

The background of the slide features a light-colored, textured surface with a faint, stylized illustration of a mountain range in the upper half and a willow tree with drooping branches on the right side. The text is overlaid on this background.

Evaluating the Financial Systems of Emerging Market Economies

*Applied General Equilibrium Development
Economics*

Robert M. Townsend

*The Marschak Lecture
The Econometric Society
Bogota, Colombia
October 5th, 2007*

Outline of the Lecture

- ❖ **The importance of measurement, and actually doing it:** from individuals to the national economy
- ❖ **A Research Algorithm – Application:** Thailand
- ❖ **General Equilibrium CME Benchmark Standards:** anomalies, but with some successes
- ❖ **Policy Impact:** financial institutions help move toward standard
- ❖ **Salient Patterns in the Data:** national, regional village, household
- ❖ **Micro and Macro Decompositions:** quasi-analytic, what is important
- ❖ **Applied General Equilibrium Models:** estimation, simulation
- ❖ **Policy Analysis:** welfare gains
- ❖ **Anomalies:** next steps
- ❖ **Applied General Equilibrium Development Economics**

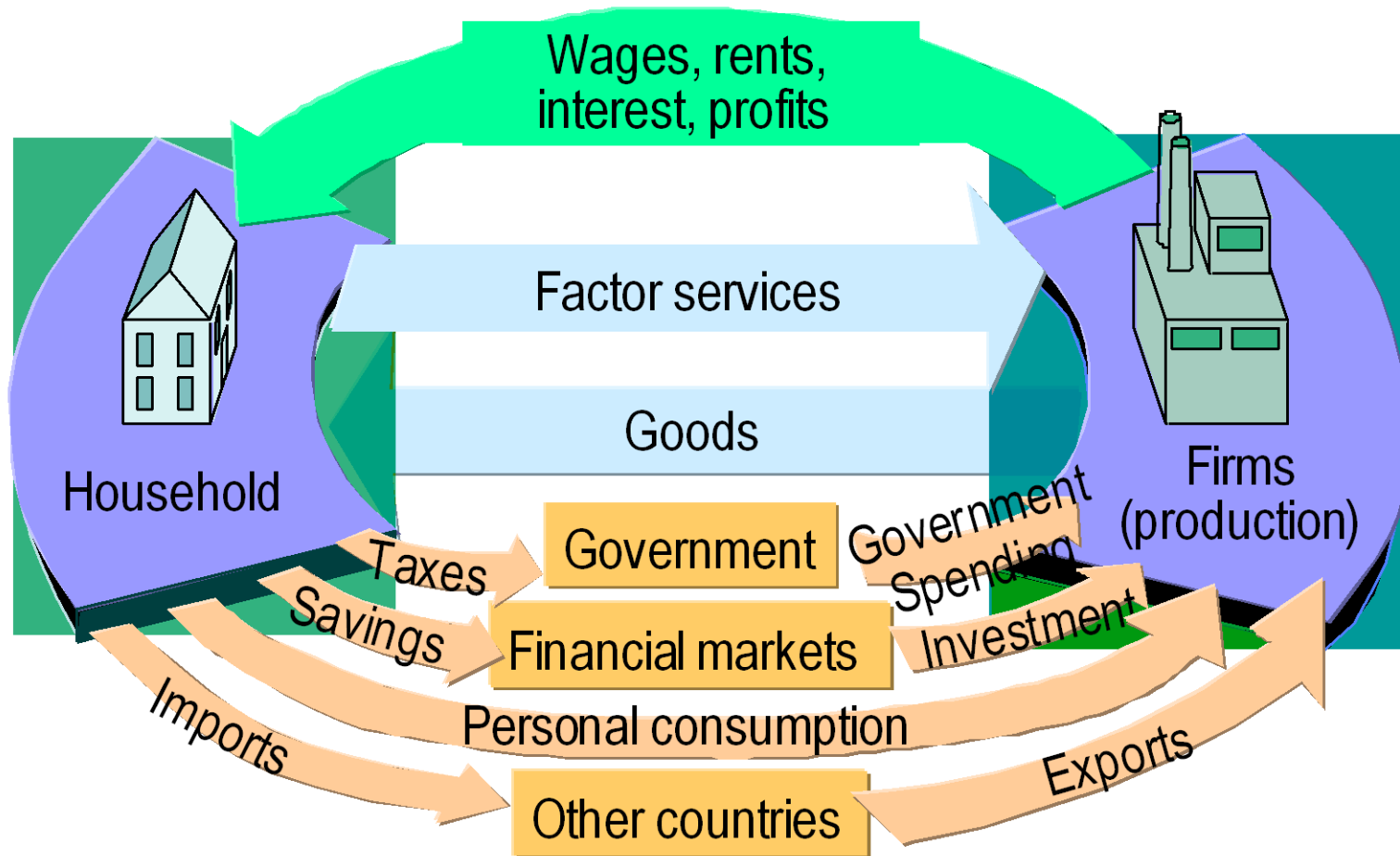


Research Algorithm

*MEASUREMENT:
COMMON MACRO/MACRO PLATFORM
AND ACTUALLY DOING IT*

The national income accounts and the associated "circular flow" diagram envision little production in the household sector.

The Circular Flow



Even as constructed, non farm proprietary income has been large relative to other factor payments in the data. Nonfarm proprietary income still dominates corporate profits, for example.

nonfarm

proprietor

wage

Corp profit

Source: NESDB data series

Thai Regions

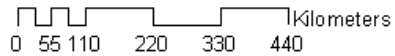
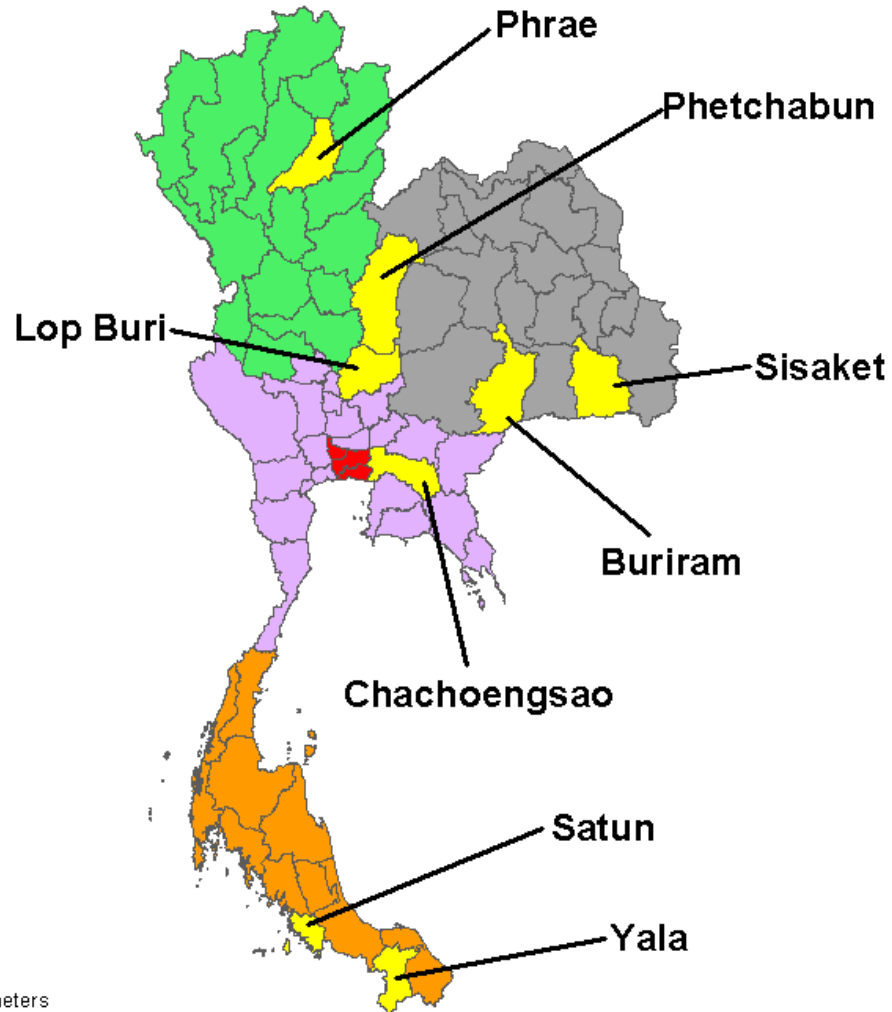
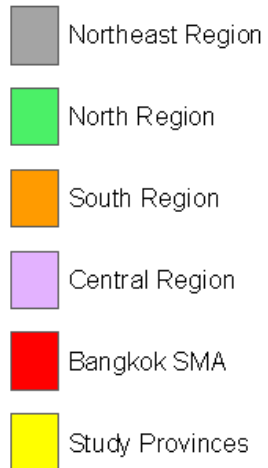


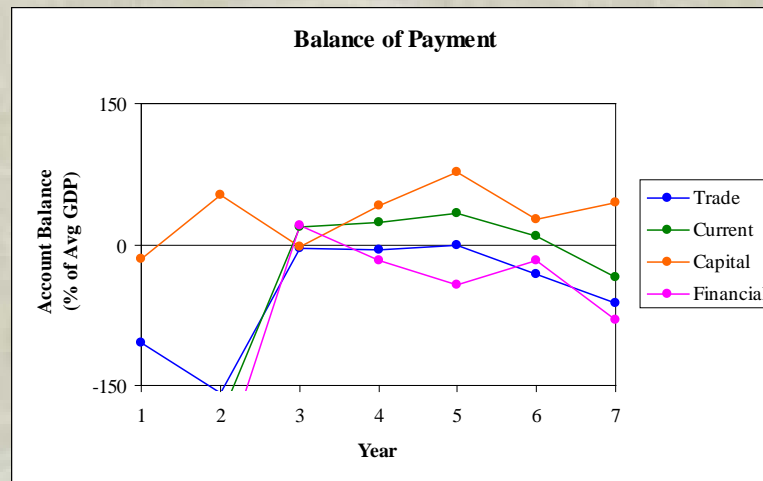
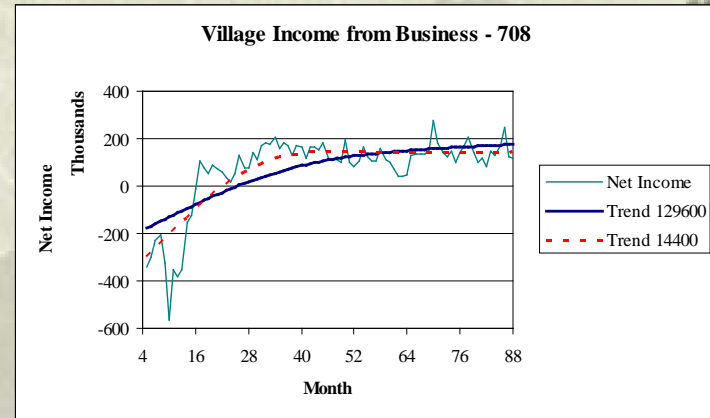
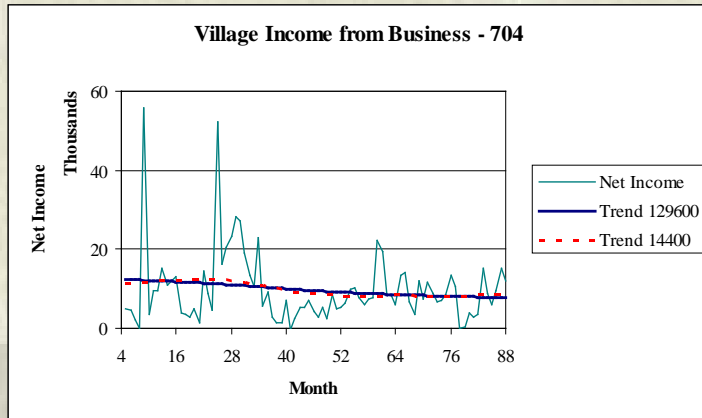
Table A2 Income Statement of Household A

Month	5	6	7	8	9	10	11	12	13	14	15	16
Cultivation							3,200	11,676	11,676	11,676	11,700	
Livestock	30,485	27,753	26,180	21,780	26,730	28,050	39,000	39,600	79,600	39,600	33,000	31,900
Livestock Produce	28,985	27,753	26,180	21,780	26,730	28,050	33,000	39,600	39,600	39,600	33,000	31,900
Capital Gains	1,500						6,000		40,000			
Fish and Shrimp												
Business	184,360	145,360	183,875	152,890	160,455	167,295	249,440	169,460	175,855	166,170	167,150	170,000
Labor	11,440	11,440	11,440	11,440	11,440	11,440	11,440	10,056	11,440	10,096	10,100	10,000
Others	6,000	3,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Total Revenues	232,285	187,553	227,495	192,110	204,625	212,785	309,080	236,792	284,571	233,542	227,950	217,900
Cultivation								1,468	1,468	1,468	1,468	
Livestock	31,944	30,281	27,642	22,813	21,715	19,225	20,371	25,573	27,787	30,064	28,059	27,048
Capital Losses												
Depreciation (Aging)	3,281	3,263	3,230	3,198	3,166	3,134	3,103	3,132	3,101	3,370	3,336	3,302
Other Expenses	28,663	27,018	24,412	19,615	18,549	16,090	17,268	22,441	24,687	26,694	24,723	23,745
Fish and Shrimp												
Business	220,176	167,323	199,933	150,300	159,472	173,440	262,931	182,317	186,649	173,751	174,006	177,608
Labor											150	100
Others												
Total Cost of Production	252,120	197,604	227,575	173,112	181,187	192,665	283,302	209,358	215,905	205,283	203,684	204,756
Interest Revenue												
Interest Expense	55	55	55	75	55	55	55	55	35	55	55	55
Other Expenses	2,794	2,783	2,810	2,798	2,786	2,775	2,763	2,751	2,740	2,729	2,717	2,706
Depreciation of Fixed Assets	2,794	2,783	2,810	2,798	2,786	2,775	2,763	2,751	2,740	2,729	2,717	2,706
Insurance Premium												
Extraordinary Items												
Capital Gains												
Capital Losses												
Net Income	(22,684)	(12,889)	(2,945)	16,125	20,597	17,290	22,960	24,627	65,891	25,475	21,494	10,383
Consumption	9,035	9,362	8,145	10,849	8,566	16,186	9,663	1,472	3,005	6,332	(2,399)	9,105
Savings	(31,719)	(22,251)	(11,090)	5,276	12,031	1,104	13,296	23,155	62,886	19,143	23,892	1,278

[Source: Samphantharak and Townsend (2006)]

The national income accounts are based on corporate financial accounts. These distinguish stocks in the balance sheets from cash flow, which is distinguished in turn from (accrued) income.

Village Level



Thailand Database Research Archive

Google Search Search www Search this site

Home | Townsend Project | Related Databases | Thai GIS | Papers-Publications | Executive Summaries | Data | People

Thailand Project

- BAAC Data
- CDD Data
- BOT Data
- GPP Data
- Labor Force Survey
- SES Data**
- World Bank Data
- Ajann Bank Data
- PACAP
- Data Stream
- World Scope
- OEFC1
- OEFC2
- JBIC

This site contains a variety of databases for Thailand and a number of models that can be used to understand the Thai economy. These can be used as an integrated research and data source for policy makers. The data include microeconomic data on household consumption, economic data from the Bank of Thailand and the National Bureau of Economic Research (NESDB). Intermediate between these two is the National Community Development Department (CDD) and the National Bureau of Economic Research (NESDB).

One of the most important resources readily available and easily accessible is the National Bureau of Economic Research (NESDB). The foundations of the macro economy, that is, to develop a general equilibrium model, ideally combining the two. Specifically, these data can be used to construct and estimate general equilibrium models with impediments to trade and with heterogeneity across households and firms. The user can choose the appropriate degree of aggregation of the microeconomic data, or go back and forth between micro and macro. Indeed, this archive facilitates fact-finding missions. Several of the individual databases have automated search and data extraction facilities. Several of the microdata files include geographic identifiers at the plot, village, sub-county (tambon), county (amphoe), or province (changwat) level, thus enabling use of an accompanying [Geographic Information System](#).

The larger goal of this web-based archive is to facilitate the integration of theory with measurement. Frequently the data a theorist might need to calibrate or estimate a model is not available in the single database on hand, hence the inclusion of multiple databases here. Frequently, the necessary data are not available at all. That is, existing surveys do not include variables critical to theoretical models. For example, until recently, there were no longitudinal data for Thailand. A key component of this website is a panel database derived from micro surveys designed from a theoretical perspective. This collection, know as the [Townsend Thai Project](#), is available from this site. The other databases [Related Thai data](#) are also available.

The project was funded primarily by US government foundations, specifically, the National Institute of Health (NICHD) and the National Science Foundation (NSF), with Robert M. Townsend as principal investigator. Grants from the Ford Foundation, Melon Foundati on and the University of Chicago are also gratefully acknowledged.

[Papers and publications](#) that use the data available in this archive and describe the details of the models are also available from this site, along with professional abstracts and executive summaries for policy makers. Additionally, a [Theoretical Overview](#) is available.

IN THE NEWS

We make available the use of spatial analysis at the village tambon, amphoe, and changwat level of Thailand.

RECENTLY PUBLISHED

An assessment of the relationship between growth and inequality using micro data from Thailand.

Robert Townsend's Homepage | Thai Home | Contact Us

• NORC at The University of Chicago •

National Accounts Underlie Computable General Equilibrium Model

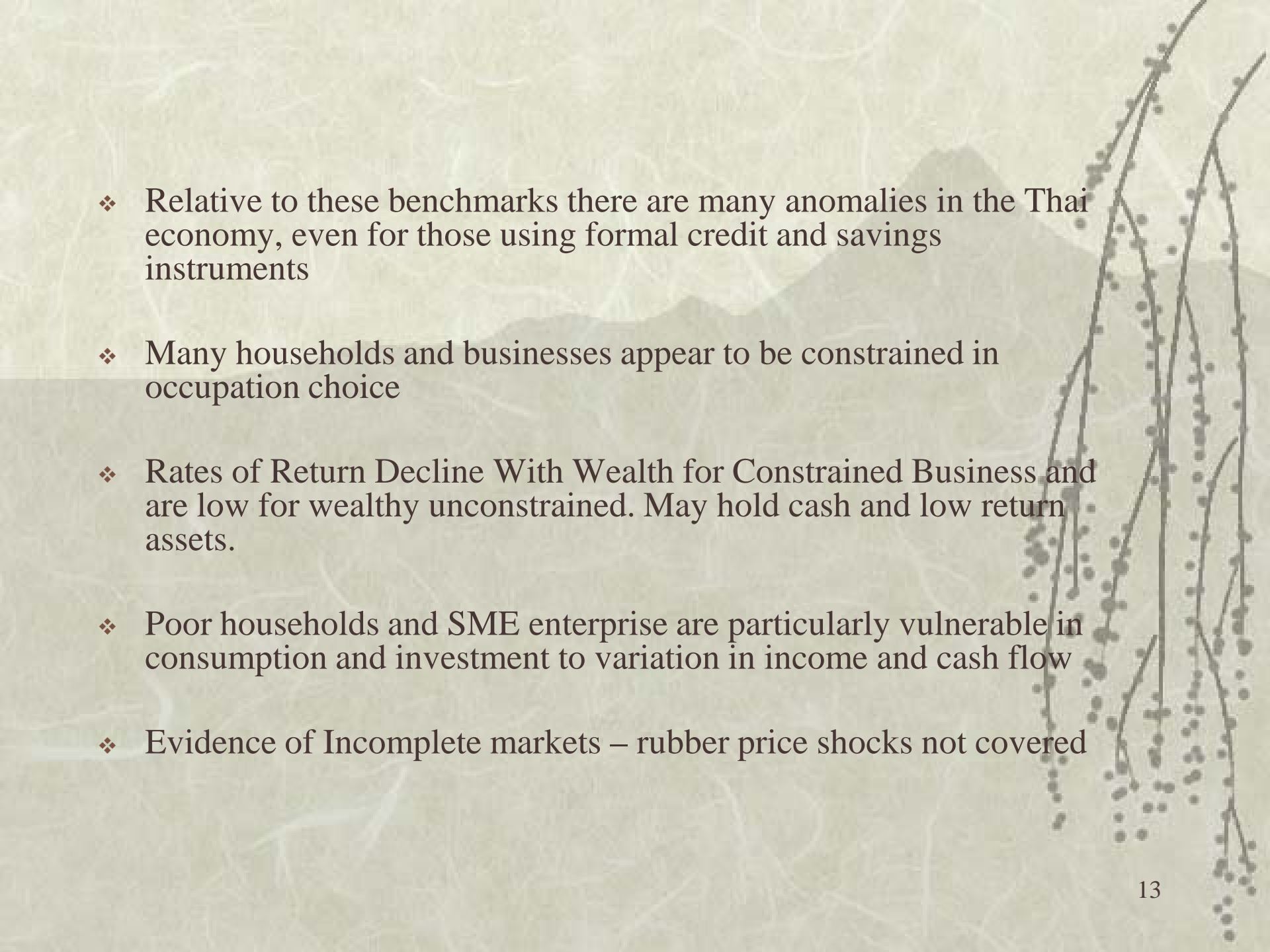
- But be careful about aggregated production function
- Households as Firms- Heaton, Lucas, Vissing-Jorgensen, DeNardi, Basseto
- Be careful about presumed household economies
- Caveats: the difficulty of measurement
 - Sectors
 - Services
 - Quality
 - Prices
 - Consumption versus investment
 - Gifts

*Also on the wish list:
Better Measurement*

Combo Surveys of Firms and Owners

Research Algorithm continued...
Neoclassical Anomalies

- If markets and institutions were perfect and there were no policy distortions, then certain benchmark standards would be implied.
- From GE models of entire economy, but could be kinship group, local village, region for example.
- May work for consumption but not investment; some shocks and not others
- Looking at micro evidence for appropriate assumptions about market/institutional structure
- These diagnostics tests are relatively easy to do and can be part of a Financial Sector Evaluation

- 
- ❖ Relative to these benchmarks there are many anomalies in the Thai economy, even for those using formal credit and savings instruments
 - ❖ Many households and businesses appear to be constrained in occupation choice
 - ❖ Rates of Return Decline With Wealth for Constrained Business and are low for wealthy unconstrained. May hold cash and low return assets.
 - ❖ Poor households and SME enterprise are particularly vulnerable in consumption and investment to variation in income and cash flow
 - ❖ Evidence of Incomplete markets – rubber price shocks not covered

IMPORTANT EXCEPTIONS:

- ❖ Village as Arrow-Debreu economies, NY Markets are not
- ❖ Risk sharing in consumption – can estimate heterogeneity in risk aversion (with Schulhofer-Wohl, Chiappori)
- ❖ Investment not sensitive to cash flow though poor if in network (Samphantharak)
- ❖ Firms in family-related syndicate are also not credit constrained internally (Samphantharak)

The Risk Sharing Equation

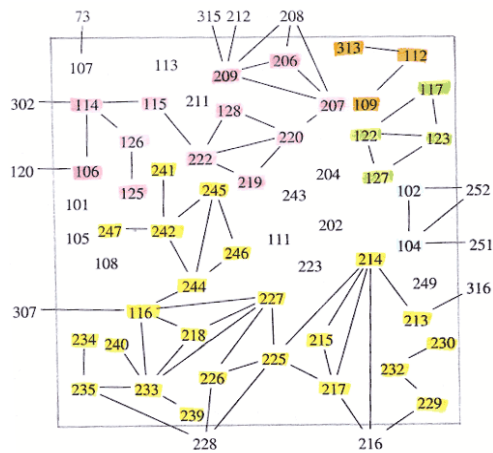
$$\Delta c_{t,t+1}^j = \beta_{t,t+1}^j D_{t,t+1}^j + \delta \Delta \bar{A}_{t,t+1}^j + \eta \Delta h s_{t,t+1}^j \\ + \mu X_{j96} + \xi \Delta Y_{t,t+1}^j + \nu \Delta Y_{t,t+1}^j X_{j96} + u_{t,t+1}^j$$

$$\frac{I_t^i}{k_t^i} = \beta_{t,t+1}^j D_{t,t+1}^j + \delta \Delta \bar{A}_{t,t+1}^j + \eta \Delta h s_{t,t+1}^j + \mu X_{j96} + \xi \Delta Y_{t,t+1}^j + \nu \Delta Y_{t,t+1}^j X_{j96} + u_{t,t+1}^j$$

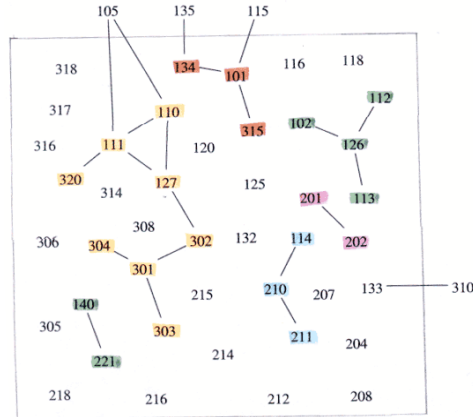
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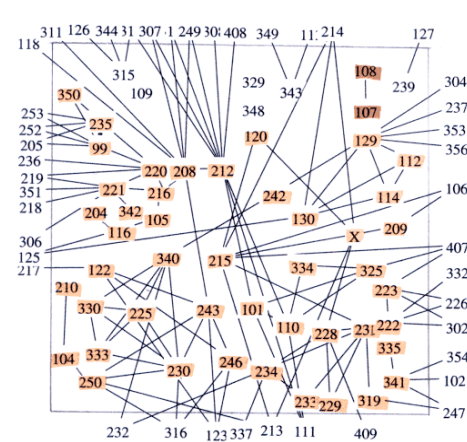
Aggregation applied at subunits within village and related industrial conglomerates



Buriram (Bankrod)

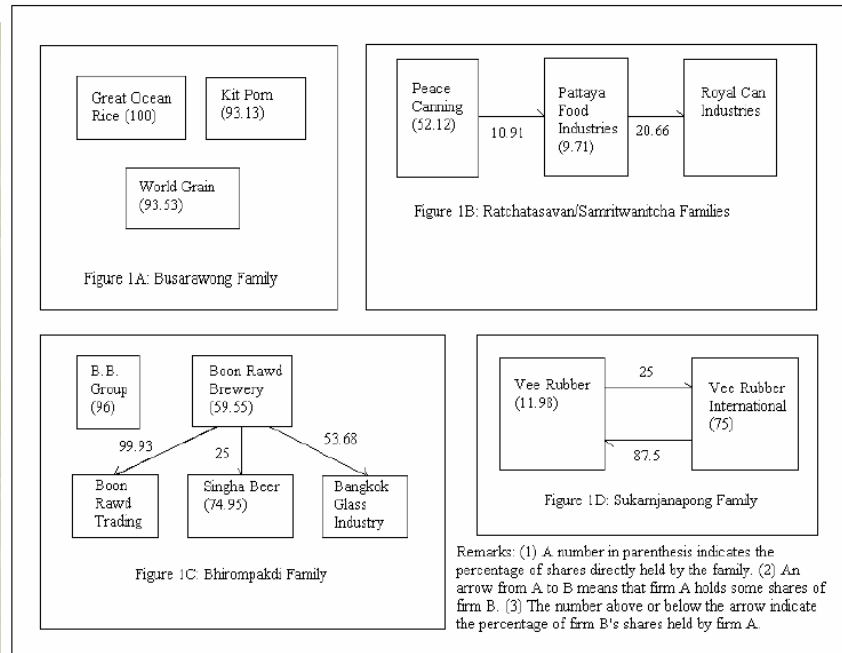


Chachoengsao



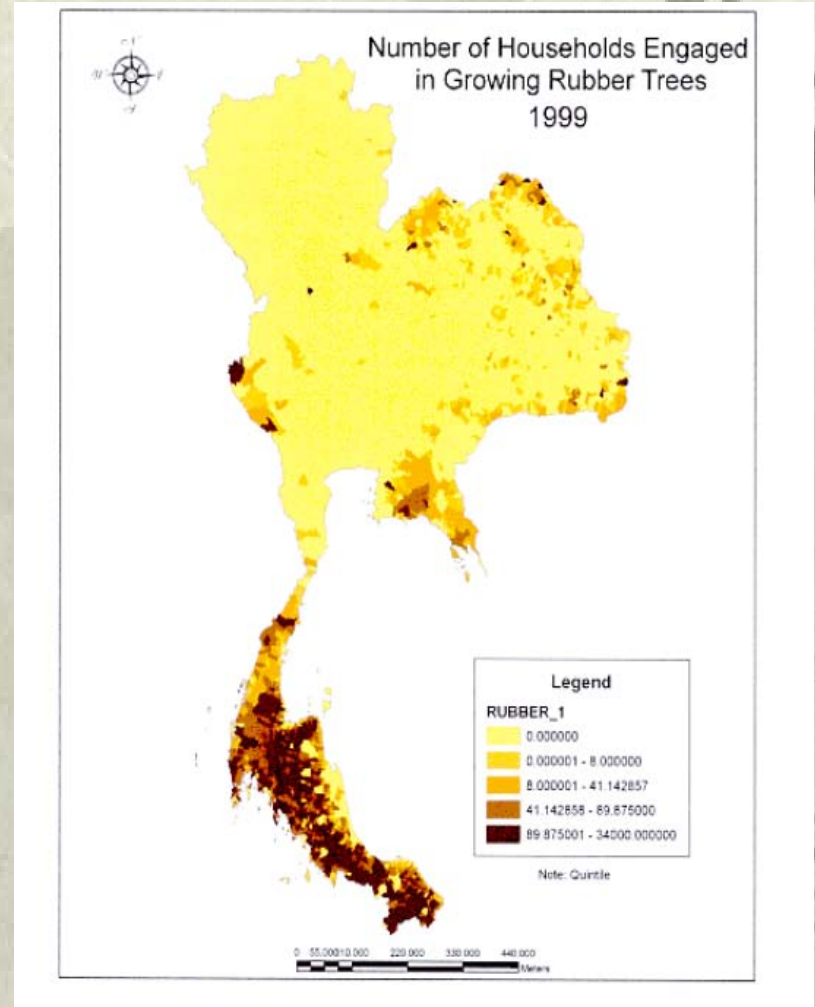
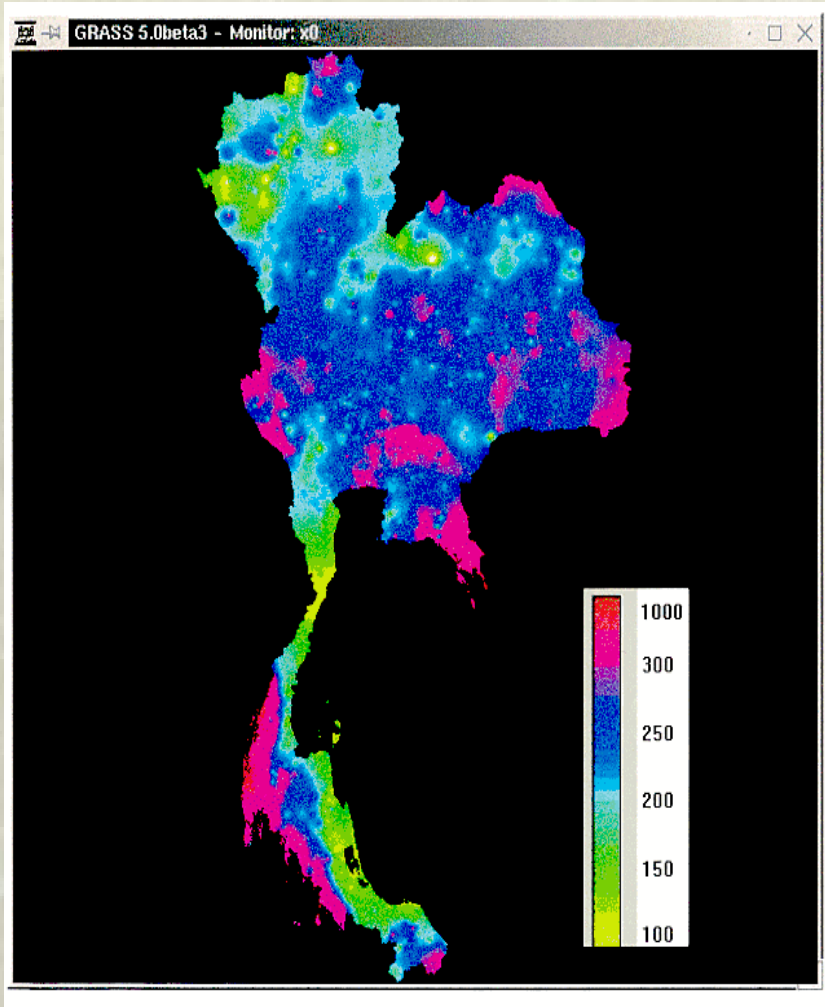
Srisaket

[Family Networks in Villages. Source: Townsend Thai Data research with Samphantharak]



[Examples of Simple Group Structures. Source: Samphantharak (2003)]

RAINFALL IS COVERED



[Average Rainfall in Thailand. Source: Data from Thai Meteorological Department]

Research Algorithm continued

ECONOMY IS NOT NEOCLASSICAL- POLICY IMPACT

- Government program innovations and plausibly exogenous variation in access to intermediation have had nontrivial impacts on households and businesses.
- Often not simply an effect of wealth transfer
- Good financial institutions bring us back toward neoclassical standard
- Exploiting exogenous variation or likely instruments

The new one million baht village funds program seems to have increased consumption, profits from businesses, labor income, agricultural investment, and total borrowing above and beyond village fund credit, while raising default rates and lowering assets/savings.

Instrument is inverse number of households per village (with Kaboski)

$$VFCR_{n,t} = \sum_{i=1}^I \delta_i X_{i,n,t} + \theta_t + \theta_n + \lambda_1 invHH_{t,n} + \lambda_2 invHH_{t,n} * \chi_{t=2002} + \lambda_3 invHH_{t,n} * \chi_{t=2003} + e_{n,t}$$

(8.1.5)

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

(8.1.3)

- Arguably, exogenous variation in villages funds by:
 - Policy (emergency services training, monitoring, pledged saving, collateral)
 - Type (rice bank, buffalo bank, production credit group, women's groups)
- Implies variation in impact (asset accumulation, risk sharing, occupation choice, and reliance on money lenders).
- Variation is coming from ministries promoting different institutions and not tracking failures

Alem Scorecard

Different lenders are different: plus depend on region/ time

Commercial Bank	Consumption → not helpful Investment → helps overall and after crisis, “hurt” during
BAAC	Consumption → helps overall, NE, NE during crisis Investment → hurts NE, Central after crisis, NE after crisis
Ag. Coop	Consumption → helps NE, NE after crisis Investment → helps overall, Central, NE – but helps DURING but not after
PCG	Consumption → helps NE after, NE after Investment → hurts overall, Central, NE, but helps DURING but not after, esp. Central
Informal Debt	Consumption → helps NE, after crisis, after NE Investment → helps during NE, but pretty uniformly helps in Central
Rice	→ helps consumption in NE, not Central

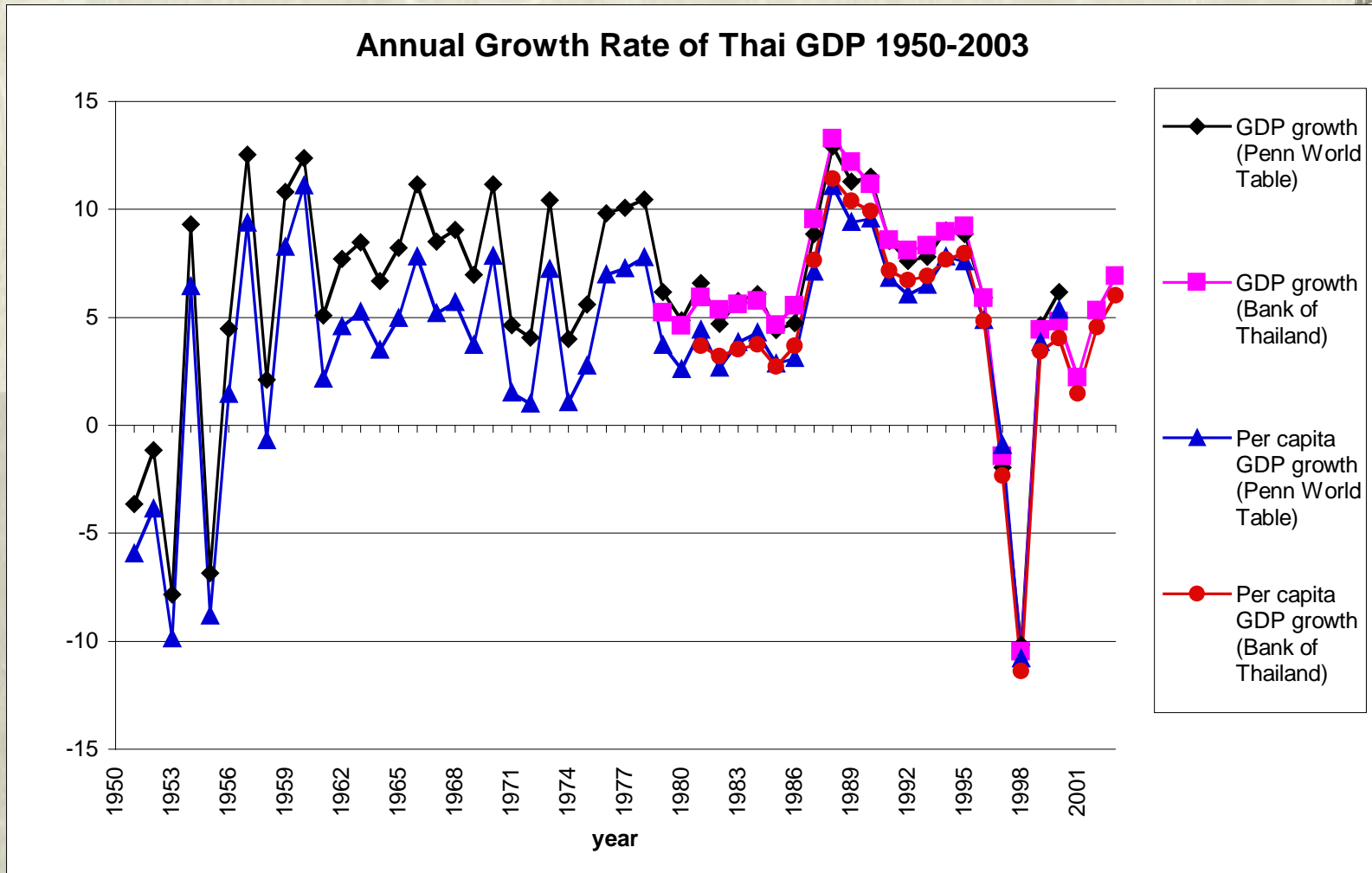
Instrumented variation includes whether headman says village has access, distance to district center, surprise local variation, for the impact on consumption and investment smoothing.

Caveats

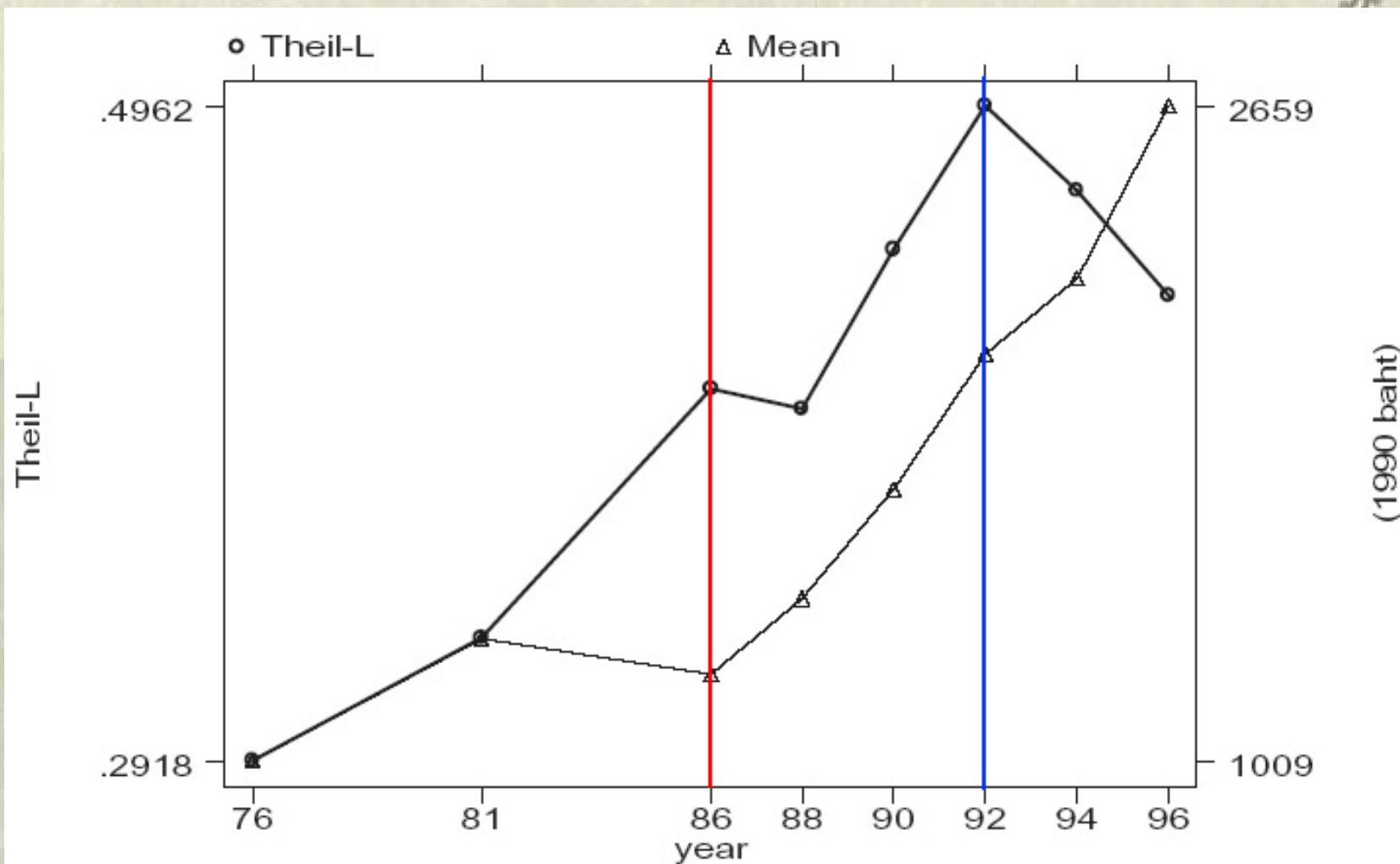
- General Equilibrium Effects - wages (treatment on non-treated)
- Instruments without Modeling - (with Sergio Urzua)



Salient Facts:
Macro: Growth, Inequality
Poverty, Financial Deepening



Growth has been relatively high for the past 50 years, but with a sharp drop in 1997 and the recession in the years of following the financial crisis. But the trend of long term industrialization dominates the data. Caveat: this is not Latin America or Africa



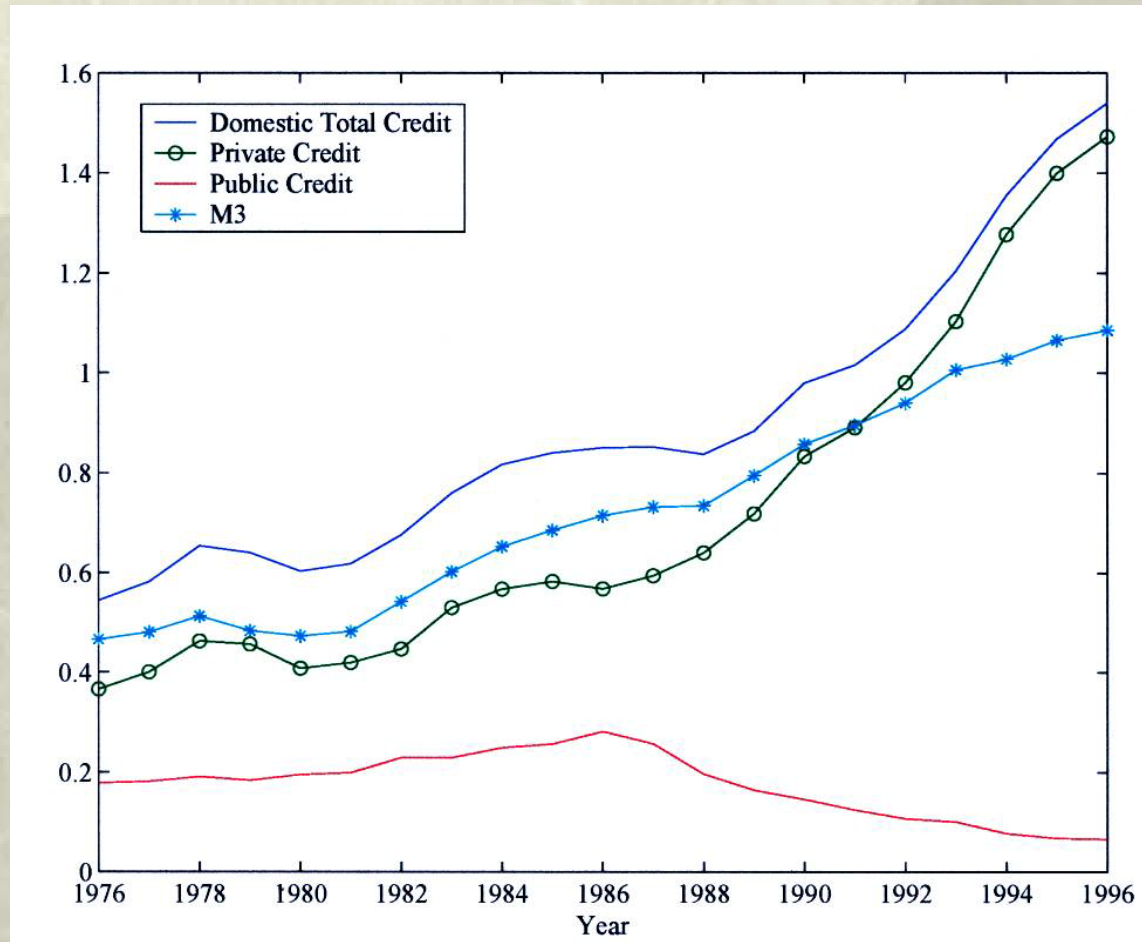
Inequality by almost all measures has been increasing since at least 1976, along with income, but unlike the growth of income, inequality peaks in 1992, with some backtracking for the crisis

Poverty	1976	1981	1986	1988	1990	1992	1994	1996	1998	2000	2002
Head-count Ratio	0.483	0.359	0.446	0.365	0.307	0.256	0.205	0.130	0.125	0.149	0.089
Poverty Gap	0.175	0.119	0.170	0.127	0.100	0.079	0.061	0.034			
FGT P_2	0.083	0.054	0.085	0.060	0.044	0.034	0.026	0.013			
Sample Size	11356	11880	10895	11044	13174	13458	25208	25110			

[Summary Statistics of Income in Thai SES. Source: Jeong (2000)]

There has been a steady decrease in the fraction of poor and distance of the poor from the poverty line, with only a slight wobble in the crisis. However, in panel data poverty is shown to be a transient rather than chronic phenomenon, especially if income data are used.

Financial deepening displays astounding trends relative to the U.S. There was repression. Then part of the increase starting in 1986 can be attributable to financial liberalization



[Macro Indicators of Financial Deepening in Thailand. Source: Jeong and Townsend (2005)]

Variation in Policy comes from this history

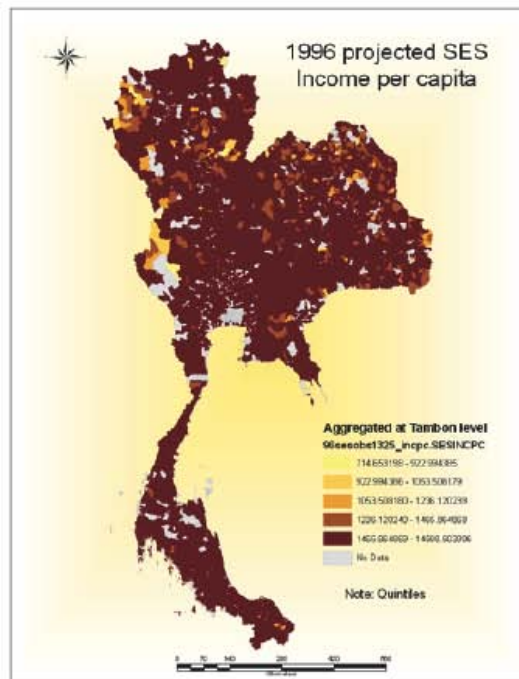
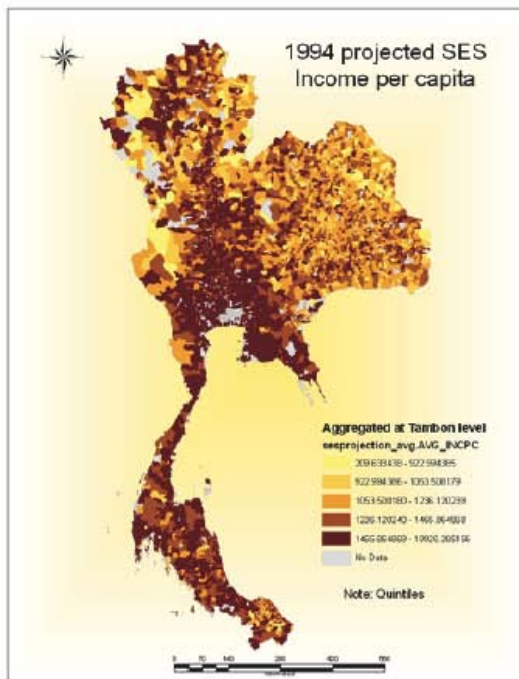
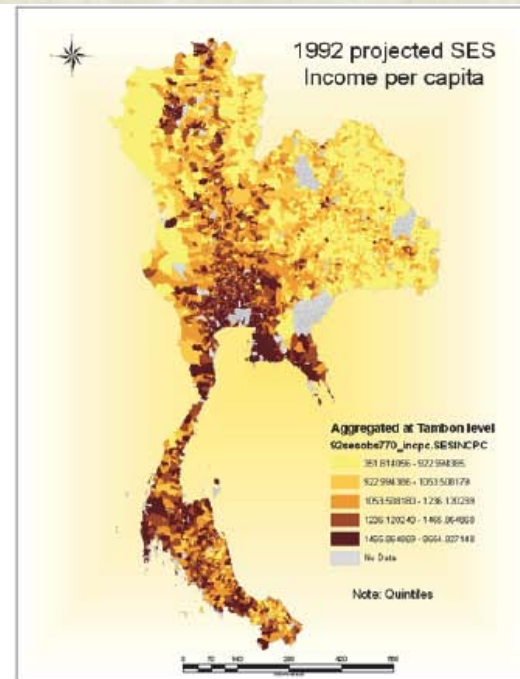
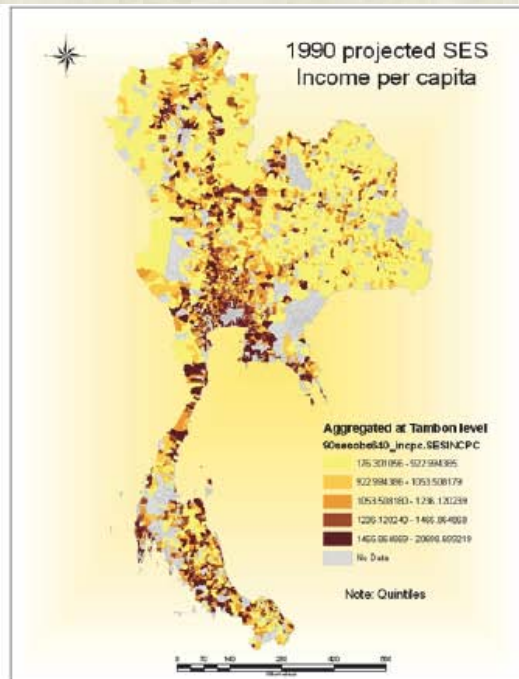
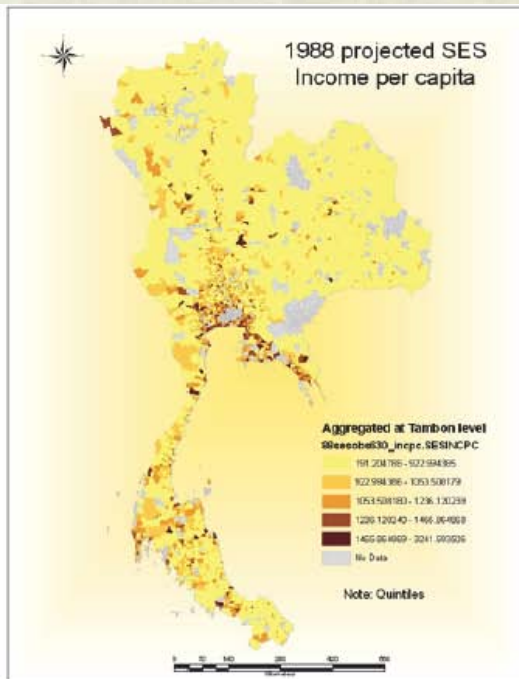
- Repression
- Liberalization
- Village funds of different ministries
- By the 1990's commercial bank regulation appears deficient and government transfers masked the distortion.
- Crisis and recession
- Post crisis, the government involvement in the financial sector has increased (million baht fund).
- BAAC debt moratorium

The background features a soft, sepia-toned image of a mountain range with a prominent peak on the right. In the foreground on the right side, there is a detailed illustration of a willow tree branch with long, drooping catkins. The overall aesthetic is classic and scholarly.

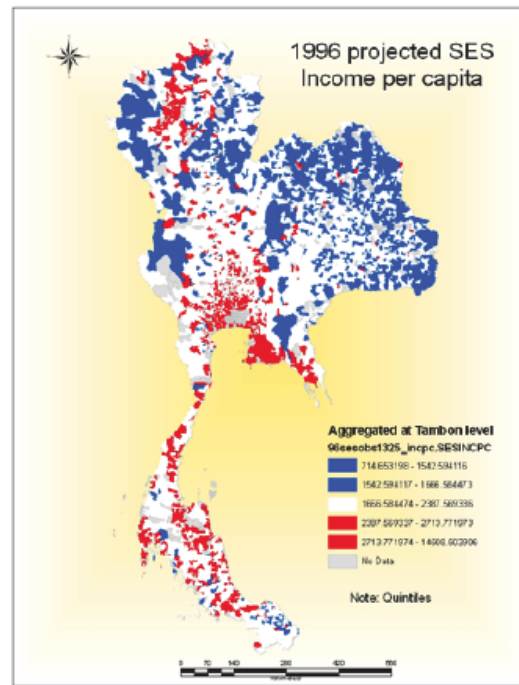
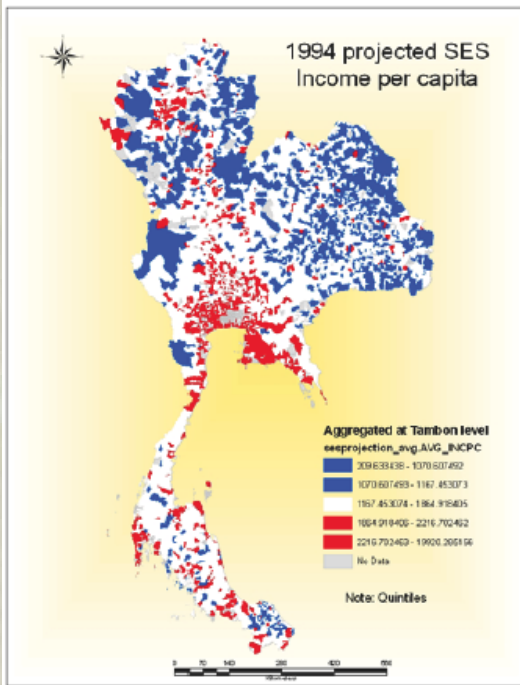
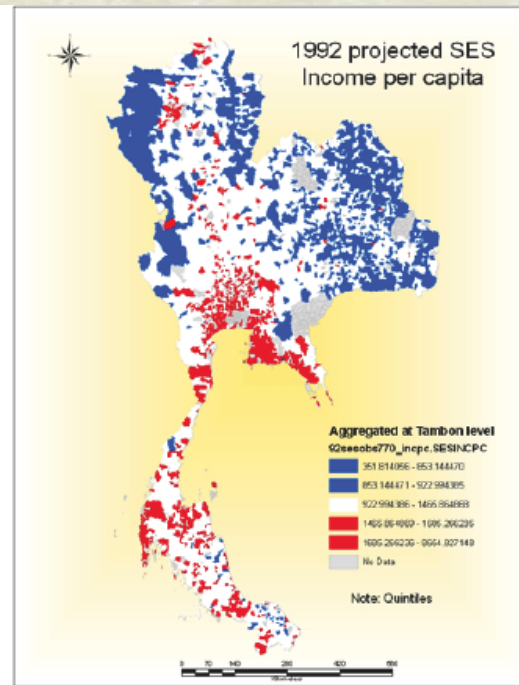
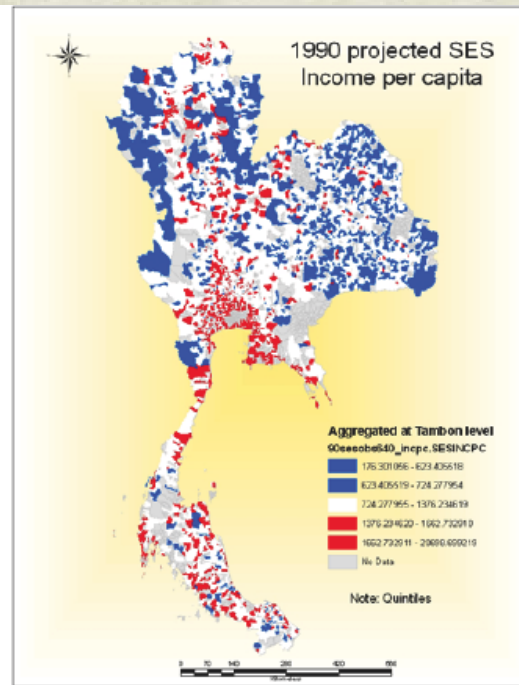
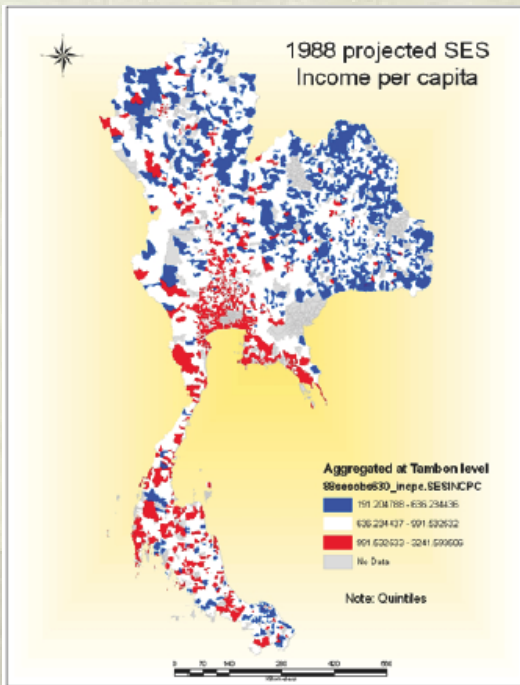
Salient Facts continued:

From Macro Back Toward Micro

*Relative to Cross Country
Comparisons*



SES projected
Income per capita
(Quintiles: 1992 level)

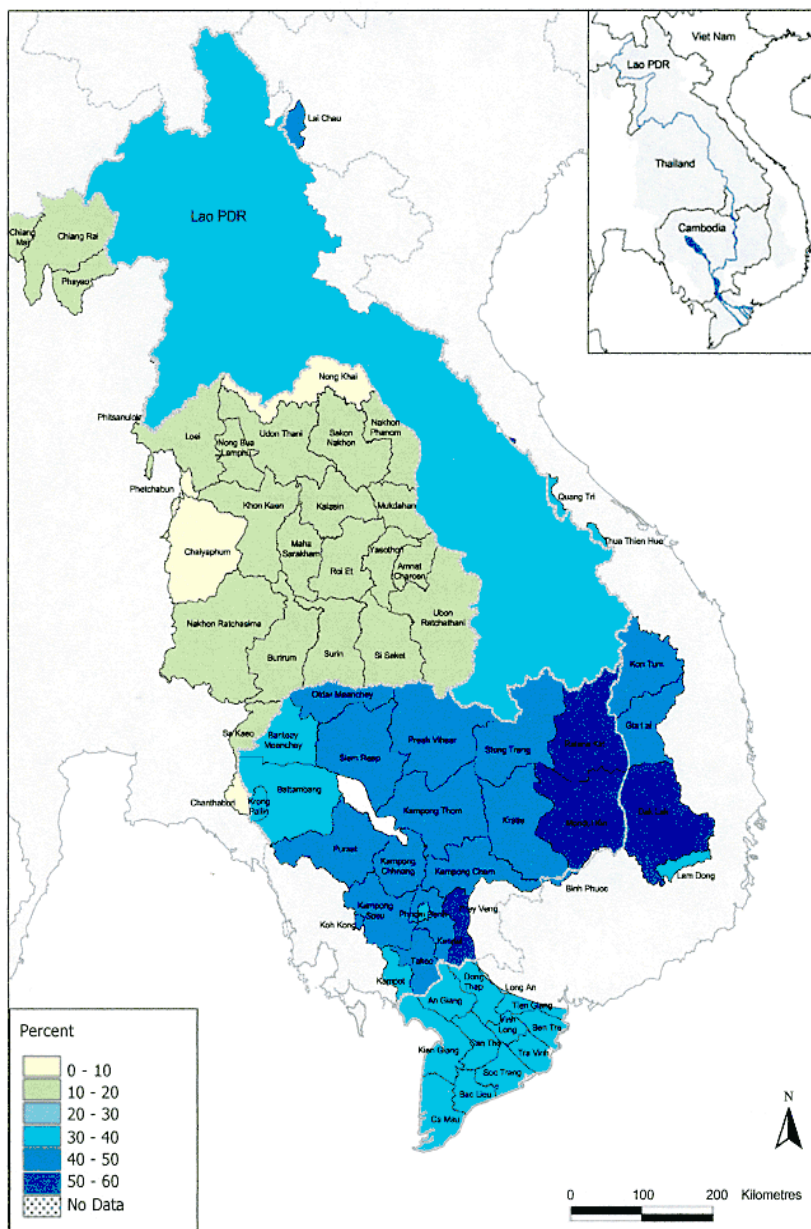


Lowest and Highest 20%



Map 33: Child Malnutrition

Proportion of children underweight for age



Map 50: Land Cover

Major land cover categories

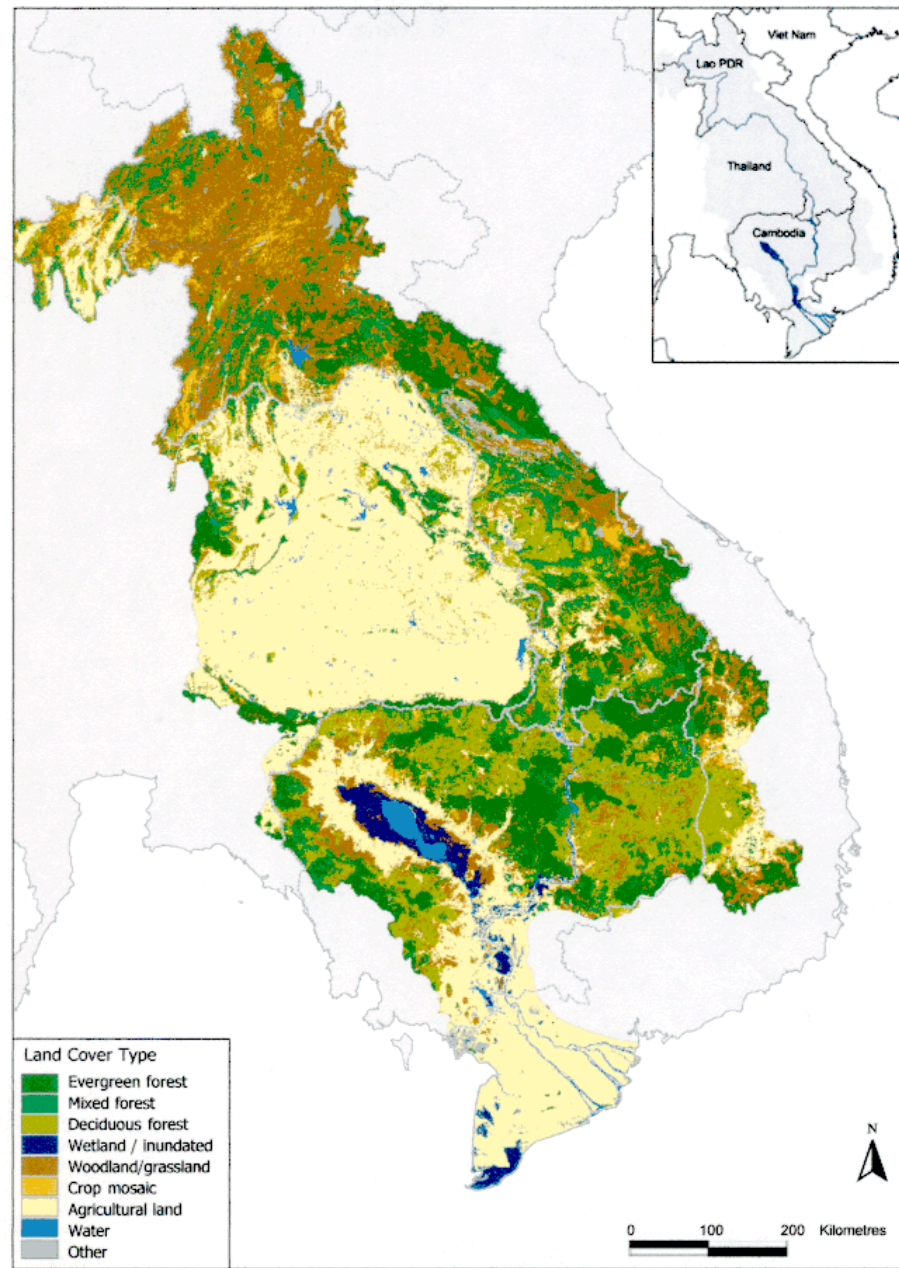
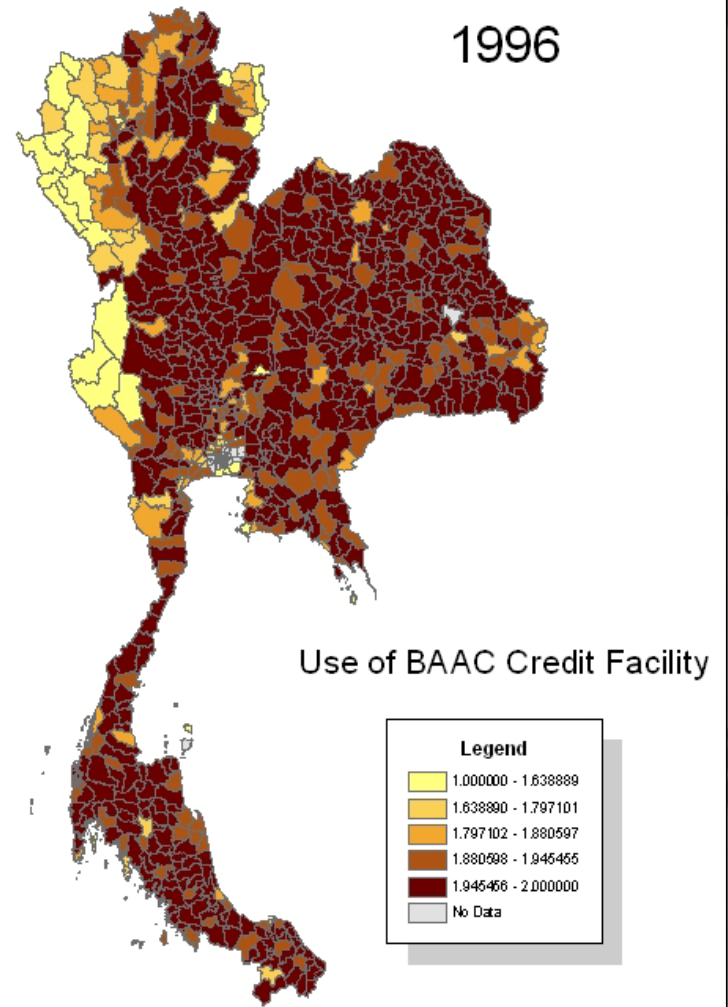
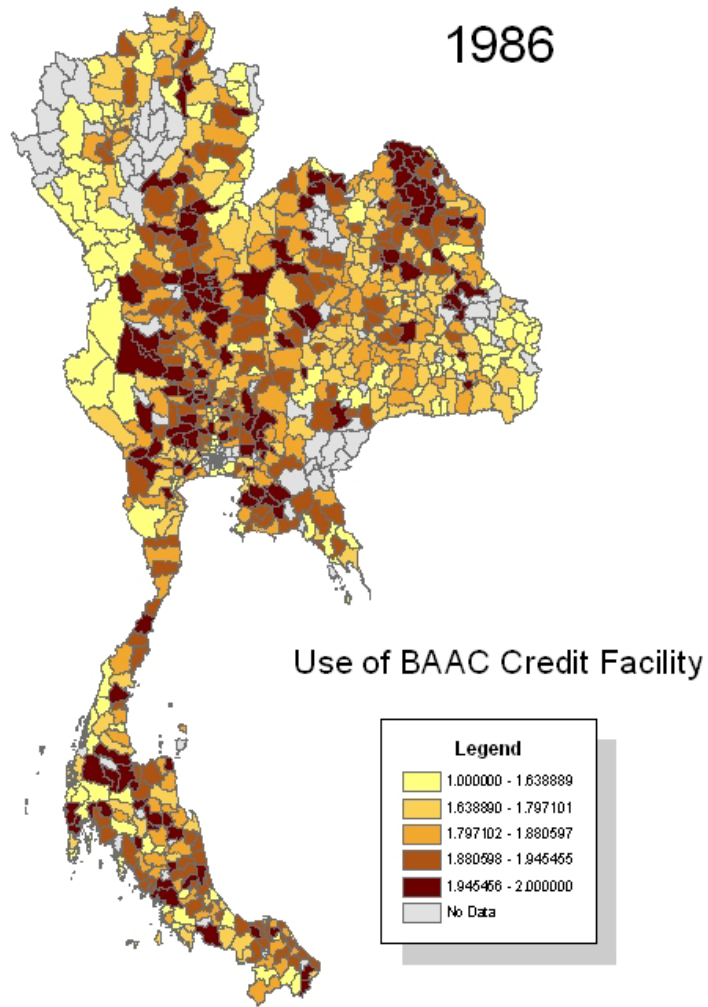


Figure 7 - Geographical distribution of the use of BAAC and commercial banks



Decompositions Quasi Analytic- Both Micro and Macro

- ❖ List of common factors/variables; financial intermediation is among
- ❖ Others are occupation choice, education, urbanization
- ❖ Caution: these are like correlations, but some causality was established earlier

Micro Kuznets decompositions

Increasing access/use of the formal sector along with high and increasing income differentials account for a nontrivial part of growth of per capita income and increasing inequality, albeit with other factors (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

population shifts

rises again

peak

Big but falling

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

Characteristics	Within-group Inequality		Across-group Inequality	
	Intra-group	Composition	Income-Gap	Composition
Age	101	-2	1	0
Gender	97	0	2	1
Community Type	67	-1	24	10
<u>Production Sector</u>	<u>58</u>	<u>9</u>	<u>25</u>	<u>8</u>
<u>Occupation</u>	<u>59</u>	<u>2</u>	<u>32</u>	<u>7</u>
<u>Financial Participation</u>	<u>59</u>	<u>12</u>	<u>2</u>	<u>27</u>
<u>Education</u>	<u>54</u>	<u>-7</u>	<u>5</u>	<u>47</u>
<u>Joint Three</u>	<u>28</u>	<u>2</u>	<u>19</u>	<u>51</u>

Education
then finance
composition
effect

Chapter 4 - Equations

Work more of income gaps

$$WI = \sum_{k=1}^K p^k I^k \quad \text{and} \quad AI = \sum_{k=1}^K p^k \log \left(\frac{\mu}{\mu^k} \right) \quad (4.2.2)$$

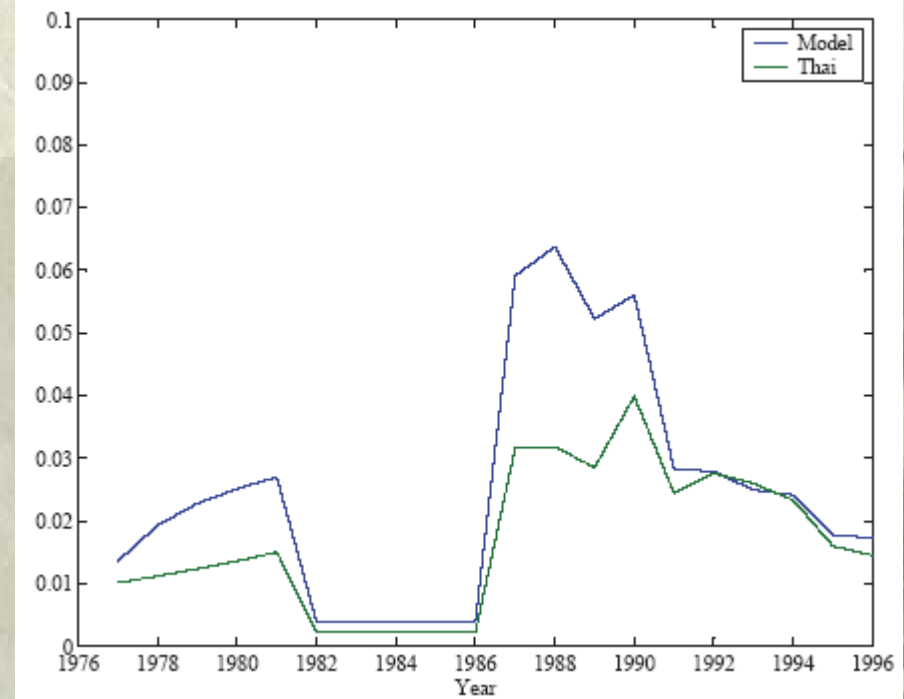
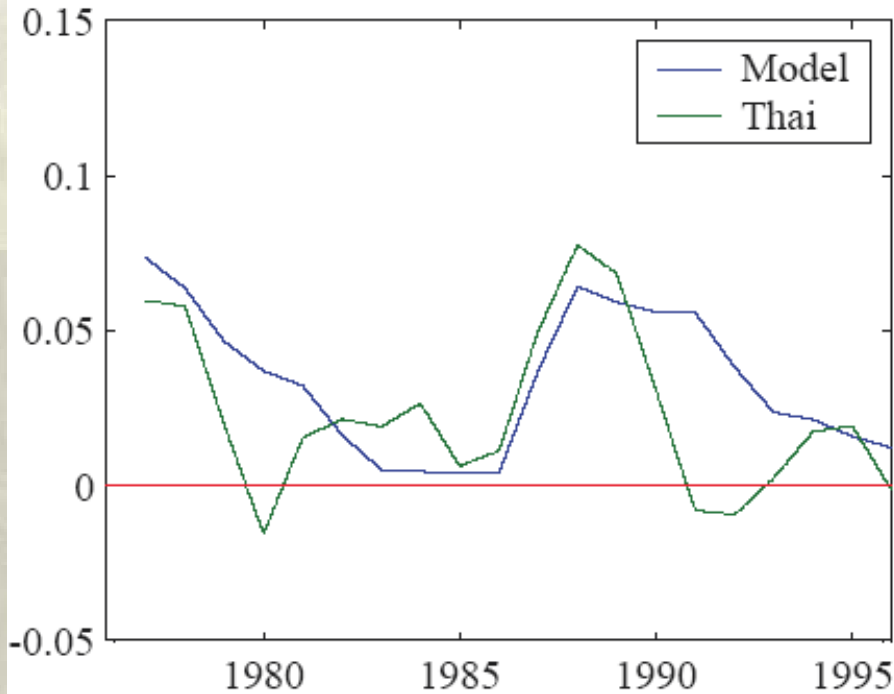
$$\Delta WI = \sum_k \bar{p}^k \Delta I^k + \sum_k \bar{I}^k \Delta p^k \quad (4.2.4)$$

$$\Delta AI = \underbrace{\sum_k \bar{p}^k \left[\frac{\mu^k}{\mu} - 1 \right] \Delta \ln \mu^k}_{\text{Divergence}} + \underbrace{\sum_k \left[\frac{\mu^k}{\mu} - \ln \frac{\mu^k}{\mu} \right] \Delta p^k}_{\text{Kuznets}} \quad (4.2.5)$$

[Decomposition of Inequality Change. Source: Jeong (2001)]

(4.2.6)

- Macro, total factor productivity is largely explained,
- It is NOT an unmeasured residual aggregate shock
- Access-no access dichotomy is used- (with Hyeok Jeong)



$$TFPG = TFPG_SSR + TFPG_ACH + TFPG_OCCS + TFPG_FIN$$

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

Importance

❖ Causes of growth and favorite sons/daughters:

- FINANCIAL INTERMEDIATION
- OCCUPATION CHOICE/INDUSTRIALIZATION
- EDUCATION
- URBANIZATION
- TECHNOLOGY, OPENNESS?
- INFRASTRUCTURE/INSTITUTIONS?
- CORRUPTION, POLITICAL ECONOMY?

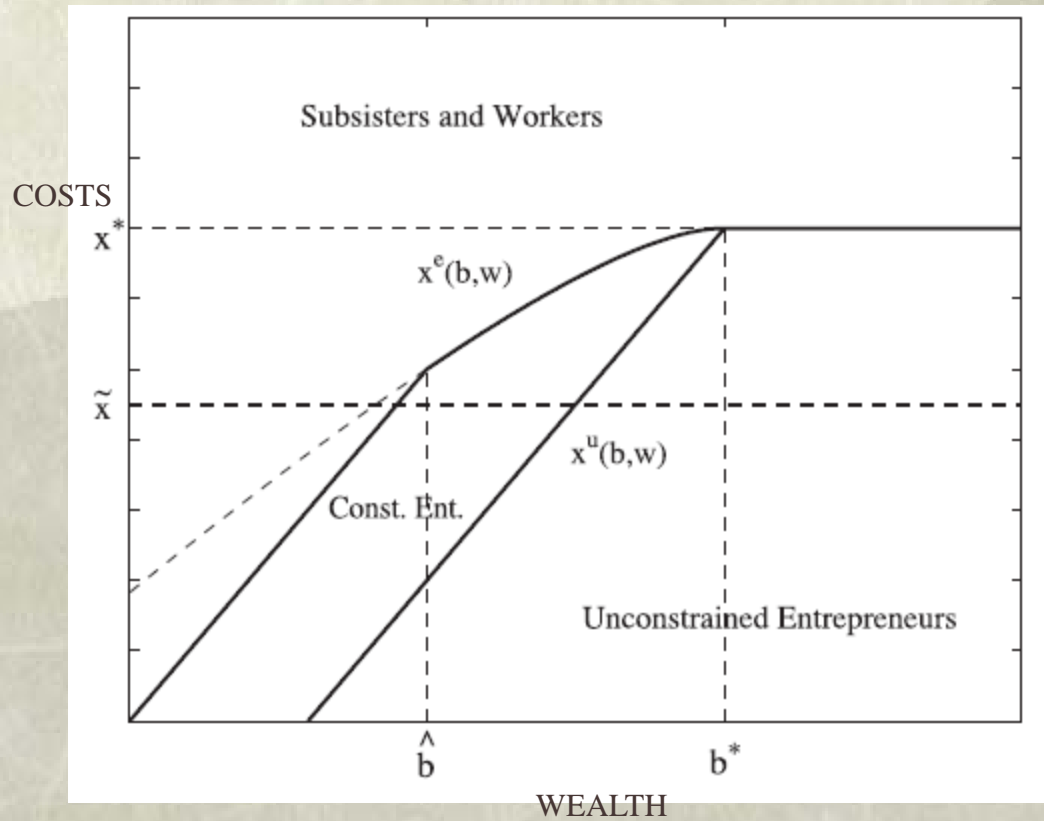
Caveat: unobserved heterogeneity, talent

GOAL: do all this in one economy

Algorithm continued
*MODEL BUILDING BASED ON SALIENT
PATTERNS, FACTORS*

*Applied General Equilibrium
Models*

- Thai economy as an integrated micro/macro system, with the choices of diverse individual agents aggregated up to explain macro variables.
- Start with dual models (perfectly intermediated sector vs. financial autarky)



With Xavier Giné
 Parameters Estimated with Micro data

INTERMEDIATION IMPACTS GROWTH , INTERMEDIATION, INEQUALITY, POVERTY, # FIRMS

Macro simulation:
Credit Matters

Eventual diminishing
Returns, BUT WE GET
TFP

Investment will move
too

Dynamics due to
improved
intermediation

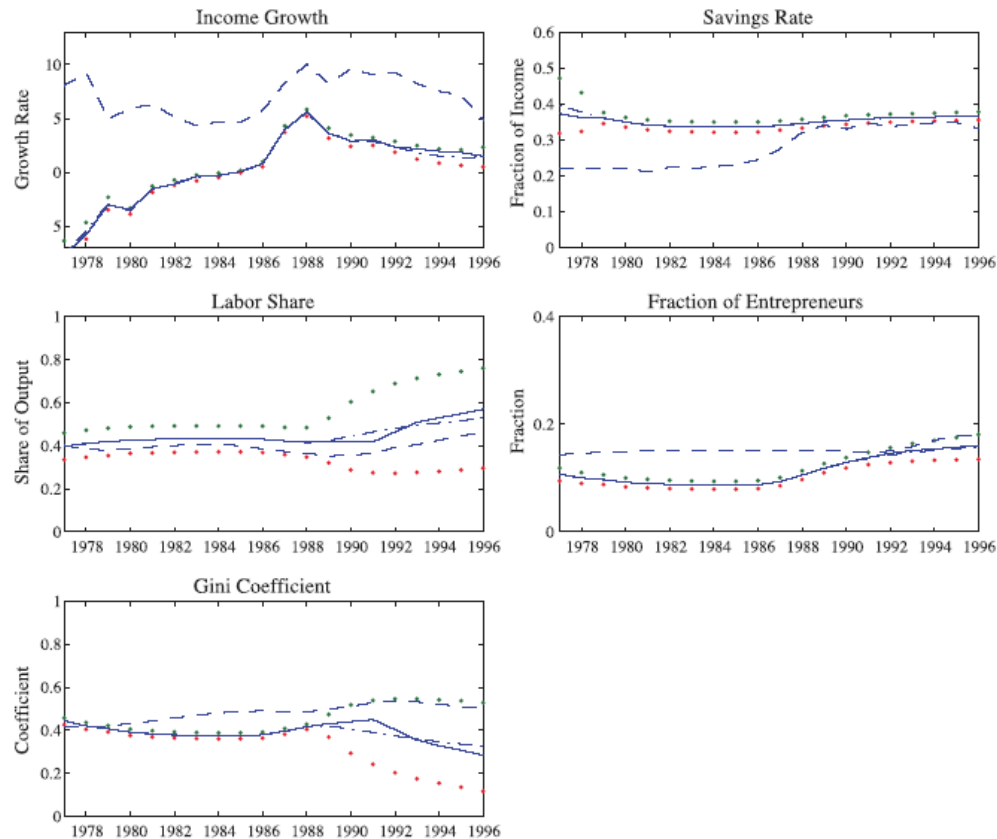


Fig. 3. Intermediated model (SES Data). Legend: - - (dash-dot) Thai economy, — (solid) simulation at estimated parameters, -·- (dash-dot). Mean simulation, ··· (dot-dot) confidence intervals.

[Intermediated Model (SES Data). Notes: $\eta = .026$, $\omega = .321$, $\gamma_{gr} = 0$. Source: Giné and Townsend (2004)]

A model of occupation choice WITH EXOGENOUS FINANCIAL DRIVER and occupation choice explains well the upturn in the Thai economy at the time of a financial liberalization

DISTRIBUTION OF GAINS

Gains depend on wealth and talent-need disb of each -

Rich hh sensitive to Interest rate, occupation choice

Not talented rich give up firms and save

Change in talent will change impact

Poverty Reduction: Laudable Goal

Here it is Linked to macro growth

Fig 12 a: Pct. Change in Wealth in 1979

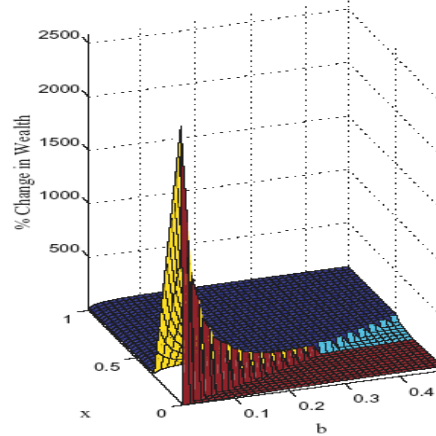


Fig 12 b, $w_{NC} = 0.02, w_C = 0.02, r = 1.93$

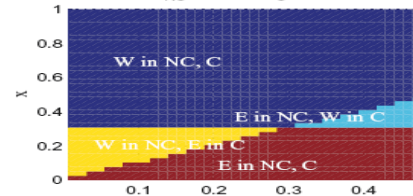


Fig 12 c and 12 d: Wealth Dist.: NCr and C

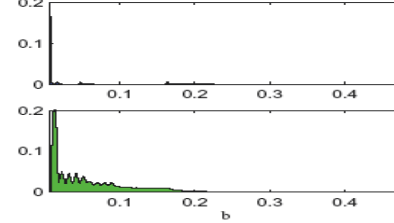


Fig 12 e :Pct. Change in Wealth: NC Dist.

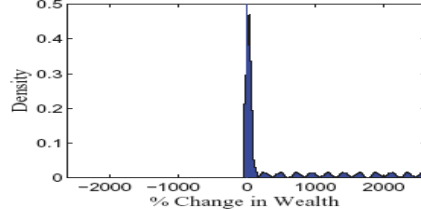


Fig 12 f: Final Wealth: NC Dist.

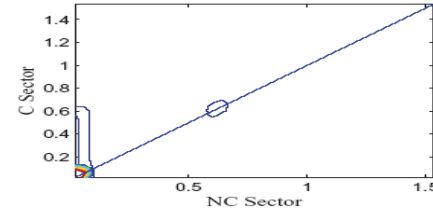


Fig 12 g :Pct. Change in Wealth: C Dist.

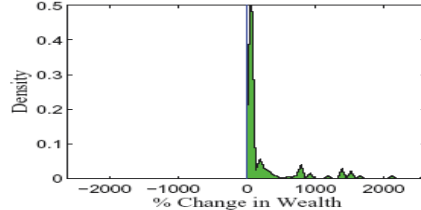
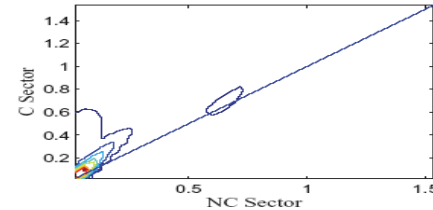
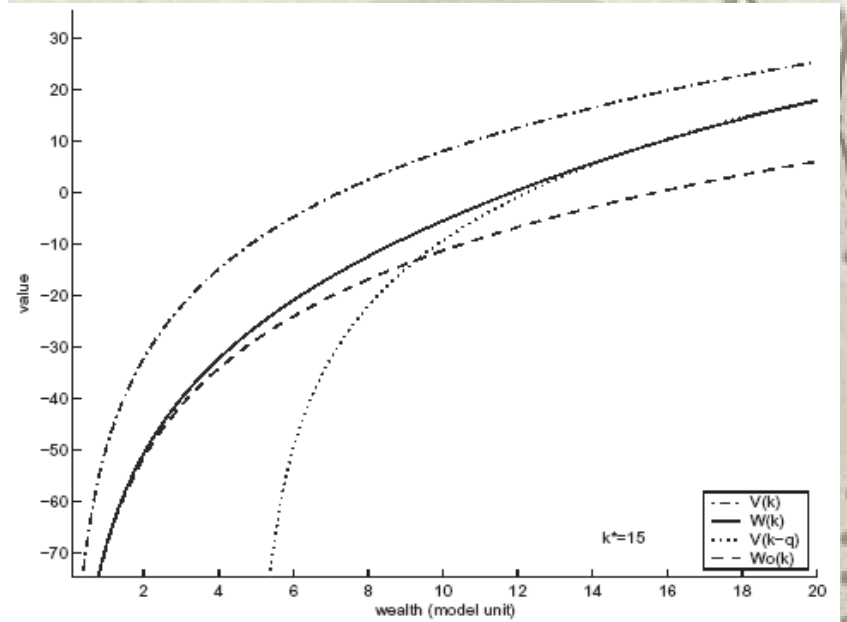
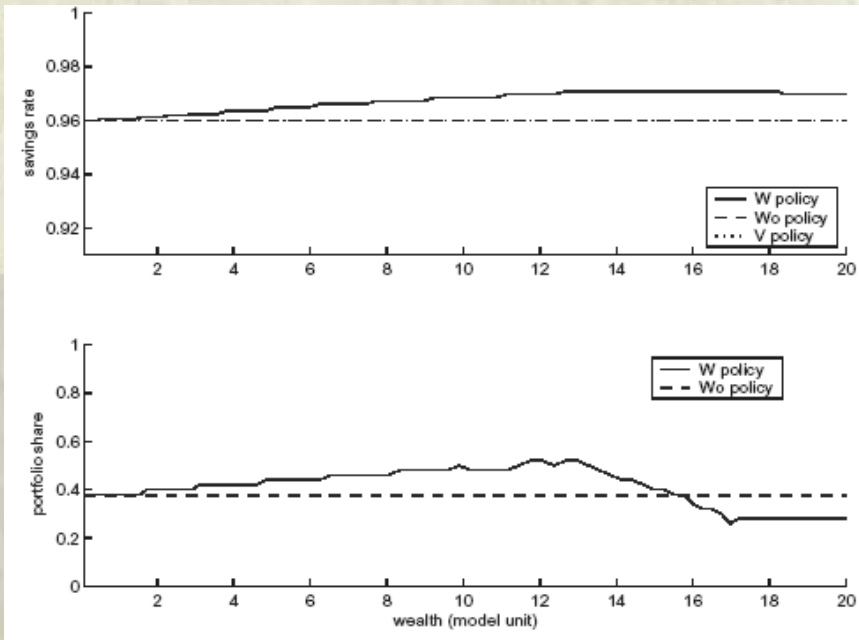


Fig 12 h: Final Wealth: C Dist.

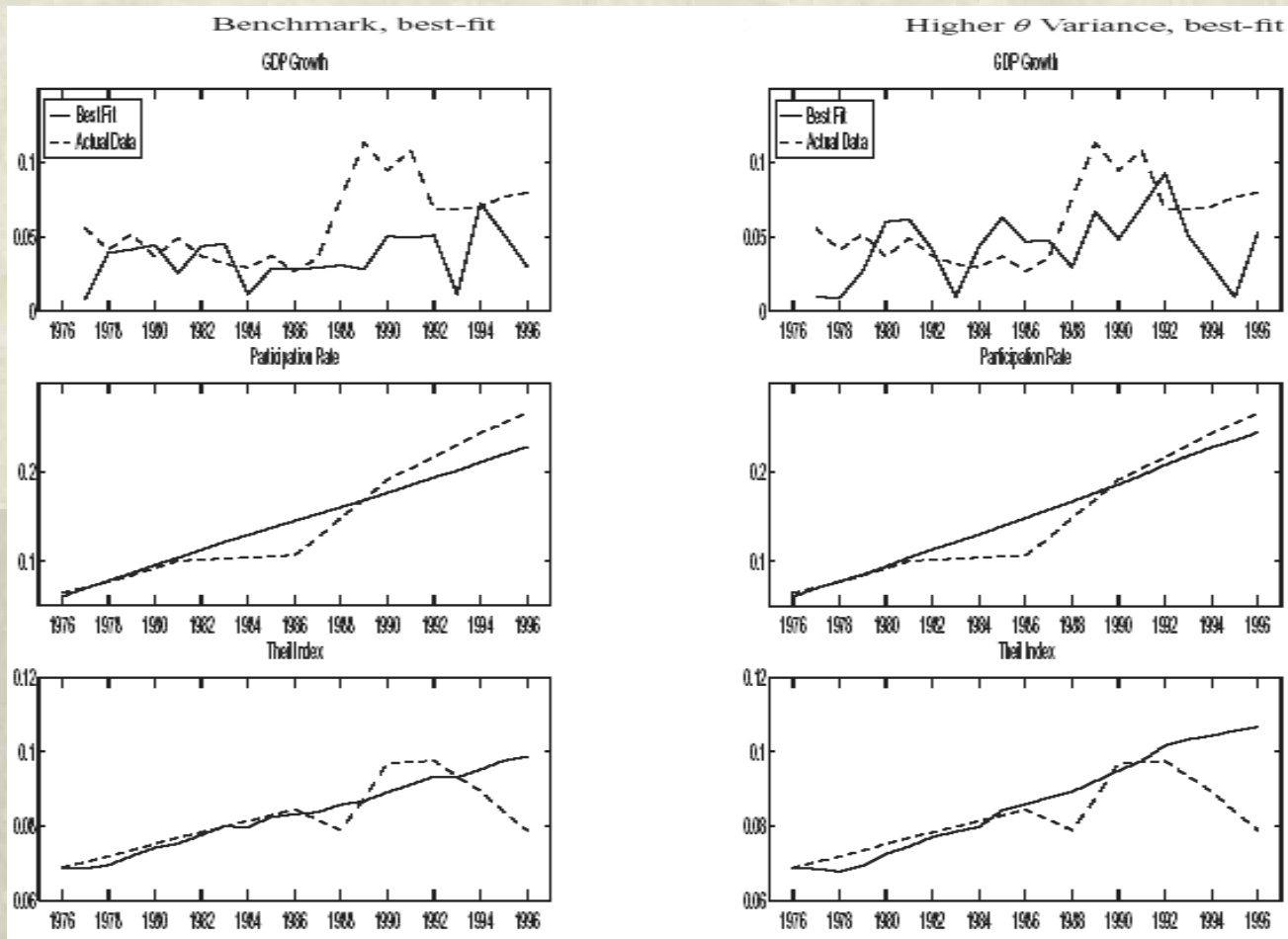


[Welfare Comparison in 1979 (Townsend Thai data) Source: Giné and Townsend (2004)]

The general equilibrium effect of price changes from financial liberalization can cause losses for existing firms that use unskilled labor.



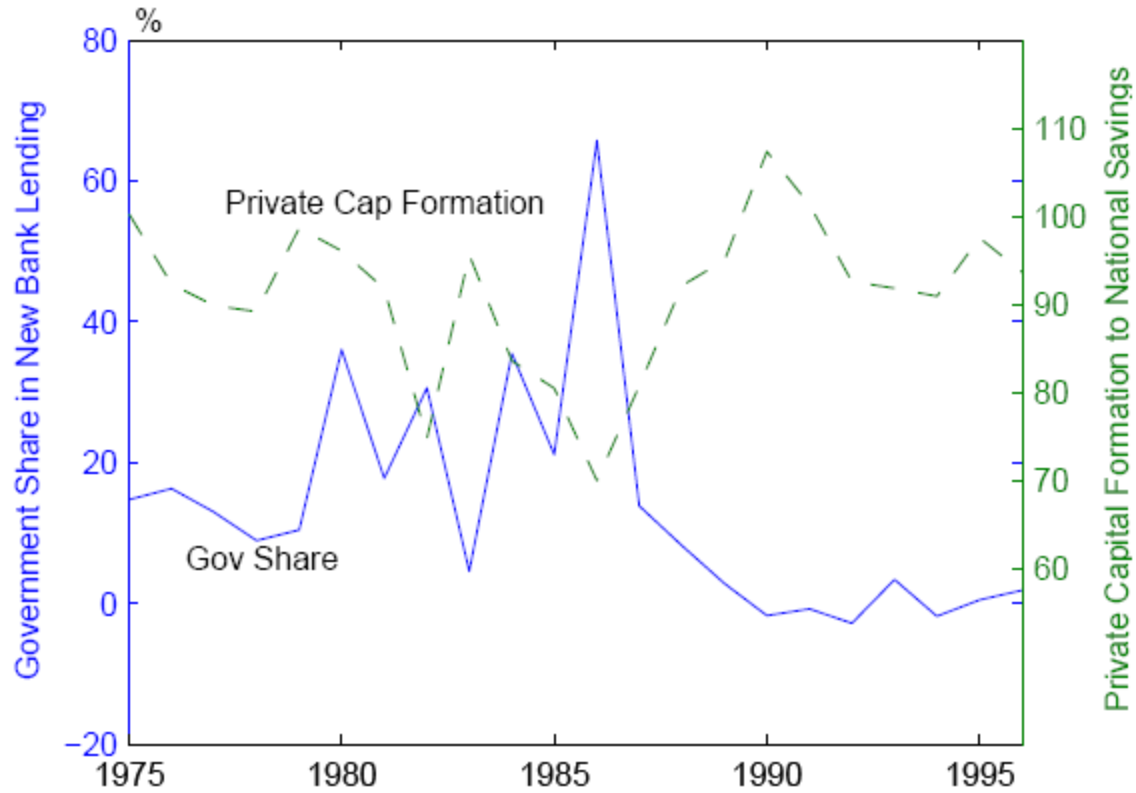
With Kenichi Ueda



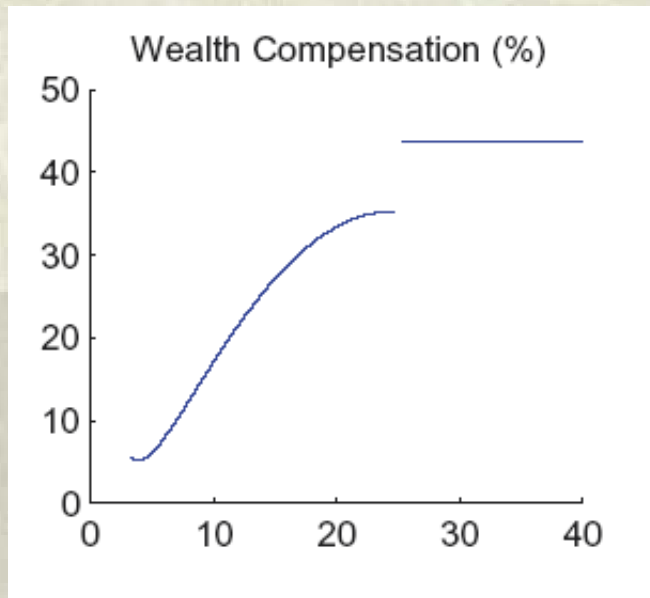
[Benchmark, best-fit (left-hand graphs) and Higher θ Variance, best-fit (right-hand graphs). Source: Townsend and Ueda (2005)]

- A model with endogenous financial access delivers observed long term trends but not that upturn - not a stationary time series
- Need to take into account financial policy intervention

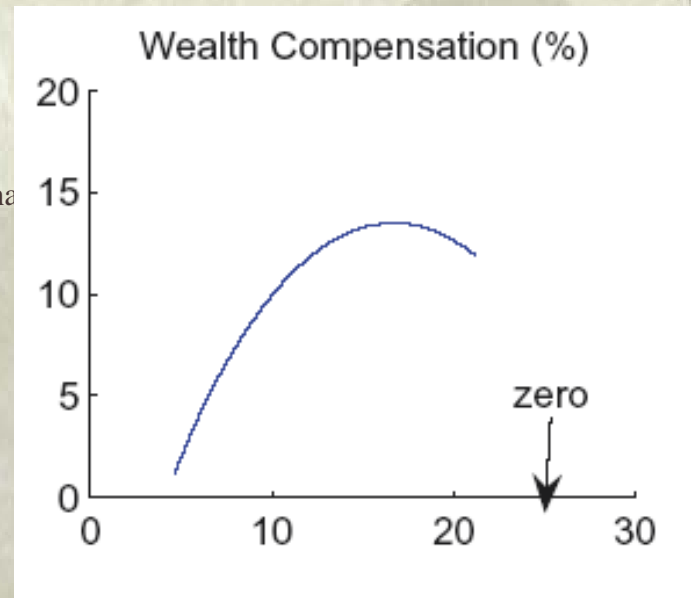
Figure 1. Use of Savings



[Use of savings. Source: Townsend and Ueda (2007)]



on fina



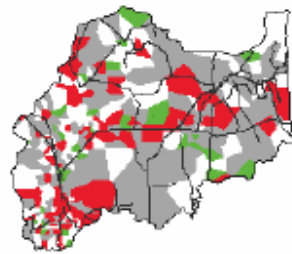
Be careful about difference and differences
Growth and welfare are not synonymous

[Welfare gains from reduction of marginal costs (left) and from reduction in entry costs (right). Source: Townsend and Ueda (2007)]

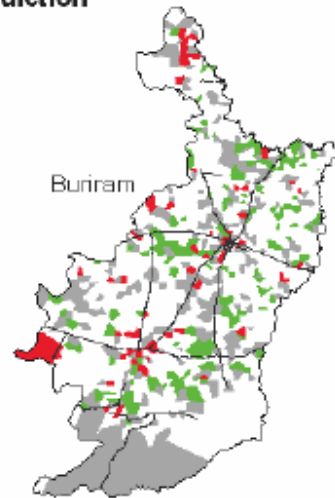
The background features a light beige, fibrous paper texture. A dark grey silhouette of a mountain range spans the middle ground. On the right side, a dark branch of a willow tree hangs down, adorned with small, dark, round buds.

From Macro to Regional

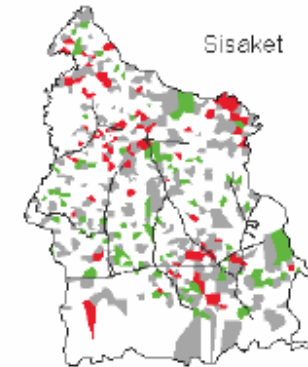
**Reds are Areas of Model Over-Prediction,
Greens are Areas of Model Under-Prediction**



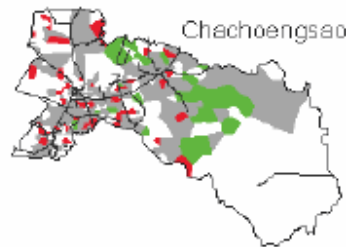
Lop Buri



Buriram



Sisaket



Chachoengsao



0 12.5 25 50 75 100 Kilometers

Binary Differences

Major Roads

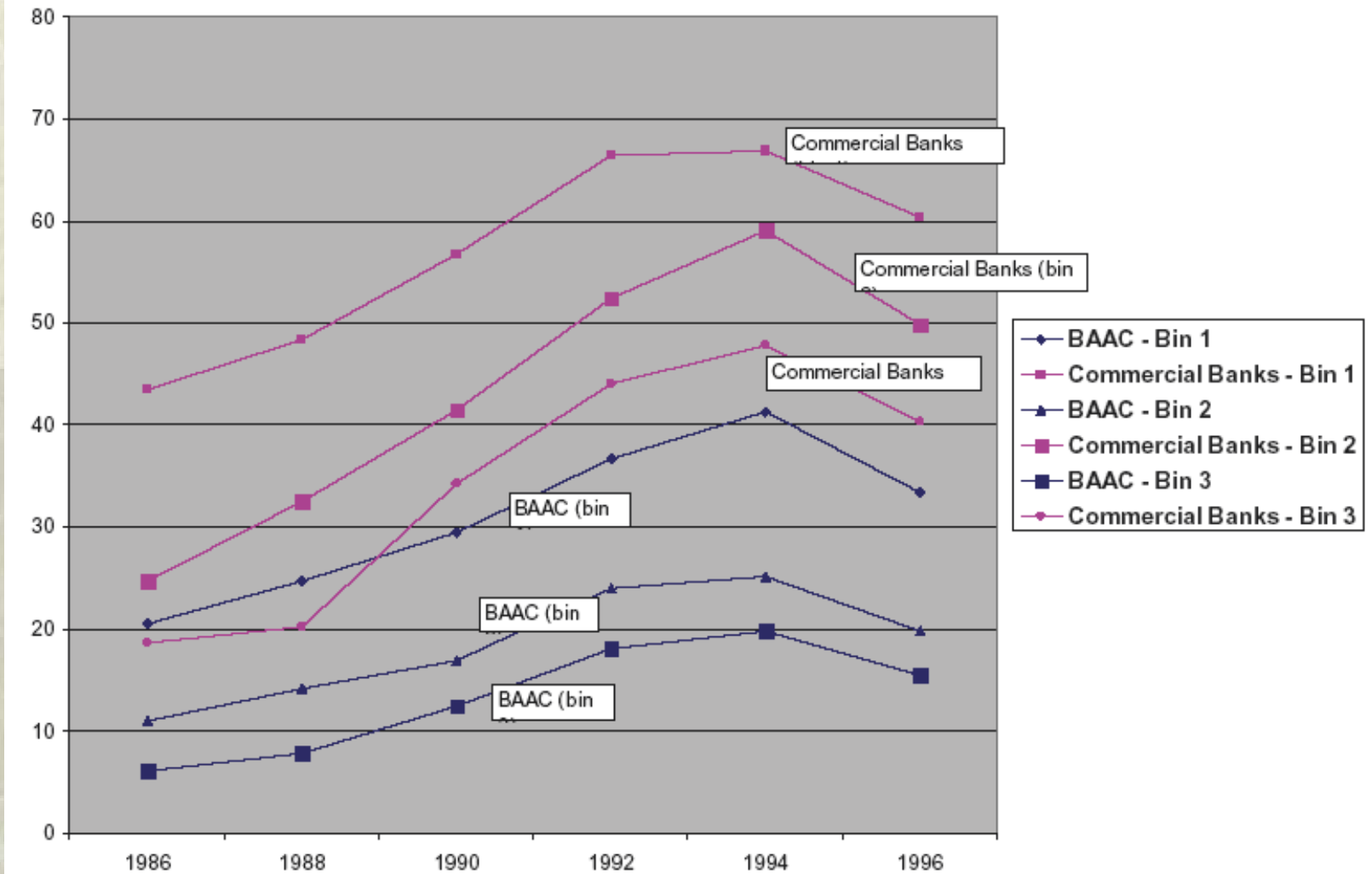
No Data

UNDERPREDICT (96 yes, simulated no)

NO CHANGE (between actual and simulated)

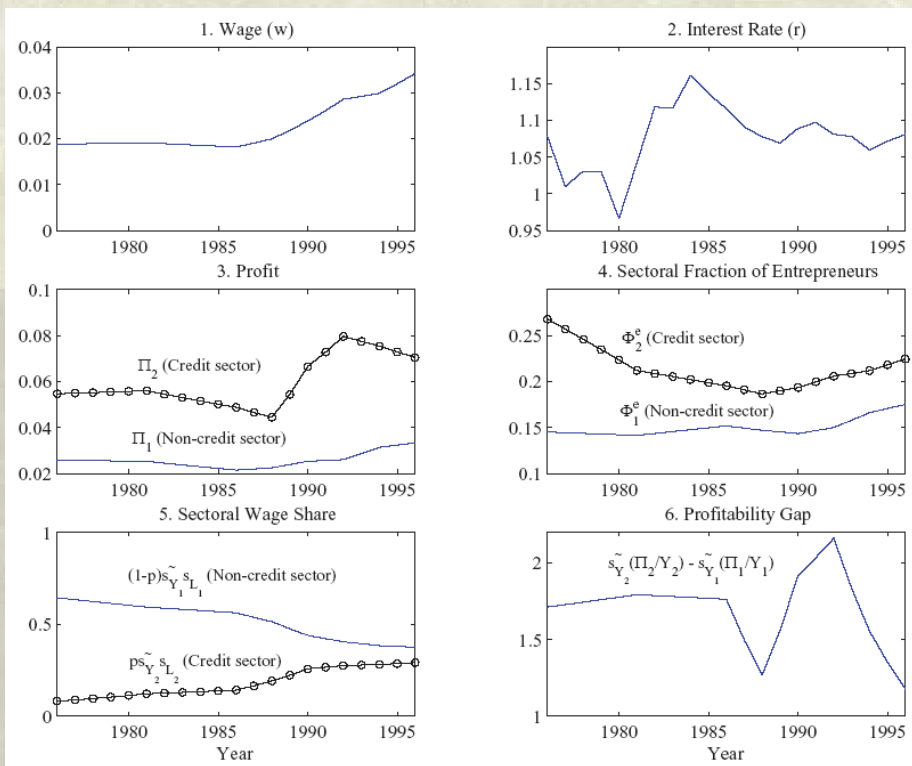
OVERPREDICT (96 no, simulated yes)

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

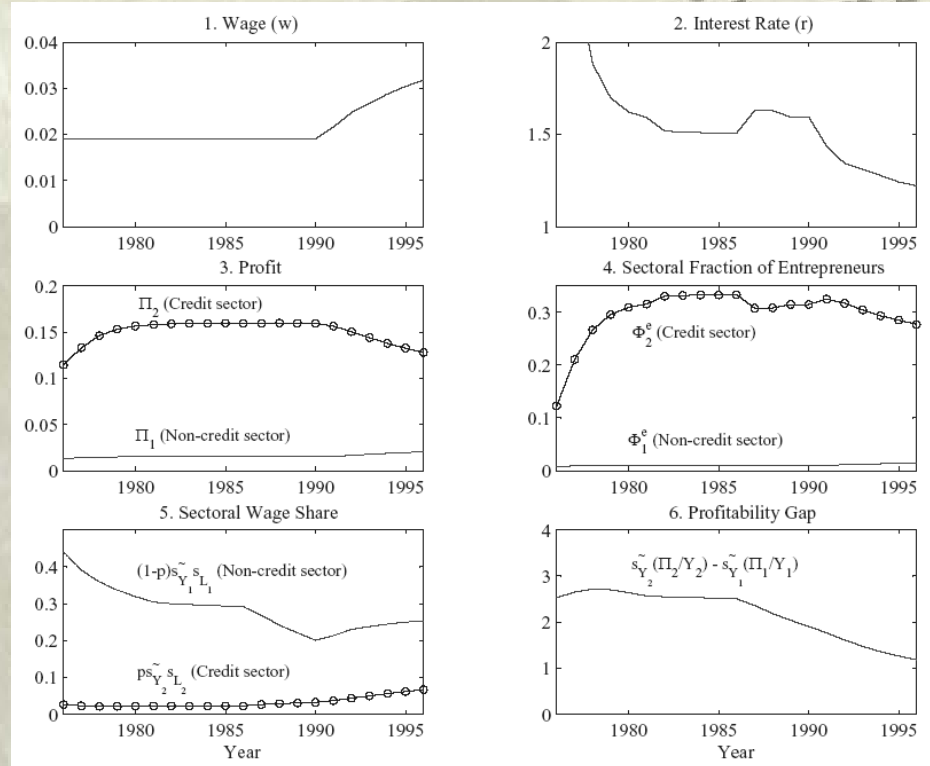


[Financial Deepening Simulation - k^{\wedge} Defined by Actual Wealth Distribution and Participation Rate. Source: Felkner and Townsend (2004)]

Down to Household-Level Anomalies



THAI ECONOMY



MODEL ECONOMY

[Source: Jeong and Townsend (2005)]

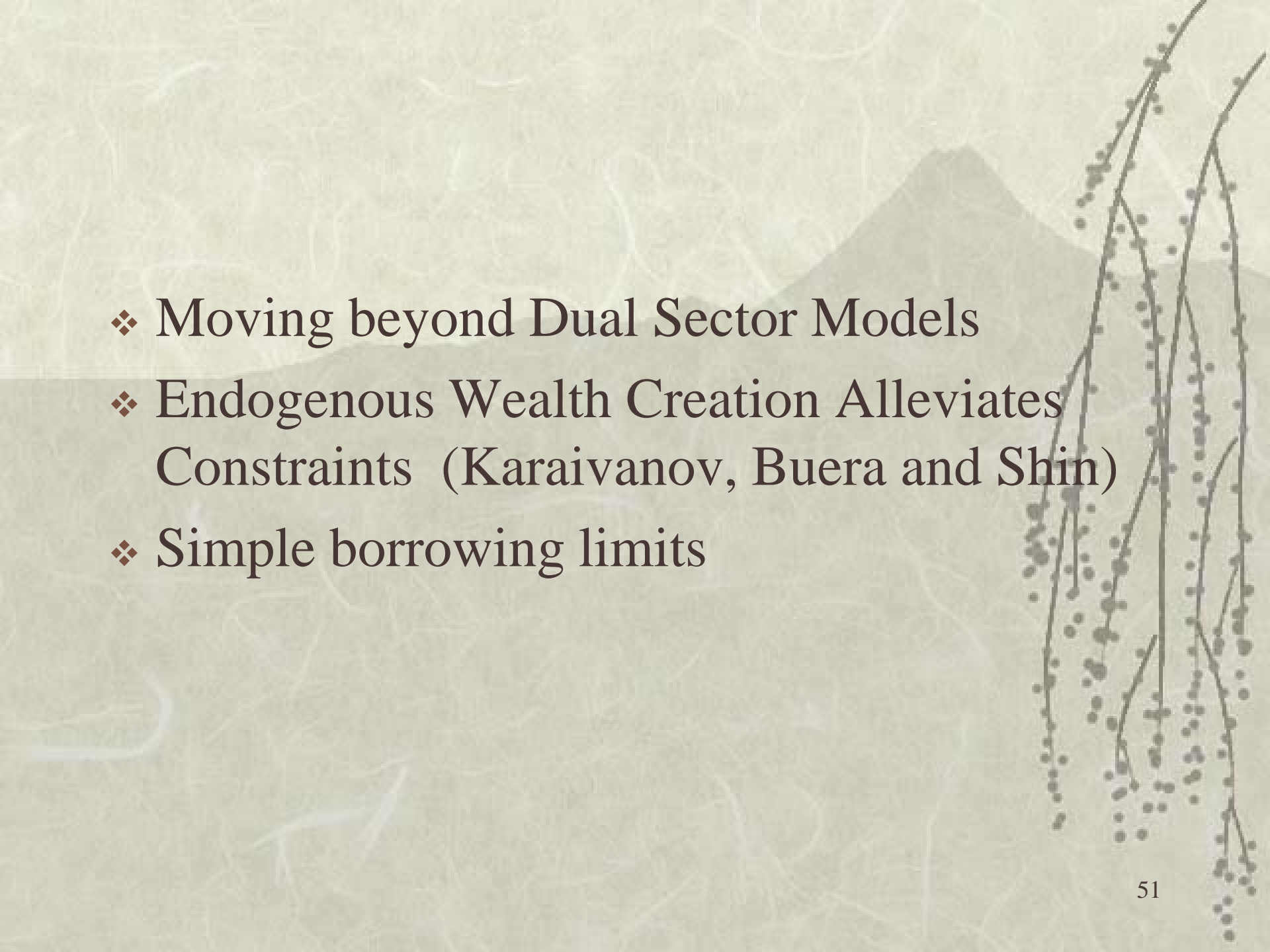
- 
- The background features a stylized, muted-toned illustration of a mountain range in the upper half and a willow tree with drooping branches on the right side. The overall aesthetic is soft and textured, resembling a light-colored paper or fabric.
- ❖ Moving beyond Dual Sector Models
 - ❖ Endogenous Wealth Creation Alleviates Constraints (Karaivanov, Buera and Shin)
 - ❖ Simple borrowing limits

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

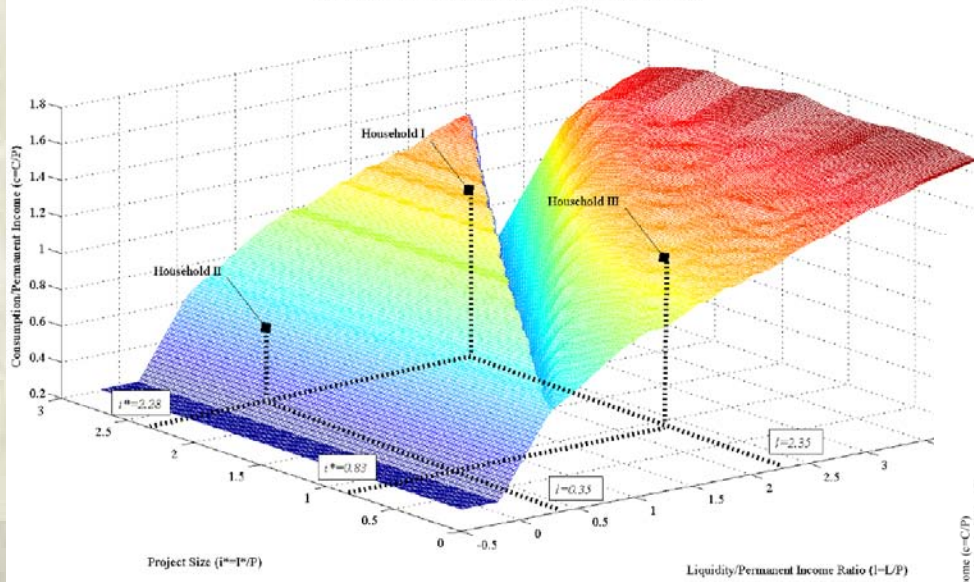
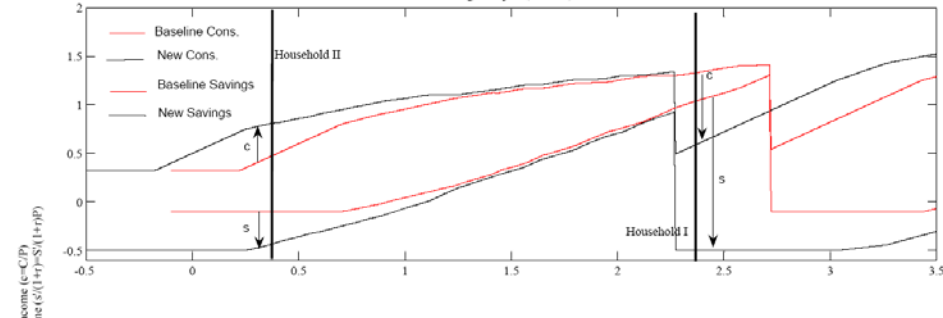


Figure 4: Examples of Consumption and Savings Policy Changes with Increased Borrowing Limit
Larger Project ($I^*=2.28$)



Smaller Project ($I^*=0.83$)

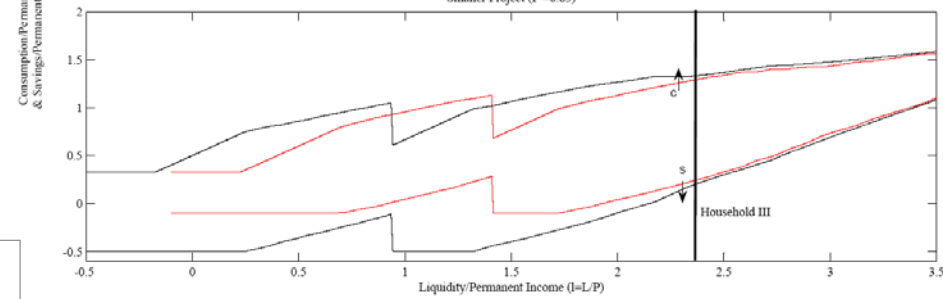
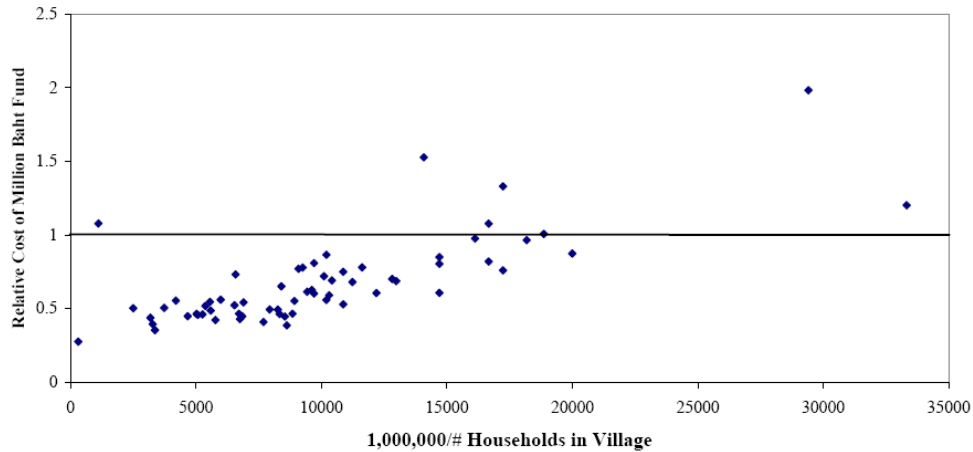


Figure 6: Relative Cost of Million Baht Fund as a Function of Cost/Household



Notes: Each dot represents a village.

With Joe Kaboski
Village fund with particular obstacle

*Adding Impediments to Trade and Distinguishing
Work with Paulson, Karaivanov, Ahlin,*

Choices are shown to be constrained by real obstacles to trade. There seems to be **MORAL HAZARD** in entrepreneurial effort and project choice.

A further example is **MONITORING** by joint liability borrowers. There seems to be **ADVERSE SELECTION**, the exclusion of safer customers from the loan market.

There seem to be **LIMITED COMMITMENT** problems, with loan size limited by collateral or wealth, and a tendency for strategic default limited by unofficial sanctions.

- ❖ Dynamic Mechanism Design
- ❖ The Pareto frontier
- ❖ With Alex Karaivanov

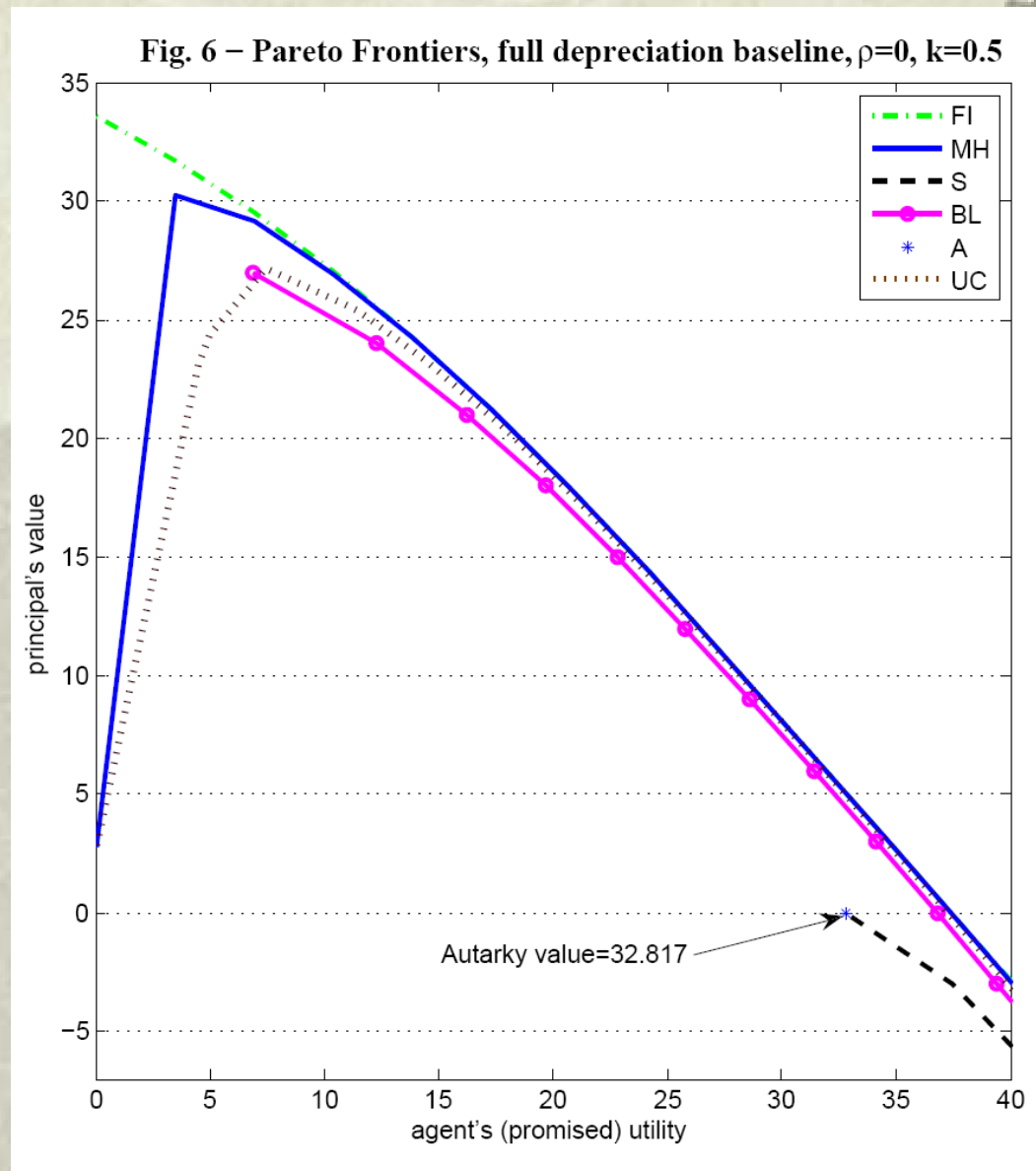


Table 6 - Model Comparisons Using Data on Consumption Smoothing (c,q)
benchmark is Moral Hazard, n=1000

Incomplete depreciation ($\delta = 5\%$), low measurement error ($\gamma_{me} = 0.1 * \text{gridmax}$)

Model	Vuong Test Z-stats					LL value
	MH	FI	B	S	A	
MH	n.a.					-2561.3
FI	5.157***(MH)	n.a.				-2597.4
B	7.250***(MH)	3.963***(FI)	n.a.			-2646.4
S	8.750***(MH)	6.320***(FI)	4.059***(B)	n.a.		-2682.4
A	13.52***(MH)	12.11***(FI)	16.35***(B)	12.81***(S)	n.a.	-2793.6

Incomplete depreciation ($\delta = 5\%$), high measurement error ($\gamma_{me} = 0.5 * \text{gridmax}$)

Model	Vuong Test Z-stats					LL value
	MH	FI	B	S	A	
MH	n.a.					-2715.8
FI	2.105**(MH)	n.a.				-2724.7
B	1.633(draw)	-0.791(draw)	n.a.			-2721.4
S	2.240**(MH)	0.748(draw)	1.582(draw)	n.a.		-2729.7
A	3.087***(MH)	2.066**(FI)	2.989***(B)	1.151(draw)	n.a.	-2735.7

Complete depreciation ($\delta = 100\%$), low measurement error ($\gamma_{me} = 0.1 * \text{gridmax}$)

Model	Vuong Test Z-stats						LL value
	MH	FI	B	S	A	UC	
MH	n.a.						-2729.6
FI	4.593***(MH)	n.a.					-2768.8
B	6.856***(MH)	2.943***(FI)	n.a.				-2811.4
S	9.616***(MH)	5.958***(FI)	5.636***(B)	n.a.			-2860.2
A	17.18***(MH)	14.14***(FI)	17.11***(B)	19.18***(S)	n.a.		-3096.3
UC	3.308***(MH)	-1.67*(UC)	-6.09***(UC)	-8.40***(UC)	-16.5***(UC)	n.a.	-2754.2

Complete depreciation ($\delta = 100\%$), high measurement error ($\gamma_{me} = 0.5 * \text{gridmax}$)

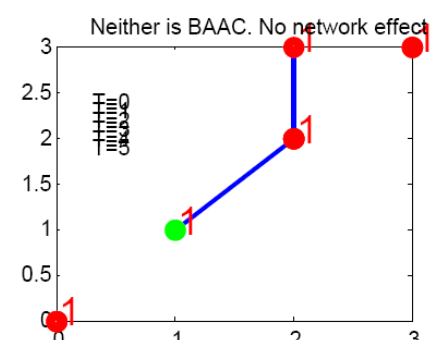
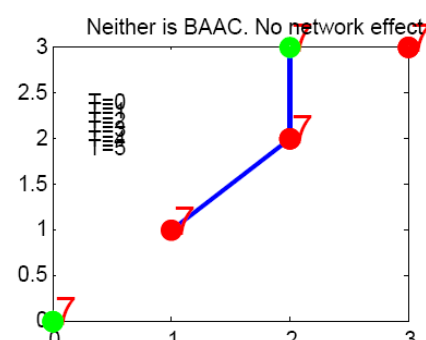
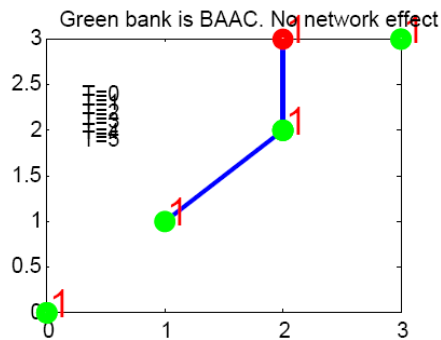
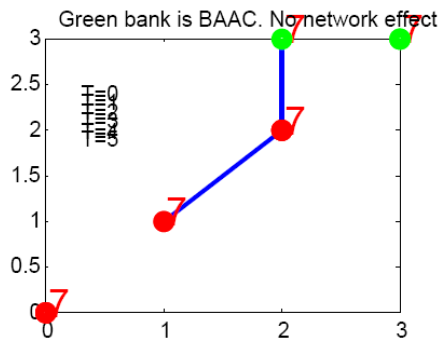
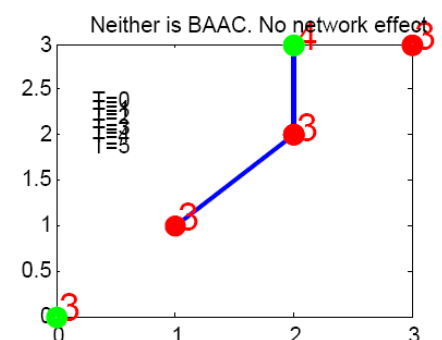
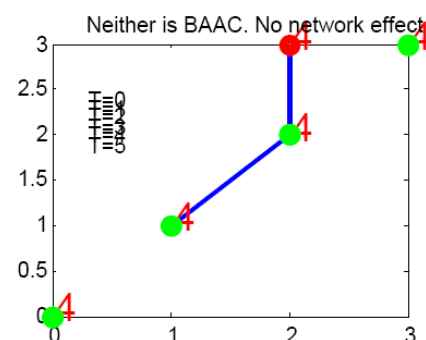
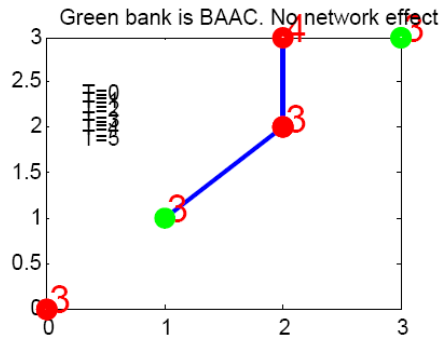
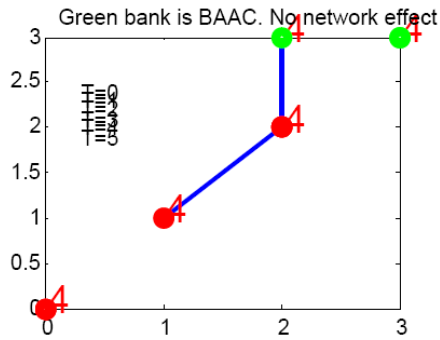
Model	Vuong Test Z-stats						LL value
	MH	FI	B	S	A	UC	
MH	n.a.						-2790.6
FI	0.857(draw)	n.a.					-2793.8
B	2.009**(MH)	1.646*(FI)	n.a.				-2801.9
S	4.923***(MH)	4.560***(FI)	4.793***(B)	n.a.			-2845.1
A	6.664***(MH)	6.113***(FI)	7.100***(B)	5.077***(S)	n.a.		-2881.7
UC	1.346(draw)	0.680(draw)	-0.77(draw)	-4.15***(UC)	-6.24***(UC)	n.a.	-2797.5

NOTES:

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

"draw" denotes the tested regimes cannot be statistically distinguished from each other relative to the data.

Vuong tests
distinguishing
regimes



More Work on the Supply Side - Industrial Organization

With Sergey Mityakov and Juliano Assuncao

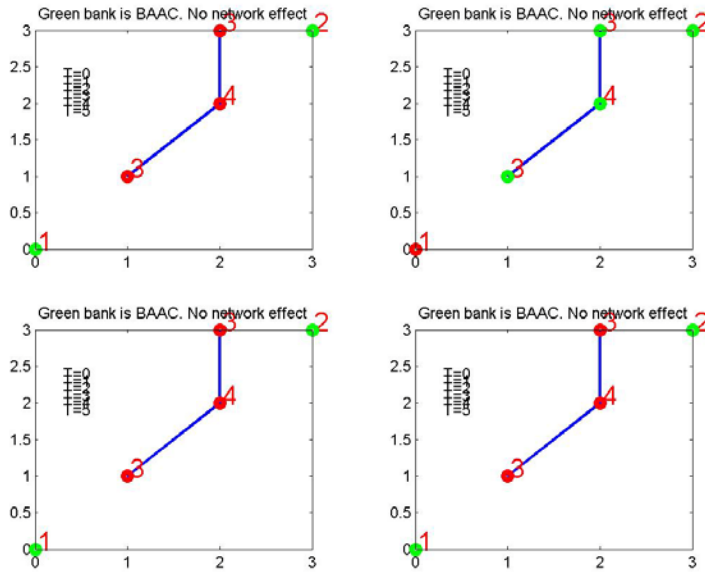
Other Related Efforts

- ❖ There are relatively few contributions of this kind, and practically none in developing countries.
- ❖ **Banerjee and Duflo**: cross-country growth dynamics and TFP pioneered by **Lucas** among others are hard to reconcile with an aggregated production function, that is, as if the neoclassical framework were assumed to cover the micro data.
- ❖ Build toward a new micro-founded model with a small number of alternative technologies and varying fixed costs.
- ❖ They view their contribution as a preliminary attempt but of interest precisely because there are few other studies and almost none which combine micro estimates with endogenous growth and inequality dynamics.
- ❖ Clearly progress can be made:
 - **Heckman, Cameron, and Taber** study wage dynamics and inequality in dynamic general equilibrium models estimated with US data
 - **Cagetti and DeNardi** study entrepreneurial wealth in inequality in the U.S. with structural g.e. models.
 - Some of the asset pricing literature is solidly in this tradition (**Hansen, Cochrane, Singleton, Lucas**).
 - Real business cycle literature
 - International Trade

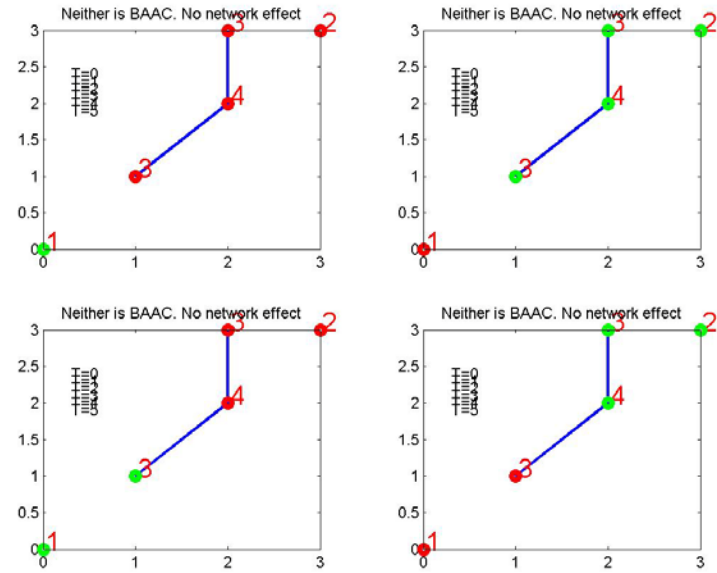
Applied General Equilibrium Development Economics

- ❖ The whole may be greater than the sum of the parts
- ❖ There is relatively little work in development that combines micro economics and macro economics
- ❖ Relatively little work that combines both theory and data
- ❖ Both the micro and macro data are put into a common framework for measurement
- ❖ Various theories can be rejected in the data (fathering further rounds of iterative research agenda)
- ❖ Modified and new theories which link growth, inequality, poverty, and financial deepening.
- ❖ Research to assess and quantify the heterogeneous impact of financial policy change at the level of households and firms while being consistent with the facts of growth, inequality, and poverty.

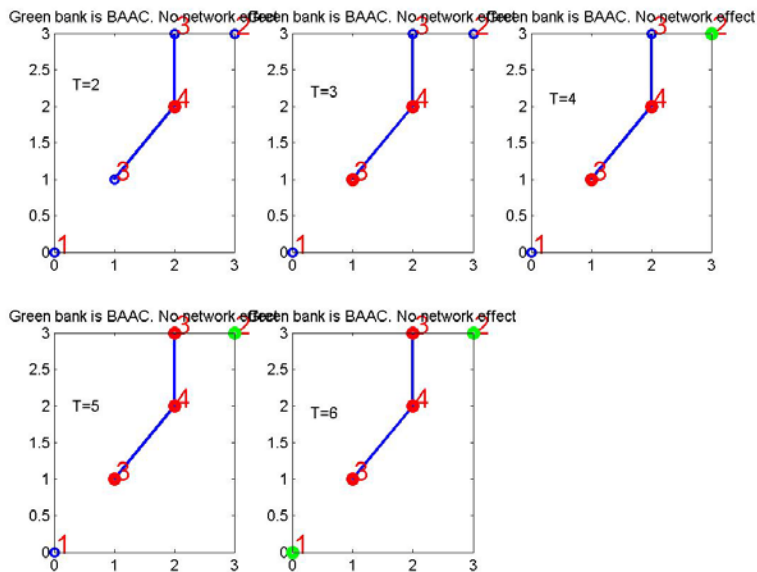
Green BAAC: All Regions



Both Commercial: All regions



Green Baac: One Region



With Sergey Mityakov and Juliano Assunção

