

Financial Systems Across Time and Space: The Thailand Project

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Overview: Models, Methods and Policy

- ▶ Apply GE Theory for Developing Countries:
 - Understanding → Positive economics
 - Evaluating → Analyzing impact of policy/interventions
 - Design → Of better markets and policy
- ▶ A research algorithm and the Main Methodological Approach
 - Realistic environment in GE terms – Preferences, Endowments, Technology, Shocks, **and Geography**
 - based on reality from data (not assumptions)
 - Testing a benchmark from theory of GE
 - Fits – may fit one level (village) and not another (across provinces)
 - if anomalies:
 - If natural, then remodel and start algorithm again
 - If policy induced barriers, then innovate to remove artificial barriers
- ▶ Micro-to-macro modeling helping to identify:
 - Micro up, real intermediation on the ground, and macro down (e.g., inflation, crisis)
 - Get rid of micro versus macro distinction
 - Interactions, channels of transmission
 - Heterogeneous agents and heterogeneous policy effects

General Equilibrium Theory–Bringing Abstract Material to Life

Definition 1 (Walrasian Equilibrium) A Walrasian Equilibrium is an allocation (x^*, y^*) and a price vector $p \in \mathbb{R}_+^L$ such that:

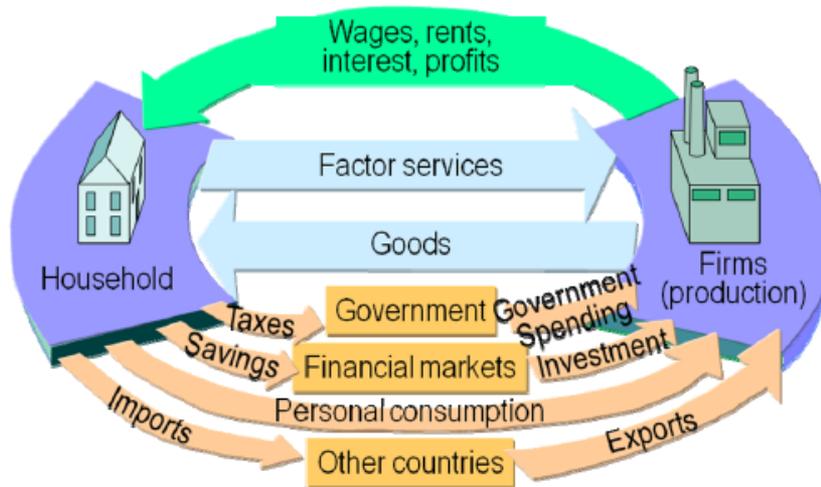
1. For each $j = 1, 2, \dots, J$, y_j^* maximizes profits given prices: $py_j^* \geq py_j$ for all $y_j \in Y_j$
2. For each $i = 1, 2, \dots, I$ x_i^* is maximal for i 's preference over her budget set; that is: $x_i^* \succsim_i x_i$ for all $x_i \in X_i : px_i \leq p\omega_i + \sum_{j=1}^J \theta_{ij}py_j^*$
3. The allocation is feasible: $\sum_{i=1}^I x_i^* = \bar{\omega} + \sum_{j=1}^J y_j^*$

Definition 2 (Price Equilibrium with Transfers) An allocation (x^*, y^*) and a price vector $p^* \in \mathbb{R}_+^L$ constitute a price equilibrium with transfers if there exists an assignment of wealth levels (w_1, w_2, \dots, w_I) such that $\sum_{i=1}^I w_i = p^*\bar{\omega} + \sum_{j=1}^J p^*y_j^*$ such that:

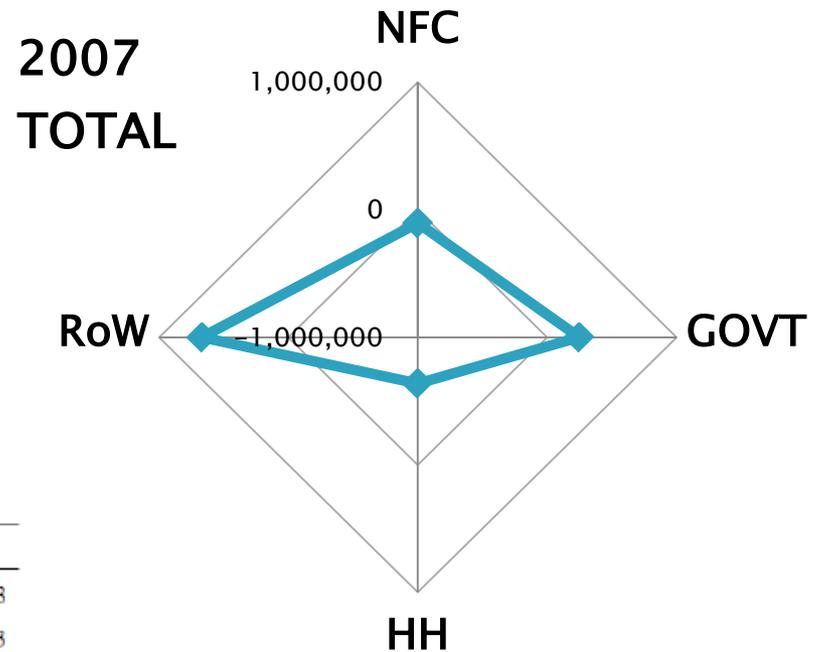
1. For each $j = 1, 2, \dots, J$, y_j^* maximizes profits given prices: $p^*y_j^* \geq p^*y_j$ for all $y_j \in Y_j$
2. For each $i = 1, 2, \dots, I$, x_i^* is maximal for i 's preference over her budget set; that is: $x_i^* \succsim_i x_i$ for all $x_i \in X_i : p^*x_i \leq w_i$
3. The allocation is feasible: $\sum_{i=1}^I x_i^* = \bar{\omega} + \sum_{j=1}^J y_j^*$

Of course, any Walrasian equilibrium is a price equilibrium with transfers, with $w_i = p\omega_i + \sum_{j=1}^J p\theta_{ij}y_j^*$

The Circular Flow Basis of NIPA: It is from GE



[Figure 2.1.1. The Circular Flow. Based on: Colander (2004)]



National Income Accounts for Mexico

In 10 Trillion Mexican Pesos

Expenditures		Income	
Private Consumption	35	Wages and Salaries	13
Private Investment	7	Other Factor Payments	33
Government Consumption	4	Indirect Taxes and Tariffs	5
Government Investment	5		
Exports	8		
- Imports	-8		
Gross Domestic Product	51	Gross Domestic Product	51

- Positive is inflow from intermediary to that sector
- Zero is midpoint
- Lower is outflow

Two widely used models: CGE and DSGE, underpinnings

- ▶ Aggregation is questionable
- ▶ IF complete markets benchmark is inadequate
 - then cannot separate households and firms
 - DSGE not perform well on financial crises
- ▶ There is no financial sector in either CGE or DSGE
- ▶ Two paths
 1. Impose frictions and actors – still macro aggregated – assume functions, markets, contracts
 2. Or measure obstacles, micro context
 - explain markets and institutions we see (or recommend)
 - investigate micro underpinnings and rebuild

General Equilibrium Development Economics

"Financial Structure and Economic Welfare: Applied General Equilibrium Development Economics," Annual Review of Economics, 2010

- ▶ Key building blocks– Be True to the Environment
 - Family, Network, Village
 - Geography, Financial institutions, flow of funds
 - Households as firms
 - Impediments to trade as measured in micro data

Village Economies

As general equilibrium small open economies

This is an example of how to proceed from below

Also building our understanding of micro underpinnings

Also metaphor of how to use theory, then repeat steps for macro

THE THAILAND PROJECT: Monthly Survey of Villages

- ▶ Started in 1998
 - Chachoengsao, Buriram, Lopburi, and Sisaket
- ▶ Longevity
 - 144 continuous months of data for 720 households
- ▶ Survey Design:
 - 16 villages, 45 households per village
- ▶ Data include:
 - Village-level family networks, markets and formal credit and insurance institutions
 - Measures of savings and loans, income, wealth, consumption
 - Crop operations, fish and shrimp businesses, shops, livestock, illness, formal and informal borrowing, lending and gift-giving
 - Estimates of regular purchases such as food

ECONOMETRIC SOCIETY MONOGRAPHS

Households as Corporate Firms

An Analysis of Household Finance Using Integrated Household Surveys and Corporate Financial Accounting

Krislert Samphantharak,
Robert M. Townsend

Not separate accounts of households,
not distinct from firms

Income Statement: An example, a household over 5 months – there are also balance sheet and cash flow statements

Table A.2. *Income Statement of Household A*

Month	5	6	7	8	9	Month	5	6	7	8	9
Revenue from Cultivation						Interest Revenue					
Revenue from Livestock	30,485	27,753	26,180	21,780	26,730	Interest Expense	55	55	55	75	55
Livestock Produce	28,985	27,753	26,180	21,780	26,730	Other Expenses	2,794	2,783	2,810	2,798	2,786
Capital Gains	1,500					Depreciation of Fixed Assets	2,794	2,783	2,810	2,798	2,786
Revenue from Fish and Shrimp						Insurance Premium					
Revenue from Business	184,360	145,360	183,875	152,890	160,455	Extraordinary Items					
Revenue from Labor	11,440	11,440	11,440	11,440	11,440	Capital Gains					
Provision						Capital Losses					
Other Revenues	6,000	3,000	6,000	6,000	6,000	Net Income	-22,684	-12,889	-2,945	16,125	20,597
Total Revenues	232,285	187,553	227,495	192,110	204,625	Consumption	9,035	9,362	8,145	10,849	8,566
Cost of Cultivation						Savings	-31,719	-22,251	-11,090	5,276	12,031
Cost of Livestock	31,944	30,281	27,642	22,813	21,715						
Capital Losses											
Depreciation (Aging)	3,281	3,263	3,230	3,198	3,166						
Other Expenses	28,663	27,018	24,412	19,615	18,549						
Cost of Fish and Shrimp											
Cost of Business	220,176	167,323	199,933	150,300	159,472						
Cost of Labor Provision											
Cost of Other Production Activities											
Total Cost of Production	252,120	197,604	227,575	173,112	181,187						

Remark: The unit of currency is THB. Month 5 is corresponding to January 1999.

[Source: Samphantharak & Townsend, 2006]

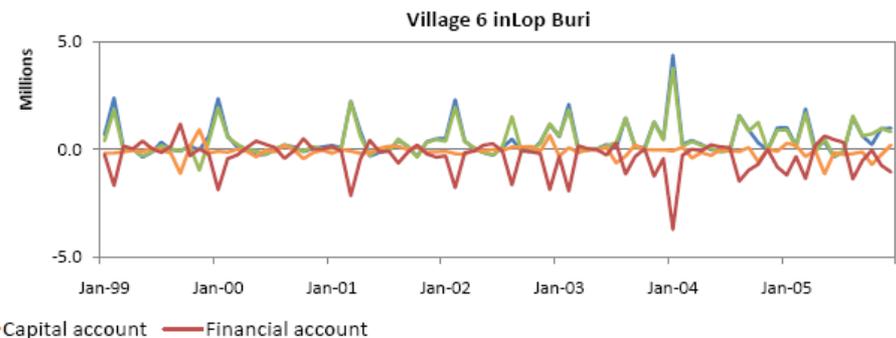
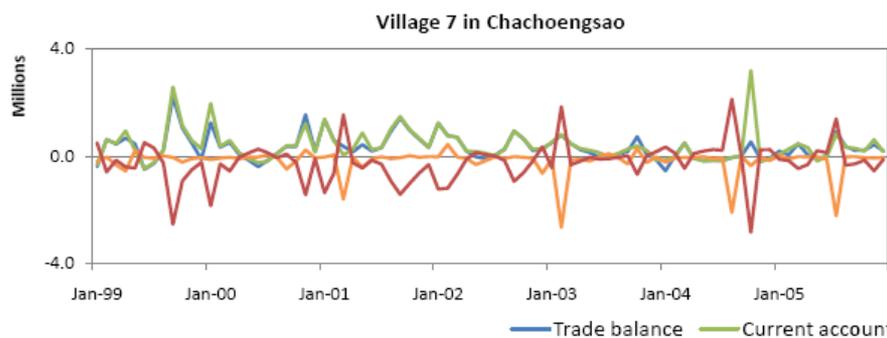
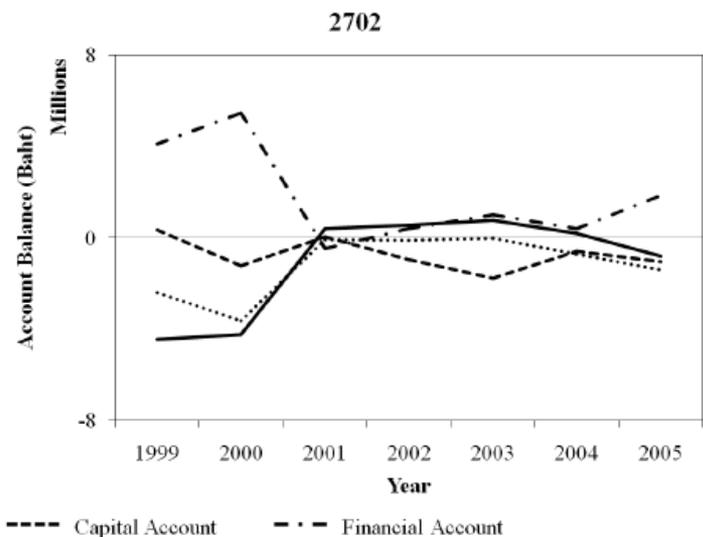
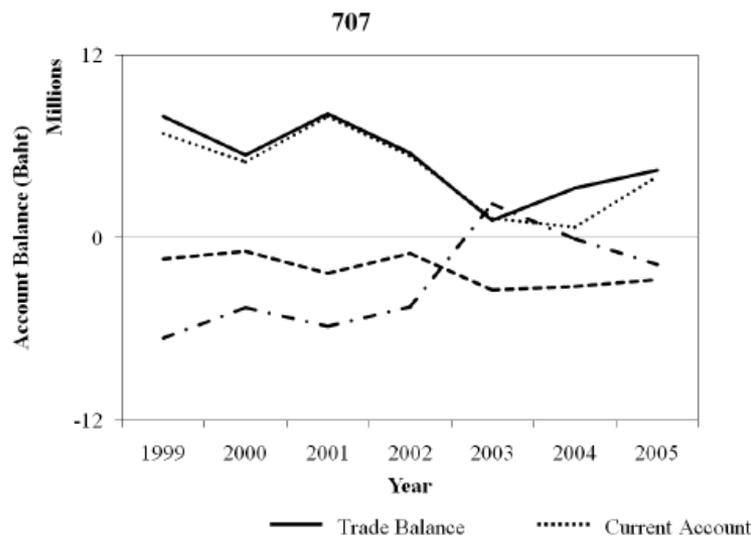
Village Accounts as Countries: NIPA, and aggregating up from financial accounts, as is standard

Saving-investment account			
Uses		Sources	
Change in current assets		Change in village net wealth	
Change in financial assets	2,604,839	Change in contributed capital	3,999,915
Within village	-1,302,716	Within village	534,019
With other villages	2,868,077	With other villages	3,465,896
With government	1,039,478	With government	0
Change in prepaid insurance	0	Current retained earnings	330,388
Change in inventories	2,982,070	Depreciation	1,436,771
Within village	3,339		
With other villages	2,782,573		
With government	196,158		
Change in livestock assets	-2,028,160		
Within village	-904,617		
With other villages	-1,123,543		
Change in fixed assets	2,037,296		
Within village	-1,129,273		
With other villages	3,166,569		
<i>Plus:</i> Depreciation	1,436,771		
<i>Less:</i> Change in current liabilities	1,265,743		
Within village	691,789		
With other villages	573,954		
Gross investment	5,767,073	Gross saving	5,767,074

Table 12.3 - Example of Village Saving-Investment Account in Northeast (5306)¹⁰

[Source: Paweenawat & Townsend, 2009]

Balance of Payments: Real (NIPA) and financial flows (FF) in an open economy, both real trade and macro financial



Balances of Payment in Selected Villages

Risk and Insurance Within Villages

(then return to villages in regions below)

TABLE I
COMPOSITION OF INCOME, BY SOURCE AND LANDHOLDINGS^a

← Wealth and occupation

Village	Income Source	Landholdings				All
		None	Small	Medium	Large	
Aurepalle	Crop	0.0225	0.2623	0.3967	0.5645	0.4476
	Labor	0.6527	0.3363	0.1623	0.0429	0.1538
	Trade & Handicrafts	0.2799	0.2919	0.3033	0.1242	0.1957
	Animal Husbandry	0.0449	0.1095	0.1373	0.2685	0.2029

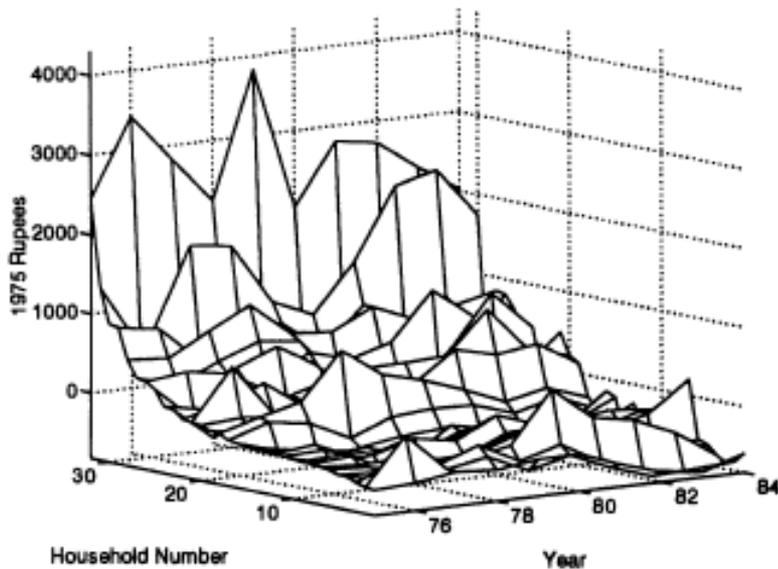
TABLE II
COEFFICIENTS OF VARIATION AND CORRELATION OVER INCOME SOURCES^a

← Risk but covariances low

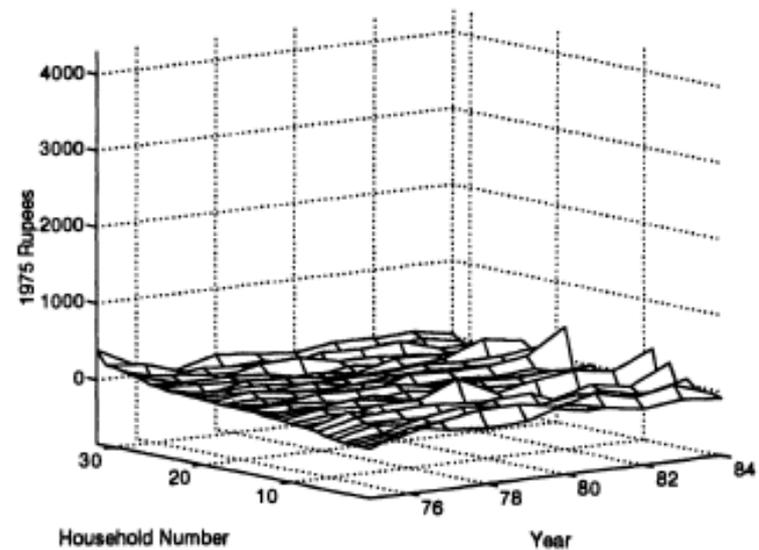
Village	Profits from Crop Prod.	Livestock Income	Earned Wages	Trade & Handicraft
Aurepalle	0.4227 (0.1101)	-0.0188 [-0.50, 0.50]	0.5800 [0.05, 0.85]	0.6297 [0.05, 0.85]
		0.2136 (0.0499)	0.3607 [-0.25, 0.75]	0.4586 [-0.20, 0.75]
			0.4554 (0.1211)	0.8194 [0.45, 0.95]
				0.4292 (0.1123)

Risk and Insurance

- ▶ Importance of idiosyncratic risk
- ▶ Little co-movement in income and consumption
- ▶ There must be intermediary mechanisms and devices



Income



Consumption

VCOV Decomposition

➡ F_j is a Financing Device

➡ $D = \sum_j F_j$ is Deficit

➡
$$1 \equiv \frac{\text{Cov}(D, F_1)}{\text{Var}(D)} + \frac{\text{Cov}(D, F_2)}{\text{Var}(D)} + \dots + \frac{\text{Cov}(D, F_n)}{\text{Var}(D)}$$

Managing Risks=household level

Cash management; some borrowing and gifts

Table 5.7 Variance Decomposition of Consumption and Investment Deficits

Cov(D,F) Var(D)	Definition of Deficit			
	Household A [1 st , 2 nd , 3 rd Province Quartiles]			Household B [1 st , 2 nd , 3 rd Province Quartiles]
	C+I-Y	C-Y	I-Y	C+I-Y
Decrease in Deposit at Financial Institution	0.75 [-0.14, 0.05, 2.31]	0.82 [-0.12, 0.08, 3.02]	0.70 [-0.02, 0.12, 2.91]	0.19 [-0.19, 0.01, 0.33]
Decrease in Net ROSCA Position	0.27 [0.00, 0.00, 0.00]	0.94 [0.00, 0.00, 0.00]	0.28 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.00]
Lending	-0.05 [0.00, 0.00, 0.00]	-0.10 [0.00, 0.00, 0.00]	-0.05 [0.00, 0.00, 0.00]	0.00 [0.00, 0.00, 0.00]
Borrowing	0.58 [-0.02, 3.47, 13.94]	2.87 [-0.82, 1.82, 13.74]	0.75 [-0.10, 3.28, 13.70]	8.84 [-0.16, 2.72, 14.51]
Net Gifts Received	-2.05 [-0.08, 1.48, 12.17]	-7.01 [-0.48, 1.11, 12.19]	-2.34 [-0.25, 0.88, 6.73]	13.00 [0.11, 8.27, 24.55]
Decrease in Cash Holding	100.49 [64.58, 85.54, 98.92]	109.20 [71.22, 95.76, 117.61]	96.54 [64.89, 84.82, 98.52]	77.97 [49.94, 78.84, 93.99]
Decrease in Fixed Assets	-	-6.72 [-20.31, -3.88, 1.16]	-	-
(Negative) Consumption Expenditure	-	-	4.12 [-0.95, 0.37, 3.19]	-
Total	100	100	100	100

Remarks: The numbers are in percentage. Regarding the definitions 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. Capital expenditure of household B was very small and very infrequent and therefore dropped from the study. The numbers are in percentage. The unit of observations is household-month, covering 48 months, from January 1999 and December 2002 for each household.

[Source: Samphantharak & Townsend, 2009]

The Programming Problem—within village operational benchmark

- ▶ Characterize Pareto Optimal Allocations using

$$(x^*, y^*) \in \arg \max_{(x, y)} \sum_{i=1}^I \lambda_i^* u_i(x_i)$$
$$s.t. : \begin{cases} x_i \in X_i, y_j \in Y_j \\ \sum_{i=1}^I x_i = \sum_{i=1}^I \omega_i + \sum_{j=1}^J y_j \end{cases}$$

- ▶ Rejection (non-rejection) providing reasons for intervention (non-intervention, apart from income redistribution goals)
- ▶ Don't worry: Generalizes to open economy

The Programming Problem—within village operational benchmark (cont.)

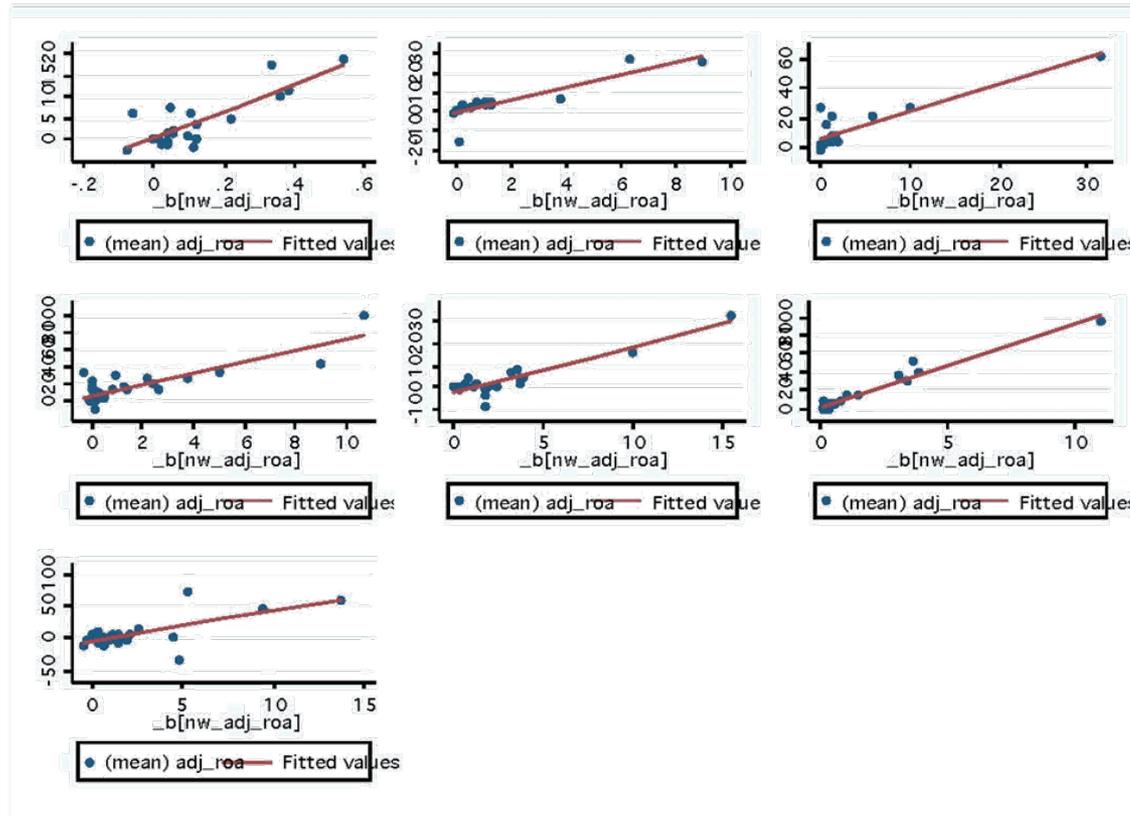
- ▶ General Lessons from Risk Sharing
- ▶ Largely pass or close to passing tests for networks and villages: consumption, investment, labor, asset returns
 - Networks or village as key entity for building block – close to CME
 - Poor without networks are vulnerable
 - POLICY: target but some remedies might even be internal to village –

$$\left(\frac{\ln(c_t^i) - \ln(c_\tau^i)}{t - \tau} \right) = \beta \left(\frac{\ln(\overline{c_t^g}) - \ln(\overline{c_\tau^g})}{t - \tau} \right) + \varphi \left(\frac{\ln(y_t^i) - \ln(y_\tau^i)}{t - \tau} \right) + \varepsilon_{t,\tau}^{i,g}$$

Aggregate

Idiosyncratic

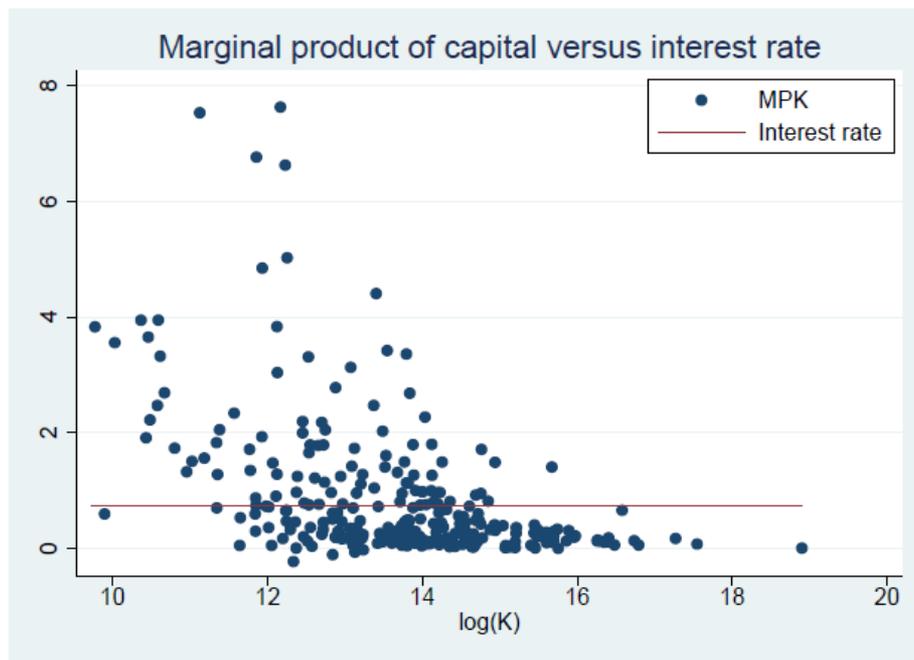
CAPM in Village Networks: Beta and Expected Return– Example of Efficient Markets



Panel D: Network as Market

Remarks: Horizontal Axis = Beta; Vertical Axis = Expected Return. Each graph represents each of the networks. We treat each network as the market. From left to right and from top to bottom are networks from Buriram (village 14), Lopburi (villages 1, 4, and 6), and Srisaket (villages 1, 6, and 9).

But intermediation of savings to borrowers is quite limited



- ▶ Debt/asset ratios are low even for those with high TFP and ROA
- ▶ Talented Poor are investing and saving in own enterprise—long term remedy
- ▶ Networks help, but not enough

[Pawasutipaisit & Townsend, 2010]

Question: What is the Overall Financial Regime

Using consumption data, investment data, combination of the two– pooling all data

Table 9 - Model Regime Comparisons^{1,2,3} Using Thai Data - Baseline; Vuong Test Z-Statistics

Comparison	MH v FI	MH v B	MH v S	MH v A	FI v B	FI v S	FI v A	B v S	B v A	S v A	Best Fit
1. Using (k,i,q) data											
1.1. years: 99-00	-1.81*(FI)	-6.80***(B)	-6.70***(S)	-4.79***(A)	-5.34***(B)	-5.54***(S)	-3.51***(A)	-0.02(tie)	3.36***(B)	2.00*(S)	B,S
1.2. years: 04-05	7.30***(MH)	1.59(tie)	-0.01(tie)	3.63***(MH)	-2.15**(B)	-4.20***(S)	-0.08(tie)	-3.24***(S)	9.28***(B)	5.83***(S)	S,MH,B
2. Using (c,q,i,k) data											
2.1. years: 99-00	6.20***(MH)	-10.7***(B)	-9.97***(S)	-8.18***(A)	-11.7***(B)	-11.6***(S)	-9.45***(A)	0.94(tie)	6.71***(B)	3.50***(S)	B,S
2.2. years: 04-05	4.31***(MH)	-9.83***(B)	-9.35***(S)	-4.90***(A)	-10.0***(B)	-11.2***(S)	-6.40***(A)	1.48(tie)	10.9***(B)	5.79***(S)	B,S
3. Using (c,q) data											
3.1. year: 99	4.79***(MH)	1.23(tie)	1.82*(MH)	6.26***(MH)	-2.31**(B)	-1.34(tie)	3.41***(FI)	1.16(tie)	7.22***(B)	8.20***(S)	MH,B
3.2. year: 05	3.92***(MH)	-0.56(tie)	0.15(tie)	2.77***(MH)	-3.96***(B)	-4.33***(S)	-0.60(tie)	0.75(tie)	4.58***(B)	3.11***(S)	B,MH,S
4. Two-Year Panel											
4.1. (c,q), yrs: 99 and 00	14.2***(MH)	-10.1***(B)	-4.45***(S)	-2.24**(A)	-20.5***(B)	-17.7***(S)	-13.0***(A)	2.08**(B)	5.24***(B)	4.21***(S)	B
4.2. (c,q), yrs: 99 and 05	14.1***(MH)	-11.2***(B)	-6.87***(S)	-7.25***(A)	-17.3***(B)	-14.7***(S)	-16.5***(A)	0.02(tie)	0.06(tie)	0.05(tie)	B,S,A

NOTES:

1. *** = 1%, ** = 5%, * = 10% two-sided significance level, the better fitting regime is in the parentheses

2. Z-statistics cutoffs: 2.575 = *** 1.96 = ** 1.645 = * "tie"

3. Investment, i is constructed from the firm assets data as $i = k' - (1 - \delta)k$ with $\delta = .05$

Vuong tests of mechanism design outcomes to distinguish obstacle: constrained and exog. incomplete regimes– with Alex Karaivanov

Moral hazard, very good risk sharing in consumption/income data
But more limited borrowing/lending, or savings only in investment and combo data

Policy Remedy: Actual Interventions from the Outside Have Impact

Improved Financial Intermediation Matters

Actual Interventions: First IV, then structural impact assessment

- ▶ One Million Baht Village Funds Program
- ▶ \$24,000 To Capitalize– for borrowing and internal saving
 - Identification strategy: variation in funds/capita per village
- ▶ Impacts: increased consumption, profits from businesses, wages, labor income, agricultural investment, and total borrowing above and beyond village fund credit, while raising default rates and lowering assets/savings

$$y_{n,t} = \sum_{i=1}^I \alpha_i X_{i,n,t} + \beta VFCR_{n,t-1} + u_{n,t}$$

Buffer stock, lumpy investment – models of the intervention as relaxing credit constraints

Figure 3: Consumption Policy as a Function of Liquidity and Project Size

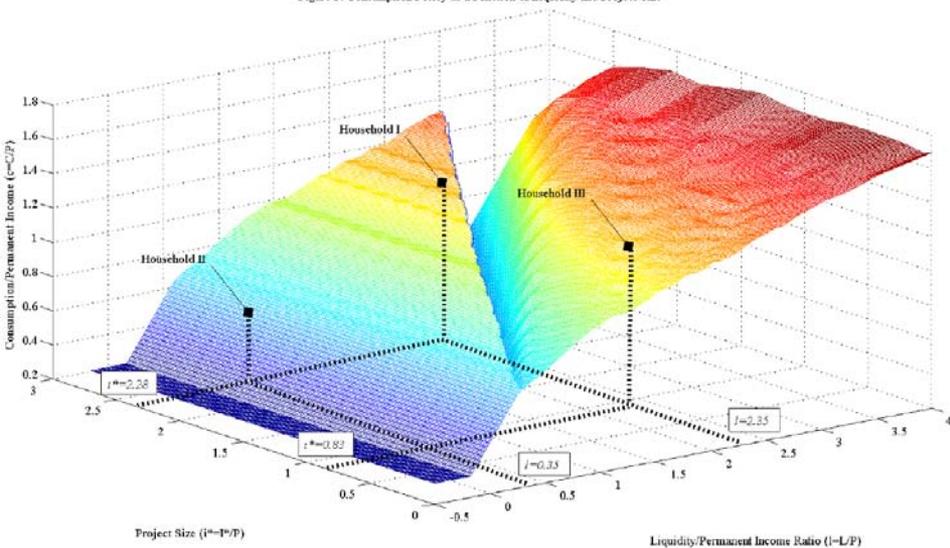
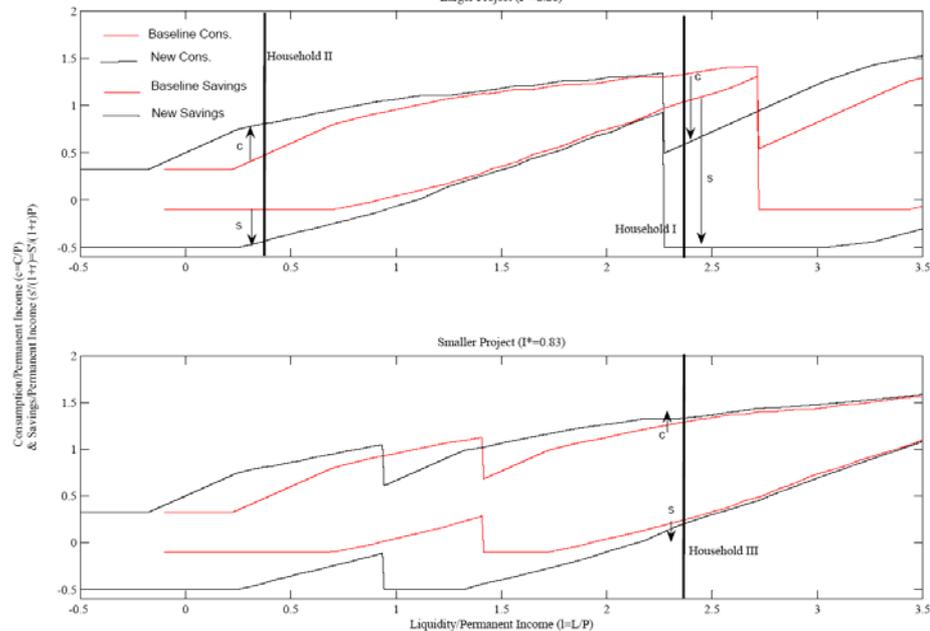


Figure 4: Examples of Consumption and Savings Policy Changes with Increased Borrowing Limit
Larger Project ($I^*=2.28$)



With Joe Kaboski: Village fund, Econometrica

- Caveat: heterogeneous treatment and IV, not same here

Welfare Analysis of Policy Impact:

best use of outside funds, tax revenue not in the analysis

- ▶ Comparing the cost of the program to cost of a transfer program
- ▶ Heterogeneity of impact
 - 28% value at more than cost
 - Many households benefit disproportionately from the program because of the increased availability of liquidity, low wealth and/or on threshold of investment
 - But most benefit much less
 - The median equivalent transfer is less than cost

Variation Across Villages and Regions: Policy lessons

- ▶ Repayment is positively associated with the quality of institutions in rural areas.
 - From a poll among the surveyed households in the original baseline 1997 surveys, four years before the million baht program was implemented.
- ▶ The strength of local, social sanctions is positively correlated with repayment in both rural and urban areas.
- ▶ External policy control variables: compulsory savings is positively correlated with repayment.
- ▶ The degree of joint liability per se is negatively associated with repayment.
- ▶ Using contract theory, joint liability, occupation choice: Obstacles vary across regions – Central (imperfect info) versus Northeast (limited commitment)

Zoom Out

Villages, Counties, States
Repeat the Algorithm, again

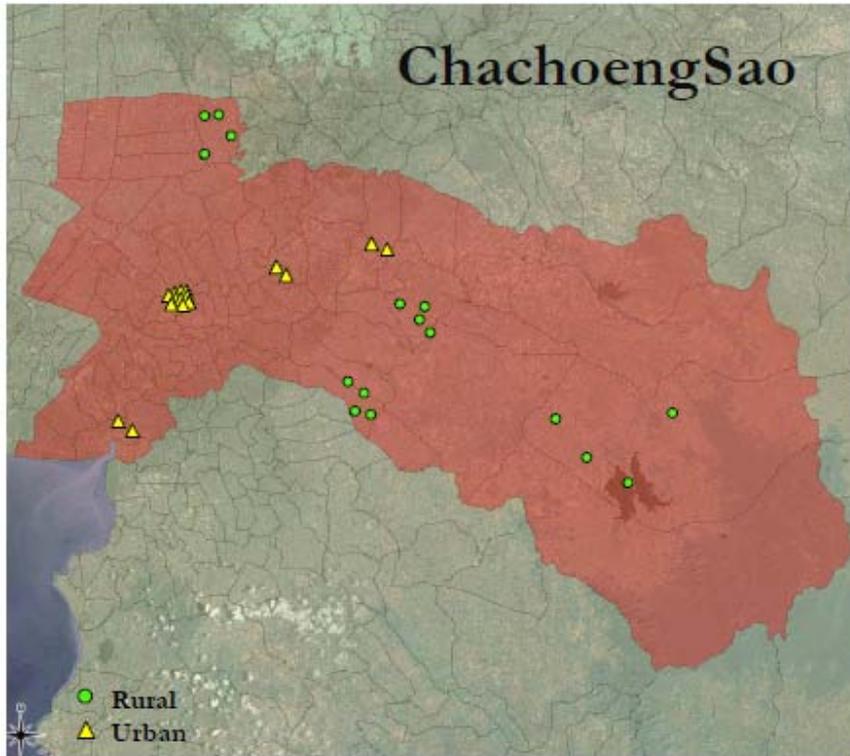
Data: Measurement of Environment

Townsend Thai Survey – Annual

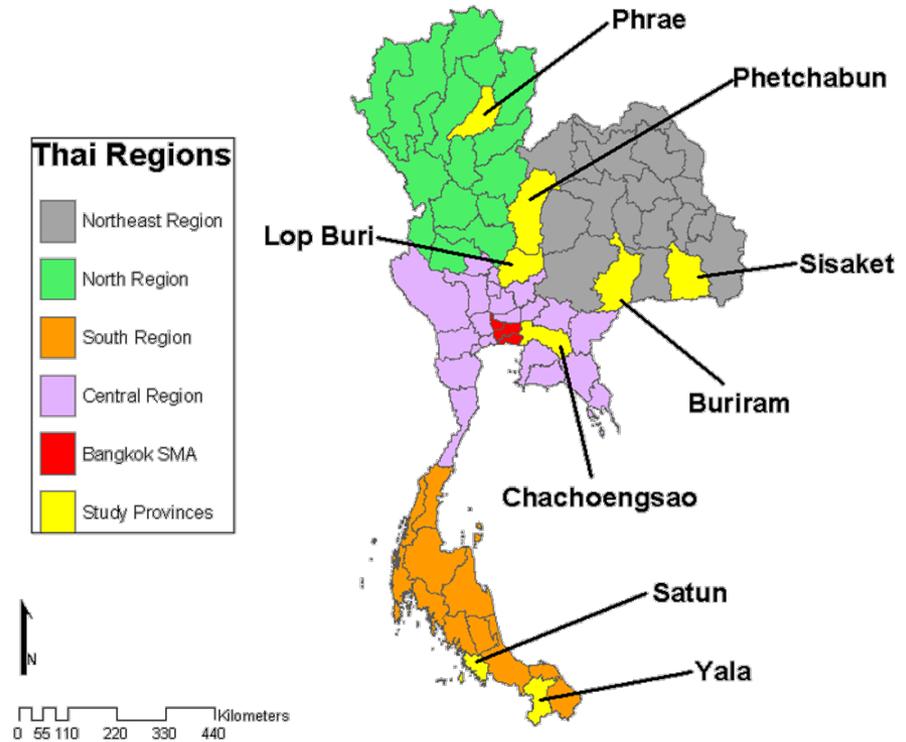
▶ Scope and Scale

- 13 years of continuous annual data for 985 households in urban and rural enumeration areas
 - In 2009, enumerators surveyed a total of 3,184 households across 200 villages and towns in the monthly survey and urban and rural annual surveys.
- ### ▶ Started Rural Areas in 1997 with 192 villages
- Chachoengsao, Buriram, Lopburi, and Sisaket
- ### ▶ Resurvey in 64 villages every year since 1998
- Allows us to assess impact of financial crisis
- ### ▶ Expanded to North and South in 2003 and 2004
- Phrae & Phetchabun (North), Satun & Yala (South)
- ### ▶ Extended to Urban Areas in 2005
- ### ▶ New Survey of Firms is Underway

Data From Urban/Rural and from Every Region



Villages are clustered by design
Urban is towns and cities (capital of province)

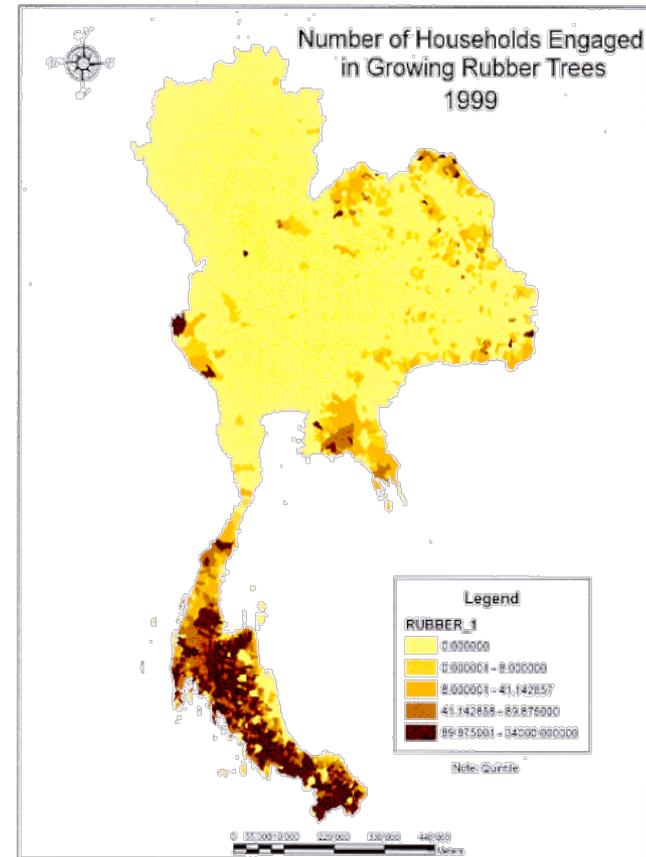
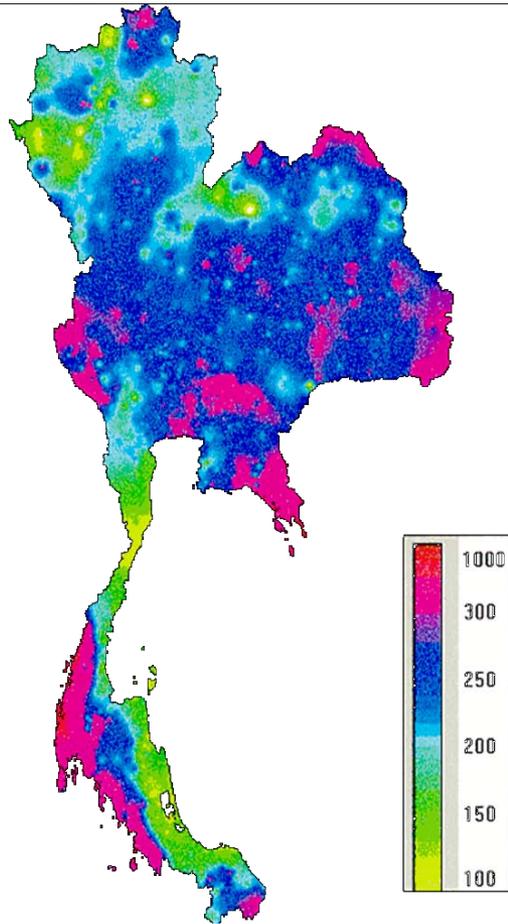


Tests of Risk and Insurance – and then key institutions and markets

- ▶ PIH and buffer stock tests (including other data)
- ▶ Paxon, AER, 1992, SES
 - “Using weather variability to estimate the response of savings to transitory income in Thailand” – largely pass, central
- ▶ Townsend and Vickery, 2004. SES and CDD
 - “Commodity price shocks, consumption and risk sharing in rural Thailand” in Vickery, 2004 – big failure, south

Environment: Important Shocks

Rainfall and rubber prices, regional and national



Risk Sharing Fixed Effects: Locally, not by village but by Country (same idea, idiosyncratic) and by Occupation (vulnerability)

- ▶ Many statistically significant fixed effects,
 - especially for farmers;
 - less so for rice farmers;
 - few for entrepreneurs.
- ▶ Many fixed effects in income disappear in consumption.

	F test for	Different Occupation Groups **								Different Measures of Income and Consumption **			
		All Households		All Farmers		Rice Farmers		Entrepreneurs		All Income	No In Kind	Wages	Food
		Y	C	Y	C	Y	C	Y	C	Y	Y	Y	C
1	N: 75-81												
2	N: 81-86			..									
3	N:86-88	..		..	..	..	..			..	.
4	N	..		..	..	..	..			.
5	NE: 75-81											..	
6	NE: 81-86												
7	NE: 86-88	..	.	..	..	.		.	..	..	..	..	..
8	NE	..		..					..	..	..	..
9	C: 75-81												
10	C: 81-86												
11	C: 86-88	..	.	..	..	..	..			..	..		..
23	U: 86-88			..	..	.							..
24	U			..	..	.				
25	SD: 75-81												
26	SD: 81-86												
27	SD: 86-88	..		.		.		..	..	..	..	.	.

N = North, C = Central, S = South, B = Bangkok, U = Urban, SD = Sanitary District, Y= year, C= community

.. = significant at 5% level, . = significant at 10% level

** = measured in C (community types) and Y (years)

(Table 3.4.5)

From Households to Villages as Units: Village Level VCOV in Sea of Regional Economy

Household Level - Mean

	Chachoengsao				Lop buri				Buri Ram				Si Sa Ket			
	702	704	707	708	4901	4903	4904	4906	2702	2710	2713	2714	5301	5306	5309	5310
Cash	68.34	70.43	67.71	77.35	65.30	69.85	61.07	70.03	71.00	80.22	70.33	75.95	46.05	75.72	77.25	81.43
Deposit	2.54	4.12	4.59	2.14	11.96	0.23	7.13	7.20	4.12	6.35	1.88	3.84	10.29	1.47	4.17	1.16
ROSCA	1.65	0.30	0.02	-0.01	0.17	0.24	0.65	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lending	-1.31	0.00	-1.40	0.14	-2.21	1.18	1.06	0.61	0.72	2.30	7.92	1.50	1.05	0.77	0.99	-0.79
Borrowing	5.07	5.61	2.06	7.30	9.06	11.70	19.02	10.19	4.77	0.83	6.22	8.26	17.50	4.36	3.20	4.37
Gift	23.71	19.54	26.74	13.05	15.90	16.88	11.47	11.31	19.40	10.26	13.65	10.45	25.12	17.68	14.39	13.83

- ▶ Cash is more at village level
- ▶ Borrowing more at village level

Village Level

	Chachoengsao				Lop buri				Buri Ram				Si Sa Ket			
	702	704	707	708	4901	4903	4904	4906	2702	2710	2713	2714	5301	5306	5309	5310
Cash	45.38	85.02	92.25	90.12	77.39	79.40	71.61	77.05	61.75	69.72	93.04	97.52	2.09	76.21	96.69	104.15
Deposit	4.14	1.91	8.84	2.03	7.83	6.53	7.86	5.37	2.42	7.15	4.09	0.27	35.13	-1.35	-3.17	0.77
ROSCA	0.27	0.03	0.01	-0.11	-0.05	-0.21	0.16	0.61	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.00
Lending	0.10	-0.02	-0.47	-0.70	-1.03	-0.86	-0.74	0.61	-0.54	-3.70	0.73	0.21	3.42	1.05	1.07	0.41
Borrowing	-1.14	8.36	3.66	9.58	9.08	6.26	13.02	15.88	6.38	12.85	-0.64	0.29	56.81	14.48	7.14	0.44
Gift	51.24	4.71	-4.29	-0.92	6.78	8.87	8.09	0.49	29.99	14.13	2.78	1.71	2.55	9.60	-1.74	-5.77

- ▶ Gifts are less at village level
- ▶ Lending is less at village level

Tables 2A & 2B - Covariance Decompositions at Household and Village Levels

Source: Paweenawat and Townsend

Mechanisms: Formal/Informal FI as Member Syndicate

Consumption (and Investment) Smoothing, A Rating/Score Card – Instrumenting for Access

- ▶ Alem and Townsend
- ▶ First column: estimates of the time-varying constant for members of the institution
- ▶ Second column: sensitivity of consumption to income changes for non-participants of the financial institution
- ▶ Third column: the effect of financial participation on the income coefficient sensitivity
- ▶ Fourth column: tests the complete-markets-full-insurance hypothesis for financial participants
- ▶ A new way to rate financial institutions using GE benchmarks
 - ▶ Policy suggestions
- ▶ Need to come back to intermediaries in GE

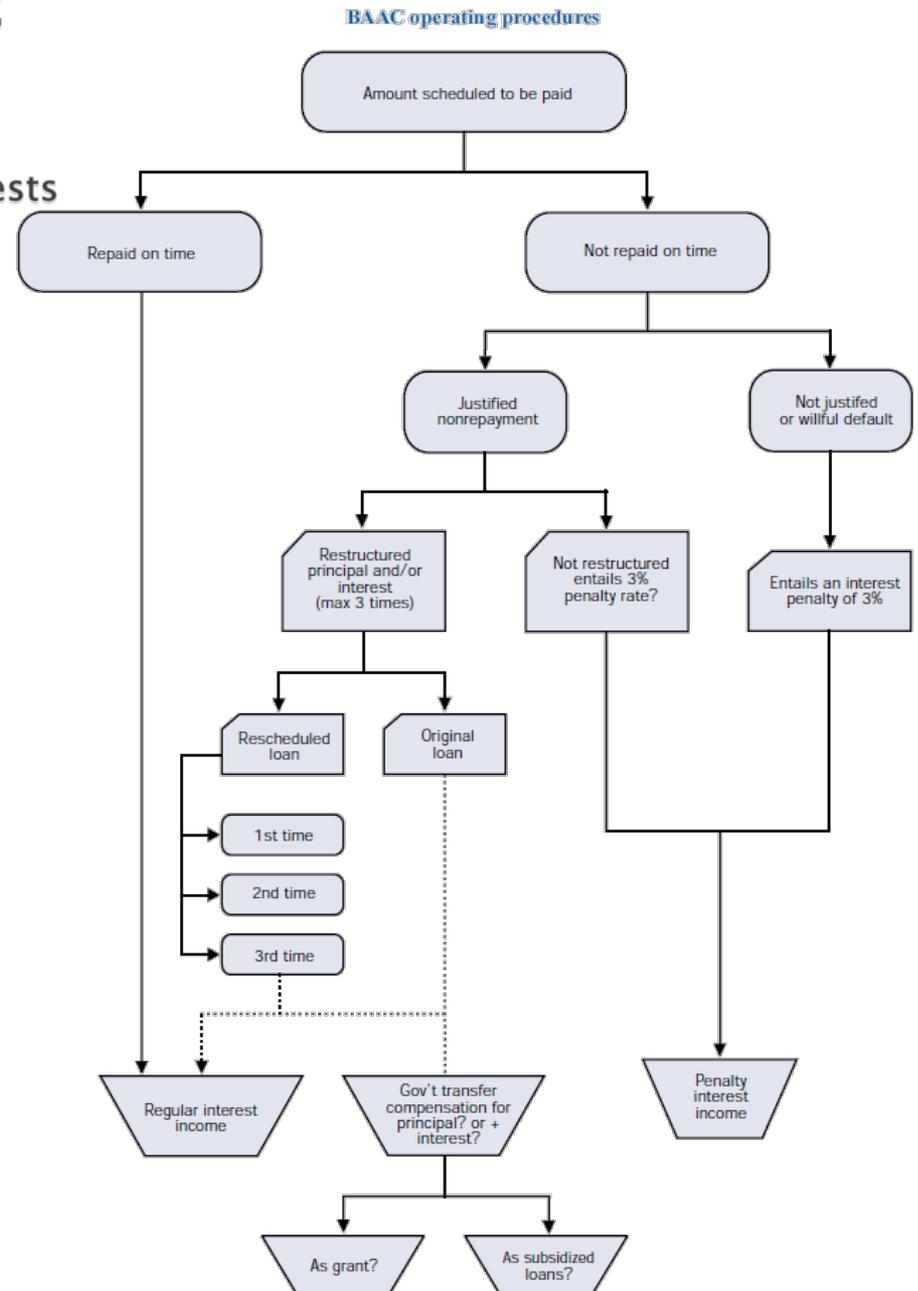
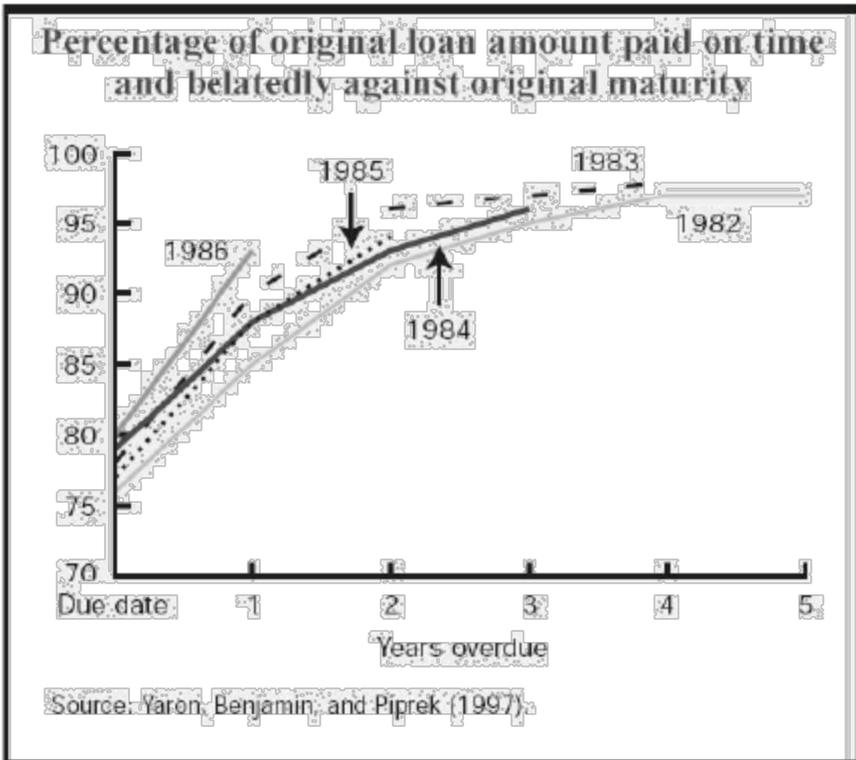
	F-test $P_0 dt = 0$	η_1	$P_0 \eta_1$	F-test $\eta_1 + P_0 \eta_1 = 0$
	(p-value)	(p-value)	(p-value)	(p-value)
<u>BAAC</u>				
OLS	1.66 (.157)	.249*** (.000)	-.062 (.439)	13.04 (.000)
IV	17.21 (.002)	.571*** (.000)	-.618*** (.000)	.31 (.578)
<u>Commercial Banks</u>				
OLS	8.01 (.000)	.246*** (.000)	-.094 (.234)	7.97 (.0048)
IV	29.58 (.000)	.299*** (.000)	-.223* (.072)	1.08 (.300)
<u>Agric. Cooperatives</u>				
OLS	7.17 (.000)	.204*** (.000)	-.006 (.966)	1.95 (.163)
IV	34.25 (.000)	.303*** (.010)	-1.427 (.304)	.77 (.379)
<u>PCG – Village Funds</u>				
OLS	1.19 (.313)	.221*** (.000)	-.116 (.539)	.33 (.567)
IV	23.82 (.000)	.196*** (.000)	.427 (.455)	1.31 (.253)
<u>Informal Sector</u>				
OLS	4.45 (.001)	.117*** (.001)	.223*** (.000)	50.35 (.000)
IV	32.70 (.000)	.156*** (.001)	.114 (.279)	13.44 (.000)

Table 4: Impact of Financial Institutions on Consumption Smoothing

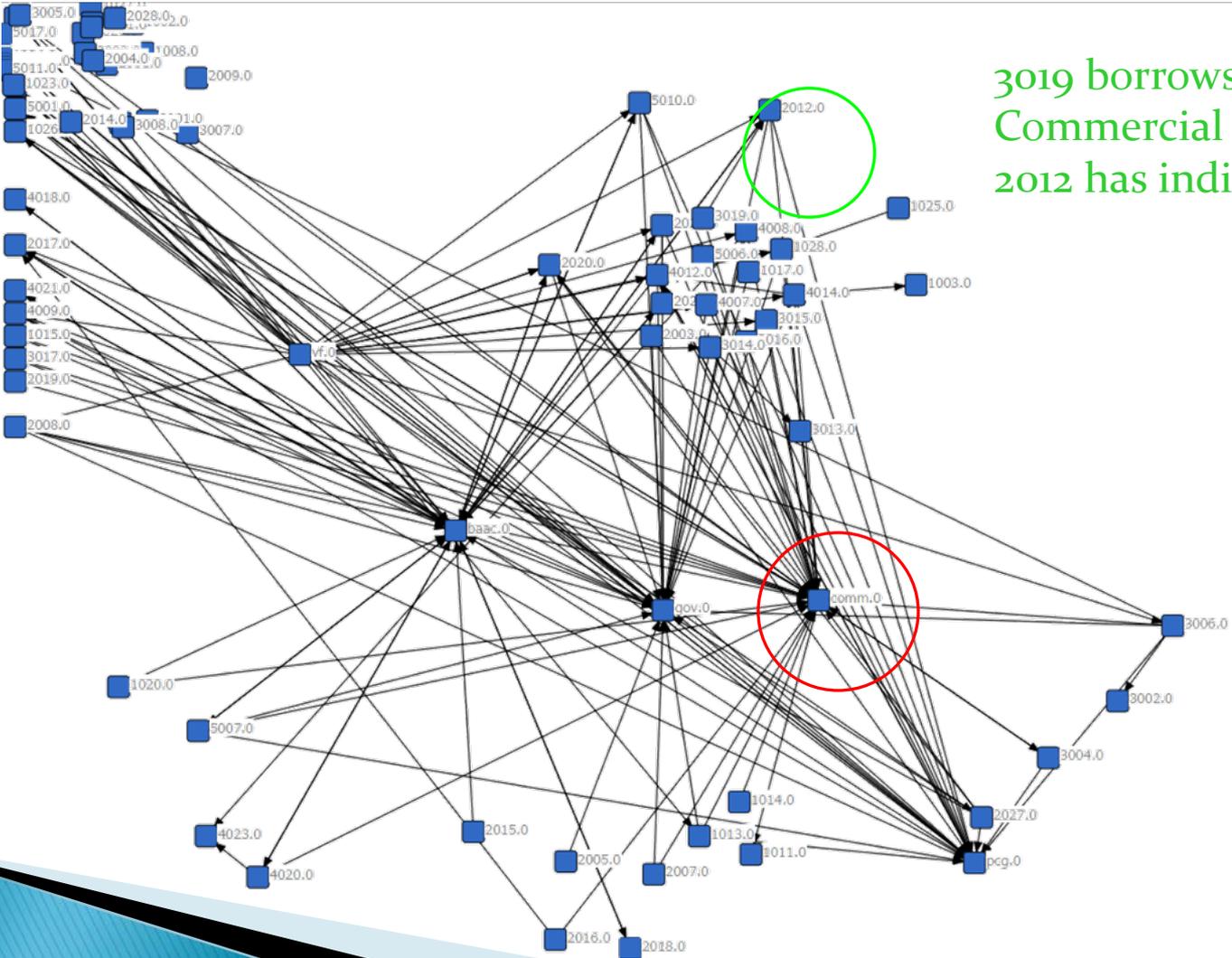
BAAC-GOVERNMENT BANK:

How is it done,

Procedures and repayment rates- good but not using lump sum transfer that GE suggests



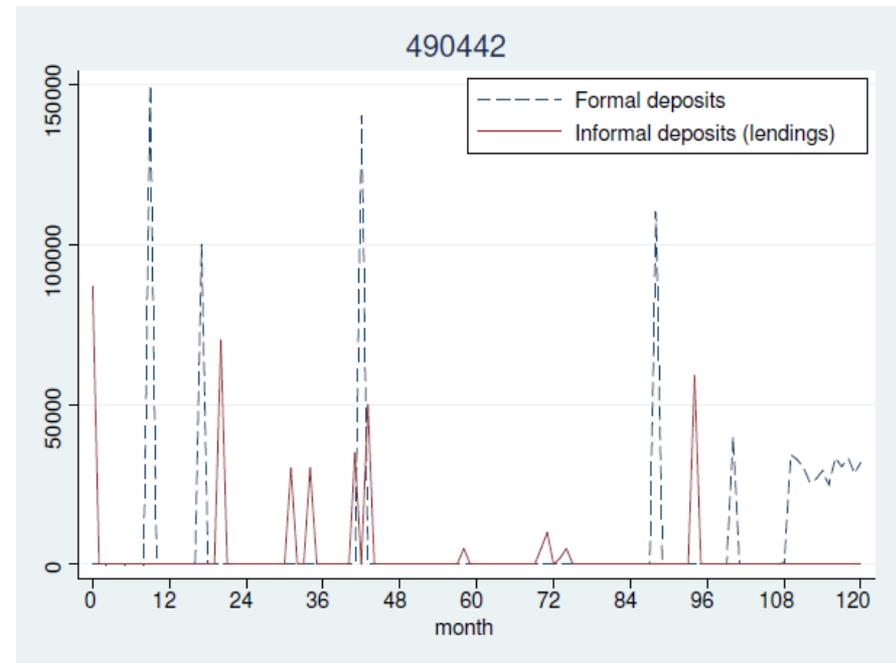
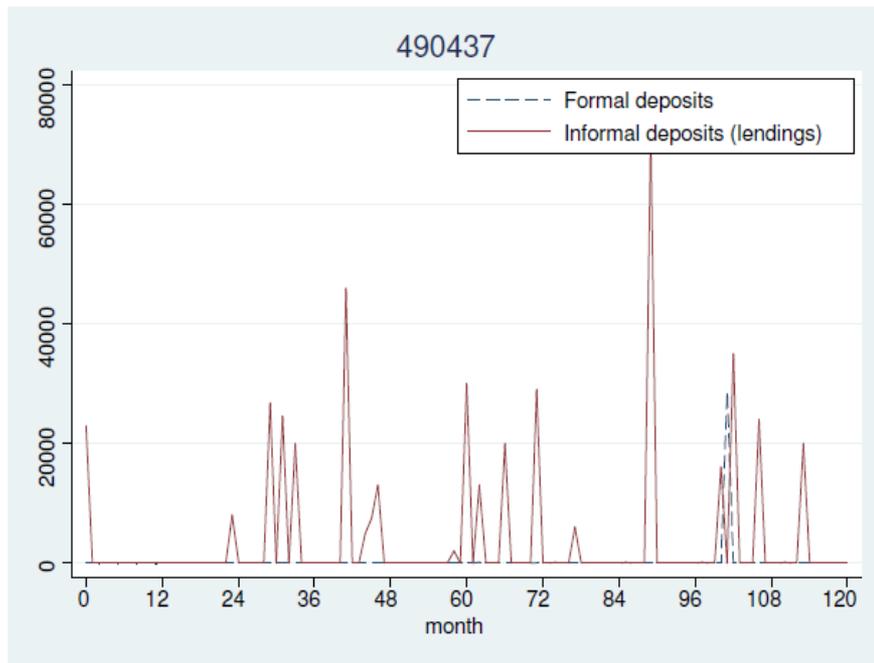
Local Networks: Kinnan (2010)



2019 borrows from
Commercial Bank
2012 has indirect access.

Demand for cash, Alvarez– Anan Informal money market versus formal savings: tradeoff?

- ▶ Two example profiles–extensive and intensive



Applied GE Models

Comparing across regions and villages

But first some facts reinforcing role of finance and additional key facts

Decompositions–What matters for income and for inequality, from SES

- ▶ Increasing access/use of the formal sector along with high and increasing income differentials
- ▶ Plus occupation, education, urbanization (Jeong thesis)

Characteristics	Overall	Stage 1	Stage 2	Stage 3
Age	0	3	0	0
Gender	2	5	1	4
Community Type	7	17	2	12
<u>Production Sector</u>	<u>18</u>	<u>33</u>	<u>13</u>	<u>21</u>
<u>Occupation</u>	<u>21</u>	<u>39</u>	<u>17</u>	<u>30</u>
<u>Financial Participation</u>	<u>20</u>	<u>23</u>	<u>27</u>	<u>18</u>
<u>Education</u>	<u>25</u>	<u>45</u>	<u>20</u>	<u>24</u>
<u>Joint Three</u>	<u>39</u>	<u>66</u>	<u>38</u>	<u>38</u>
Total Growth	4.96	1.98	8.78	6.94

Annotations:

- Handwritten "H₀" above "population shifts" with an arrow pointing to the Stage 3 column.
- "population shifts" with an arrow pointing to the Stage 3 column.
- "rises again" with an arrow pointing to the Stage 3 column.
- "peak" with an arrow pointing to the Stage 2 column.
- "Big but falling" with an arrow pointing to the Education row.

$$\Delta\mu = \sum_k \bar{p}^k \Delta\mu^k + \sum_k \bar{\mu}^k \Delta p^k$$

Understanding the Evolution

- ▶ Key ingredient in Thailand:
 - Expanding financial system: in macro and micro

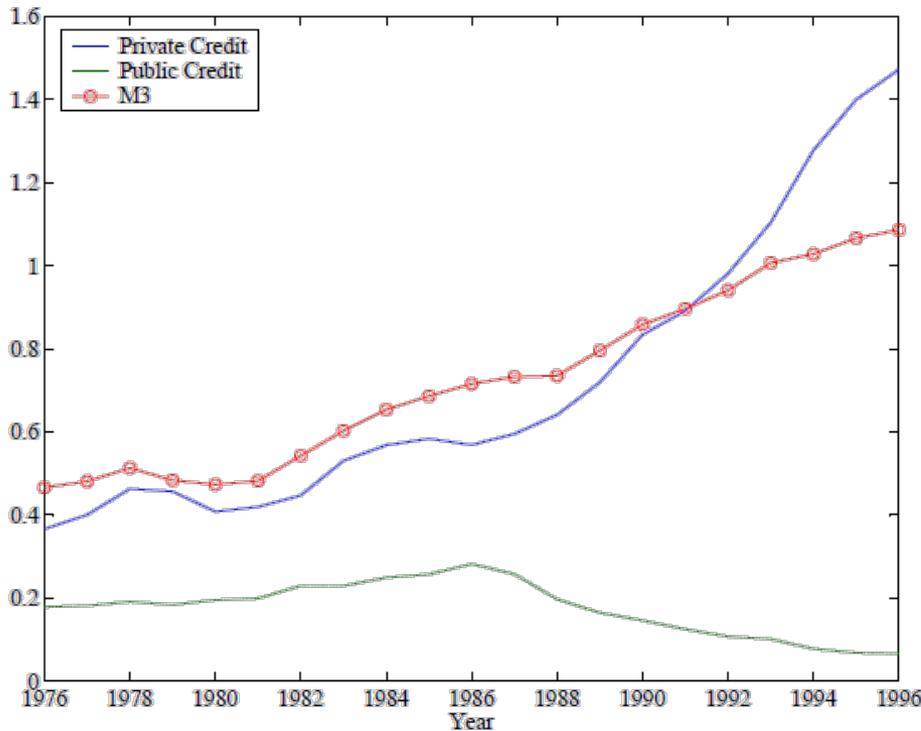


Figure 5. Macro Indicators of Financial Development in Thailand

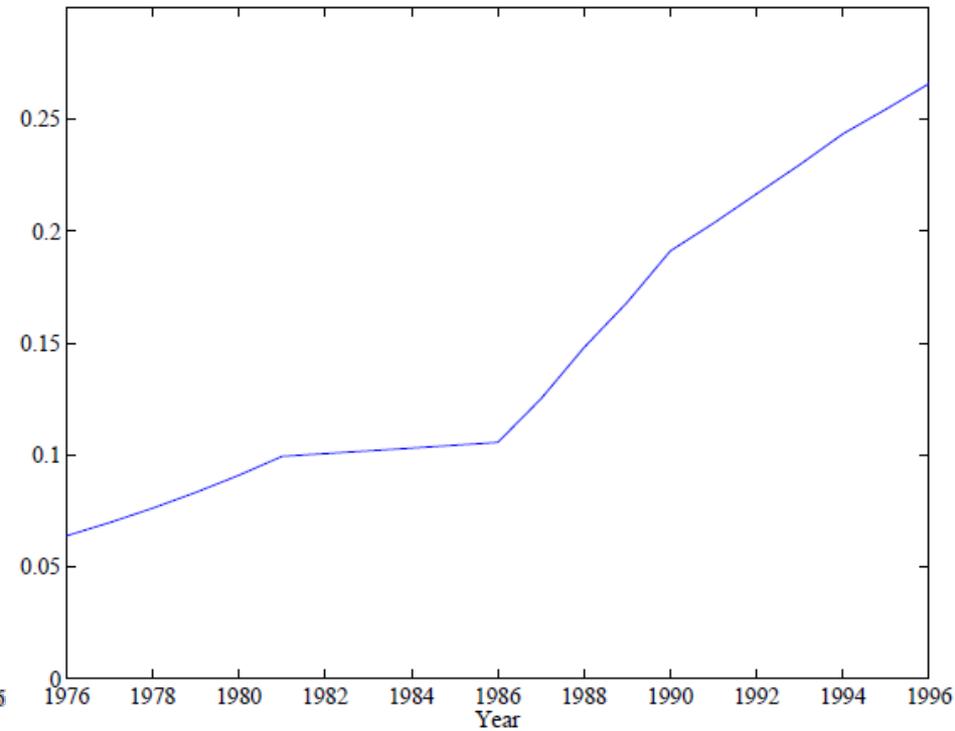
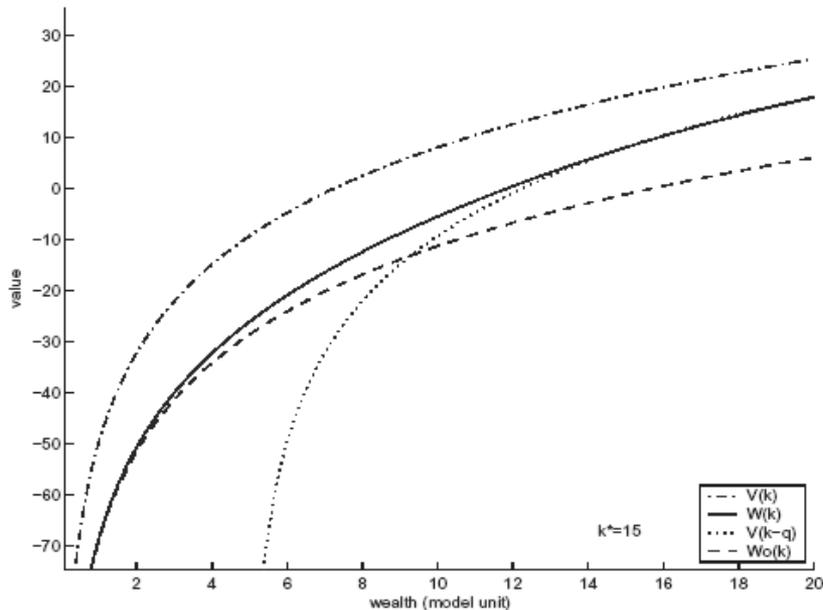
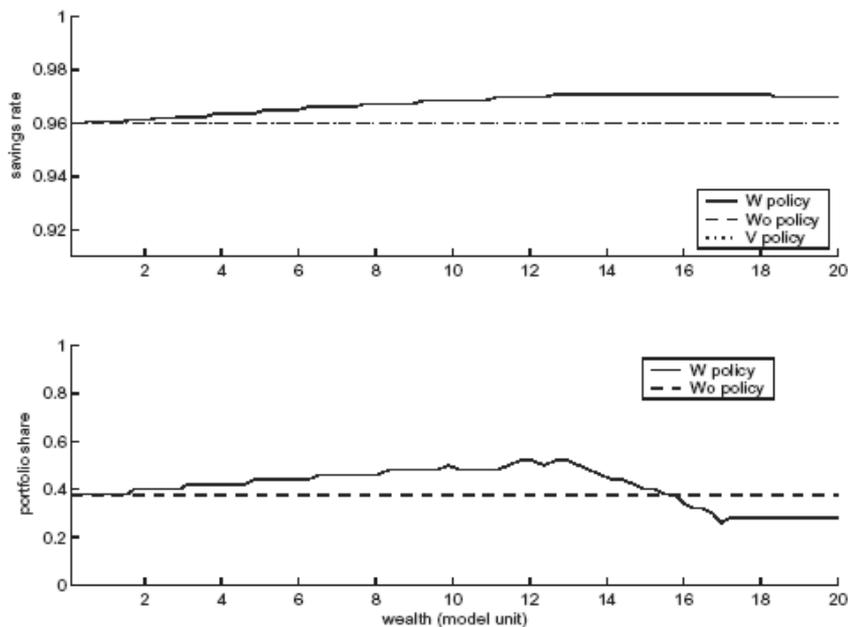


Figure 6. Expansion of Financial Sector in Thailand

[Jeong and Townsend, 2005]

Model 1: Risk and Endogenous Financial Deepening

- ▶ Forward looking, plus fixed cost of entry implies a key wealth threshold. Some households without access.
- ▶ Policies are saving rate and % in risky sector



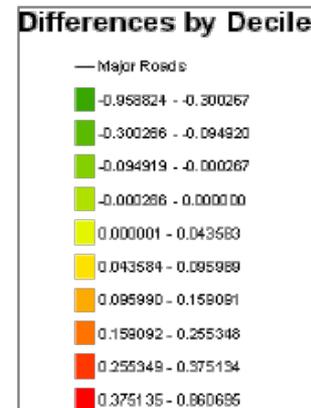
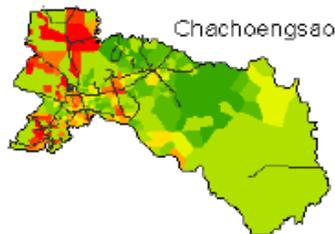
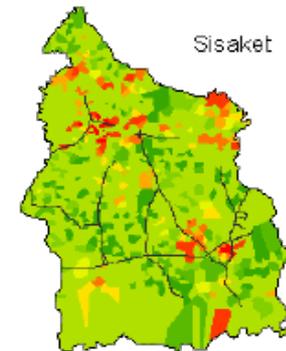
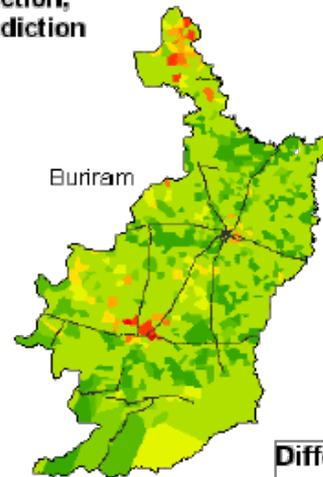
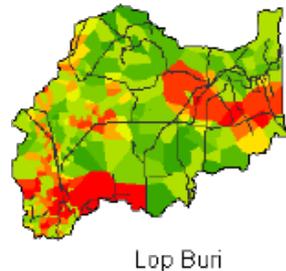
(With Kenichi Ueda)

- ▶ This is fully Pareto Optimal path, from Infinite Horizon Programming Problem
- ▶ Model does well at the macro level, largely₄₁

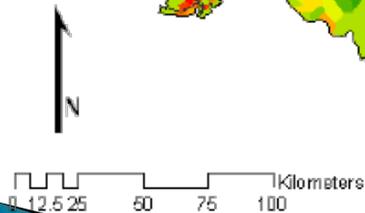
Detecting policy distortions regionally through the lens of the model

Differences are Between Actual and Simulated Window-Average Smoothed Values, Using 10 Nearest Neighbors

Reds are Areas of Model Over-Prediction,
Greens are Areas of Model Under-Prediction

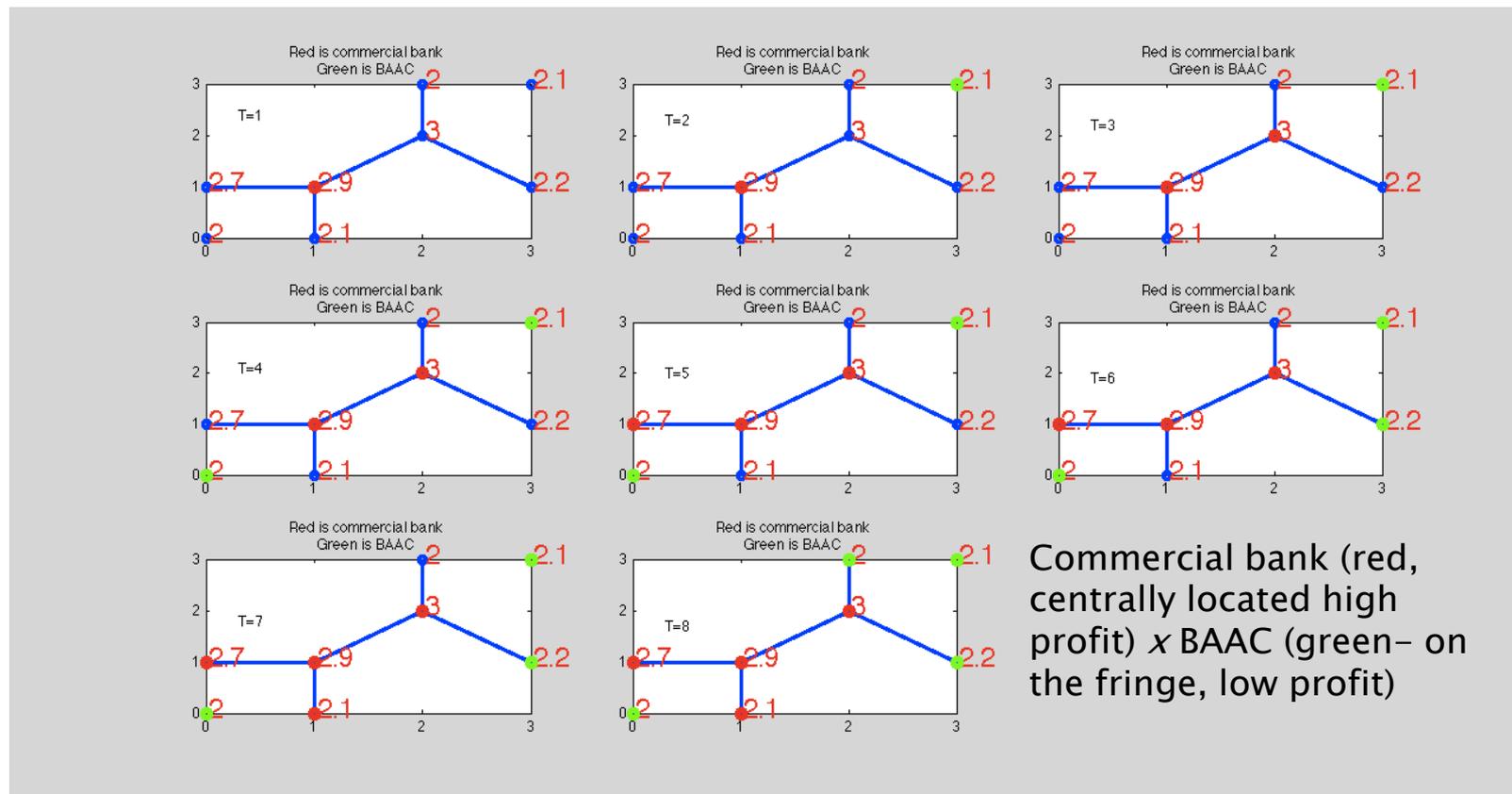


- Prediction errors at village level
- Failure suggest policies distortion
- Less intermediation in towns and more in rural areas than model with endogenous access predicts
- Part of this is BAAC, ag bank



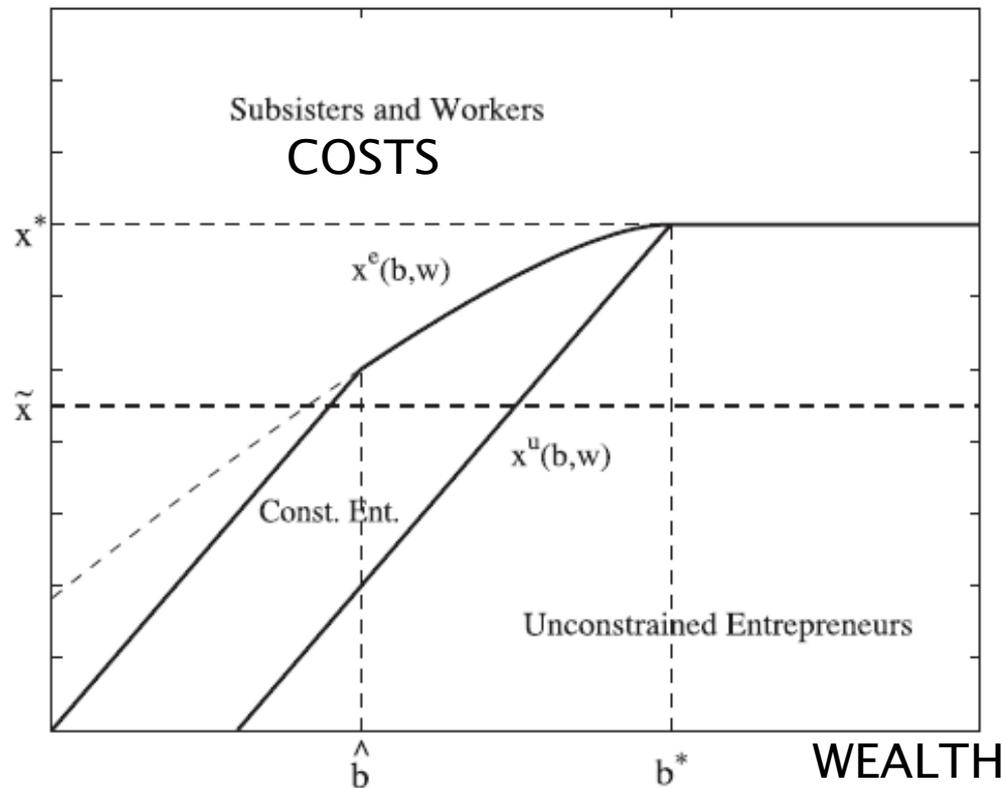
1996 GJ Access Index Simulation Differences.
Source: Felkner and Townsend (2004)

One Modeling Attempt: Bank Ownership and Expansion of the Financial System in Thailand (with Assunção and Mityakov)



- An altruistic government bank playing with a for-profit, commercial bank
- BAAC goes to low population, fewer roads
- Equilibrium is generally not Pareto Optimal

Model 2: occupation choice with dual sector financial autarky versus perfect intermediation (exogenous)



With Xavier Giné
parameters estimated with micro data

- ▶ Occupational choice
 - Constrained by wealth
 - Heterogeneous talent
- ▶ Note 1: There are two sectors in this graph
- ▶ Note 2: Not STD GE, as intermediation is exogenous

FINANCIAL SECTOR EXPANSION IS DRIVING GROWTH OF ENTERPRISE

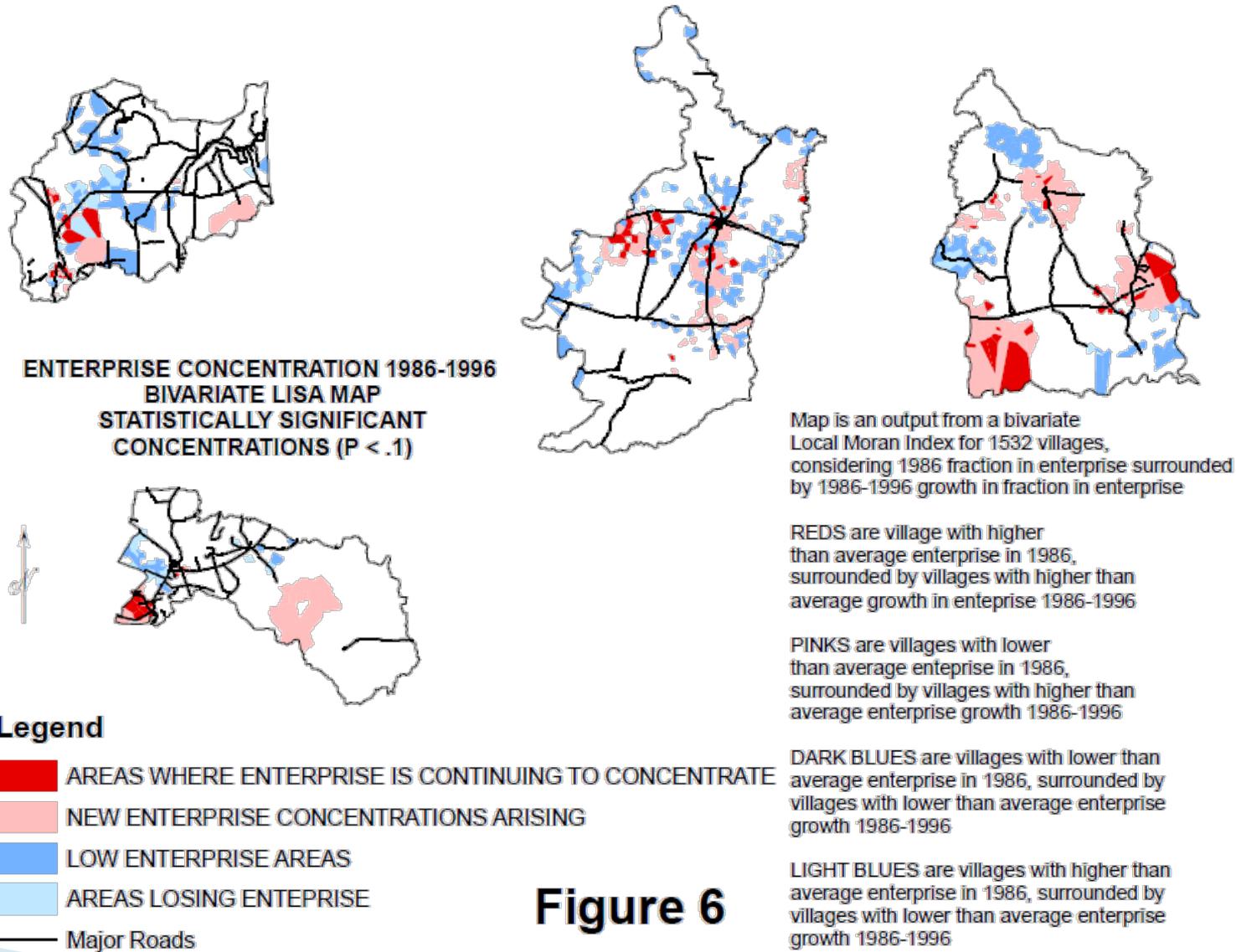


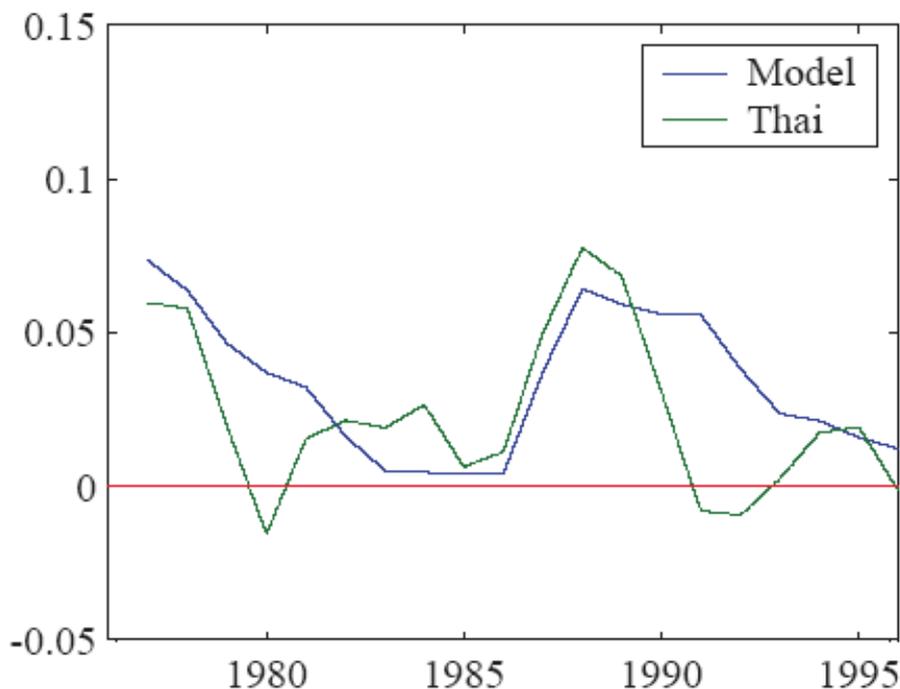
Figure 6

Macro: National

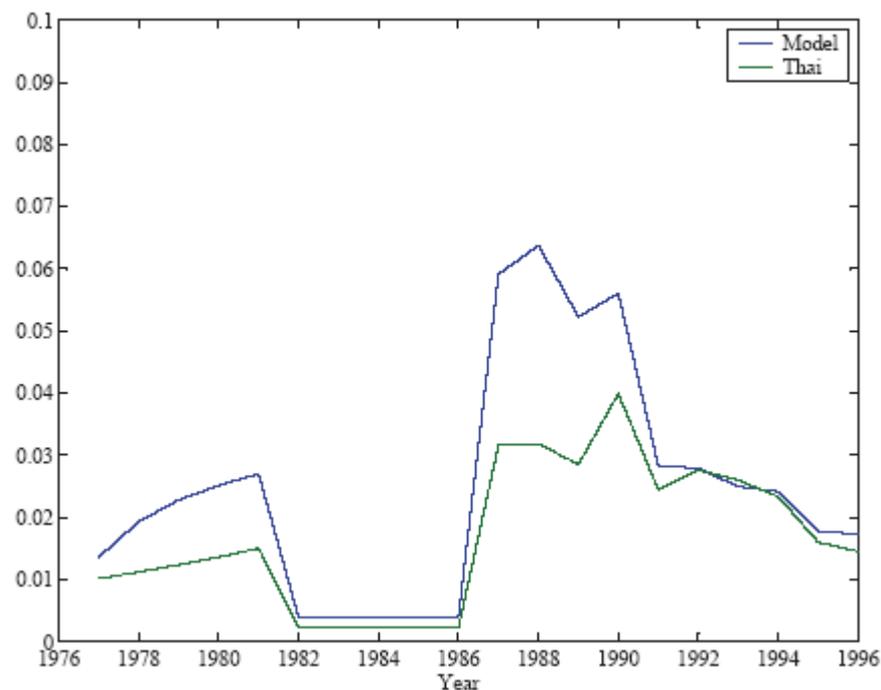
Micro-Founded Macro Models

Micro Founded Model at the National Level transitional growth and TFP upsurge in financial liberalization

- Macro, total factor productivity is largely explained
- It is NOT an unmeasured residual aggregate shock– as in DSGE
- Access–no access dichotomy is used – (with Hyeok Jeong) through the lens of a model



$$TFPG = TFGP_SSR + TFGP_ACH + TFGP_OCCS + TFGP_FIN$$



$$TFPG_FIN = \left[s_{Y_2} \frac{\Pi_2}{Y_2} - s_{Y_1} \frac{\Pi_1}{Y_1} \right] p g_p$$

Yet a broader view of the Existence and the Welfare Theorems– FAILURE implies either OPTIMAL DESIGN or SYSTEMATIC INTERVENTION as NECESSARY for optima

Works

- ▶ **Infinite Horizon economies**
 - Debreu (1954), "Valuation Equilibrium and Pareto Optimum"
 - Jones (1983), "Existence of Equilibria with Infinitely Many Consumers and Infinitely Many Commodities: A Theorem Based on Models of Commodity Differentiation"
- ▶ **Private Information**
 - Prescott and Townsend (1984), "General Competitive Analysis in an Economy with Private Information"
- ▶ **Indivisibilities**
 - Rogerson (1988), "Indivisible labor, lotteries and equilibrium"

May Work

- ▶ **Externalities and Lindahl Equilibria**
- ▶ **Private Information:**
 - Prescott and Townsend (1984), "Pareto Optima and Competitive Equilibria with Adverse Selection and Moral Hazard"
 - Bisin and Gottardi (2006), "Efficient Competitive Equilibria with Adverse Selection"
- ▶ **Collateral Constraints**
 - Kilenthong and Townsend "Moral Hazard, Retrading, Externality, and Its Solution"
 - –, "Market Based, Segregated Exchanges in Securities with Default Risk"

Does not work

- ▶ **OLG, at least in general**
- ▶ **Incomplete markets**
- ▶ **Monetary economies**
 - Manuelli and Sargent (2009), "Alternative Monetary Policies in a turnpike economy"
 - Jack, Suri and Townsend (2010), "Monetary Theory and Electronic Money: Reflections on the Kenyan Experience,"