# Integrated Household Surveys and Corporate Financial Accounting: Lessons from Thailand

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# **Townsend Thai Project**

#### Annual

- > Started in rural areas in 1997 with 192 villages
  - Currently 18 years
  - o Chachoengsao, Buriram, Lopburi, Sisaket
- Resurvey in 64 villages every year since 1998
- Expanded to North and South in 2003 and 2004
  - Phrae & Phetchabun (North)
  - Satun & Yala (South)

#### Urban

- Extended to Urban Areas in 2005
- Recent new urban monthly survey
- Monthly Survey
  - Started in 1998
    - o 204 continuous months of data for 720 households
  - Survey Design
    - o 16 villages
    - o 45 households per village
- Current scale per year
  - > Over 3,000 households in 200 villages and towns
- Longest running high-frequency panel in developing world

# > Townsend Thai Project - TFRP



# **Townsend Thai Monthly Survey: Overview**

- Intensive monthly survey initiated in August 1998 in 16 villages (four villages in each of four provinces in central and northeastern regions of Thailand)
- ♦45 households per village  $\Rightarrow$  720 households total

Survey involves

- 1. Initial census
- 2. Baseline interview on initial conditions of sampled households
- 3. Rosters (household, land plot, credit contracts, etc.)
- 4. Monthly interviews to track changing conditions

# **Complete Financial Accounts**

Table A.2. Income Statement of Household A

Month	5	6	
Revenue from Cultivation			
Revenue from Livestock	30,485	27,753	
Livestock Produce	28,985	27,753	
Capital Gains	1,500		
Revenue from Fish and Shrimp			
Revenue from Business	184,360	145,360	
Revenue from Labor Provision	11,440	11,440	
Other Revenues	6,000	3,000	
Total Revenues	232,285	187,553	
Cost of Cultivation			
Cost of Livestock Capital Losses	31,944	30,281	
Depreciation (Aging)	3.281	3.263	
Other Expenses	28,663	27,018	
Cost of Fish and Shrimp			
Cost of Business	220,176	167,323	
Cost of Labor Provision			
Cost of Other Production			
Activities			
<b>Total Cost of Production</b>	252,120	197,604	

Month	5	6
Cash in Hand	1,966,139	1,862,121
Account Receivables	688,971	805,259
Deposits at Financial Institutions	167,271	167,969
ROSCA (Net Position)	33,000	37,000
Other Lending	153,136	153,136
Inventories	1,346,939	1,440,729
Livestock	326,280	323,018
Fixed Assets	967,342	973,759
Household Assets	598,758	596,261
Agricultural Assets	66,104	65,829
Business Assets	2,479	11,669
Land and Other Fixed Assets	300,000	300,000
Total Assets	5,649,079	5,762,991



Table A.1. Balance Sheet of Household A Table A.3. Statement of Cash Flows of Household A

Month	5	6	
Net Income (+)	-22,684	-12,889	
Adjustments:			
Depreciation (+)	6,075	6,046	
Change in Account	-147,488	-116,288	
Receivable (-)			
Change in Account	149,960	149,960	
Payable (+)			
Change in Inventory (-)	-126,465	-106,205	
Change in Other Current Assets (-)	1,781	3,263	
Consumption of Household- Produced Outputs (-)	-350	-314	
<b>Cash Flow from Production</b>	-139,171	-76,427	



[Source: Samphantharak & Townsend, 2006]<sup>4</sup>

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# **Transaction-based Accounts**

Transaction Example of Corresponding Balance Sheet Survey Questions		Balance Sheet	Income Statement	Statement of Cash Flows	Remarks
Receive wage income in cash	<b>JM4D</b> What is the total amount of cash payments that you received since the last interview for doing this job? Include the value of any cash tips, bonuses or overtime payments. If no cash pay- ments were received, record 0.	Increase in cash; Increase in cumulative savings	Revenue from labor	Net income (Cash inflow)	
Use cash to pay telephone bill	XM1A [6] Since the last interview, have you or members of your household made any cash purchases of [telephone and telecommunication services]? If yes, what is the total amount that you and members of your household have spent on [telephone and telecommunication services] since the last interview?	Decrease in cash; Decrease in cumulative savings	Consumption	Consumption (Cash outflow)	
Deposit cash with the pro- duction credit group	<b>SM3B</b> How much have you depos- ited to [the production credit group] in total since the last interview?	Decrease in cash; Increase in depos- its at financial institutions		Increase in deposits at finan- cial institutions (Cash outflow)	

#### Table 4.1. Examples of Transactions and Their Records

# **NIPA Accounts:**

# From Household, to Village, to Diverse Regions, to Macro Aggregates (Paweenawat & Townsend, 2012)

We create village/county economic accounts by aggregating the economic accounts of every household

- Appropriation account
- Balance of payments account
  - Production account

Uses	Sources
Interest expenses	Production revenues
Less: Interest revenues	Less: Production expenses
Depreciation	
Insurance premium	
Property tax	
Profit	
Net income before tax	
Less: Capital gains	
Plus: Capital losses	
Less: Insurance indemnity	
Charge against output	Output

#### Saving-investment Account

Uses	Sources
Change in financial assets	Change in net worth
Change in inventories	Contributed capital
Change in livestock assets	Current retained earnings
Change in fixed assets	Depreciation
Plus: Depreciation	
Less: Change in liabilities	
Gross investment	Gross saving

Within country impact of financial deepening and increased trade
Welfare distribution of gains and losses (due to price effects)

### Flow of Funds Accounts (with Narapong Srivisal, NESDB & UTCC)

- - > Updating, need more data
- Flow of Funds from Financial Corporation National
   Undating need more data
   Flow of funds between a village in Chachoengsao and the other sectors in November 2009



- Monthly policy transmission mechanism onto regions, villages (Srivisal)
- \* Inter-regional flow of funds from rural to urban, Northeast to Central (Moll, Townsend, Zhorin)
- Possible extension to high frequency payments

# Efficiency Tests of Financial Systems: Consumption Smoothing, Income Data

(Chiappori, Samphantharak, Schulhofer-Wohl and Townsend, 2014)

Programming problems to determine Pareto optimal allocations

Risk sharing in consumption

Maximize weighted sum of discounted expected utilities

$$\max_{h^{t}, i_{it}(h^{t})} \sum_{i=1}^{N} \lambda_{i} \left\{ u(c_{i0}, \xi_{i0}) + \sum_{t=1}^{\infty} \beta^{t} \sum_{h^{t}} prob(h^{t} \mid h_{0}) u[c_{it}(h^{t}), \xi_{it}] \right\}$$

Subject to resource constraints

$$\sum_{i=1}^{N} c_{it}(h^{t}) \leq C_{t}(h^{t}) \text{ for all } t$$

First order condition

Equated weighted marginal utilities

 $\succ \lambda_i \beta^t \operatorname{prob}(h^t \mid h_0) u_c'(c_{it}, \xi_{it}) = \mu(h^t)$ 

Key Equation

 $C_{it}$ 

 $\succ c_{it} = \alpha_i + \beta_1 c_t + \beta_2 y_{it}$ 

Basic Principle

- Aggregate risk should be shared
- Idiosyncratic risks pooled away
- Welfare gains (or losses!) from hypothetical elimination of aggregate (village) risk, e.g., indexed rainfall insurance

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Applies to village but could be any group

Allows small open economy

> Derive nonparametric implications

### Portfolio Management – Long Term Liquidity Management – Short Term

Statement of cash flow from accounting identities

$$\blacktriangleright D = F1 + F2 + \ldots + Fn$$

Variance decomposition of deficit

$$D_{t} - \bar{D} = [F_{1,t} - \bar{F}_{1}] + [F_{2,t} - \bar{F}_{2}] + \dots + [F_{n,t} - \bar{F}_{n}]$$

$$\sum_{t} [D_{t} - \bar{D}]^{2} = \sum_{t} [F_{1,t} - \bar{F}][D_{t} - \bar{D}] + \sum_{t} [F_{2,t} - \bar{F}][D_{t} - \bar{D}] + \dots + \sum_{t} [F_{n,t} - \bar{F}][D_{t} - \bar{D}]$$

$$\operatorname{Var}(D) = \operatorname{Cov}(D, F_{1}) + \operatorname{Cov}(D, F_{2}) + \dots + \operatorname{Cov}(D, F_{n})$$

$$1 = \frac{\operatorname{Cov}(D, F_{1})}{\operatorname{Var}(D)} \div \frac{\operatorname{Cov}(D, F_{2})}{\operatorname{Var}(D)} + \dots + \frac{\operatorname{Cov}(D, F_{n})}{\operatorname{Var}(D)}$$
(2)

#### Table 7 Variance Decomposition of Consumption and Investment Deficits

Annualized VCOV on all four provinces

Cov(D,F)/Var(D)	[1st, 2nd, 3rd Quartiles]				
	Definition of Deficit				
	D=C-Y	D=C+I-Y			
Decrease in Deposit at Financial Institution	[-0.75, 0.10, 3.41]	[-0.42, 0.15, 4.66]			
Decrease in Net	[0.00, 0.00, 0.00]	[0.00, 0.00, 0.00]			
ROSCA Position					
Lending	[0.00, 0.00, 0.00]	[0.00, 0.00, 0.13]			
Borrowing	[-3.70, 0.07, 6.17]	[-1.35, 0.96, 9.27]			
Net Gift Received	[-0.89, 10.30, 34.27]	[1.92, 16.69, 42.97]			
Decrease in Cash	[28.92, 64.12, 90.07]	[32.07, 65.71, 90.15]			

Remarks: The Numbers are in percentage. Regarding the definition of deficits, "C" denotes consumption expenditure, i.e. consumption of outputs not produced by the household and must be acquired from outside household; "I" denotes capital expenditure, gross of depreciation; and "Y" denotes cash flow from production. The unit of observations is annualized from household-monthly data covering 156 months, from January 1999 to December 2011 in all 16 villages and 4 provinces.



### One of the Mechanisms Used: Bridge Loans (with Parit Sripakdeevong)



#### **Correlation Between Amount Repaid and Amount Borrowed**



(Short Term)
Joan B
JOAILI

(Flow of R	epayment)	'Target' Loan		
% of Total (51.7 M Baht)		Short Term	Long Term	Total
	Short Term	0.2	30.7	30.9
'Repay' Loan	Long Term	27.6	41.4	69.1
200	Total	27.8	72.2	100

### Wealth Distribution, Inequality and Growth: From Balance Sheet (Pawasutipaisit & Townsend, 2011)

- Top 1% households own about 1/3 of the total wealth. Top 5% households own about half of the total wealth. Bottom half own less than 10%.
- The gap between rich and poor has been decreasing over time.
- Correlation of growth of net worth with savings rates, especially RoA

Table 5. % of Net Worth Held by Various Groups Defined by Percentiles of the Wealth Distribution in each year

	Year												
Percentile	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
0-50%	5.58	5.99	6.43	6.81	7.24	7.70	8.75	9.22	9.62	9.94	10.07	10.40	10.67
50-90%	28.31	28.08	28.03	28.29	28.70	29.03	31.25	32.18	32.70	33.45	34.28	34.88	35.42
90-95%	11.99	11.58	11.66	11.23	10.96	11.46	11.43	11.25	11.46	11.32	11.34	11.26	11.23
95-99%	19.52	19.67	18.75	18.29	17.90	17.86	17.88	17.60	17.20	17.04	16.91	16.47	16.13
99-100%	34.60	34.69	35.12	35.38	35.19	33.95	30.70	29.76	29.02	28.25	27.40	26.99	26.55

Growth is decreasing in initial wealth

Table 6. Growth of Net Worth b	by the Initial Wealth Distribution in 1999
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Initial Wealth in 1999	1 quartile	2 quartile	3 quartile	4 quartile
Growth of Wealth(Mean)	17.36	7.51	5.07	2.95
Growth of Wealth(Median)	20.36	7.28	4.31	2.53



### ROA Convergence (with Hong Ru)



#### **Extraordinary Financial Lives of Ordinary People: Huge** Variation in Financial Situations (with Narapong Srivisal)

#### Household 1: High and increasing wealth, mainly land asset holdings, little debt



#### Household 2: Low and decreasing wealth, declining cash asset holdings, significant debt



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### Life Cycle (with Dejanir Silva)



Life Cycle Stock Method: Central









### Cash Management: High Frequency Payments (Alvarez, Pawasutipaisit & Townsend, 2014)

The basic ingredients of the model are as follows:

- ≻ Let e = c y be net expenditures. So e(t) > 0 means an expenditure paid in cash at time *t* and e(t) < 0 means an income received in cash.
- > We assume that the net expenditures in cash are iid through time and that during a period of length  $\Delta$  they are distributed as follows:

 $e(t) = \begin{cases} z_p \text{ with probability } \kappa_p \Delta \\ \Delta c + \sigma \Delta^{1/2} \text{ with probability } \frac{1 - (\kappa_p + \kappa_n)\Delta}{2} \\ \Delta c - \sigma \Delta^{1/2} \text{ with probability } \frac{1 - (\kappa_p + \kappa_n)\Delta}{2} \\ -z_n \text{ with probability } \kappa_n \Delta \end{cases}$ 

The evolution of cash will be as follows:

$$m(t+\Delta) = m(t) - e(t+\Delta) + w(t+\Delta) - d(t+\Delta)$$

# **Difficulties in Measurement**

### $n_d D$ or Actual Deposit

This is because the survey team will record when money goes into savings accounts as a deposit, regardless of whether households made deposits by themselves. For instance, if households receive direct deposit, or money transfer from some organization, they will be treated as deposits in the survey.

### $\mathbf{*}y$ or Income in Cash

- There are two types of income that households may receive as direct deposit but somehow they are recorded as cash in the survey
  - Salary from employer
  - Revenue from selling milk to milk cooperatives for dairy farmers in Lopburi

#### New Borrowing

Because if new loan is from BAAC, commercial bank, village fund, they are supposed to go through savings account and thus we do not have to include that as cash inflow.



### Extension to (Household) Businesses (with Samphantharak)

Risk and Return: Township as Market

Step 1: Compute household beta from a simple time-series regression for each HH

$$R'_{j,t} = \alpha_j + \beta_j R_{M,t} + \varepsilon_{j,t}$$

> Step 2: Cross-sectional regression for each township, using time-series average

$$\overline{R_j'} = \sum_{t=1}^T R_{j,t}'$$

as proxy for expected return

$$\overline{R_j'} = \alpha + \lambda \beta_j + \eta_j.$$

> In theory, the null hypotheses from the model are that,  $\lambda = E(R_M)$ , and that the constant term  $\alpha$  is zero.

# **Covariate vs. Idiosyncratic Risk**



Panel A:			
Panel A.1: Decomp	Panel A.2: Decon		
Region:	Central		
Township (Province):	Chachoengsao	Lopburi	Chachoe
Aggregate Risk	1.9%	2.4%	78.49
Idiosyncratic Risk	98.1%	97.6%	21.69

#### Panel A.2: Decomposition of Risk Premium

Centr	Central			
Chachoengsao	Lopburi			
78.4%	38.5%			
21.6%	61.5%			

#### **Extension to Interconnections: Informal Financial Networks** as Links to Outside Financial Provider (Kinnan & Townsend, 2012)

- Consumption smoothed by active networks Investment by kin, threat for default 124 137 156 306 346 Not linked in any way are most vulnerable This was somewhat concealed before  $\geq$ 345 - 349 Active Financial Network 337 345 327 170 Figure 1: Klongkah borrowing network 1025.0 1003.0 214 -310 153 Family Ties 1020.0 2015.0
- Panel B: A Village in Srisaket

# Financial Architecture: Measurement and Ex Ante Optimal

Design (with Juan Pablo Xandri; and with Weerachart Kilenthong)





Table 7: Equilibrium allocation of (non-zero-mass) lotteries. There are multiple active secu-



rity exchanges; z = 0.6113 and z = 0.8132.

u = 3	h = 3	h = 2	h = 1 $h$		h = 1 $h = 2$		
	0.0000	0.0000	4.6072	6.3082	k		
	-0.2735	-1.3159	1.6384	1.3892	$\hat{\tau}$		
Μ	0.7319	1.9898	-2.4776	-3.7176	τ		
un	2.3961	4.4835	5.6204	5.6204	C10		
co	1.4491	2.7106	3.3982	3.3982	$c_{20}$		
	4.7265	5.6841	2.1384	1.8892	$c_{11}$		
Re	7.7319	6.9898	2.6296	3.0905	C <sub>21</sub>		
62	0.6113	0.8132	0.8132	0.6113	z		
54	-0.7209	-2.9340	3.6532	3.6618	Δ		
	1.0000	1.0000	0.8031	0.1969	$x^h$		
	-1.4483	-0.9110	211	-1.3	$U^h$		



Remove fire sales, crises