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**Spring, 2020**

**Life Cycle Models and Data; Behavior and  
RCT Interventions; With Insurance Limits,  
Credit Constraints and Transaction Costs  
for Liquidity, Life Cycle as Basis for Models  
of Growth and Inequality  
(Lecture 9)**

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## **Lecture 9: Life Cycle Models and Data; Behavior and RCT Interventions; With Insurance Limits, Credit Constraints and Transaction Costs for Liquidity, Life Cycle as Basis for Models of Growth and Inequality (4/7)**

“Extraordinary Financial Lives of Ordinary People,” Chapters 3 and 4, case studies, life cycle planner

"Households as Corporate Firms: An Analysis of Household Finance Using Integrated Household Surveys and Corporate Financial Accounting." Krislert Samphantharak and Robert M. Townsend. Econometric Society Monograph Series No. 46, December 2009.

### Life Cycle Models With Limited Insurance

\*"Risk-taking over the Life Cycle: Aggregate and Distributive Implications of Entrepreneurial Risk" Dejanir H. Silva and Robert M. Townsend. Working Paper, 2018.

### With Credit Constraints

"Human Capital Acquisition and Occupational Choice: Implications for Economic Development". Marti Mestieri, Johanna Schauer and Robert M. Townsend, Review of Economic Dynamics, 25, 2017: 151–186.

With Transaction Costs and Liquidity Constraints • Kaplan, G. and Violante, G. L. (2014), A Model of the Consumption Response to Fiscal Stimulus Payments. Econometrica, 82: 1199-1239.

doi:10.3982/ECTA10528

Kaplan, Greg, Giovanni L. Violante, and Justin Weidner (2014). The Wealthy Hand to Mouth. Brookings Papers on Economic Activity, Spring 2014

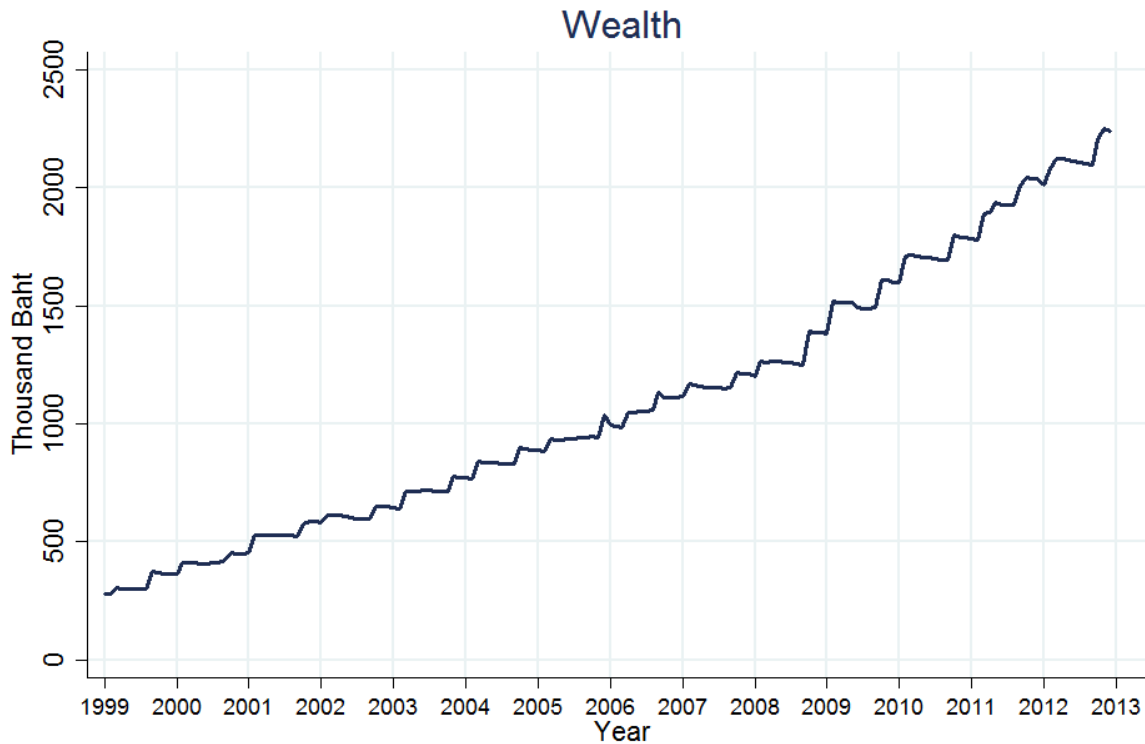


# Overview

- ❖ How well do households manage their financial lives over the life cycle?
- ❖ Could information and planning tools help?
- ❖ Impact assessments from RCTs
- ❖ Diverse obstacles to trade used in life cycle models
- ❖ Implications for individual paths and for the entire economy
- ❖ Impact of policy lowering obstacles on inequality
- ❖ Welfare within and across generations



# Extraordinary Tales of Ordinary Households: The First Household

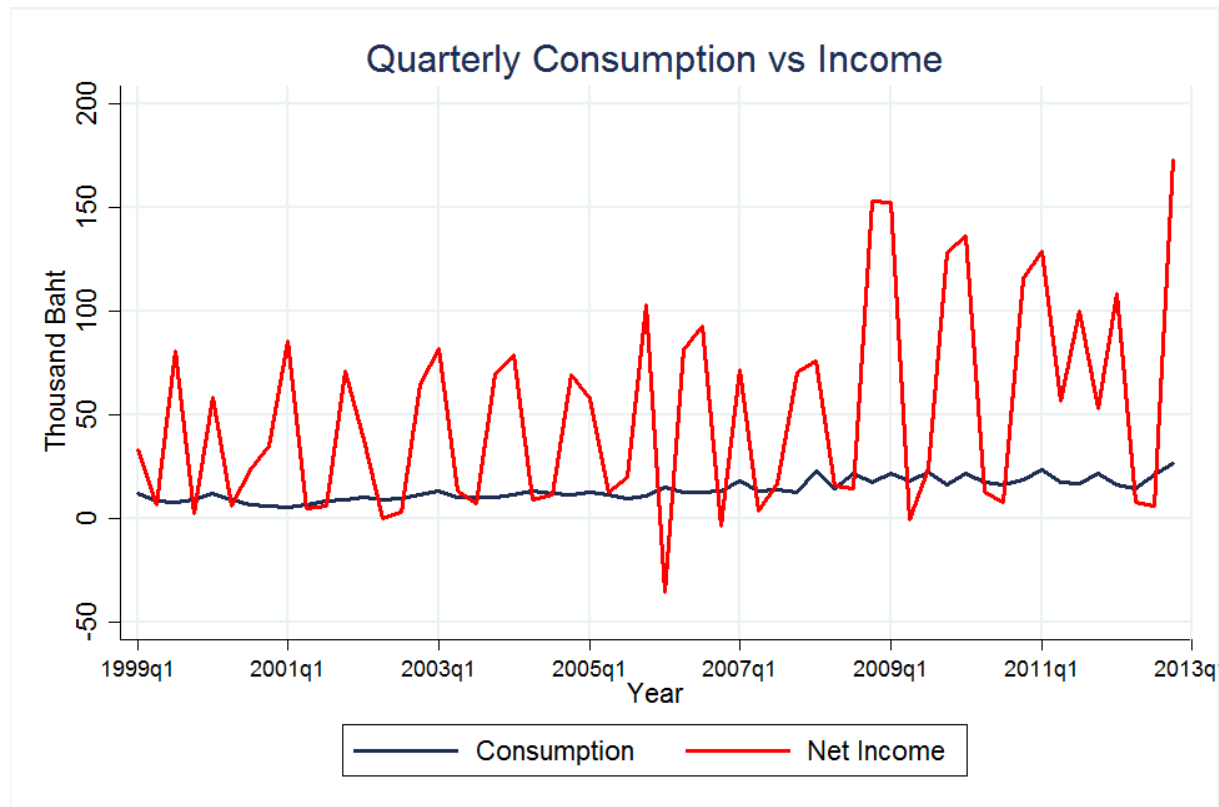


Growth Rate:

- 13.23% a year

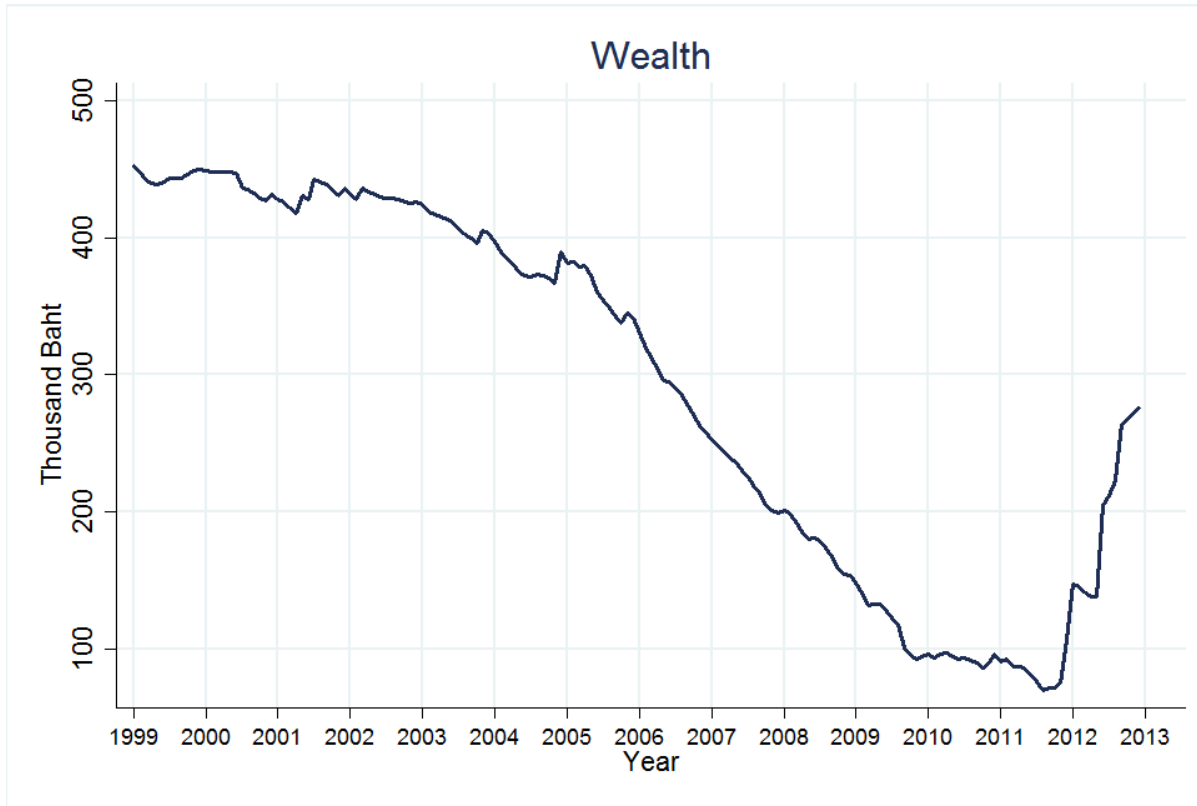


# The First Household: Consumption Smoothing



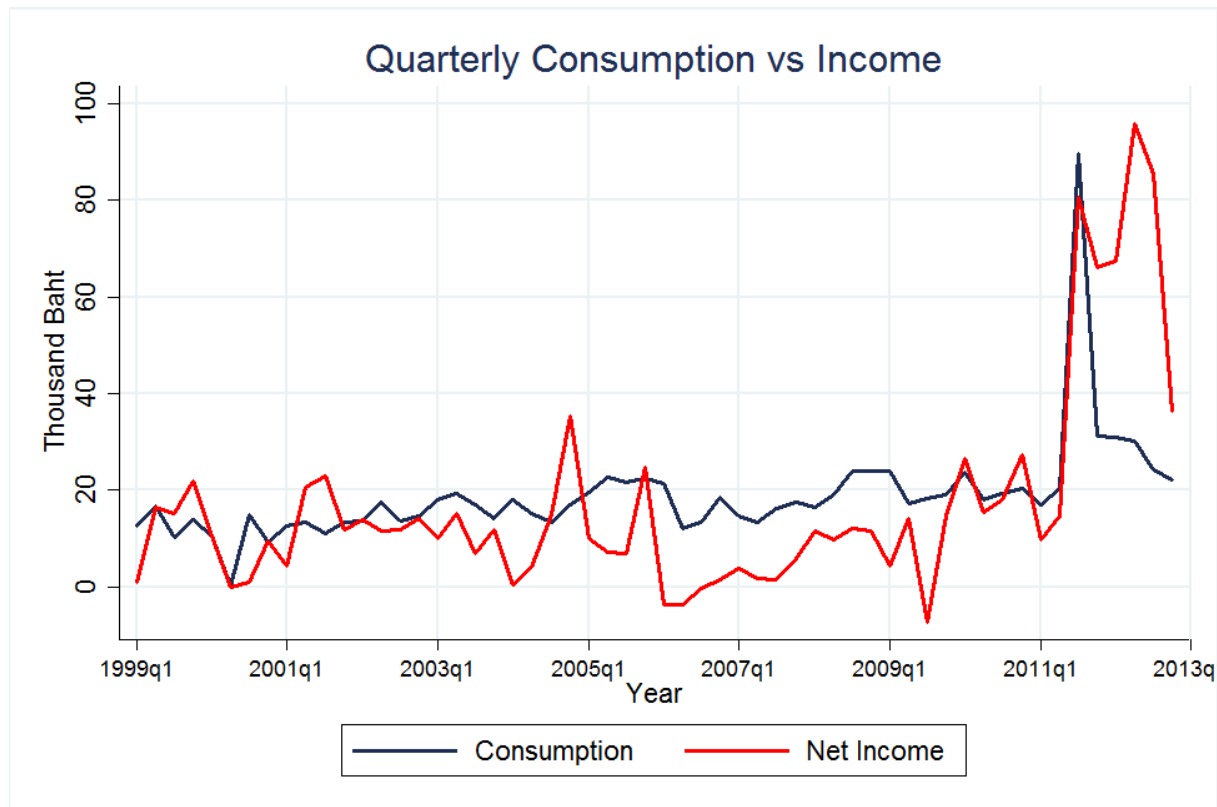


# Extraordinary Tales of Ordinary Households: The Second Household



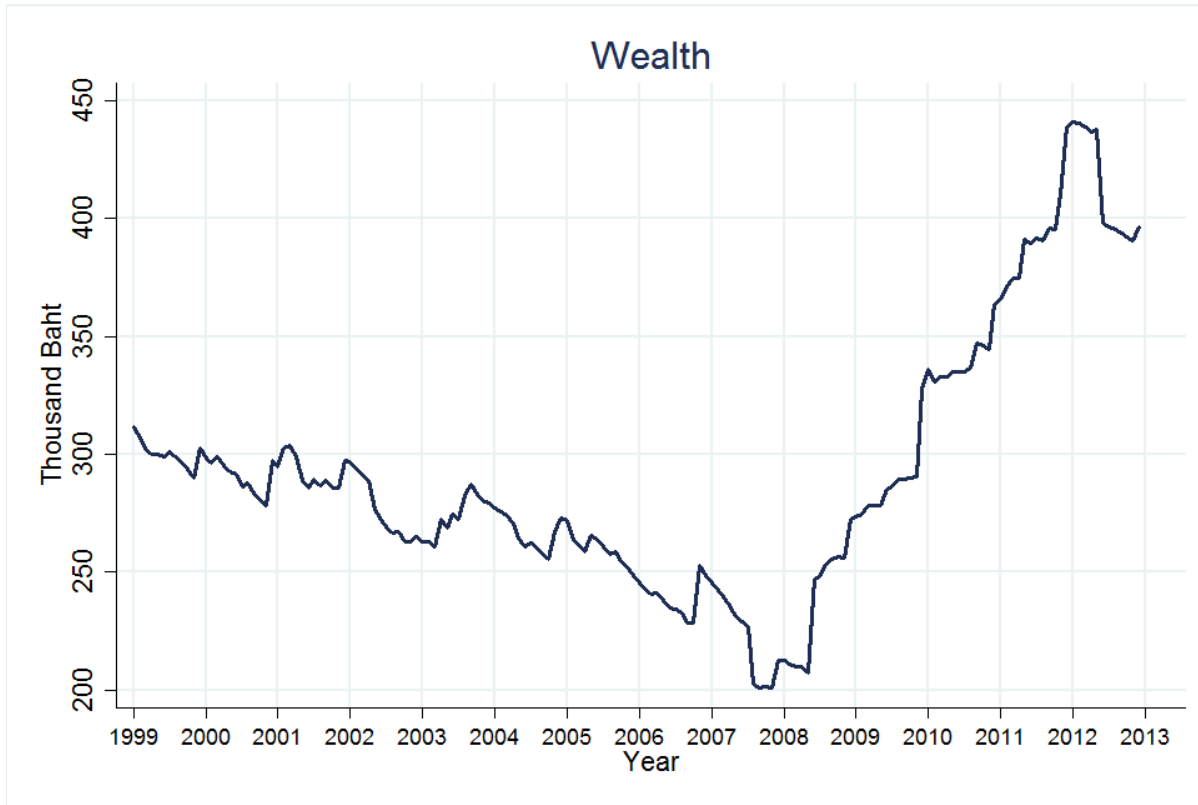


# The Second Household: Consumption Smoothing





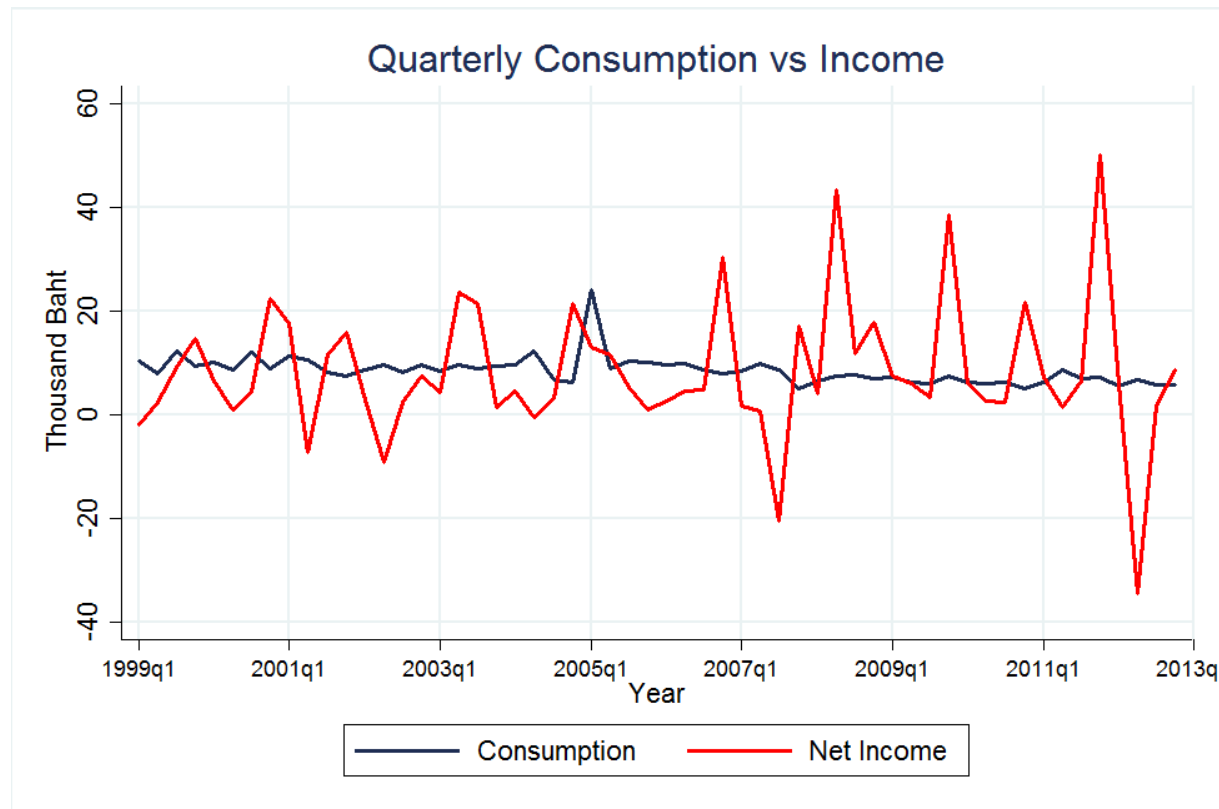
# Extraordinary Tales of Ordinary Households: The Third Household







# The Third Household: Consumption Smoothing





# Wealth Planner

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- Victor Zhorin
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# Srivalal and Townsend (2018) “Extraordinary Financial Lives of Ordinary People”

More precisely, the model underlying our dynamic stochastic optimization program over the lifecycle can be described as:

$$\max_{\{c_t, z_t\}} \mathbb{E} \left[ \sum_{t=0}^{T-1} \delta^t \frac{c_t^{1-\kappa}}{1-\kappa} + \delta^T \beta \frac{w_T^{1-\kappa}}{1-\kappa} \right]$$

where  $c_t$ ,  $z_t$ , and  $w_t$  denote the household’s aggregate consumption, fraction of asset invested in risky assets, and wealth at time  $t$  respectively. The parameters  $\delta$ ,  $\beta$ , and  $\kappa$  captures discount factor, bequest factor, and coefficient of relative risk aversion respectively. Theoretically, higher value of  $\delta$  implies that the household is less patient and gives more weight to sooner consumption. The higher value of  $\beta$  means that the household cares more about their bequest; hence, tending to leave more assets for the next generation at the end of life. Regarding the parameter  $\kappa$  as a measure of risk aversion, higher value of  $\kappa$  implies that the household would increase lower fraction of risky asset holding in response to wealth increase. Yet, under this preference specification, the parameter  $\kappa$  also captures tradeoff between consumptions across periods, since the elasticity of intertemporal substitution is equal to  $1/\kappa$ . In this regard, a higher  $\kappa$  makes households less responsive to rate of returns on holding assets across period. In other words, when rate of returns increases, the household with higher  $\kappa$  tends to reduce current consumption less in exchange for future consumption.

# Srivisal and Townsend (2018) (cont.)

The maximization problem is subject to the following wealth dynamics:

$$w_{t+1} = \left( r_t^r z_t + r^f (1 - z_t) \right) \left[ w_t + \frac{x_t}{(1 + \pi)^t} I\{dead_t\} + Income_t + B_t - c_t - C_t - (1 + r^b) B_{t-1} \right]$$

and borrowing constraint:

$$0 \leq B_t \leq \lambda \cdot w_t$$

where	$r^f$	denotes risk-free interest rate,
	$r^r$	denotes realized rate of returns on risky assets,
	$r^b$	denotes borrowing interest rate,
	$x$	denotes entitled insurance indemnity when the head of the household dies,
	$\pi$	denotes expected inflation rate,
	$B$	denotes borrowing,
	$C$	denotes committed consumption reported by the household, and
	$\lambda$	is a fraction of wealth that serves as the upper bound for borrowing.

The function  $I\{dead_t\}$  is binary random, returning value 1 if the household's head pass away in period  $t$ , which then resulting in an inflow of indemnity in nominal value  $x_t$  to the household, or  $\frac{x_t}{(1+\pi)^t}$  in real term. In addition, in order to capture stochastic movements in risky asset returns, we model  $r_t^r$  as log-Normally distributed, i.e.  $\ln r_t^r \sim N(\mu_r, \sigma_r^2)$ .

# Srivalal and Townsend (2018) (cont.)

To make our program applicable for rural Thai households, we carefully selected parameters to reflect the rural Thai economy. In addition, deliberate solicitation of household specific parameters and input data are important to produce the output consistently with each household's economic situation.

The discount factor ( $\delta$ ) and coefficient of relative risk aversion ( $\kappa$ ) are respectively chosen to be 0.99 and 5, which are in line with previous literatures. The risk-free interest rate, inflation, as well as mean and volatility of rate of returns on risky assets are chosen to match Thai economy and stock market. The borrowing upper-bound parameter ( $\lambda$ ) is set as 20 percent, reflect the stylized facts from Townsend Thai Monthly Micro survey data that most of the households did not borrow more than 20 percent of their net asset. In addition, the transitional probabilities of health status, either from being healthy to disability or to death, are consistent with the hazard rates and life expectancy of Thai population published by.

# Srivalal and Townsend (2018) (cont.)

In contrast, the bequest-factor parameter  $\beta$  are estimated from data which can vary across households. More precisely, we ask, under a hypothetical situation in which the household knows for certain that they can live for exactly one more year and has a fixed amount of total asset, say  $M$  Baht, how much they will be willing to spend for themselves ( $m$ ) and how much to leave for their bequest ( $M - m$ ). This is like a two-period consumption allocation problem between oneself and bequest, with given intertemporally transferable wealth of value  $M$ :

$$\max_m \left\{ \left( \frac{m^{1-\kappa}}{1-\kappa} \right) + \delta \left( \beta \frac{(M-m)^{1-\kappa}}{1-\kappa} \right) \right\}$$

Then, we can calculate the bequest factor ( $\beta$ ) by revert engineering the problem. The implied bequest factor, taking the household's answer as the optimal solution, is

$$\beta = \frac{1}{\delta} \left( \frac{M-m}{m} \right)^\kappa$$

# Srivilal and Townsend (2018) (cont.)

Another imperative ingredient of the model is household income. In a sense, one can think of a household's future income as the return on its human capital, which is a theoretical kind of assets. Future income is very difficult to estimate as it can depend on several random factors and involve decision making of household as well. Several literatures attempt to model occupational choices and returns on human capital. However, we take a simplified stance by letting each household forecast their own expected future incomes. Yet, we add some stochastic components to the households' forecast in order to generate uncertain realized income in each period in the model. Fundamentally, the income variable in this model comprises three main components as follows.

The first component is expected income forecasted by the household, denoted in the model by  $\mu_y$ . We solicit this information by asking households for expected income by sources or activities in each of the following 30 years before aggregating up all the sources to get total income in each period. However, if household lives more than 30 years, we assume that they will maintain the same level of expected income up to age 60 years old before fading down the income at a constant rate until remaining at 10% at the age of 80 years old. In addition, this expected household income is a function of health status of the head of the household ( $h_t$ ). Health status in the model can be in one of the three states, which are normal, disable, and dead. The transition of health among the three states is described in Table \*. That is if the head of a household becomes disable or dead, his or her health cannot be revert back to normal. The transitional probabilities from normal state to disability or death are conditional on age and gender and consistent with the hazard rates and life expectancy of Thai population.

\*\*\* Transitional health matrix table. ??

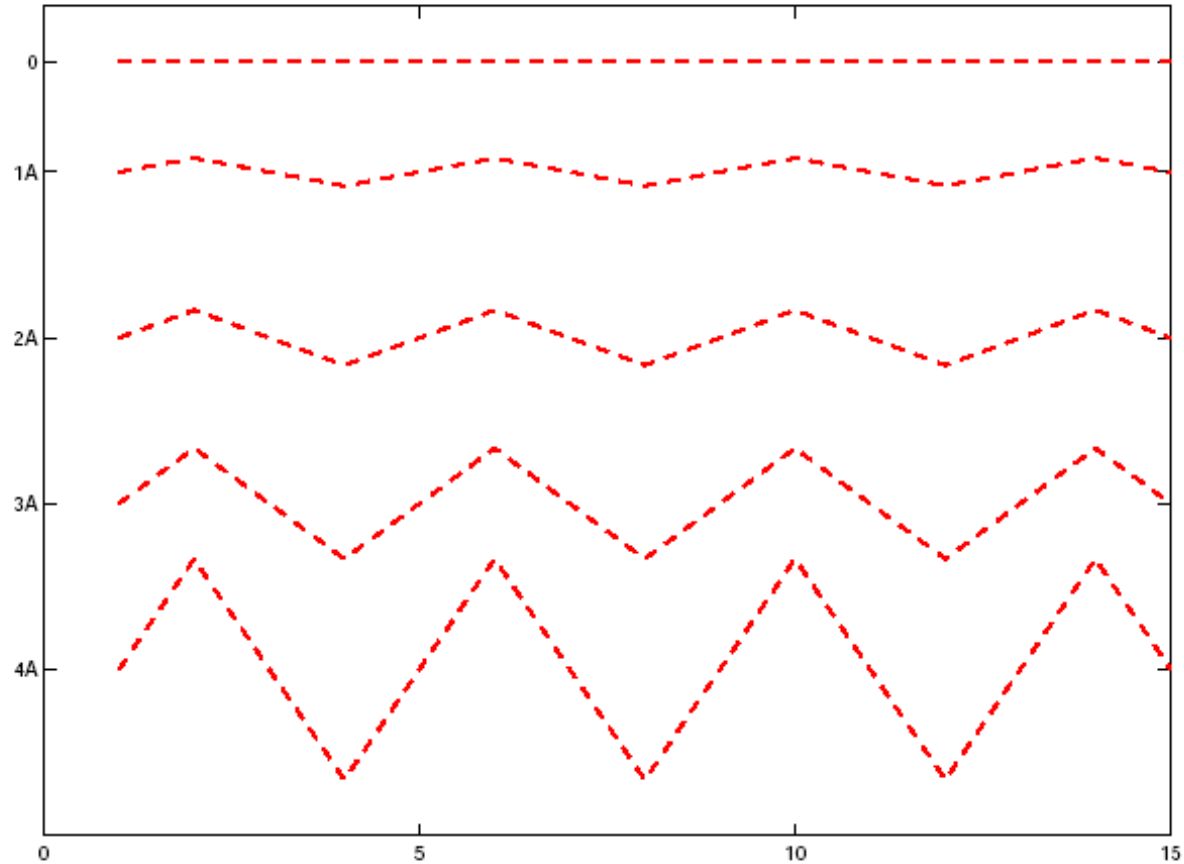
# Srivalal and Townsend (2018) (cont.)

The second component is the income shock  $y_t$  that causes fluctuation in realized income. We generate this income shock from log-Normal distribution, i.e.  $\ln y_t \sim N(-0.5\sigma_y^2, \sigma_y^2)$ , where  $\sigma_y^2$  capture the estimated household-specific income volatility. This model assumption is to make the expected value of  $y_t$  equal to one. Thereby, we can compute the realized income from  $y_t\mu_y(h_t)$ , which has mean equal to  $\mu_y(h_t)$  and variance equal to  $\sigma_y^2$ .

To derive an estimate of  $\sigma_y^2$  for a given household, we first group sources of its income into types, including cultivation, livestock, fish and shrimp farming, business, wage, aids or transfers, and other incomes. For each of the income group, we try to solicit volatility by asking for magnitude and frequency of income fluctuation from its mean. Practically, we find it helpful to plot graph of the expected income by group of income sources that the household reports, overlay transparent sheets with several fluctuated series as example in Figure \*\*\* and \*\*\* but one series at a time, and ask the household to select one of the series. An important reason that have to group income sources into these categories is that there generally exists correlation among income from different sources within the same categories, but different households experience different patterns of correlation and it is difficult to ask for correlation directly from rural households who have no background in statistics. For example, cultivation income could be positively correlated if households rely on rain and live outside the irrigation area, but for some households with several crops as a way for diversification, the correlation could be negative. Last, we make an assumption that incomes are uncorrelated across the groups.



# Srivisal and Townsend (2018) (cont.)



# Srivisal and Townsend (2018) (cont.)

Last but not least, we model the third component of income to capture risk-sharing behavior of rural Thai households as documented in several literatures such as \*\*\*\*\*. When rural Thai households face difficult times and experienced drops in income, they typically receives help from neighbors, friends, or relatives. In reverse, when the others have bad luck, households typically sacrifice some of their wealth to help out. As a consequence, we can see the rural Thai households able to enjoy smooth consumption despite largely fluctuated realized income. In a sense, if we consider including gifts and transfers due to risk-sharing behaviors as a part of income, we should see similar income level on average but with a lower variance, because the risk-sharing helps reduce magnitude of the deviation from mean income. Hence, we model the third component as the risk-sharing that preserves mean but lower variance of the realized income. More specifically, we define risk-sharing-adjusted realized income as

$$Income_t = \mu_y(h_t) + \gamma\{y_t\mu_y(h_t) - \mu_y(h_t)\}$$

where  $\gamma$ , taking value between zero and one, captures degree of risk-sharing behavior. If a household receives lower realized income than the mean, the deviation from the mean represented by the term in the bracket is negative. Then, multiplying by  $\gamma$  makes the deviation less negative, and the risk-sharing-adjusted income will be higher than the realized income. On the other hand, when lucky and enjoying higher income than expected, the deviation will be positive. Then, multiplying by  $\gamma$  makes it less than the actual deviation. In sum, the risk-sharing factor  $\gamma$  helps reduce magnitude of deviation of realized income from the mean. The lower value of  $\gamma$  can reduce deviation more; thus, implying higher degree of risk-sharing behavior.

# Srivalal and Townsend (2018) (cont.)

Similar to the bequest factor, we allow the risk-sharing parameter  $\gamma$  to vary across households, since we observe various inter-household networking and relationship patterns. For example, some households prefer to live quietly and isolated with the surrounding community, while some households like to socialize. These different behaviors imply different degree of risk-sharing. Hence, in order to estimate this parameter for each household, we need to solicit information from survey data. More specifically, we ask several hypothetical situations related to risk-sharing incidents, such as how much, if at all, the household expects other to help them when the household income unexpectedly drops by 25% or 50% in a given year?

Apart from income, sensible estimation of initial wealth is also important, since an inclusion of irrelevant assets will result in too high recommendation for consumption. First of all, we have to exclude assets that the households cannot or will never liquidate for consumption. The assets like land and residence must be determined case by case. Some households purchased land as investment or storage of wealth; so, it is fine to liquidate this kind of land for consumption. However, some households intend to keep some piece of land as inheritance for their heirs or plan to reside on it until the end of life; so, the value of this kind of land should not be included in the wealth planner. Second of all, some assets used for production activities should not be counted as initial wealth. The reason is that this kind of productive assets is a factor of production that generate future income. This implies that the present value of the assets is already be a part of the income. Consequently, counting the value of assets used for production as initial wealth would be double counting of their value. Instead, we ask for the time that households plan to relinquish assets used for generating income and the estimated value at the point of relinquishment. The estimated value is then added to income of that relinquishing year.

# Srivilal and Townsend (2018) (cont.)

Unsurprisingly, we documents both households behaving quite consistently with what the theory suggests and those deviating far from the model recommendations. Fortunately, among those living in deviation from the theory, there are only few households predicted by the program to face financial problems in the future. Let us begin with an example of households living consistently with the program result, following by examples of more-than-sufficient saving households and those predicted to soon become in trouble respectively.

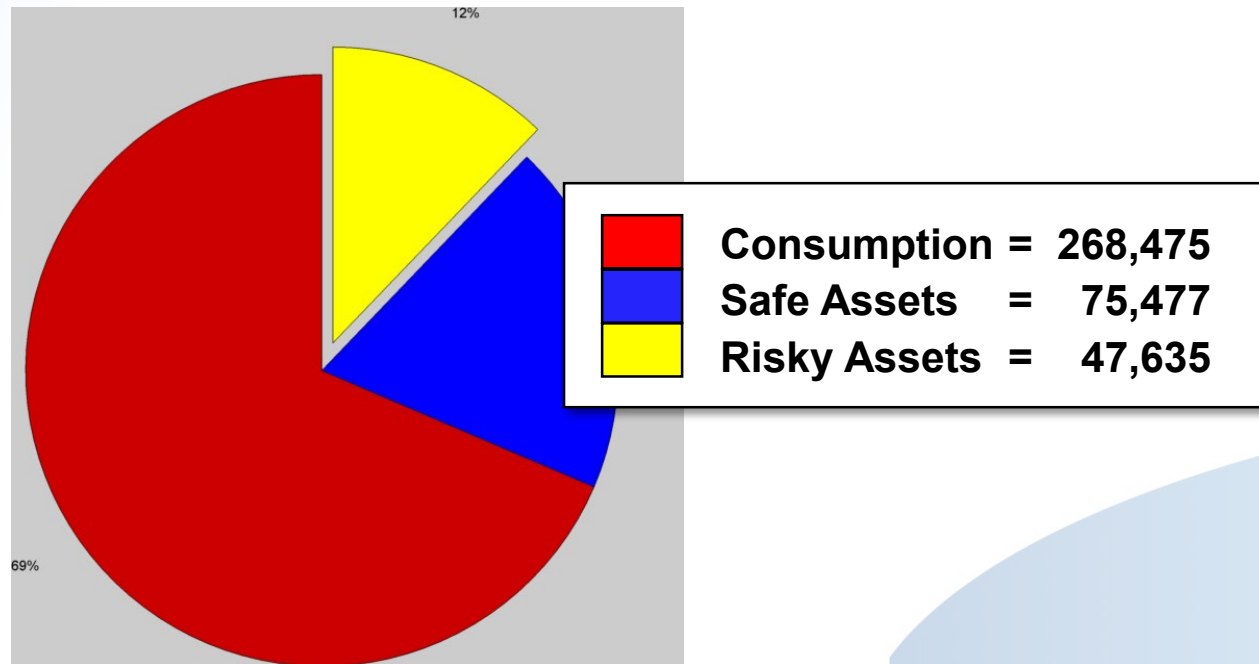
[270245] This household lives in Burirum, consisting of 5 members. The head of the household was 37 years old at the moment we conducted the life-cycle planning program, quite young relative to many of the households in our sample. Their sources of incomes were mainly from the head couple, working for general hires, which surprisingly predicted by the households to have stable mean of 144,000 Baht in all years in the future until they retire themselves at the age of 60. Then, the household planned to live on the governmental elderly allowance, starting at 600 Baht a month for a person age 60 years old.

For this household, our life-cycle wealth planner program recommends that they consume at 94,286 Baht for the immediate following year, in addition to their committed 5,600 Baht for their children's education. Furthermore, looking over the life cycle (up to age 100 years old), the planner program provides quite smooth path of real consumption up to age \*\*\* before fading down toward the end of the life. The smooth consumption according to the planner program can be achieved by asset accumulation in the early part of life and running down in the latter half as illustrated by Figure \*\*\*\*, including 90, 95, and 99% confidence interval bands.



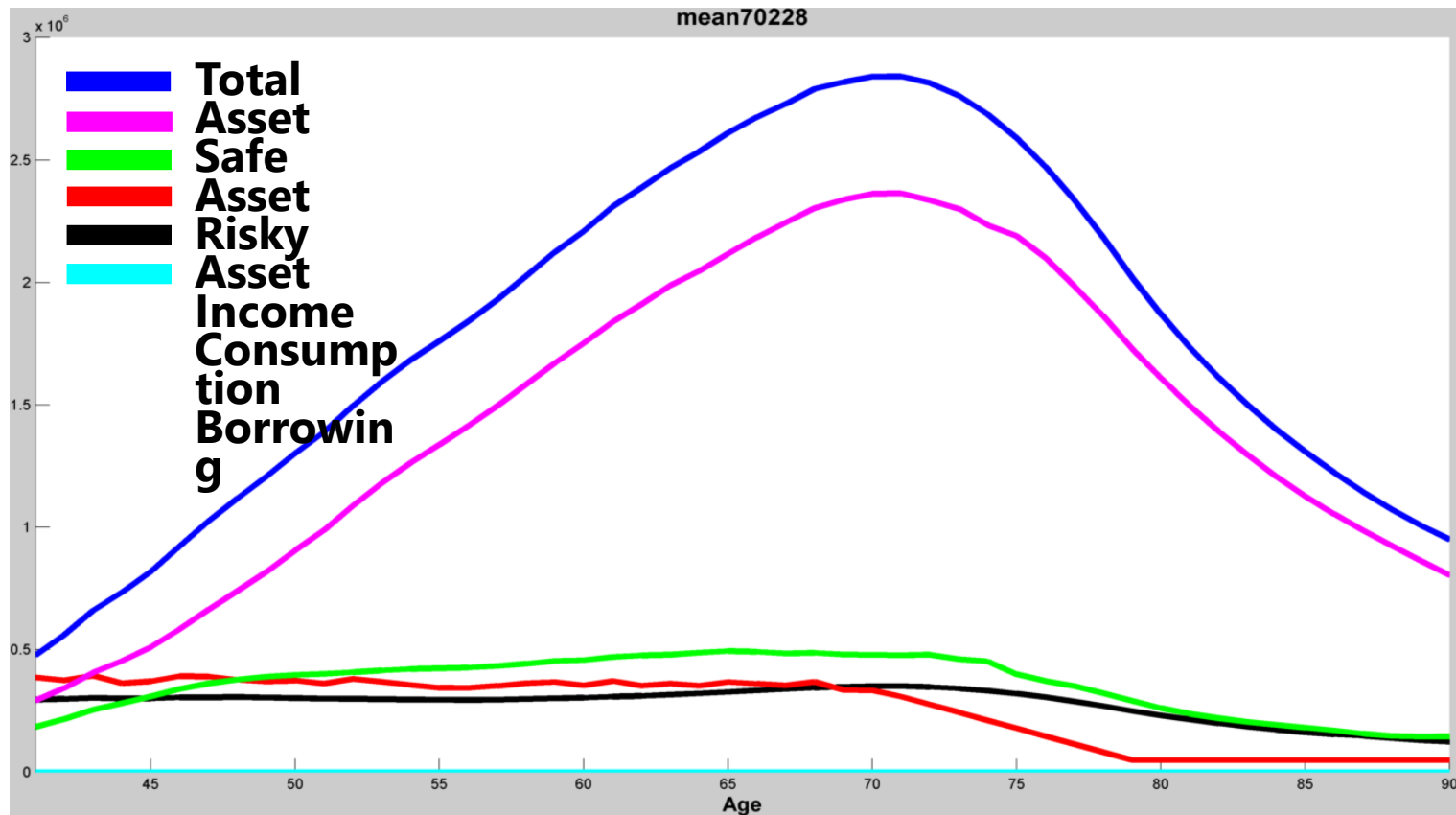
# The Planner Result for The First Household

- The input for the planner was collected in 2013





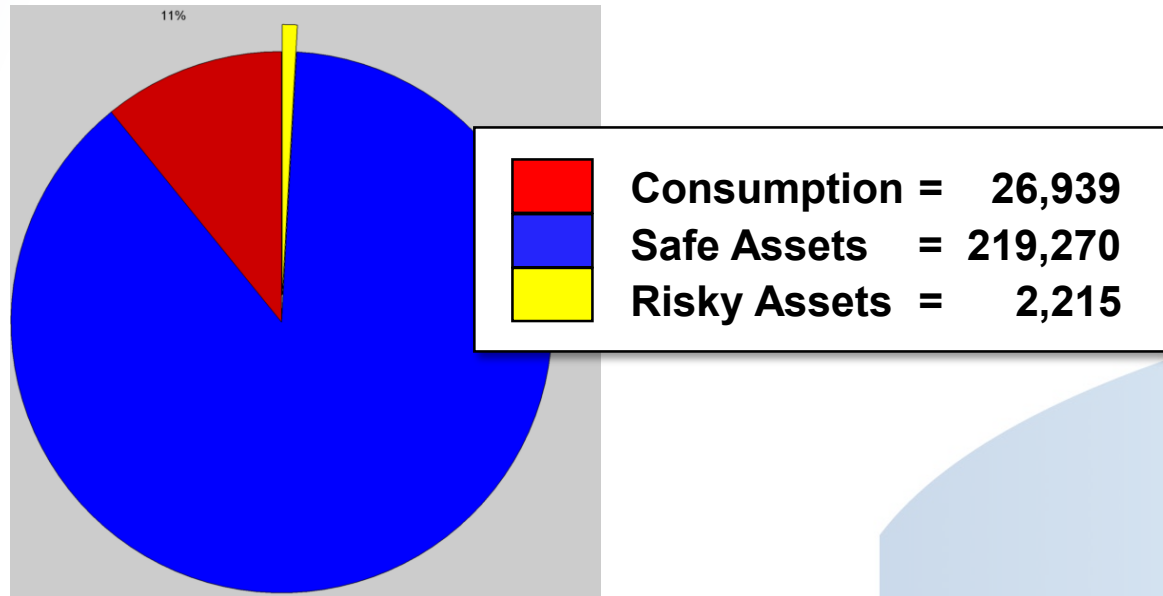
# The Planner Result for the First Household Average Path over Life-cycle





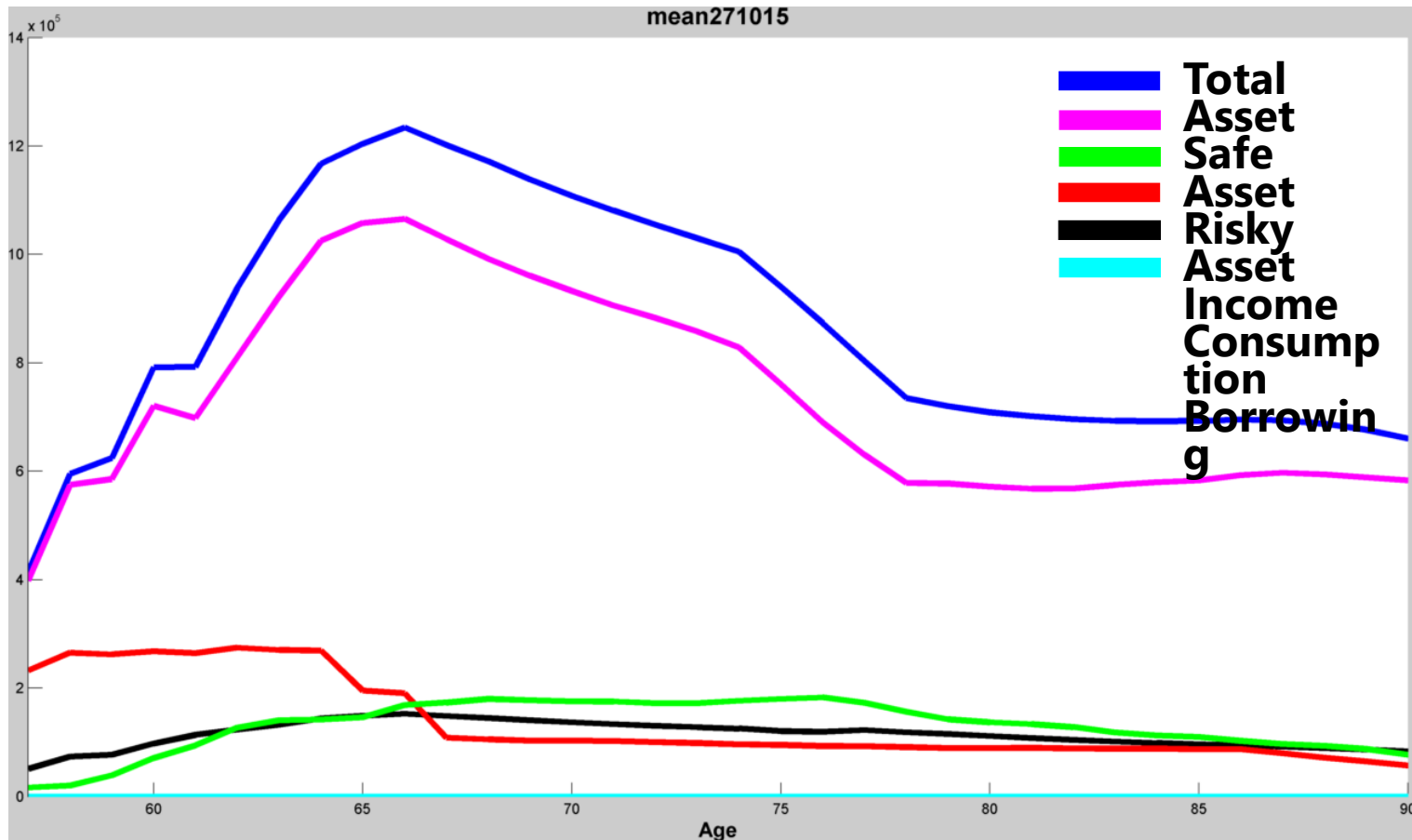
# The Planner Result for The Second Household

- Suggested to scale down more than two-third of the actual recent consumption.
- Very low level of risky assets recommended.





# The Planner Result for the Second Household Average Path over Life-cycle

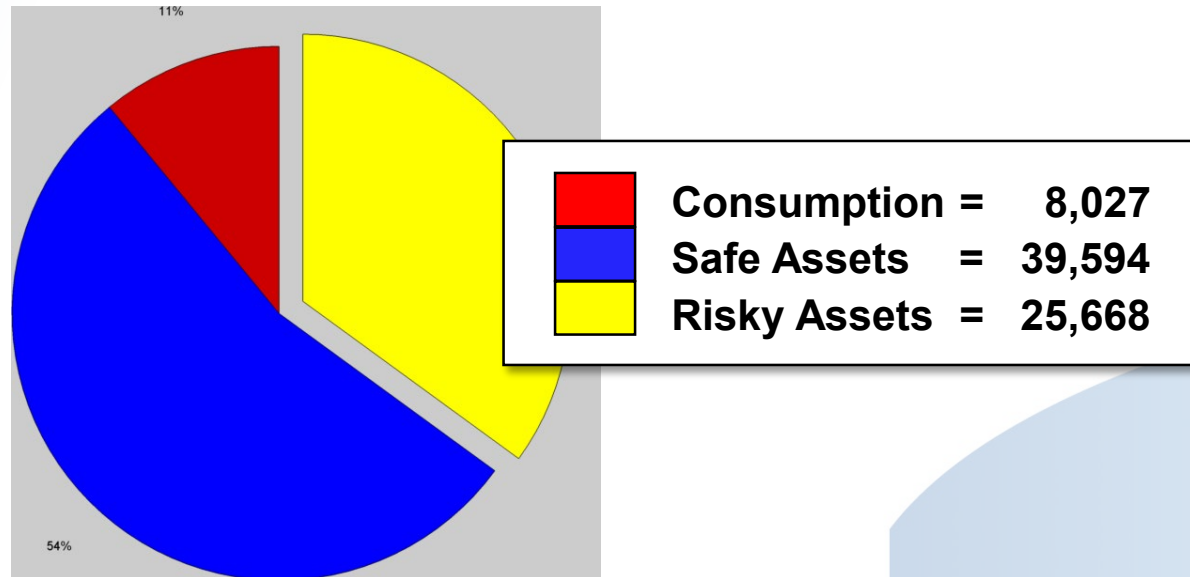






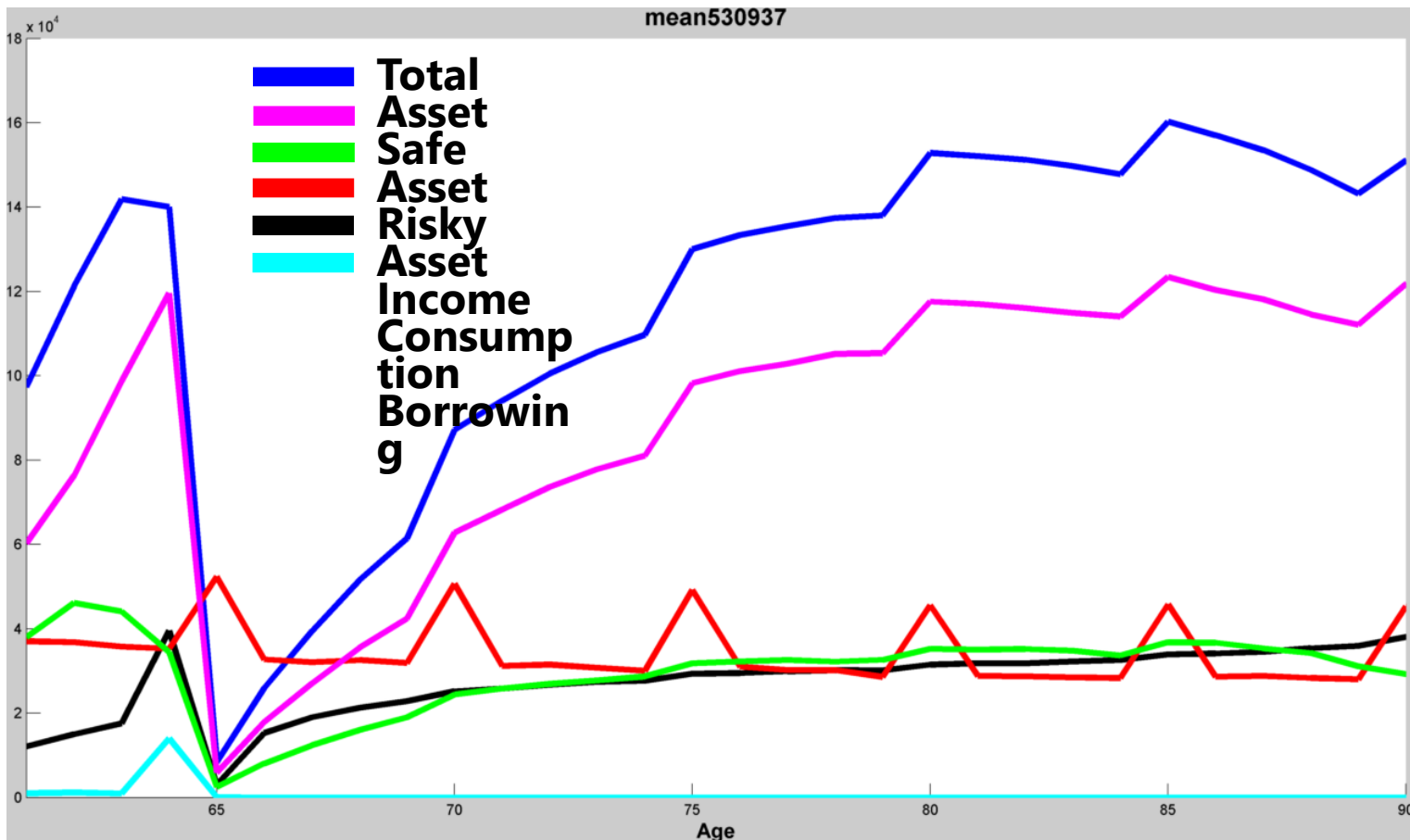
# The Planner Result for The Third Household

- Suggested impossibly low consumption: less than 700 Baht/month
- The result implies that the household will get into trouble.





# The Planner Result for the Third Household Average Path over Life-cycle



# A theory of the idiosyncratic risk premium

Framework will account for key features of the Thai data

## ① **Aggregate and idiosyncratic risk:**

- Idiosyncratic risk accounts for more than 90% of variance
- It explains around 50% of expected returns

## ② **Risk-taking varies substantially over life cycle:**

- Share of wealth invested in the business is 40% larger for young entrepreneurs

This will motivate our two main ingredients:

- Partial insurance of idiosyncratic risk
- Overlapping generations of finite-horizon entrepreneurs

Relaxing insurance constraints will affect the *idiosyncratic risk premium*

- Id. risk premium will play a key role in the analysis
- It will shape risk-taking decisions, inequality, and aggregate production

## Production technology

Entrepreneur  $i$  uses capital  $k_{i,t}$  and labor  $l_{i,t}$  to produce final good  $y_{i,t}$ :

$$y_{i,t} = A_t k_{i,t}^\alpha l_{i,t}^{1-\alpha} \quad (1)$$

Productivity  $A_t$  is subject to *aggregate* shocks:

**Discrete-time:**

$$\frac{\Delta A_{t+1}}{A_t} = \mu_A + \sigma_A \epsilon_{t+1},$$

where  $\epsilon_{t+1} \sim N(0, 1)$ .

**Continuous-time:**

$$\frac{dA_t}{A_t} = \mu_A dt + \sigma_A dZ_t$$

where  $Z_{t+1} - Z_t \sim N(0, 1)$ .

Capital accumulation is subject to *idiosyncratic* shocks:

**Discrete-time:**

$$k_{i,t+1} = \iota_{i,t} k_{i,t} + (1 - \delta) k_{i,t} + \sigma_{id} k_{i,t} \epsilon_{i,t+1}$$

where  $\iota_{i,t}$  is the investment rate.

**Continuous-time:**

$$dk_{i,t} = (\iota_{i,t} - \delta) k_{i,t} dt + \sigma_{id} k_{i,t} dZ_{i,t}$$

## The return of investing in the business

There are two ways to change the amount of capital

- Entrepreneurs can buy “old” capital at price  $q$
- Invest subject to the adjustment costs  $\Phi(l_{i,t})A_t k_{i,t}$

Entrepreneurs hire labor at wage  $w_t$  and buy capital at price  $q_t$

- We will focus on a stationary equilibrium
- In such equilibrium,  $w_t = wA_t$  and  $q_t = qA_t$ .

The return of investing in the business is given by

$$dR_{i,t} = \mu_{i,t}^R dt + \sigma_A dZ_t + \sigma_{id} dZ_{i,t}$$

where

$$\mu_{i,t}^R \equiv \underbrace{\frac{y_{i,t} - w_t l_{i,t} - \Phi(l_{i,t})A_t k_{i,t}}{q_t k_{i,t}}}_{\text{dividend yield}} + \underbrace{\mu_A + l_{i,t} - \delta}_{\text{expected capital gains}} \quad (2)$$

## Preferences and labor supply

Entrepreneurs live for  $T$  periods and derive utility of leaving bequests

$$U_{i,s} = \mathbb{E}_s \left[ \int_s^{s+T} e^{-\rho(t-s)} \frac{c_{i,t}^{1-\gamma}}{1-\gamma} dt + e^{-\rho(T-s)} (1-\theta)^\gamma V^* \frac{n_{i,s+T}^{1-\gamma}}{1-\gamma} \right] \quad (3)$$

where  $s$  is the entrepreneur's birthdate and  $n_{i,t}$  is the financial wealth.

Entrepreneurs receive income assets and from labor

- Asset income: business and riskless financial asset
- Labor income: exogenous and varies over the life cycle

To isolate role of risk, we abstract from borrowing constraints

- Entrepreneurs can borrow up to the value of their human wealth  $h_{i,t}$

$$n_{i,t} \geq -h_{i,t} \quad (4)$$

where  $h_{i,t}$  is the expected present discounted value of future labor income.

## Aggregate and idiosyncratic insurance

The entrepreneur has access to three financial assets:

- Riskless savings with return  $r$
- Aggregate insurance with cost  $p^{ag}$
- Costless idiosyncratic insurance

Aggregate insurance:

- It reduces aggregate vol. by  $\theta_{i,t}^{ag}$  and expected return by  $p^{ag}\theta_{i,t}^{ag}$
- Price  $p_t^{ag}$  will later be determined in equilibrium

Idiosyncratic insurance:

- It reduces idiosyncratic vol. by  $\theta_{i,t}^{id}$  without reducing expected returns
  - Price of idiosyncratic insurance will be zero in equilibrium
  - Providers of insurance can perfectly diversify id. risk
- But entrepreneurs are subject to a *skin-in-the-game* constraint:

$$\theta_{i,t}^{id} \leq (1 - \phi)q_t k_{i,t} \sigma_{id} \quad (5)$$

## Lemma (Financial and human wealth)

Suppose the economy is in a stationary equilibrium.

① Value function is given by

$$V_{i,t}(n_{i,t}) = V_{s_i,t}^* \frac{(n_{i,t} + h_{i,t})^{1-\gamma}}{1-\gamma}$$

where  $V_{s_i,t}^*$  is a deterministic function of age  $t - s_i$ .

② Human wealth is then given by

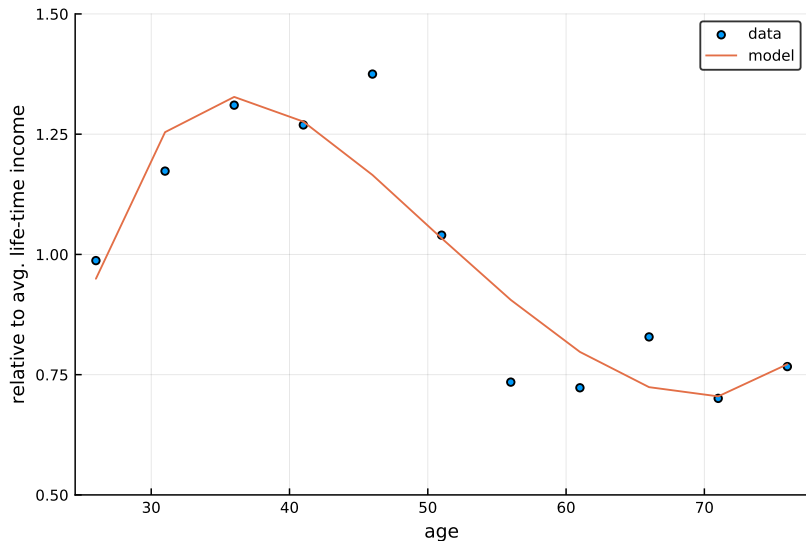
$$h_{i,t} = \int_t^{s_i+T} e^{-(r+p^{ag}\sigma_A)(z-t)} \mathbb{E}_t[w_{t+z}] \bar{l}_{i,z} dz$$

③ The effective risk aversion of entrepreneur  $i$  is given by

$$-\frac{V_{i,nn}n_{i,t}}{V_{i,n}} = \frac{\gamma}{1 + \frac{h_{i,t}}{n_{i,t}}}$$

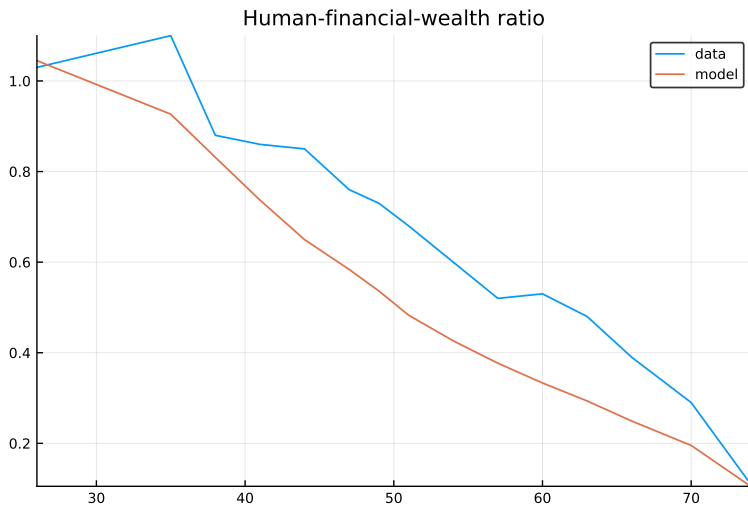


# Labor income over the life-cycle



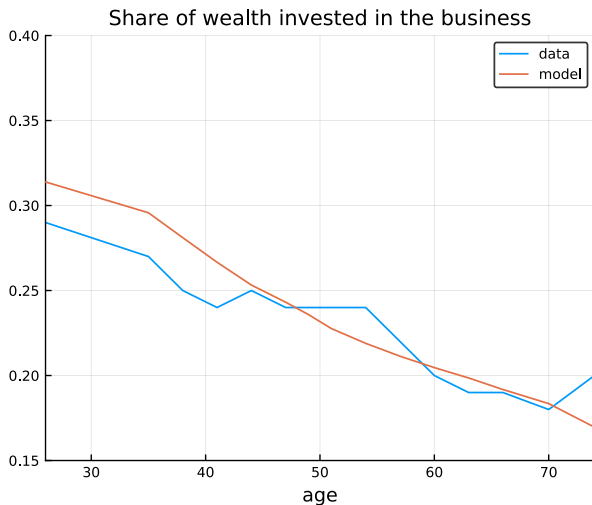
# Human-financial-wealth ratio

$$h_{i,t} = \int_t^{s_i+T} e^{-(r+p^{ag}\sigma_A)(z-t)} \mathbb{E}_t[w_{t+z}] \bar{l}_{i,z} dz$$



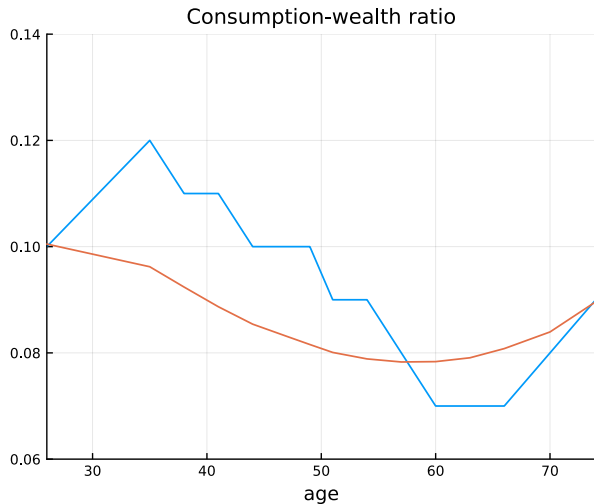
# Risk-taking - Life Cycle Profiles

$$\frac{q_t k_{i,t}}{n_{i,t}} = \frac{1 + \frac{h_{i,t}}{n_{i,t}} p^{id}}{\gamma \phi \sigma_{id}}$$



# Consumption-wealth ratio - Life Cycle Profiles

$$\frac{c_{i,t}}{n_{i,t}} = \frac{\bar{r}}{1 - \psi e^{-\bar{r}(T-(t-s_i))}} \left( 1 + \frac{h_{i,t}}{n_{i,t}} \right)$$



# Blanco (2017) “Townsend Thai Project: Lessons from the wealth planner intervention, Jun-Aug 2017”

## 2 Lessons from... the model

During this period, we have also reviewed the model, trying to come up with potential improvements. Some of them are the following.

### a) Dejanir’s model

Dejanir’s model (in progress) has given us some insights that are worth thinking about in the future. The paper replicates three important features in the data. First, consumption to net worth ratio is U-shaped with respect to age. Second, human wealth to net worth ratio is decreasing with age. Third, the share of risky assets over total assets is also decreasing over the lifetime.

We have tested whether the output of the planner is consistent with these predictions for the rural households. In the standard case (where the household “lives” until the head turns 100 years old and there is uncertainty regarding death and disability, as opposed to Dejanir’s model), we observe on average the same patterns. Note that we have approximated human wealth in an analogous way to that of Dejanir’s model, which is in continuous time, so the graph for this variable is not an exact representation. Results are shown in Figure II. The trend for consumption is less convincing, since it seems to be decreasing rather than U-shaped and the final upward trend takes place when the individual is too old, whereas Dejanir observes that the ratio starts to increase at approximately 65.

# RCT Intervention and Impact

## 4 Lessons from... urban data

Even if the data on the financial accounts is not available for the urban sample yet, we have been able to assess some aspects of the impact of the intervention on this subset of households.

- a) **Baseline comparison.** Out of 33 variables, there is no statistically significant difference between the treatment and the control groups in the baseline except for three of them: total livestock inventory, number of credit products and total value of loans lent. The details can be found in the document “Baseline Sumstats”.
- b) **Pre-treatment trends.** Note that, besides the baseline date, we have 15 months of data, 4 of which correspond to the pre-intervention period. We checked whether there is a difference in trends prior to the intervention, as a proof of the crucial assumption of “parallel trends” in any differences-in-differences analysis. We only detect a statistically significant difference in the level of total value of loans lent between treatment and control, with no specific time trend. The details can be found in the document “Pretreatment Analysis”.

c) **Knowledge analysis.** Next, we have used a differences-in-differences approach to assess whether the urban households learned about savings, credit, insurance and financial investment after the intervention. Within each category, we examine approximately 10-15 questions and we ran three specifications: no fixed effects, household fixed effects and household-year fixed effects. The details can be found in the document “Evaluation of knowledge”.

- *Single hypothesis testing.* When we test each question separately, these are the number of questions that show a statistically significant effect at the 95% confidence level: 4 out of 12 in savings, 4 out of 15 in credit, 6 out of 13 in insurance and 0 out of 10 in financial investment.
- *Heterogeneity analysis.* By “mainly negative”, we mean the heterogeneity variable has a negative impact on significantly more questions (over 4) than the positive ones, “slightly negative” is for the situation that the heterogeneity variable has negative impact on slightly more questions than the positive ones (like 2-3 more). “Mainly positive” and “slightly positive” have the similar meanings.
  - a) Gender - Head gender: mainly negative on knowledge for being a male
  - b) Marital Status - Head marital status: no significant impact on knowledge outcomes
  - c) Age:
    - Head age: no significant impact on knowledge outcomes
    - HH average age: mainly positive on knowledge for being older
  - d) Health:
    - Head health condition: mainly negative for being healthier? It is kind of weird, probably because health also related to other characteristics like education.
    - Household health index: mainly positive for being healthier

- e) Household size - Number of household members: slightly negative for households with larger size.
- f) Education
  - Head years of schooling: no significant impact on knowledge outcomes
  - Household average years of schooling: slightly negative for being more educated (educated households already learned a lot before the treatment?)
  - Household maximum years of schooling: slightly negative for being more educated
- g) Income
  - Gross income for the past year: mainly negative for having more income (also related to education)
  - Net income for the past year: mainly negative for having more income
- h) Precious financial experiences: mainly negative for having more financial experiences, probably because households with more financial experiences already learned before the treatment.
  - Total savings at financial institution: mainly negative for having more savings at financial institution
  - Number of debit products household owns: mainly negative for having more debit products
  - Number of credit products household owns: mainly negative for having more credit products
  - Number of loans borrowed: mainly negative for having more loans
  - Total value of loans borrowed: mainly negative for having more loans
  - Number of loans lent: mainly negative for lending out more loans
  - Total value of loans lent: mainly negative for lending out more loans
  - Number of ROSCA participating: mainly negative for participating in more ROSCA
  - Number of insurance policies own: no significant impact on knowledge



# Mestieri, Schauer and Townsend (2017) “Human Capital Acquisition and Occupational Choice: Implications for Economic Development”

Using household-level data from Mexico we document patterns among schooling, entrepreneurial decisions and household characteristics such as assets, talent of household members and age of the household head. Motivated by our findings, we develop a heterogeneous-agent, incomplete-markets, overlapping-generations dynasty model. Households jointly decide over their life cycle on (i) kids' human capital investments (schooling) and (ii) parents' entry, exit and investment into alternative entrepreneurial modes (subsistence and modern). With financial constraints all of these are co-determined. A calibrated version of our model can account for the broad correlation patterns uncovered in the data within and across generations, e.g., a non-monotonic relationship between educational choices and assets across occupations, growth in profits and employment for modern firms only, and dynastic persistence across generations in education and wealth. Endogenous human capital acquisition is a key driver of inequality and intergenerational persistence. Eliminating this channel would decrease the top 10% income share by 47%. Eliminating within-period borrowing constraints would increase average household expenditure by 7.1% and benefit the middle class, reducing top and bottom expenditure shares. It would also reduce by 28% the correlation between household assets and kids' schooling levels.

# Kaplan and Violante (2014) “A Model of the Consumption Response to Fiscal Stimulus Payments”

A wide body of empirical evidence finds that approximately 25 percent of fiscal stimulus payments (e.g., tax rebates) are spent on nondurable household consumption in the quarter that they are received. To interpret this fact, we develop a structural economic model where households can hold two assets: a low-return liquid asset (e.g., cash, checking account) and a high-return illiquid asset that carries a transaction cost (e.g., housing, retirement account). The optimal life-cycle pattern of portfolio choice implies that many households in the model are “wealthy hand-to-mouth”: they hold little or no liquid wealth despite owning sizable quantities of illiquid assets. Therefore, they display large propensities to consume out of additional transitory income, and small propensities to consume out of news about future income. We document the existence of such households in data from the Survey of Consumer Finances. A version of the model parameterized to the 2001 tax rebate episode yields consumption responses to fiscal stimulus payments that are in line with the evidence, and an order of magnitude larger than in the standard “one-asset” framework. The model’s nonlinearities with respect to the rebate size and the prevailing aggregate economic conditions have implications for policy design.

## Lecture 9: Life Cycle Models and Data; Behavior and RCT Interventions; With Insurance Limits, Credit Constraints and Transaction Costs for Liquidity, Life Cycle as Basis for Models of Growth and Inequality (4/7)

“Extraordinary Financial Lives of Ordinary People,” Chapters 3 and 4, case studies, life cycle planner

"Households as Corporate Firms: An Analysis of Household Finance Using Integrated Household Surveys and Corporate Financial Accounting." Krislert Samphantharak and Robert M. Townsend. Econometric Society Monograph Series No. 46, December 2009.

### Life Cycle Models With Limited Insurance

\*"Risk-taking over the Life Cycle: Aggregate and Distributive Implications of Entrepreneurial Risk" Dejanir H. Silva and Robert M. Townsend. Working Paper, 2018.

### With Credit Constraints

"Human Capital Acquisition and Occupational Choice: Implications for Economic Development". Marti Mestieri, Johanna Schauer and Robert M. Townsend, Review of Economic Dynamics, 25, 2017: 151–186.

With Transaction Costs and Liquidity Constraints • Kaplan, G. and Violante, G. L. (2014), A Model of the Consumption Response to Fiscal Stimulus Payments. Econometrica, 82: 1199-1239.

doi:10.3982/ECTA10528

Kaplan, Greg, Giovanni L. Violante, and Justin Weidner (2014). The Wealthy Hand to Mouth. Brookings Papers on Economic Activity, Spring 2014