cohort effects. They then scale the age effects so that, on average, the age effects match the unconditional variance of some reference age group (Storesletten et al. (2004) use age 42).

We first conduct an investigation with the same approach as in Storesletten et al. (2004). The regression model is specified as follows:

$$Y_j^c = \alpha_c + \beta_j + \varepsilon, \tag{4}$$

where the dependent variable, $Y_j^c$, is variance of log earnings or log consumption for households with a head in age $j$ and birth cohort $c$. $\alpha_c$ captures the cohort effect, $\beta_j$ captures the age effect for households with a head in age $j$, and $\varepsilon$ is the residual with mean zero.

In our analysis, there are 50 ages dummies covering ages 26 to 75, 2 employment sectors (formal and informal) and 12 cohort dummies indicating twelve 5-year cohort groups from 1936-1940 to 1991-1995 for household heads. For example, the cohort 1 dummy is equal to 1 if the household head was born during the period from 1991 to 1995, and 0 otherwise.

The net-of-cohort-effect measure $\widehat{Y}_j$ is constructed by using the result from the above regression with removing $\alpha_c$ and with a normalization parameter so

that the measure matches the unconditional variance of age group 42 (following Storesletten et al. (2004) for the reference age):

$$\widehat{Y_j} = \beta_j + m, \tag{5}$$

where $m$ is a parameter used to scale up the net-of-cohort-effect variances so that $(\widehat{Y_j}|\, j = 42)$ is equal to $E(Y_j^c|\, j = 42)$.

We further extend the approach to investigate the role of labor informality: the dependent variable $Y_{js}^c$, i.e. variance of log earnings or log consumption, for households with a head in age $j$, employed in sector $s$ and born in a cohort period $c$ is modeled as follows:

$$Y_{js}^c = \alpha_c + \beta_{js} + \varepsilon. \tag{6}$$

$\alpha_c$ captures the cohort effect, $\beta_{js}$ captures the age effect for households with a head in age $j$ conditional on employment sector $s$, and $\varepsilon$ is the residual with mean zero.

The net-of-cohort-effect measure $\widehat{Y_{js}}$ is constructed similarly by using the result from the above regression with removing $\alpha_c$ and with sector specific normalization parameters.

$$\widehat{Y_{js}} = \beta_{js} + m_s, \tag{7}$$

where $m_s$ is a sector specific parameter used to scale up the net-of-cohort-effect variances so that $(\widehat{Y_{js}}|\, j = 42)$ is equal to $E(Y_{js}^c|\, j = 42, s)$ conditional on household head's sector $s$.

# 5 Earnings and Consumption Inequality Patterns

We first investigate the patterns of household earnings and consumption inequality over age according to the regression model (7) with the Thai SES data from 2011 to 2019 to isolate the effects of the COVID-19 pandemic. The inequality measure is according to Equation (5). Figure 2 presents the results and a comparison with the patterns of the US households reported in Storesletten et al. (2004). We find that the patterns of inequality of earnings and consumption among working-age households in Thailand align with patterns observed in

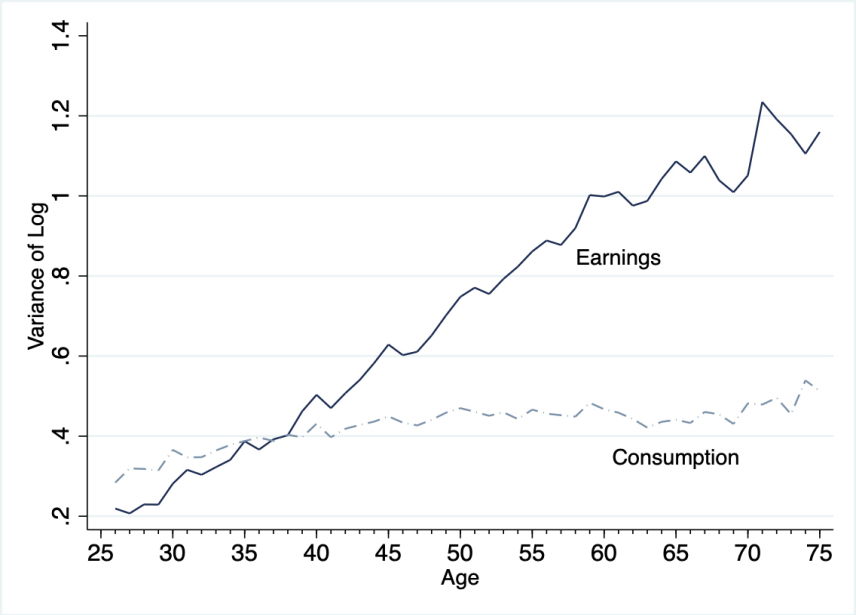
the U.S. Both earnings and consumption inequality measures increase over age, and the growth of earnings inequality surpasses that of consumption inequality. However, unlike the U.S., where earnings inequality declines after retirement, earnings inequality in Thailand continues to rise beyond the retirement age. Furthermore, consumption inequality in Thailand is not consistently lower than earnings inequality across all ages, particularly before age 35. Theoretically, this suggests that younger households in Thailand have limited capabilities to insure against earnings risk.

Our benchmark estimation extends the above investigation. Specifically, we estimate the regression model in Equation (6) using the same 2011–2019 SES data. This specification allows us to analyze inequality patterns jointly by household head's age and employment sector. Figure 3 presents the results, displaying the variance of log household earnings (solid lines) and log consumption (dashed lines) for each age group, separately for (a) formal-worker-headed households and (b) informal-worker-headed households.[5]

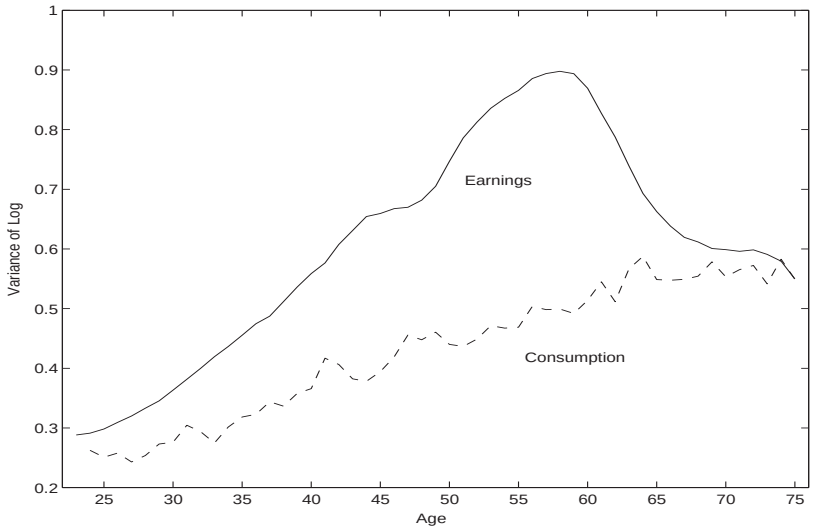
We find that the age patterns of inequality of earnings and consumption conditional on household heads with formal employment in Thailand are similar to the aggregate patterns as shown in Figure 2 (a). The patterns also theoretically imply that younger households with formal-worker heads have limited capabilities to insure against earnings risk.

Contrasting this with the pattern conditional on household heads with informal employment in Thailand, shown in panel (b) of Figure 3, reveals that the inequality pattern of consumption is relatively flatter compared to that conditional on formal-worker-headed households. Moreover, the consumption inequality is generally lower than the earnings inequality, theoretically indicating a relatively higher degree of risk sharing. This finding is surprising and counters our initial expectation, given that informal workers typically lack employment protection and government-provided welfare.

[5]The detailed regression results and the original variances of log household earnings and consumption without removing cohort effects are presented in the appendix.

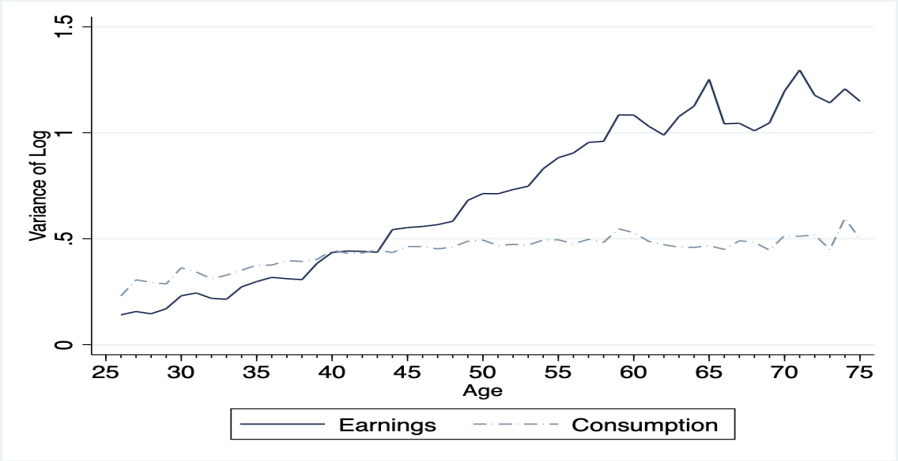



(a) Thai households (SES, 2011-19)




(b) US households from Storesletten et al. (2004)

Figure 2: Variances of log household earnings/consumption, Thailand and the US




(a) Formal-worker headed households


(b) Informal-worker headed households

Figure 3: Variances of log household earnings/consumption, Thailand (2011-19)

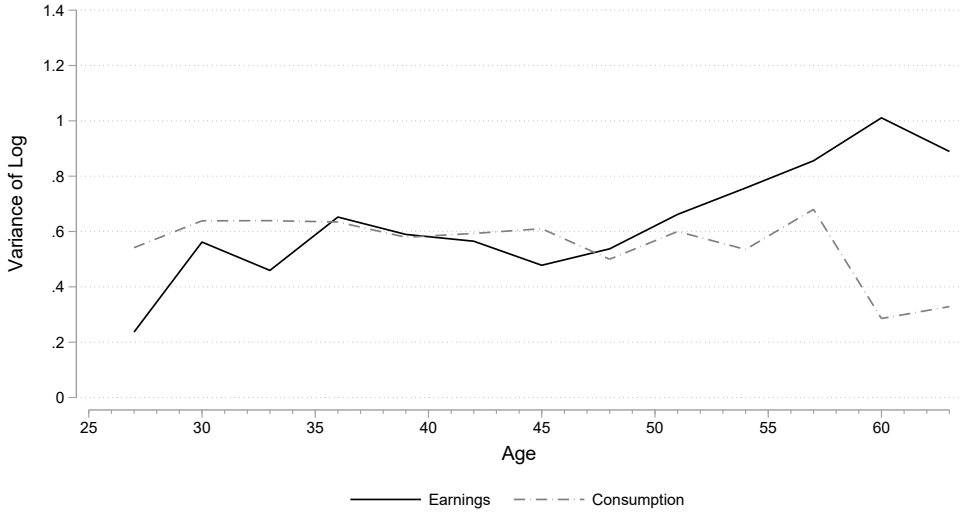
We further apply the same methodology to Indonesia and Vietnam. Because the sample sizes are smaller and the number of observations for old households is limited, we use dummies of 3-year age groups covering from age 26 to 64, instead of dummies for each age. Figure 4 illustrates the earnings and consumption inequality over age conditional on (a) formal-worker headed households and (b) informal-worker headed households in Indonesia. Similarly, Figure 5 presents the same inequalities for Vietnam. In these figures, solid lines represent the variance of log household earnings over age, while dashed lines represent the

variance of log household consumption over age. The key characteristics align closely with the case of Thailand:

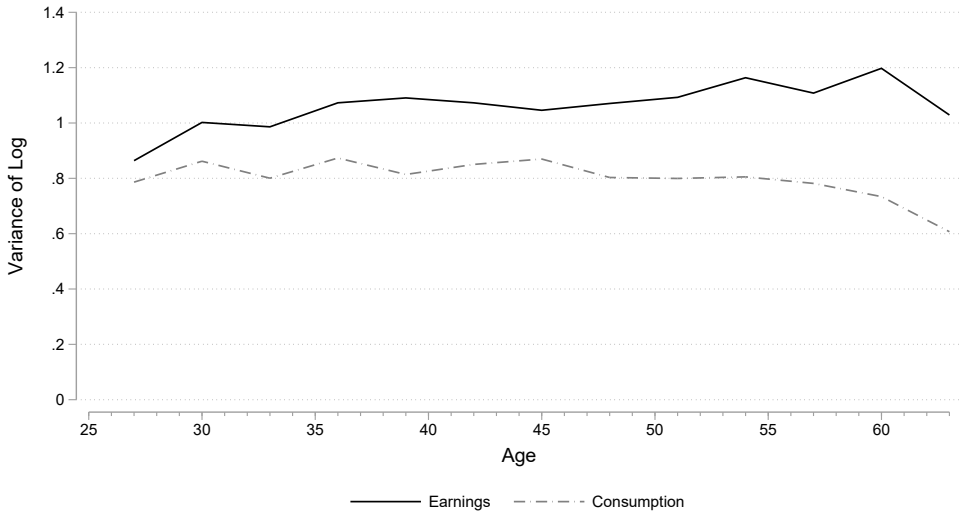
(1) Conditional on household heads with formal employment, both earnings inequality and consumption inequality increase with age. However, consumption inequality is not consistently lower than earnings inequality for younger households. In Indonesia, consumption inequality roughly mirrors earnings inequality from ages 26 to 50 (see panel (a) of Figure 4). In Vietnam, consumption inequality is also not less than earnings inequality between ages 26 to 50 (see panel (a) of Figure 5).

(2) Conditional on household heads with informal employment, the pattern of earnings and consumption inequality is markedly flatter compared to that conditional on formal-worker household heads. Moreover, consumption inequality is generally lower than earnings inequality among informal-worker-headed households, theoretically implying a greater ability to insure consumption against earnings risk.

These patterns raise questions about the risk-sharing mechanisms among households with informal-worker heads in developing countries, and point to the necessity for further investigation. We leave this question for future research and shift our focus to the impact of the COVID-19 crisis for now.

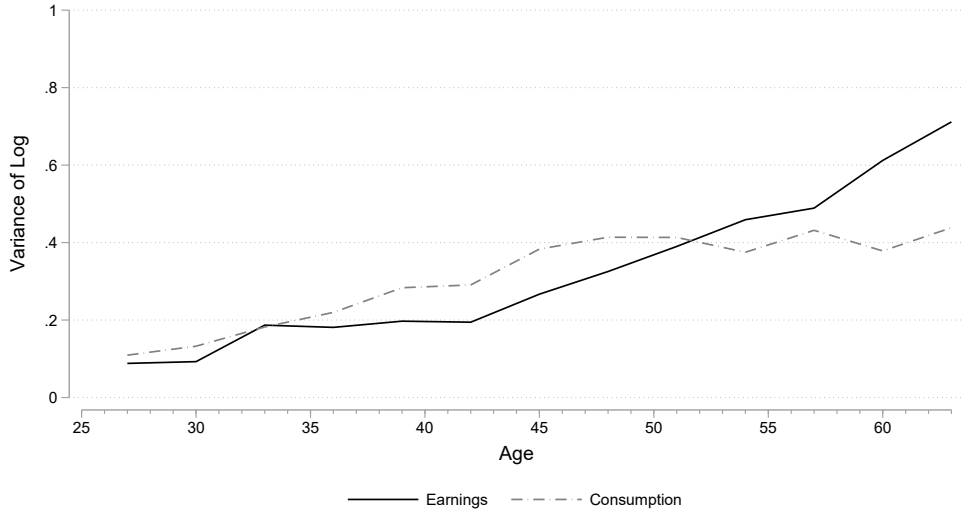



(a) Formal-worker headed households

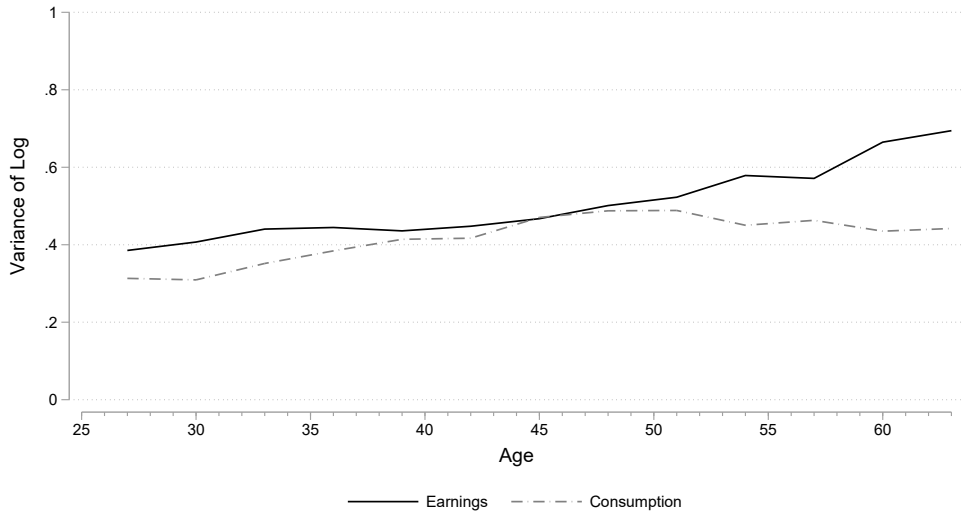



(b) Informal-worker headed households

Figure 4: Variances of log household earnings/consumption, Indonesia (2000 - 2014)




(a) Formal-worker headed households




(b) Informal-worker headed households

Figure 5: Variances of log household earnings/consumption, Vietnam (2010-18)

# 6 Impacts of the COVID-19 Crisis

The COVID-19 pandemic disrupted economic activity across the globe, with wide-ranging impacts on labor markets and household well-being. In particular, the crisis affected earnings through job losses, reduced working hours, and business closures, while also influencing consumption through uncertainty, mobility restrictions, and changes in household income and behavior. These disruptions likely affected not only the average levels of earnings and consumption, but also their dispersion across demographic and employment groups. In response to the crisis, many governments, including in developing countries such as Thailand, implemented emergency measures such as cash transfers, utility subsidies, and expansions of social assistance programs. These interventions may also have influenced inequality patterns.

Having obtained the most recent Thai SES data from 2021—a year still affected by the COVID-19 pandemic—we examine whether the patterns of earnings and consumption inequality shifted during this period. To this end, we extend our benchmark model to include the 2021 data and estimate the impact of the pandemic on the variances of log household earnings and consumption across age groups and employment sectors of household heads.

The regression model is specified as follows. The dependent variable $Y^c_{jst}$ denotes the variance of log household earnings or variance of log household consumption for households with a head in age group $j$, employed in sector $s$, surveyed in year $t$, and born in 5-year cohort $c$:

$$Y^c_{jst} = \alpha_c + \alpha_{covid} \cdot \text{COVID} + \beta_{js} + \gamma_{js} \cdot \text{COVID} + \varepsilon, \tag{8}$$

where COVID is a dummy variable equal to 1 for the year 2021 and 0 otherwise. This specification allows us to test whether the COVID-19 shock altered the age-specific inequality patterns.

The estimated overall effect of the pandemic on inequality is negative: $\alpha_{covid}$ is -0.052 for the variance of log earnings and -0.087 for the variance of log consumption, both statistically significant at the 1% level. However, when combined with the age-sector interaction terms $\gamma_{js}$, the total effect becomes significantly positive (i.e. $\alpha_{covid} + \gamma_{js} > 0$) for specific groups. In particular, the vari-

ance of log earnings increases significantly for households with older formal-worker heads (aged 60 and above), while the variance of log consumption rises significantly for both younger households (headed by either formal or informal workers under age 40) and older formal-worker-headed households above age 65. The results are presented in Figure 6, and detailed estimates of $\alpha_{covid}$ and $\gamma_{js}$ are reported in Table 8 in the appendix. We also conduct a joint F-test to assess the overall significance of the regression models with the inclusion of the COVID dummy. For the model of log earnings variance, the test yields an F-statistic of 808.30 with degrees of freedom (100, 100675). For the model of log consumption variance, the F-statistic is 4413.6, with the same degrees of freedom. In both cases, the associated p-values are less than 0.0001, indicating that the null hypothesis—that all coefficients associated with the COVID dummy are jointly zero—is strongly rejected at the 1% significance level.

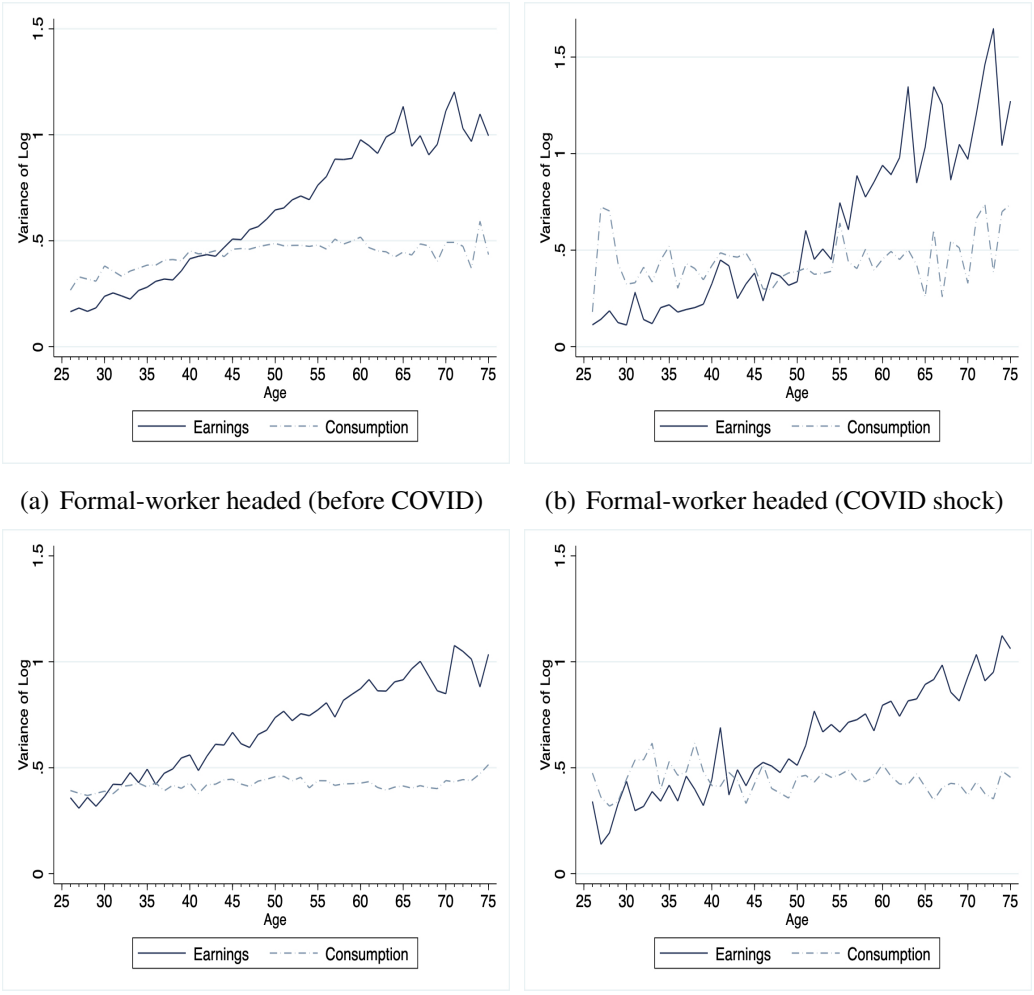
These results suggest a deterioration in consumption risk-sharing for the young and for older formal-sector households during the pandemic period. For other groups, the patterns remain relatively stable, although they appear more volatile. This increased volatility likely reflects the limited data availability during the COVID-19 period, as only one year of observations is included and sample sizes are smaller.

One potential interpretation for the negative general COVID effects on earnings and consumption inequality in 2021 (i.e., the negative $\alpha_{covid}$ estimates) is that they may partly reflect the impact of expanded social welfare programs and government support introduced during the pandemic. These temporary measures may have helped cushion income shocks for lower-income or more vulnerable groups, thereby reducing overall dispersion in the short run.

However, when examining the total effects on each age group conditional on household head's employment type ($\alpha_{covid} + \gamma_{js}$), we find significant increases in inequality for specific demographic groups. For example, some older formal workers may have continued to receive stable pensions or salaries, while others, particularly those still in wage employment, might have experienced job disruptions or (forced) early retirement during the pandemic. These differing experiences may have widened the earnings distribution among older formal-worker headed households. In contrast, informal older workers may have already earned

at lower and more stable levels, resulting in limited changes in dispersion.

The increase in consumption inequality among younger households may reflect life-cycle vulnerabilities. Younger households, being earlier in the life cycle, often have less accumulated wealth and more unstable employment, making them less able to smooth consumption in the face of economic disruptions, such as the COVID-19 pandemic. Further research will be needed to empirically identify the true mechanisms underlying these observed patterns.




(a) Formal-worker headed (before COVID)

(b) Formal-worker headed (COVID shock)

(c) Informal-worker headed (before COVID)

(d) Informal-worker headed (COVID shock)

Figure 6: Variances of log household earnings/consumption, Thailand (with COVID-19 shock), 2011-2021

# 7 Model v.s. Data: Implications for Structural Analyses

To gain deeper insights from our empirical findings through a structural perspective, we use the standard incomplete-markets life-cycle model as described in Section 3 to conduct a quantitative exercise and compare the model predicted evolution of consumption inequality with the observed pattern from our main empirical analysis for Thailand, as shown in Figure 2 (a).

In this quantitative illustration, we calibrate four shock parameters governing the stochastic income process in the model: shock persistence $\rho = 0.99$, variance of the persistent shock $\sigma_p^2 = 0.055$, variance of the transitory shock $\sigma_{tr}^2 = 0.150$, and variance of the fixed effects $\sigma_\gamma^2 = 0.010$, so that the resulting age profile of earnings inequality closely matches the empirical pattern (variance of log earnings in panel (a) of Figure 2). To reflect the institutional context of a developing economy, we set both the borrowing limit $\underline{a}$ and minimum consumption level $\underline{c}$ to zero, capturing limited credit access and the absence of formal social insurance. All other parameters remain as specified in Section 3. Given these parameters, we simulate the model for 100,000 agents over the life cycle. The resulting profiles of earnings and consumption inequality are presented in Figure 7.

Figure 7 compares the model-generated and empirical variances of log earnings and consumption. The model replicates the empirical earnings inequality profile closely (see the black solid line and blue circles), since the income process is calibrated to match the data. In contrast, the consumption inequality patterns display a clear and systematic divergence between the model and the data (see the green dashed line and red crosses), and this divergence varies notably over the life cycle.

For young households (ages 25–40), the model predicts lower consumption inequality than what is observed in the data. This divergence could reflect heterogeneity in non-earnings endowments (such as initial assets, education, and parental financial support) as well as unmodeled expenditure shocks, including housing costs and child-related expenses. These sources of variation are absent in the model but likely contribute to greater consumption dispersion among

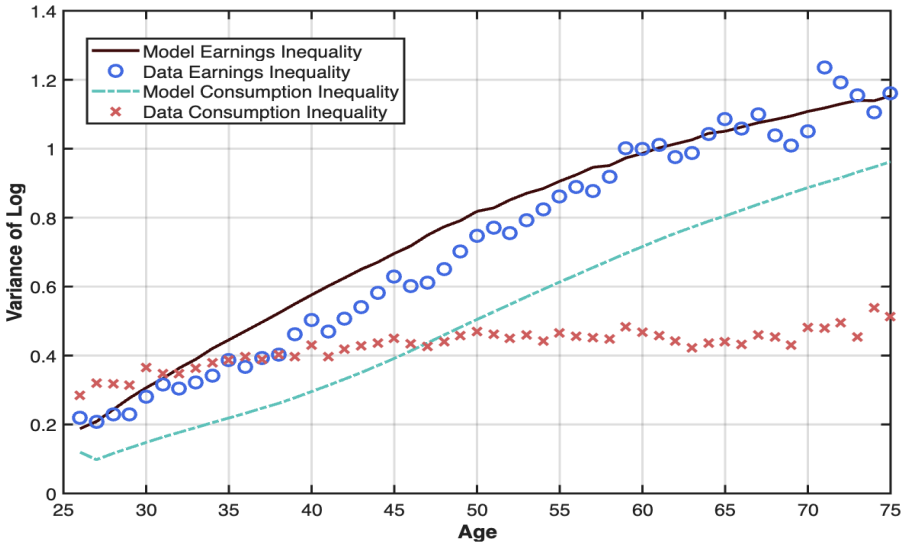



Figure 7: Variances of log household earnings/consumption: Model v.s. Data

younger households.

For older households (ages 50+), the model predicts a steep increase in consumption inequality, reflecting accumulated income shocks and widening wealth dispersion. In contrast, the empirical consumption inequality rises only modestly and remains comparatively flat. This divergence suggests that informal insurance mechanisms, such as kinship-based financial support, intergenerational transfers, and community-based mutual-help networks, might play a meaningful role in mitigating idiosyncratic shocks and compressing consumption dispersion in later life. These mechanisms are particularly relevant in the context of developing economies and require further research to be identified and quantitatively assessed.

Understanding these deviations is essential for designing structural models that more accurately capture consumption smoothing behavior, especially in settings where informal networks and family support play a significant role in developing economies.

# 8 Conclusion

This study investigates how inequality in consumption and earnings changes with age in developing economies that provides insights into the level of risk sharing for households in the absence of a well-developed social security system. Additionally, in light of the substantial impact of the prolonged COVID-19 pandemic since 2020, we investigate whether there have been any changes in earnings and consumption inequality during this crisis.

Using household survey data from Thailand, with robustness checks from Indonesia and Vietnam, we document several key findings. In Thailand, earnings and consumption inequality both increase with age during prime working years, resembling patterns observed in developed countries such as the U.S., but earnings inequality continues to rise even after the retirement age. When we disaggregate by the household head's employment sector, we find that formal-worker-headed households exhibit consumption inequality that is not consistently lower than earnings inequality at younger ages, suggesting limited risk-sharing capacity. In contrast, informal-worker-headed households display flatter consumption-inequality profiles, indicating a relatively strong degree of informal risk sharing despite the absence of formal protection systems. During the COVID-19 pandemic, overall earnings and consumption inequality declined, but consumption inequality increased among younger households, highlighting vulnerabilities within this group.

To provide structural insights alongside our empirical findings, we employ a standard life-cycle model calibrated to match the observed age profile of earnings inequality. The model, however, understates consumption inequality for younger households and overstates its increase for older households, suggesting that important developing-economy features, such as household networks and other informal insurance mechanisms, are not fully captured in the standard framework.

Taken together, our results indicate that labor market informality and informal risk-sharing arrangements (e.g., informal networks and family support) are central to inequality dynamics and should be incorporated more explicitly into structural frameworks for understanding risk-sharing mechanisms in developing

economies.[6]

[6]Several studies in the literature attempt to understand consumption inequality and risk sharing through structural approaches, including Blundell, Graber, and Mogstad (2015), Blundell, Pistaferri, and Saporta-Eksten (2016), and Wu and Krueger (2020).

# Reference


Ambrus, A., Mobius, M.M., Szeidl, A., 2014. "Consumption risk-sharing in social networks." American Economic Review 104(1), 149–182.

Attanasio, O. P., Székely, M., 2004. "Wage shocks and consumption variability in Mexico during the 1990s." Journal of Development Economics, 73(1), 1–25.

Benjamin, D., Brandt, L., McCaig, B., 2017. Growth with equity: Income inequality in Vietnam, 2002–14. Journal of Economic Inequality, 15(1), 25–46.

Binelli, C., Attanasio, O., 2010. "Mexico in the 1990s: The main cross-sectional facts." Review of Economic Dynamics 13(1), 238–264.

Blundell, R., Etheridge, B., 2010. "Consumption, income and earnings inequality in Britain." Review of Economic Dynamics 13(1), 76–102.

Blundell, Richard, Luigi Pistaferri, and Ian Preston. 2008. "Consumption Inequality and Partial Insurance." American Economic Review 98, 5:1887–1921.

Blundell, Richard, Monica Costa Dias, Jonathan Cribb, Robert Joyce, Tom Waters, Thomas Wernham, and Xiaowei Xu. 2022. "Inequality and the COVID-19 Crisis in the United Kingdom." Annual Review of Economics 14:607–36.

Blundell, Richard, Luigi Pistaferri, and Itay Saporta-Eksten. 2016. "Consumption Inequality and Family Labor Supply." American Economic Review, 106, 2:387–435.

Blundell, Richard, Michael Graber, Magne Mogstad. 2015. "Labor income dynamics and the insurance from taxes, transfers, and the family." Journal of Public Economics, 127, 58–73.

Brzozowski, M., Gervais, M., Klein, P., Suzuki, M., 2010. "Consumption, income, and wealth inequality in Canada." Review of Economic Dynamics 13(1), 52–75.

Deaton, A., and C. Paxson. 1994. "Intertemporal Choice and Inequality." Journal of Political Economy 102, 3:437–467.

De Magalhães, L.S., and Santaeulàlia-Llopis, R., 2018. "Consumption smoothing and informal insurance in developing countries: Evidence from Malawi." Journal of Development Economics, 135, 265–278.

De Nardi, Mariacristina, Giulio Fella and Gonzalo Paz-Pardo. 2020. "Nonlinear Household Earnings Dynamics, Self-Insurance, and Welfare." Journal of the European Economic Association, 18, 2:890–926.

Dell'Anno, R., 2021. "Inequality and informality in transition and emerging countries." IZA World of Labor, 2021: 325v2.

Gorodnichenko, Y., Sabirianova Peter, K., Stolyarov, D., 2010. "Inequality and volatility moderation in Russia: Evidence from micro-level panel data on consumption and income." Review of Economic Dynamics, 13(1), 209–237.

International Labour Organization (ILO), 2018. Women and Men in the Informal Economy: A Statistical Picture. Third Edition. Geneva: International Labour Office.

Kaplan, G., Violante, G. L., 2010. "How Much Consumption Insurance Beyond Self-Insurance?" American Economic Journal: Macroeconomics, 2(4), 53–87.

Kebalo, L., Zouri, K., 2024. "Income inequality in developing countries: fiscal policy's role amid uncertainty." Journal of Applied Economics, 27(1).

Kinnan, C., Samphantharak, K., Townsend, R., and Vera-Cossio, D., 2024. "Propagation and insurance in village networks." American Economic Review, 114(1), 252–284.

Kinnan, C., and Townsend, R., 2012. "Kinship and financial networks, formal financial access, and risk reduction." American Economic Review, 102(3), 289–293.

Lipton, M., Eastwood, R., 2004. Rural and urban income inequality and poverty. In G. A. Cornia (Ed.), Inequality, growth, and poverty in an era of liberalization and globalization (pp. 54–78). Oxford University Press.

Madeira, C., 2023. "The evolution of consumption inequality and risk-insurance in Chile," Emerging Markets Review, 54, 100996.

Makhlouf, Y., 2023. "Trends in income inequality: Evidence from developing and developed countries." Social Indicators Research, 165(1), 213–243.

Mani, S.; Mitra, S. and Sambamoorthic, U. 2018. "Dynamics in health and employment: Evidence from Indonesia. " World Development, 104, 297-309.

McCaig, B. and N. Pavcnik. 2018. "Export Markets and Labor Allocation in a

Low-Income Country." American Economic Review 108 (7): 1899–1941.DOI: 10.1257/aer.20141096

McCaig, B. and N. Pavcnik. 2015. "Informal Employment in a Growing and Globalizing Low-Income Country." American Economic Review 105 (5): 545–50.

Santaeul'alia-Llopis, R., and Zheng, Y., 2018. "The price of growth: Consumption insurance in China 1989–2009." American Economic Journal: Macroeconomics, 10(4), 1–35.

Storesletten, Kjetil, Christopher I. Telmer, and Amir Yaron. 2004. "Consumption and risk sharing over the life cycle." Journal of Monetary Economics 51, 3:609– 633.

Tsuruga, I., Brimblecombe, S., and Landry, A., 2023. Unemployment insurance in Indonesia: Challenges and recommendations. Jakarta: International Labour Organization.

Townsend, R.M., 1994. "Risk and insurance in village India." Econometrica, 62(3), 539–591.

Townsend, R.M., 1995a. "Consumption Insurance: An Evaluation of Risk-Bearing Systems in Low-Income Economies." Journal of Economic Perspectives, 9(3), 83–102.

Townsend, R.M., 1995b. "Financial systems in northern Thai villages." The Quarterly Journal of Economics, 110(4), 1011–1046.

Townsend, R. M. 2016. "Village and Larger Economies: The Theory and Measurement of the Townsend Thai Project." Journal of Economic Perspectives, 30(4), 199–220.

United Nations Development Programme (UNDP). 2015. Humanity Divided: Confronting Inequality in Developing Countries. New York: UNDP. Available at: https://www.undp.org/publications/humanity-divided-confronting-inequality-developing-countries

Wu, C. and D. Krueger. 2020. "Consumption Insurance against Wage Risk: Family Labor Supply and Optimal Progressive Income Taxation." American Economic Journal: Macroeconomics, 13, 1: 79–113.

Yamada, Ken. 2016. Tracing the impact of large minimum wage changes on household welfare in Indonesia. European Economic Review, 87, 287-303.

DOI:10.1016/j.euroecorev.2016.05.008.

# Appendix A1: Main regression results

In the Appendix, we report the main regression results used to estimate the age-specific patterns of earnings and consumption inequality while removing cohort effects.

Tables 6 and 7 present the benchmark results for Thailand using the 2011–2019 SES data: Table 6 shows the estimated age effects ($\beta_j$) for the variance of log household earnings and the variance of log household consumption, respectively. These regressions include cohort dummies to control for cohort-specific effects and isolate life-cycle variation.

Table 7 extends the analysis by estimating the variance regressions conditional on the household head's employment sector (formal vs. informal): The coefficients ($\beta_{js}$) show that, conditional on formal employment, earnings and consumption inequality increase with age but that consumption inequality among younger formal-worker-headed households is not consistently lower than earnings inequality. In contrast, among informal-worker-headed households, consumption inequality is generally lower than earnings inequality across most age groups, and the rise in inequality over age is flatter.

Table 8 presents the regression results incorporating the COVID-19 period (2021): Here, a COVID-period dummy and its interactions with age and household head's employment sector are included in the regressions. The estimation results of the coefficients ($\alpha_{covid}$ and $\gamma_{js}$) show that although the overall COVID effect ($\alpha_{covid}$) on inequality was negative (suggesting a compression of inequality), specific age and sector groups experienced significant increases in inequality (i.e. $\alpha_{covid} + \gamma_{js}$ ). Notably, younger households (under age 40) saw an increase in consumption inequality during the pandemic.

Table 6: Results of Regression of Variance of Log Household Earnings/Consumption for Thailand, Benchmark (2011-2019)

| | **Regression (1)** **Variance of Log Earnings** | **Regression (2)** **Variance of Log Consumption** |
|---|---|---|
| | $\beta_j$ | $\beta_j$ |
| $j$ =26 | – | – |
| 27 | -0.013* | 0.039*** |
| 28 | -0.010 | 0.032*** |
| 29 | -0.018*** | 0.023*** |
| 30 | 0.031*** | 0.077*** |
| 31 | 0.058*** | 0.056*** |
| 32 | 0.031*** | 0.050*** |
| 33 | 0.035*** | 0.064*** |
| 34 | 0.053*** | 0.078*** |
| 35 | 0.092*** | 0.087*** |
| 36 | 0.062*** | 0.097*** |
| 37 | 0.078*** | 0.089*** |
| 38 | 0.079*** | 0.104*** |
| 39 | 0.132*** | 0.097*** |
| 40 | 0.164*** | 0.133*** |
| 41 | 0.122*** | 0.101*** |
| 42 | 0.154*** | 0.124*** |
| 43 | 0.176*** | 0.137*** |
| 44 | 0.215*** | 0.145*** |
| 45 | 0.256*** | 0.161*** |
| 46 | 0.221*** | 0.148*** |
| 47 | 0.225*** | 0.143*** |
| 48 | 0.261*** | 0.159*** |
| 49 | 0.305*** | 0.178*** |
| 50 | 0.347*** | 0.192*** |
| 51 | 0.375*** | 0.186*** |
| 52 | 0.354*** | 0.176*** |
| 53 | 0.395*** | 0.190*** |

*(continued on next page)*

Table 6: (continued)

| | (1) | (2) |
|---|---|---|
| | **Variance of Log Earnings** | **Variance of Log Consumption** |
| 54 | 0.419*** | 0.173*** |
| 55 | 0.457*** | 0.201*** |
| 56 | 0.491*** | 0.196*** |
| 57 | 0.474*** | 0.191*** |
| 58 | 0.526*** | 0.193*** |
| 59 | 0.601*** | 0.223*** |
| 60 | 0.607*** | 0.215*** |
| 61 | 0.633*** | 0.213*** |
| 62 | 0.600*** | 0.197*** |
| 63 | 0.600*** | 0.177*** |
| 64 | 0.663*** | 0.197*** |
| 65 | 0.685*** | 0.202*** |
| 66 | 0.702*** | 0.198*** |
| 67 | 0.754*** | 0.222*** |
| 68 | 0.688*** | 0.219*** |
| 69 | 0.638*** | 0.197*** |
| 70 | 0.658*** | 0.247*** |
| 71 | 0.862*** | 0.243*** |
| 72 | 0.843*** | 0.263*** |
| 73 | 0.806*** | 0.232*** |
| 74 | 0.725*** | 0.300*** |
| 75 | 0.812*** | 0.293*** |
| Observations | 80,816 | 80,816 |
| R-Squared | 0.784 | 0.493 |

*Note:* ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 7: Results of Regression of Variance of Log Household Earnings/Consumption by Employment Type, Thailand (2011–2019)

| | **Regression (1)** **Variance of Log Earnings** | | **Regression (2)** **Variance of Log Consumption** | |
|---|---|---|---|---|
| $\beta_{js}$ | $s$ =Formal | $s$ =Informal | $s$ =Formal | $s$ =Informal |
| $j$ =26 | - | 0.192*** | - | 0.134*** |
| 27 | 0.015*** | 0.140*** | 0.076*** | 0.109*** |
| 28 | 0.005*** | 0.208*** | 0.065*** | 0.123*** |
| 29 | 0.029*** | 0.174*** | 0.057*** | 0.125*** |
| 30 | 0.090*** | 0.208*** | 0.133*** | 0.140*** |
| 31 | 0.103*** | 0.269*** | 0.113*** | 0.122*** |
| 32 | 0.078*** | 0.272*** | 0.081*** | 0.165*** |
| 33 | 0.074*** | 0.305*** | 0.098*** | 0.176*** |
| 34 | 0.132*** | 0.281*** | 0.122*** | 0.180*** |
| 35 | 0.157*** | 0.350*** | 0.145*** | 0.173*** |
| 36 | 0.177*** | 0.279*** | 0.146*** | 0.190*** |
| 37 | 0.170*** | 0.334*** | 0.167*** | 0.149*** |
| 38 | 0.166*** | 0.353*** | 0.163*** | 0.184*** |
| 39 | 0.243*** | 0.390*** | 0.173*** | 0.163*** |
| 40 | 0.294*** | 0.420*** | 0.216*** | 0.189*** |
| 41 | 0.301*** | 0.351*** | 0.202*** | 0.140*** |
| 42 | 0.299*** | 0.419*** | 0.203*** | 0.177*** |
| 43 | 0.295*** | 0.473*** | 0.217*** | 0.184*** |
| 44 | 0.402*** | 0.470*** | 0.205*** | 0.208*** |
| 45 | 0.412*** | 0.544*** | 0.233*** | 0.210*** |
| 46 | 0.417*** | 0.493*** | 0.233*** | 0.183*** |
| 47 | 0.426*** | 0.501*** | 0.222*** | 0.179*** |
| 48 | 0.441*** | 0.561*** | 0.231*** | 0.197*** |
| 49 | 0.540*** | 0.574*** | 0.259*** | 0.208*** |
| 50 | 0.572*** | 0.632*** | 0.264*** | 0.223*** |
| 51 | 0.571*** | 0.670*** | 0.238*** | 0.227*** |

*(continued on next page)*

Table 7: (continued)

| | Regression (1) Variance of Log Earnings | | Regression (2) Variance of Log Consumption | |
|---|---|---|---|---|
| $\beta_{js}$ | $s$ =Formal | $s$ =Informal | $s$ =Formal | $s$ =Informal |
| 52 | 0.591*** | 0.632*** | 0.244*** | 0.204*** |
| 53 | 0.607*** | 0.684*** | 0.240*** | 0.222*** |
| 54 | 0.689*** | 0.678*** | 0.264*** | 0.177*** |
| 55 | 0.742*** | 0.704*** | 0.265*** | 0.214*** |
| 56 | 0.764*** | 0.736*** | 0.246*** | 0.212*** |
| 57 | 0.814*** | 0.683*** | 0.267*** | 0.191*** |
| 58 | 0.819*** | 0.751*** | 0.253*** | 0.196*** |
| 59 | 0.943*** | 0.800*** | 0.317*** | 0.206*** |
| 60 | 0.943*** | 0.810*** | 0.298*** | 0.204*** |
| 61 | 0.890*** | 0.859*** | 0.258*** | 0.214*** |
| 62 | 0.848*** | 0.827*** | 0.242*** | 0.197*** |
| 63 | 0.936*** | 0.804*** | 0.230*** | 0.174*** |
| 64 | 0.985*** | 0.862*** | 0.230*** | 0.195*** |
| 65 | 1.111*** | 0.861*** | 0.238*** | 0.198*** |
| 66 | 0.901*** | 0.927*** | 0.220*** | 0.193*** |
| 67 | 0.904*** | 0.989*** | 0.261*** | 0.214*** |
| 68 | 0.868*** | 0.915*** | 0.254*** | 0.208*** |
| 69 | 0.906*** | 0.844*** | 0.216*** | 0.191*** |
| 70 | 1.056*** | 0.820*** | 0.285*** | 0.232*** |
| 71 | 1.155*** | 1.055*** | 0.282*** | 0.229*** |
| 72 | 1.036*** | 1.060*** | 0.289*** | 0.251*** |
| 73 | 1.000*** | 1.020*** | 0.219*** | 0.228*** |
| 74 | 1.067*** | 0.893*** | 0.367*** | 0.269*** |
| 75 | 1.008*** | 1.025*** | 0.267*** | 0.291*** |
| Observations | 80,816 | | 80,816 | |
| R-Squared | 0.902 | | 0.756 | |

*Note:* ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 8: Results of Regression of Variance of Log Household Earnings/Consumption with COVID Shock by Employment Type, Thailand (2011–2021)

| | **Regression (1)** | | **Regression (2)** | |
|---|---|---|---|---|
| | **Variance of Log Earnings** | | **Variance of Log Consumption** | |
| $\gamma_{js}$ | $s$ =Formal | $s$ =Informal | $s$ =Formal | $s$ =Informal |
| 26 | – | 0.035*** | – | 0.169*** |
| 27 | 0.012* | -0.118*** | 0.481*** | 0.068*** |
| 28 | 0.072*** | -0.115*** | 0.471*** | 0.037*** |
| 29 | -0.006 | 0.063*** | 0.209*** | 0.048*** |
| 30 | -0.073*** | 0.124*** | 0.029*** | 0.144*** |
| 31 | 0.079*** | -0.072*** | 0.061*** | 0.246*** |
| 32 | -0.047*** | -0.050*** | 0.166*** | 0.213*** |
| 33 | -0.053*** | -0.037*** | 0.065*** | 0.286*** |
| 34 | -0.011 | -0.035*** | 0.165*** | 0.057*** |
| 35 | -0.012 | -0.023** | 0.222*** | 0.207*** |
| 36 | -0.077*** | -0.026*** | 0.004 | 0.123*** |
| 37 | -0.074*** | 0.039*** | 0.109*** | 0.176*** |
| 38 | -0.060*** | -0.044*** | 0.080*** | 0.286*** |
| 39 | -0.085*** | -0.172*** | 0.028*** | 0.166*** |
| 40 | -0.036*** | -0.063*** | 0.054*** | 0.074*** |
| 41 | 0.075*** | 0.256*** | 0.135*** | 0.121*** |
| 42 | 0.037*** | -0.131*** | 0.116*** | 0.144*** |
| 43 | -0.125*** | -0.068*** | 0.097*** | 0.104*** |
| 44 | -0.091*** | -0.140*** | 0.147*** | -0.025*** |
| 45 | -0.075*** | -0.120*** | 0.038*** | 0.065*** |
| 46 | -0.215*** | -0.036*** | -0.077*** | 0.179*** |
| 47 | -0.118*** | -0.035*** | -0.077*** | 0.078*** |
| 48 | -0.149*** | -0.127*** | -0.027*** | 0.030*** |
| 49 | -0.232*** | -0.083*** | -0.011** | -0.002 |
| 50 | -0.257*** | -0.173*** | -0.011** | 0.085*** |
| 51 | -0.000*** | -0.109*** | 0.018*** | 0.091*** |

*(continued on next page)*

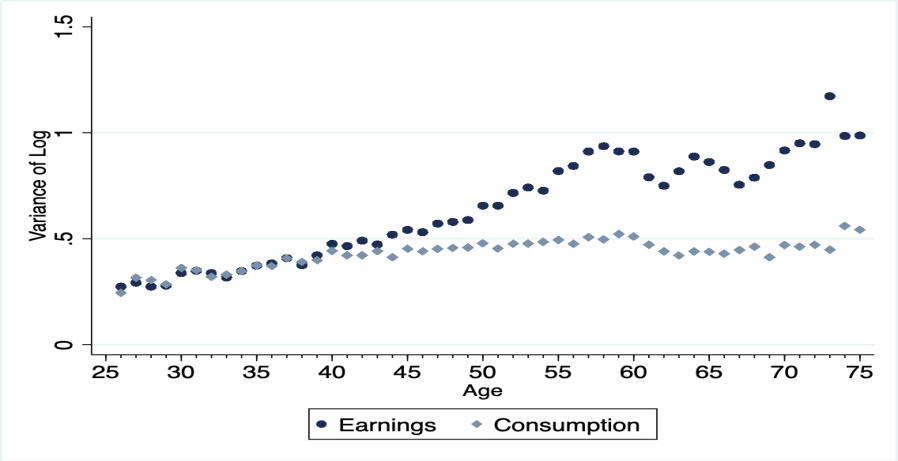
Table 8: (continued)

| | **Regression (1)** | | **Regression (2)** | |
|---|---|---|---|---|
| | **Variance of Log Earnings** | | **Variance of Log Consumption** | |
| $\gamma_{js}$ | $s$ =Formal | $s$ =Informal | $s$ =Formal | $s$ =Informal |
| 52 | -0.188*** | 0.098*** | -0.016*** | 0.081*** |
| 53 | -0.153*** | -0.034*** | -0.012** | 0.109*** |
| 54 | -0.190*** | 0.011 | 0.004 | 0.136*** |
| 55 | 0.036*** | -0.053*** | 0.248*** | 0.115*** |
| 56 | -0.145*** | -0.040*** | 0.066*** | 0.137*** |
| 57 | 0.054*** | 0.040*** | -0.017*** | 0.111*** |
| 58 | -0.056*** | -0.012 | 0.107*** | 0.098*** |
| 59 | 0.016* | -0.120*** | -0.016*** | 0.118*** |
| 60 | 0.015 | -0.026*** | 0.023*** | 0.176*** |
| 61 | -0.005 | -0.050*** | 0.113*** | 0.112*** |
| 62 | 0.119*** | -0.068*** | 0.086*** | 0.103*** |
| 63 | 0.408*** | 0.006 | 0.142*** | 0.115*** |
| 64 | -0.113*** | -0.028*** | 0.087*** | 0.149*** |
| 65 | -0.048* | 0.030*** | -0.102*** | 0.082*** |
| 66 | 0.453*** | 0.002 | 0.259*** | 0.030*** |
| 67 | 0.310*** | 0.035*** | -0.141*** | 0.078*** |
| 68 | 0.012 | -0.024** | 0.158*** | 0.107*** |
| 69 | 0.145*** | 0.004 | 0.197*** | 0.107*** |
| 70 | -0.088*** | 0.132*** | -0.077*** | 0.018** |
| 71 | 0.056 | 0.010 | 0.258*** | 0.087*** |
| 72 | 0.484*** | -0.087*** | 0.350*** | 0.020** |
| 73 | 0.730*** | -0.009 | 0.103*** | 0.001** |
| 74 | -0.004 | 0.294*** | 0.193*** | 0.100*** |
| 75 | 0.329*** | 0.079*** | 0.390*** | 0.027** |
| $\alpha_{covid}$ | -0.052*** | | -0.087*** | |
| Observations | 100,886 | | 100,886 | |
| R-squared | 0.827 | | 0.5943 | |

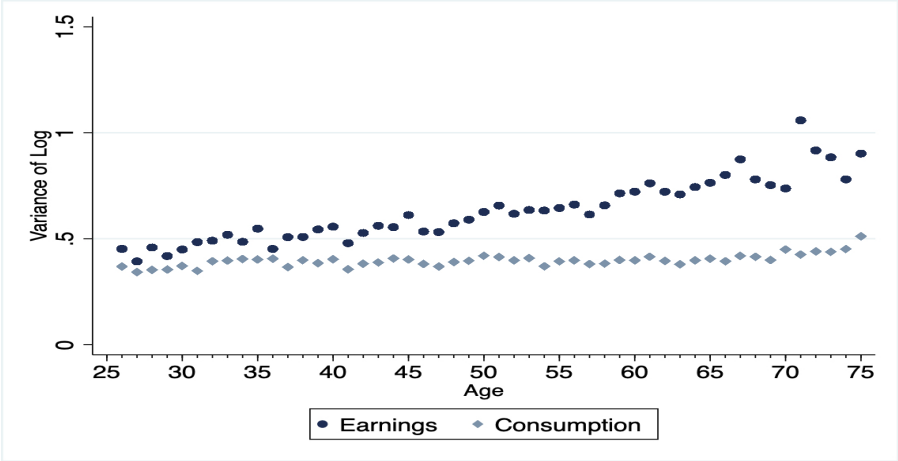
*Note:* ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

# Appendix A2: Raw variance of log household earnings and consumption (without controlling for cohort effects

In the appendix we present the original variances of log household earnings and consumption without removing cohort effects. Figure 8 and Figure 9 present the raw variances of log household earnings and consumption over age conditional on household heads with formal employment and with informal employment in Thailand in the period, 2011-19, and in the COVID period, 2021, respectively. Figures 10 and 11 similarly show the raw variances of log household earnings and consumption in Indonesia (2000-14) and Vietnam (2010-18) respectively.

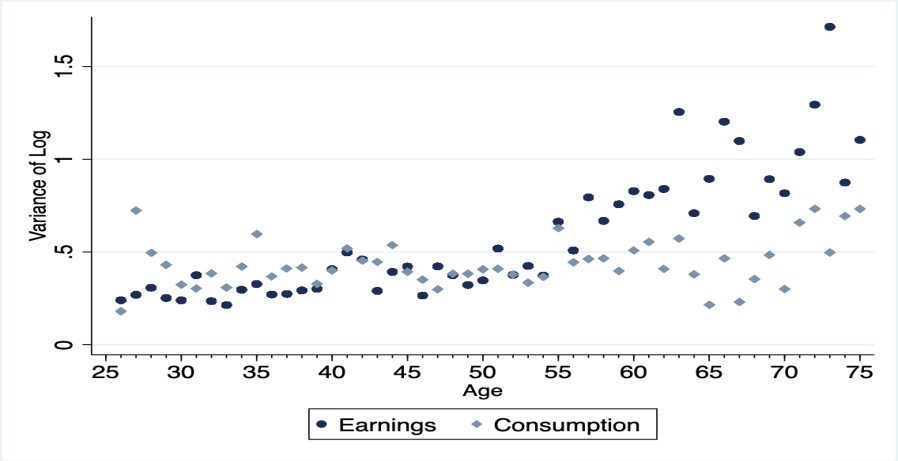



(a) Formal-worker headed households

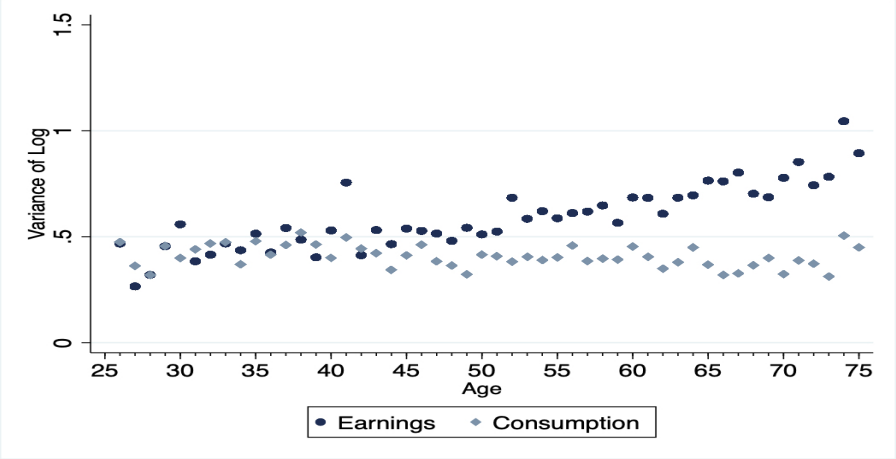



(b) Informal-worker headed households

Figure 8: Variances of log household earnings/consumption (without controlling for the cohort effect), Thailand (2011-19)

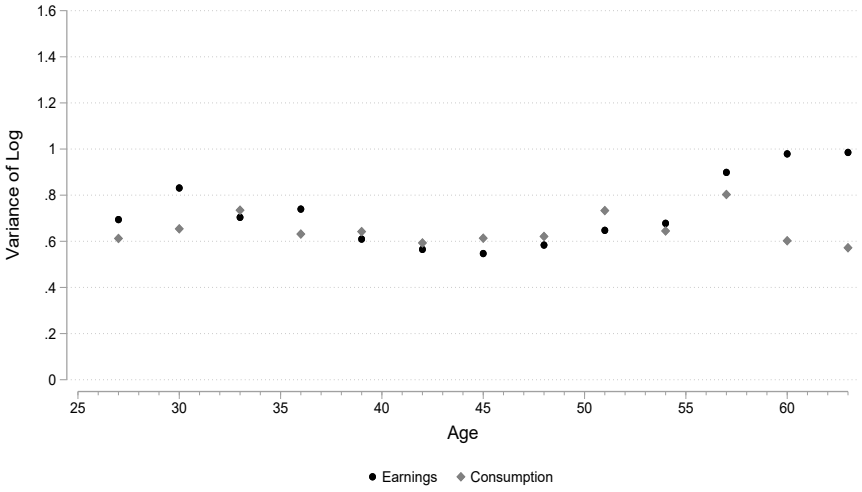



(a) Formal-worker headed households

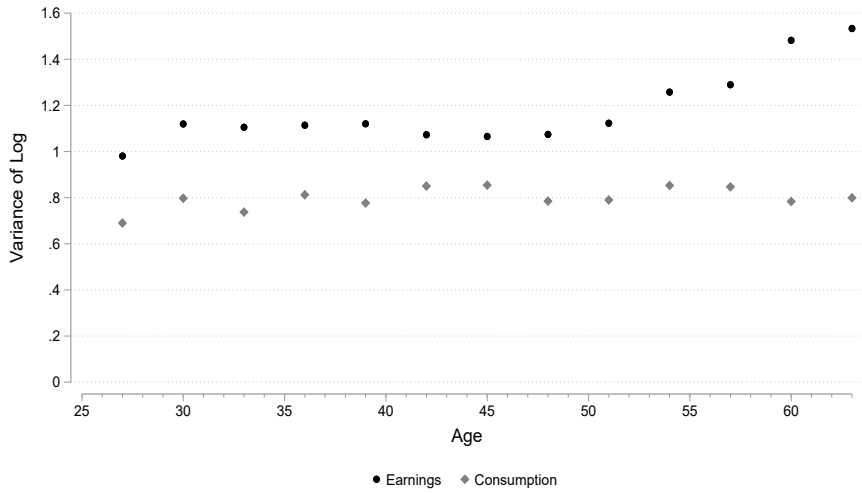



(b) Informal-worker headed households

Figure 9: Variances of log household earnings/consumption (without controlling for the cohort effect), Thailand (2021)

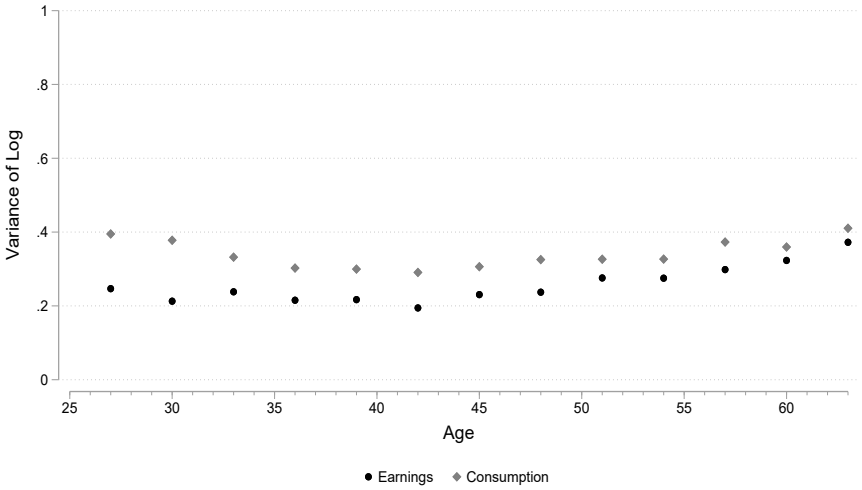



(a) Formal-worker headed households

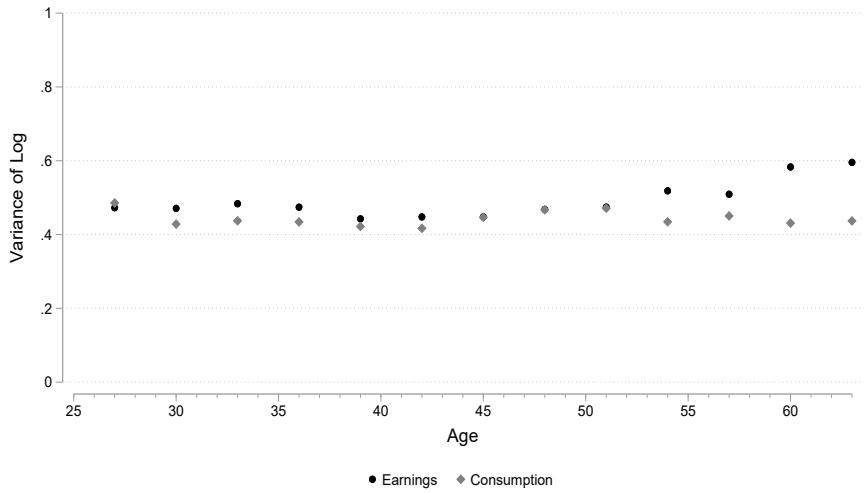



(b) Informal-worker headed households

Figure 10: Variances of log household earnings/consumption (without controlling for the cohort effect), Indonesia (2000-14)




(a) Formal-worker headed households




(b) Informal-worker headed households

Figure 11: Variances of log household earnings/consumption (without controlling for the cohort effect), Vietnam (2010-18)