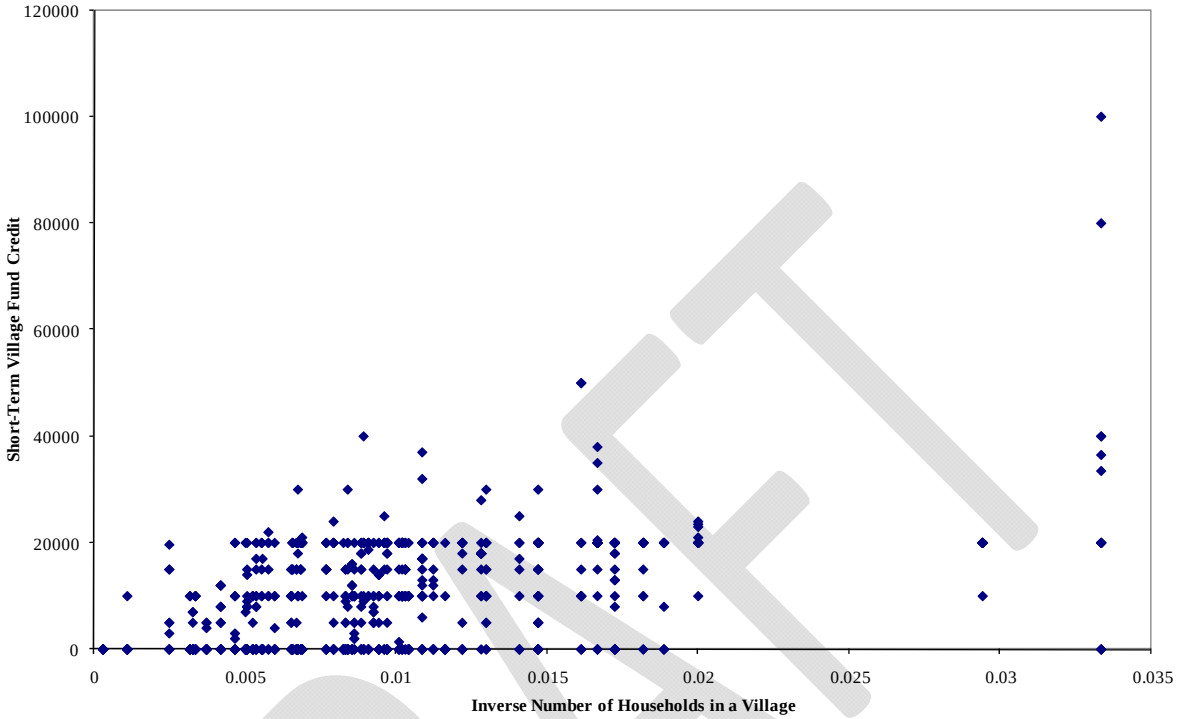
Chapter 8: Impacts – Experimental and Econometric Program Evaluations

If markets were incomplete, or were suffering from the effects of policy distortions, then exogenous variation in access to intermediation and government program innovations could have nontrivial impacts on both households and businesses. The key is to come up with policy variation that does not suffer from selection effects, that is, to find instruments for temporal variation, or cross sectional variation, that are related to access/use of a program and unrelated to the unobserved variables driving impact in other ways. The new 1 Million Baht Village Funds Program seems to have increased consumption, agricultural investment, and total borrowing above and beyond village fund credit, while also raising default rates and interest rates and lowering assets/savings. Running in reverse, a BAAC debt moratorium program has had a neutral if not negative impact. Arguably exogenous variation in villages funds by policy (emergency services, training, monitoring, pledged saving) and by type (rice bank, buffalo bank, production credit group, women groups) implies variation in impact (asset accumulation, risk sharing, occupation choice, and reliance on money lenders). Many of these impact variables are related to the key variables of the earlier models. Instrumented variation in access allows an assessment of financial institutions (commercial banks, BAAC, village funds, informal sector) and, in effect, provides a score card/rating system for the impact on clients' consumption and investment smoothing.

8.1 Million Baht Village Funds

Figure 1: Short-Term Village Fund Credit vs. Inverse Village Size in 2002



[Figure 8.1.1 Short-Term Village Fund Credit vs. Inverse Village Size in 2002. Note: each dot represents a household. Source: Created by Kaboski and Townsend (2007)]

In 2002, the government of Thailand transferred one million baht, or approximately $25,000, to every village in Thailand for the purpose of establishing a new village borrowing fund. Ironically, the number of households in a village varies considerably around the average of 173, from a minimum of 30 households per village to a maximum of 3194 households, so the potential availability of credit varied greatly. The higher the number of households in a village, the less credit there is available for each household. The diagram (See Figure 8.1.1) shows in fact that total short term village fund credit moved positively in the cross section of villages in the Townsend Thai data with the inverse of the number of households in a village.

Capital Markets	32.80%	29.80%	24.80%	24.30%	22.60%	37.50%	45.30%
Formal Borrowings	30.80%	34.50%	36.60%	36.70%	69.00%	74.20%	74.70%
Borrowing from BAAC	23.20%	25.70%	28.40%	27.20%	20.20%	20.70%	25.40%
Informal Borrowings	35.80%	41.50%	36.00%	32.80%	30.50%	25.60%	24.50%

Chachoengsao	1998	1999	2000	2001	2002	2003	2004
Capital Markets	28.00%	47.50%	36.90%	38.60%	27.80%	26.10%	29.60%
Formal Borrowings	25.50%	33.30%	37.80%	38.20%	62.20%	66.40%	68.30%
Borrowing from BAAC	20.90%	27.10%	30.70%	29.50%	18.70%	17.80%	26.70%
Informal Borrowings	19.70%	26.70%	32.80%	32.00%	24.10%	19.10%	22.50%

Buriram	1998	1999	2000	2001	2002	2003	2004
Capital Markets	36.40%	24.70%	12.90%	12.90%	19.60%	53.30%	60.80%
Formal Borrowings	39.70%	37.70%	44.60%	40.00%	79.20%	82.10%	82.90%
Borrowing from BAAC	36.40%	33.90%	40.40%	32.50%	26.70%	31.30%	37.10%
Informal Borrowings	39.30%	44.80%	40.00%	35.00%	37.90%	35.40%	35.40%

Lopburi	1998	1999	2000	2001	2002	2003	2004
Capital Markets	48.30%	25.00%	25.90%	27.20%	23.80%	20.40%	44.60%
Formal Borrowings	12.10%	24.60%	24.70%	33.50%	70.80%	75.00%	73.80%
Borrowing from BAAC	2.90%	10.40%	11.30%	17.20%	13.80%	12.90%	16.70%
Informal Borrowings	46.30%	51.30%	30.50%	31.40%	28.80%	22.90%	17.50%

Sisaket	1998	1999	2000	2001	2002	2003	2004
Capital Markets	18.40%	22.10%	23.30%	18.30%	19.20%	50.00%	46.30%
Formal Borrowings	46.00%	42.50%	39.20%	35.00%	63.80%	73.30%	73.80%
Borrowing from BAAC	32.60%	31.30%	31.30%	29.60%	21.70%	20.80%	21.30%
Informal Borrowings	38.10%	43.30%	40.60%	32.90%	31.30%	25.00%	22.50%

Yala	1998	1999	2000	2001	2002	2003	2004
Capital Markets						2.50%	
Formal Borrowings						9.20%	
Borrowing from BAAC						5.80%	
Informal Borrowings						5.80%	

Satun	1998	1999	2000	2001	2002	2003	2004
Capital Markets						5.80%	5.80%
Formal Borrowings						13.30%	20.80%
Borrowing from BAAC						9.20%	5.80%
Informal Borrowings						3.30%	1.70%

[Table 8.1.2. Source: Adapted from Townsend Thai Panel data with Puentes]

The order of magnitude of this "quasi experiment" becomes clear from the evident deviation in the time trend of the expansion of formal sector borrowing. See Table 8.1.2. Recall the earlier numbers, according to the SES, that formal sector access increased from 6% in 1976 to 26% in 1996. Including village funds with BAAC and commercial banks as part of the formal sector, the fraction of households in the Townsend Thai panel using formal sources for borrowing was 30.8% in 1998, and 36.7% in 2001. But this jumps to 69.0%, almost doubling with village fund innovation in 2002. We thus have the opportunity to see directly in the panel the impact of this intervention.

We use several specifications in thinking about the impact of village fund credit (*VFCR*) on dependent variables $y_{n,t}$, for household n at date t. In the first specification, current credit has a level effect on the outcome measure and the history of credit is not relevant:

$$y_{n,t} = \sum_{i=1}^{I} \alpha_i X_{i,n,t} + \beta VFCR_{n,t} + u_{n,t} \qquad (8.1.1)$$

The $X_{i,n,t}$ for $i = 1, 2 \ldots, I$ are a set of control variables for household n: number of adult males, number of adult females, number of children, a dummy for male head of household, age of household head, age of head squared, years of schooling of head, gross assets, gross assets squared, and income. The time-differenced version of the equation is

$$y_{n,t} - y_{n,t-1} = \sum_{i=1}^{I} \alpha_i \left(X_{i,n,t} - X_{i,n,t-1} \right) + \beta \left(VFCR_{n,t} - VFCR_{n,t-1} \right) + \left(u_{n,t} - u_{n,t-1} \right) \quad (8.1.2)$$

where below $\Delta VFCR_{n,t}$ is the time change in village fund credit in this equation.

For certain outcome variables we might expect a delayed effect. Village fund credit may have impacts on the future levels of assets and income both because of the transfer of resources over time, and the investments that it might facilitate. Other outcome measures where the delayed effects of credit are of particular interest are outcomes that measure borrowers' *ex post* ability to repay loans, amount of short-term credit in default, amount of total credit in default, fraction of short-term credit in default, amount of credit from informal sources, and average interest rates. Thus we use *lagged* village fund credit for these variables. That is,

$$y_{n,t} = \sum_{i=1}^{I} \alpha_i X_{i,n,t} + \beta VFCR_{n,t-1} + u_{n,t} \qquad (8.1.3)$$

Differencing this equation yields the analogous expression in changes:

$$y_{n,t} - y_{n,t-1} = \sum_{i=1}^{I} \alpha_i \left(X_{i,n,t} - X_{i,n,t-1} \right) + \beta \left(VFCR_{n,t-1} - VFCR_{n,t-2} \right) + \left(u_{n,t} - u_{n,t-1} \right) \quad (8.1.4)$$

where below $\Delta VFCR_{n,t-1}$ is the lagged time change in village fund credit in this equation.

Rather than use the level, *VFCR*, or the change, $\Delta VFCR$, directly in these impact equations, we use a measure that we can more safely attribute to the intervention. The key instrument: the inverse number of households in the village of household *n* interacted with dummy variables for the years of the intervention – 2002 and 2003 (unless the lagged specification removes 2003). A reduced form equation for village fund credit also allows that variable to reflect the characteristics of the household $X_{i,n,t}$, common time effects θ_t, common village effects θ_n for household n, and the (inverse) size of the village of household n directly without interaction (in addition to the instrument). Specifically, for contemporaneous effects,

$$VFCR_{n,t} = \sum_{i=1}^{I} \delta_i X_{i,n,t} + \theta_t + \theta_n + \lambda_1 invHH_{t,n} + \lambda_2 invHH_{t,n} * \chi_{t=2002} + \lambda_3 invHH_{t,n} * \chi_{t=2003} + e_{n,t} \quad (8.1.5)$$

for changes,

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

(8.1.6)

and for the lagged effects,

$$VFCR_{n,t-1} = \sum_{i=1}^{I} \delta_i X_{i,n,t} + \theta_t + \theta_n + \lambda_1 invHH_{t,n} + \lambda_2 invHH_{t,n} * \chi_{t=2002} + e_{n,t} \quad (8.1.7)$$

and lagged changes,

$$\Delta VFCR_{n,t-1} = \sum_{i=1}^{I} \delta_i \Delta X_{i,n,t} + \theta_t + \theta_n + \lambda_1 invHH_{t-1,n} + \lambda_2 invHH_{t-1,n} * \chi_{t=2002} + e_{n,t} \quad (8.1.8)$$

First Stage: Village Fund Credit on Instruments	Coeff.	Std. Err.	t-stat
Constant (1997 Dummy Excluded)	-5778**	2693	-2.07
Year=1998 Dummy	27	310	0.09
Year=1999 Dummy	42	318	0.13
Year=2000 Dummy	32	328	0.10
Year=2001 Dummy	-5	336	-0.01
Year=2002 Dummy	1978**	467	4.24
Year=2003 Dummy	3540**	474	7.46
Number of Adult Males in Household	82	137	0.60
Number of Adult Females in Household	516**	156	3.31
Number of Children (< 18 years) in Household	204	107	1.91
Male Head of Household	1499**	451	3.32
Head of Household's Primary Occupation is Farming	45	217	0.21
Age of Head	174	95	1.84
Age of Head Squared	-1.71**	0.84	-2.05
Years of Education – Head of Household	-0.99	70.27	-0.01
Wealth	-2.40e-5	4.45e-5	-0.54
Wealth Squared	3.31e-13	4.90e-13	0.67
Income	5.08e-4	4.99e-4	1.02
Inverse Village Size (invHH)	-84,371	46,394	-1.82
Interaction of Inverse Village Size and Year=2002 Dummy	759,701**	31,805	23.89
Interaction of Inverse Village Size and Year=2003 Dummy	577,203**	32,226	17.91
Number of Observations/Groups			5472/800
R^2 – within			0.5328
R^2 – between			0.1430
R^2 – overall			0.4731
Second Stage: Total New Credit on Predicted Village Fund Credit			
Constant (1997 Dummy Excluded)	20,453	21,115	0.97
Year=1998 Dummy	4267	2419	1.76
Year=1999 Dummy	2463	2480	0.99
Year=2000 Dummy	9140**	2542	3.60
Year=2001 Dummy	9338**	2624	3.56
Year=2002 Dummy	4008	3770	1.06
Year=2003 Dummy	1557	3764	0.41
Number of Adult Males in Household	2586**	1072	2.41
Number of Adult Females in Household	291	1218	0.24
Number of Children (< 18 years) in Household	288	835	0.35
Male Head of Household	7536**	3542	2.13
Head of Household's Primary Occupation is Farming	263	1694	0.16
Age of Head	-667	742	-0.90
Age of Head Squared	4.12	6.56	0.63
Years of Education – Head of Household	-54	548	-0.10
Wealth	1.32e-3**	3.47e-4	3.80
Wealth Squared	-1.43e-11**	3.82e-12	-3.74
Income	3.27e-2**	3.90e-3	8.38
Inverse Village Size (invHH)	-136,455	366,912	-0.37
Village Fund Credit (predicted)	1.61**	0.28	5.67
Number of Observations/Groups			5472/800
R^2 – within			0.0851
R^2 – between			0.1235
R^2 – overall			0.1025

** indicates significance at the five percent level.

[Table 8.1.3. Sample Regression – Two-stage fixed effect estimate of the impact of current level of village fund credit on level of total new short-term credit. Source: Created by Kaboski and Townsend]

Table 8.1.3 gives an example of one full regression result. The example shows both stages of the regression of the level of total new short-term credit from all sources relative to previous year levels on the predicted level of village fund credit relative.

In the first stage, we see that we are able to explain about half of the variation in village fund credit. Inverse village size does not in general play a large or significant role in village credit. However, in post-program years (2002-2003) the inverse of village size is a strong and significant predictor of the level of village fund credit. The coefficient of 760,000 on the 2002 instrument compares well with average amount of total credit that the village funds themselves reported offering in 2002, about 900,000 baht. The somewhat smaller coefficient of 577,000 baht in 2003 reflects some reduced lending in the second year of the program (village fund short-term credit fell from an average of 9600 baht/household in 2002 to 9100 baht in 2003).

Response Variable / Technique	New Short-Term Credit	Other Credit Sources			Stated Reasons for Borrowing				Credit Market Indicators	
		BAAC/Ag. Coop Credit	Commercial Bank Credit	Informal Credit†	Credit for Agricultural Investment	Credit for Business Investment	Credit for Fert., Pest., etc.	Credit for Consumption	Avg. Short-Term Credit Interest Rate†	Amount of Short-Term Credit in Default†
Baseline Regression	1.6056** (0.2832)	0.4488** (0.1779)	0.2506** (0.0454)	-0.0296 (0.2424)	0.0665 (0.0633)	-0.0192 (0.2072)	0.8748** (0.1596)	0.8095** (0.1194)	2.80e-6* (1.49e-6)	0.3735 (0.3827)
Regression without 1% Outliers	1.3798** (0.1767)	0.2446** (0.1184)	0.0480 (0.0322)	0.0846 (0.1798)	0.0753 (0.0542)	-0.0335 (0.1608)	0.5947** (0.1208)	0.6989** (0.0998)	2.48e-6** (1.30e-6)	0.7087** (0.2633)
Regression without 5% Outliers	1.0081** (0.1369)	0.1844* (0.0968)	-0.0494* (0.0288)	0.1102 (0.0866)	0.0821* (0.0430)	0.0685 (0.0962)	0.2722** (0.1037)	0.3471** (0.0809)	1.43e-6 (8.95e-7)	0.4935** (0.1580)
Regression with DVs for Positive Response Value and Village Fund Credit	0.3597** (0.1035)	0.0700 (0.0858)	-0.0013 (0.0164)	0.2394** (0.1046)	0.1079** (0.0525)	0.0036 (0.0489)	0.1384 (0.0943)	0.3324** (0.1021)	-0.1606 (0.1721)	0.1960** (0.0848)
Regression with DVs for Above Average Response Value and VF Credit	0.8114** (0.1090)	0.1340 (0.0878)	-0.0037 (0.0155)	0.2320** (0.0983)	0.0986** (0.0502)	0.0268 (0.0466)	0.1495 (0.0925)	0.4152** (0.0978)	0.1800 (0.2972)	0.2061** (0.0821)

** Significant at 5% level * Significant at 10% level

The independent variables are year dummies, household fixed effect dummies, male head of household dummy, number of adult males, number of adult females, number of kids, age of head and age of head squared, years of schooling of head, gross assets and gross assets squared, income, and inverse number of households in village. The treatment variable is the level of short-term village fund credit. The additional instruments in the first-stage are the inverse village size interacted with a dummy variable for year=2002 and year=2003. The fertilizer credit regressions also contain the area of cultivated land as an explanatory variable. Standard errors for the binomial regressions are not corrected for heteroskedasticity.

† Regressions are based on specification (3), where the treatment variable is the level of *lagged* village credit.

[Table 8.1.4. Impact of Village Fund Credit on Other Credit -- Levels Regressions. Source: Created by Kaboski and Townsend]

Response Variable / Technique	Total	Components of Consumption												
		Education	Grain	Dairy	Meat	Alcohol Home	Alcohol Out	Fuel	Tobacco	Ceremony	House Repair	Vehicle Repair	Clothes	Eating Out
Baseline Regression	2.1048** (.6159)	.0624 (.0594)	.0200 (.0829)	.0606** (.0290)	.0328 (.0313)	.0203 (.0296)	.0221 (.0199)	.0829 (.0718)	.0195 (.0176)	-.0415 (.0987)	.6115** (.2822)	.1465** (.0587)	.0143 (.0133)	-7.27e-4 (.0279)
Regression without 1% Outliers	1.1384** (.3662)	.0304 (.0404)	.0094 (.0277)	.0443** (.0204)	.0169 (.0203)	.0469** (.0198)	.0223** (.0107)	.0816** (.0370)	.0032 (.0106)	-.0505 (.0354)	.1360 (.0928)	.0300 (.0203)	.0143 (.0091)	-.0125 (.0185)
Regression without 5% Outliers	1.0320** (.2486)	.0094 (.0267)	.0069 (.0213)	.0370** (.0132)	.0050 (.0158)	.0267** (.0115)	.0064 (.0058)	.0704** (.0213)	-.0005 (.0061)	-.0269 (.0194)	-.0009 (.0376)	.0186 (.0125)	.0144* (.0075)	-.0009 (.0096)
Regression with DVs for Positive Response Value and Village Fund Credit	‡	-.0664 (.0781)	-.0035 (.0120)	.0821 (.1080)	.0071 (.0442)	.1445 (.0997)	.2160** (.0975)	.1404* (.0744)	-.1151 (.0837)	-.0437 (.0447)	.0633 (.1054)	.2270** (.0996)	-.0472 (.0854)	.0021 (.0958)
Regression with DVs for Above Average Response Value and VF Credit	.4744** (.1289)	-.1507 (.1202)	.0865 (.1228)	.0826 (.1161)	-.0584 (.1274)	.1637 (.1069)	.1931** (.0954)	.3356** (.1154)	-.0299 (.1130)	-.0025 (.1216)	.1163 (.0958)	.1937* (.1146)	.1595 (.1259)	-.0329 (.1244)

** Significant at 5% level * Significant at 10% level

The independent variables are year dummies, household fixed effect dummies, male head of household dummy, number of adult males, number of adult females, number of kids, age of head and age of head squared, years of schooling of head, gross assets and gross assets squared, income, and inverse number of households in village. The treatment variable is the change in short-term village fund credit. The additional instruments in the first-stage are the inverse village size interacted with a dummy variable for year=2002 and year=2003.

‡ Regression could not be run because all values were positive.

[Table 8.1.5. Impact of Village Fund Credit on Consumption Levels Regressions. Source: Created by Kaboski and Townsend]

Response Variable / Technique	Net Income			Wage Income Paid	Investment and Input Uses				Gross Farming Income		
	Farm Profits	Business Profits	Wage and Salary		Number of New Businesses	Business Investment	Agricultural Investment	Fert., Pest., etc. Expenditures	Gross Income from Rice Farming	Gross Income from Other Crops	Gross Income from Livestock
Baseline Regression	-3.94e-5 (0.0003)	3.91e-6 (6.33e-6)	4.91e-6** (1.60e-6)	-0.2451 (0.1594)	1.47e-6 (1.84e-6)	-0.0436 (0.3146)	-0.0763 (0.2150)	-0.2208* (0.1245)	-1.72e-6 (1.43e-6)	-1.95e-6* (1.09e-6)	5.48e-7 (9.28e-7)
Regression without 1% Outliers	-5.11e-6** (2.25e-6)	4.05e-7 (1.29e-6)	4.91e-6** (1.60e-6)	-0.1744 (0.1453)	††	-0.0288 (0.1375)	-0.0433 (0.1404)	-0.0454 (0.0656)	-1.53e-6 (1.39e-6)	-2.04e-6* (1.08e-6)	3.43e-7 (7.93e-7)
Regression without 5% Outliers	-3.23e-6* (1.92e-6)	1.64e-6* (8.72e-7)	4.09e-6** (1.52e-6)	††	††	-1.51e-4 (0.0673)	0.0723 (0.0790)	-0.1240** (0.0484)	-1.80e-6 (1.22e-6)	-5.50e-7 (1.04e-6)	-1.55e-7 (4.75e-7)
Regression with DVs for Positive Response Value and Village Fund Credit	-0.1180 (0.0912)	0.1482* (0.0864)	0.0737 (0.0966)	0.0635 (0.0395)	0.0544 (0.0563)	-0.0067 (0.0605)	0.2176** (0.0718)	-0.0782 (0.0673)	-0.0646 (0.0667)	-0.2009** (0.0819)	0.0418 (0.1004)
Regression with DVs for Above Average Response Value and VF Credit	-0.1404 (0.1280)	0.1441 (0.0900)	0.2383* (0.1264)	0.0881** (0.0377)	0.0518 (0.0540)	0.0206 (0.0570)	0.1658** (0.0656)	-0.1372 (0.1214)	-0.1487 (0.1166)	-0.0701 (0.1015)	0.0731 (0.0986)

** Significant at 5% level * Significant at 10% level

The independent variables are year dummies, household fixed effect dummies, male head of household dummy, number of adult males, number of adult females, number of kids, age of head and age of head squared, years of schooling of head, gross assets and gross assets squared, income, and inverse number of households in village. The treatment variable is the level of short-term village fund credit. The additional instruments in the first-stage are the inverse village size interacted with a dummy variable for year=2002 and year=2003. The fertilizer expenditure regressions also contain the area of cultivated land as an explanatory variable. Standard errors for the binomial regressions are not corrected for heteroskedasticity.

†† Outliers could not be eliminated because of large mass points (i.e., either >5% or >1%, respectively) at the boundaries of the empirical distribution.

[Table 8.1.6. Impact of Village Fund Credit on Outcome Measures – Levels Regressions. Source: Created by Kaboski and Townsend]

The tables 8.1.4 through 8.1.6 give examples of the results. There are five specifications each for levels and lag regressions: a normal regression, one with 1% outliers removed, 5% removed, a binary dummy variable for a positive value for the dependent variable (e.g., have formal credit) and a dummy for the village fund credit on the right hand side, and finally a dummy when the dependent variable is above the all-household average and a dummy for credit on the right hand side above the village average.

The tables of results can be summarized, although only levels are shown here in Tables 8.1.4 through 8.1.6: total credit and credit from other sources such as commercial banks seems to increase with village fund intervention. This point is important for it indicates that increases in village fund credit did not simply substitute for a decrease in other (potentially higher cost) sources. See Banerjee and Duflo (1994). Agricultural investment increased, though business investment and the number of new businesses; conversely, business income, while agricultural income did not. Even more so, labor market incomes increase and from the monthly Townsend Thai data it seems wage rates for unskilled labor in the villages increased. Consumption and expenditures more generally also increased, although some of these are automobile and other repairs consistent with investment. Household assets decreased as buffer stocks. Both the level and fractions of credit in default went up, as did some interest rates.

8.2 BAAC Debt Moratorium

DMP PARTICIPATION			
DMP-eligible	Yes	No	Total
Yes	136	193	329
No	0	591	591
Total	136	784	920

[Table 8.2.1 Tambunlertchai (2004)]

A related way to assess the impact of credit interventions is to take advantage of knowledge of participation rules, as in the thesis by Tambunlertchai (2004). In 2002 the government asked the BAAC to suspend payment of client loans due for 3 years. To be eligible to participate in this debt moratorium program (DMP), a farm household needed to have been a member of the BAAC in 2001 and have

outstanding loans not exceeding 100,000 baht. Potential and actual participation can be compared, as in table 8.2.1. Actual DMP participation is thus regressed onto DMP eligibility E and demographic control variables X_r to create an instrumented version of participation, as in

$$DMP_n = \sum_{i=1}^{I} \delta_i X_{i,n} + \delta E_n + \xi_n \,. \tag{8.2.1}$$

Eligibility is statistically significant. The impact equation is

$$y_n = \sum_{i=1}^{I} \alpha_i X_{i,n} + \beta DMP_n + \mu_n \tag{8.2.2}$$

The impact variables include consumption growth, asset growth, and savings growth.

	-1	-2	NE	CEN
DMP	-15,136.32	-17,043.04	54.944	-31,583.53
	[11,262.784]	[11,411.904]	[7,506.471]	[24,151.358]
No. Household members	-194.156	-170.508	585.618	157.401
	[1,322.979]	[1,327.139]	[980.709]	[2,479.249]
Age of head	439.942*	425.569*	246.981	317.384
	[240.712]	[240.317]	[182.046]	[435.044]
Female head	6,797.34	7,227.94	-3,437.79	15,659.59
	[5,155.663]	[5,154.517]	[3,798.927]	[9,572.604]
Amount of cultivated land (rai)	711.276***	697.182***	130.065	746.038***
	[80.612]	[81.665]	[95.326]	[115.670]
Children living away	-3,683.335***	-3,460.810***	-2,684.624***	-3,222.74
	[1,313.600]	[1,309.932]	[943.326]	[2,492.727]
Northeast	3,301.38	3,190.62	0	0
	[5,328.688]	[5,266.877]	[0.000]	[0.000]
(Change) Outstanding	-0.005			
	[0.030]			
(Change) Debt-income ratio	13,345.909***	11,906.517***	2,642.95	17,229.692***
	[2,183.160]	[2,006.672]	[1,740.647]	[3,348.777]
(Change) No. Businesses	2,557.18			
	[3,291.019]			
(Change) Net income	-0.006	-0.008	0.005	0.001
	[0.012]	[0.012]	[0.009]	[0.020]
BAAC savings	-0.378**	-0.382**		
	[0.170]	[0.173]		
Occupation: Shrimp farmer	392.636	-980.664		
	[31,477.334]	[31,220.011]		
Occupation: Rice farmer	1,377.87	2,690.10		
	[5,535.824]	[5,532.751]		
Occupation: Professional	-3,956.49	-13,142.31		
	[12,555.081]	[12,950.994]		
Amount outstanding		0.038***	-0.022*	0.063***
		[0.015]	[0.013]	[0.023]
No. Businesses		-3,353.51	-1,539.14	-3,484.60
		[2,477.348]	[1,872.011]	[4,495.189]
(Change) BAAC savings		0.066	0.583	-0.024
		[0.216]	[0.462]	[0.289]
Constant	-21,271.18	-20,846.64	2,082.76	-23,199.91
	[13,483.472]	[13,565.492]	[9,874.113]	[24,556.219]
Observations	768	768	399	369
R-squared	0.16	0.17	0.05	0.22

Standard errors in brackets.
* significant at 10%;
** significant at 5%;
*** significant at 1%

[Table 8.2.2. Agricultural Asset Accumulation. Source: Tambunlertchai (2004)]

Impact regressions analogous to Table 8.2.2 show that there were few benefits that were statistically significant. Indeed, agricultural investment may have actually declined as a result of the program (at 15%, the significance levels are marginal). This would be consistent with running the village fund program in reverse, so to speak, if somehow villagers felt there was an aspect of compulsion in the program. The key then is induction into the program and how this was determined.

8.3 Crises, Wealth Loss, and Commercial Banks

Given the multifaceted nature of an economic system, it is sometimes difficult to sort out the actual impact a financial institution has. Chue and Cook (2004) and others have argued that financial institutions in the Asia crisis were forced to disintermediate, i.e., reduce loans outstanding, or even close, if they had suffered exchange rate losses due to $ denominated international debt, both short and long-term. Otherwise they may have been in reasonable shape. The ratio of exchange losses relative to assets in 1997 is used as an instrument in probits and OLS regressions. Evidently, lending was reduced, though we do not have results specific to Thailand.

In more detail then, Chue and Cook study East Asian financial intermediaries, including Thailand. By and large these institutions had borrowed heavily in international markets before the 1997 currency crisis. Thailand was quite salient in this. During the crisis, financial institutions' stock market values declined sharply, many curtailed lending, and several closed. Specifically those with higher international debt, especially short term debt, suffered a more severe contraction in assets and liabilities.

The results are obtained using the following specification. Let r_j denote loss of equity as measured by the change in the domestic currency value of equity divided by the initial value of equity. This is positively related to a key variable, $\frac{FXLOSS_j}{CAP_j}$, foreign exchange losses relative to pre-crisis stock market capitalization.

$$r_j = \alpha + \beta \frac{FXLOSS_j}{CAP_j} + X_j\gamma + \varepsilon_j \qquad (8.3.1)$$

The "control" variables X_j in equation 8.3.1 include overall leverage, that is, the liability to asset ratios, so that we can distinguish the effects of international debt from other debt; financial value relative

to book value, that is, the value to asset ratio, in order to control for pre-crisis expectations; the share of assets that is loans, that is, the loan/asset ratio; and the share of assets that consists of securities to control for riskiness of assets. Another key set of equations is

$$BSE \quad GROWTH_j = \alpha + \beta \frac{FXLOSS_j}{BSE_j} + X_j\gamma + \varepsilon_j \qquad (8.3.2)$$

where $BSE \quad GROWTH$ is the growth in balance sheet line items such as on-lending, between 1996 and1998, and $\frac{FXLOSS_j}{BSE_j}$ is foreign exchange loss normalized by initial balance sheet level. Both equations, 8.3.1 and 8.3.2, are corrected for selection effects, that some institutions may not be in existence due to the same foreign exchange losses.

Vickery (2004) argues in a related context, and for Thailand separately, that credit reductions were less likely if the firm had been an exclusive customer of the bank for some time. (See Table 8.3.1) Of course a model of exclusive vs. multiple relations with supply side variation would be a logical next step.

Dependent variable is answer to the question: 'How has the availability of credit from doestic banks changed since the onset of the crisis?' Integer between 1 (much less restrictive) and 5 (much more restrictive). Estimation is by ordered probit. Robust standard errors. Coefficients represent the rate of change change in the expected value of the dependent variable following a small change in the RHS variable for each observation in the dataset.

	(1) baseline specification	(2) parsimonious	(3) Korea only	(4) Thailand only
Relationship variables				
log(1+relationship length)	-0.168	-0.148	-0.192	-0.170
	(0.055)***	(0.054)***	(0.079)**	(0.111)
log(1+no. of relationships)	0.182	0.214	0.147	0.268
	(0.069)***	(0.065)***	(0.089)*	(0.120)**
Controls				
log(1+firm age)	-0.181	-0.150	-0.252	-0.151
	(0.098)*	(0.091)*	(0.323)	(0.120)
log(total assets)	0.031		0.040	0.007
	(0.024)		(0.036)	(0.030)
log(total employment)		0.005		
		(0.031)		
profit / assets	11.396		-29.057	20.927
	(14.245)		(31.584)	(14.140)
liabilities / assets	19.199		19.882	16.467
	(8.311)**		(11.695)	(11.052)
industry*country dummies: F-test	0.0132**	0.0014***	0.0034***	0.701
Pseudo R2	0.0327	0.028	0.0193	0.0226
Number of observations	1057	1140	685	372

***, ** and * represents two-sided statistical significance at 1%, 5% and 10% levels respectively.

[Table 8.3.1. Change in availability of bank credit during the crisis. Source: Vickery (2004)]

8.4 Village Funds

To determine the effect of financial intermediation, one would like to turn such intermediation off and on exogenously and track the impact on households and businesses. Something like this is made possible with the variation in village fund policies that were evident in the 1997 retrospective institutional Townsend Thai survey. Note that this is prior to the crisis and prior to the 1 Million Baht Fund and other government policies. As noted in the Table 5.2.1.1.4 on Chapter 5, village funds varied considerably in saving, lending, application, training, and monitoring policies. Different government ministries promoted funds with different policies. Some of these policies are positively correlated with intermediation: increased numbers of members, savings, and lending. However, others are negatively correlated. That

shrinking or failing institutions continue to appear in the data is the odd part of the story of their promotion from various ministries that do not have monitoring/evaluation systems in place.

Outcome variable Presence of institution with policy	Number of observations	Asset growth	Reducing consumption or input use in bad year	Starting a business	Changing jobs	Becoming money-lender customer
Baseline	2858	0.0296 (0.0521)	0.0914 (0.0227)	0.0161 (0.0153)	0.0050 (0.0186)	−0.0821 (0.0151)
Offer lending services	716	−0.1332 (0.1186)	−0.0041 (0.0550)	−0.0477 (0.0367)	0.0145 (0.0457)	0.0333 (0.0305)
Savings used to evaluate loan applicants	731	−0.0979 (0.0960)	−0.1792 (0.0468)	−0.0209 (0.0322)	−0.0351 (0.0359)	−0.0381 (0.0283)
Offer emergency services	672	−0.0604 (0.1690)	−0.2005 (0.0826)	−0.0996 (0.0447)	−0.0693 (0.0623)	0.0118 (0.0451)
Provide training or advice	674	0.2605 (0.1125)	−0.0993 (0.0555)	−0.0175 (0.0327)	−0.0094 (0.0459)	−0.0087 (0.0319)
Offer saving services	731	0.2546 (0.0996)	−0.1344 (0.0464)	0.0068 (0.0273)	−0.0063 (0.0371)	−0.0268 (0.0289)
Offer pledged savings accounts	688	0.3183 (0.1274)	−0.1155 (0.0672)	0.0670 (0.0427)	0.1305 (0.0539)	−0.0671 (0.0339)
Offer traditional savings accounts	731	−0.1433 (0.2533)	−0.2946 (0.1149)	−0.1058 (0.0890)	−0.2644 (0.1009)	0.0663 (0.0749)
Savings is optional to members	716	−0.0735 (0.1079)	−0.1201 (0.0515)	−0.0450 (0.0316)	−0.0373 (0.0412)	−0.0291 (0.0284)
Savings requires minimum deposit	688	0.1057 (0.1015)	−0.1496 (0.0499)	−0.0286 (0.0307)	−0.0424 (0.0389)	0.0162 (0.0296)

Impact variable Presence of institution with policy	Number of observations	Asset growth	Reducing consumption or input use in bad year	Starting a business	Changing jobs	Becoming moneylender customer
Baseline	2858	0.0296 (0.0521)	0.0194 (0.0227)	0.0161 (0.0153)	0.0050 (0.0186)	−0.0821 (0.0151)
Collateral required	552	0.1230 (0.1728)	0.0776 (0.0744)	−0.0182 (0.0496)	−0.0266 (0.0690)	−0.0348 (0.0487)
Guarantor required	582	0.0318 (0.1176)	0.0268 (0.0533)	0.0044 (0.0352)	0.0464 (0.0458)	−0.0054 (0.0367)
Frequent payments	537	−0.0279 (0.1909)	0.0233 (0.0834)	−0.0237 (0.0629)	0.0105 (0.0738)	0.0150 (0.0548)
Frequent monitoring	375	0.2253 (0.1850)	0.0018 (0.0758)	−0.0071 (0.0510)	−0.0149 (0.0613)	−0.0077 (0.0563)
Everyone monitored	360	−0.1971 (0.1643)	−0.1256 (0.0762)	−0.0024 (0.0465)	0.0103 (0.0570)	−0.0215 (0.0400)

Light shading indicates significance at 5% level.
Dark shading indicates significance at the 10% level.
Notes:
Impact estimates are the OLS estimate of the coefficient on the dummy variable for all institutions in the village in 1990 having/not having the relevant policy. "Outcome variables" are the dependent variables. The other independent variables are the list of controls variables contained in the notes to Table 8.

[Table 8.4.1. Impact estimates by policies of institution, growth/failure related policies (top) and traditional microfinance policies (bottom). Source: Kaboski and Townsend (2005)]

In Kaboski and Townsend (2005), we run a regression

$$y_n = \sum_{i=1}^{I} \alpha_i X_{i,n} + \sum_{j=1}^{J} \tau_j Z_{j,n} + \beta M_n + u_{y,n} \qquad (8.4.1)$$

where the binary instrument M_n for intermediation is whether or not a household n resides in a village where there is a fund with a given policy. The X_i and Z_j are additional household and village controls for $i = 1, 2, ..., I$ and $j = 1, 2, ..., J$ (see more below). This parameter β captures ideally the average treatment effect of a fund with specified policy not only directly on members in the village but also indirectly on nonmembers in the village. The latter seems a plausible indirect effect of intermediation, though this is not modeled.

As anticipated, some of the policies which are proxies for helpful intermediation (as in Table 5.2.1.1.4) also seem to have a direct positive impact on households as in Table 8.4.1. Offering pledged saving accounts facilitates the changing of occupations, reduces reliance on moneylenders (apparently reduces constraints), and makes it less likely a household would have to reduce consumption and material inputs in a low income year. The latter is the most common effect for other policies: savings used in the evaluation of loan customers, provides training to members, offers pledged and minimum balance savings. (Flexible savings accounts are also helpful in this instance, in the provision of insurance, despite the wrong sign on intermediation.) Monitoring loan customers also facilitates insurance, a policy emphasized in the microfinance literature but not correlated with success or failure in the bottom half of Table 8.4.1.

More generally an evaluation requires both statistical controls and some variable which is an instrument for access, that is, a variable which is correlated with membership and uncorrelated with the error terms in the impact equation. Again let y_n be the outcome variable and M_n the membership variable for household n:

$$y_n = \sum_{i=1}^{I} \alpha_i X_{i,n} + \sum_{j=1}^{J} \tau_j Z_{j,n} + \beta M_n + u_{y,n} \qquad (8.4.2)$$

$$M_n = \sum_{i=1}^{I} \gamma_i X_{i,n} + \sum_{j=1}^{J} \phi_j Z_{j,n} + \delta I_n + u_{m,n} \qquad (8.4.3)$$

Membership, M_n, affects outcomes y_n additively in 8.4.2 and the presence of the institution in the village, I_n, affects membership additively in 8.4.3. The $X_{i,n}$ are sets of household specific variables and $Z_{j,n}$ are sets of village-specific variables for household n.

We assume that $u_{y,n}$ and $u_{m,n}$ are independent of $X_{i,n}$ for all i. We are interested in the parameter β in equation 8.4.2. as our measure of membership impact, and since membership M_n may be potentially endogenous and correlated with $u_{y,n}$, the presence of an institution is the key instrument for membership in the membership equation 8.4.3. Although institutions may also be present in a biased set of villages, we assume that our observable village characteristics $Z_{j,n}$ control for this village selection bias. That is, given the village-level observables, we assume I_n is uncorrelated with $u_{y,n}$ and is therefore a valid instrument for two-stage least squares estimation.

One problem with two-stage least squares estimation is that it assumes linearity of relationships that are clearly nonlinear. For example, the membership variable M_n is binary, but first stage estimation will give us intermediate values and memberships are not necessarily probabilities. Asset growth and some other outcome variables are not binary as well. Given this, we use a second model specification that allows us to account for these nonlinearities, though it requires us to assume a (normal) distribution for the errors terms.

Let the binary variables $D_{y,n}$ and $D_{m,n}$ be determined by continuous latent indices y_n^* and M_n^*, respectively:

$$D_{y,n}\begin{cases}0, \text{ for } y_n^* \le 0\\ 1, \text{ for } y_n^* > 0\end{cases} \qquad (8.4.4)$$

and

$$D_{m,n}\begin{cases}0, \text{ for } M_n^* \le 0\\ 1, \text{ for } M_n^* > 0\end{cases} \qquad (8.4.5)$$

We assume linear empirical relationships for these two latent unobserved indices and avoid imposing linear relationships for the binary outcome variable and membership variable themselves:

$$y_n^* = \sum_{i=1}^{I} \alpha_i X_{i,n} + \sum_{j=1}^{J} \tau_j Z_{j,n} + \beta M_n + u_{y,n} \qquad (8.4.6)$$

$$M_n^* = \sum_{i=1}^{I} \gamma_i X_{i,n} + \sum_{j=1}^{J} \phi_j Z_{j,n} + \delta I_n + u_{m,n}. \qquad (8.4.7)$$

Again both $u_{y,n}$ and $u_{m,n}$ are assumed independent of the $X_{i,n}$ and $Z_{j,n}$. But, we allow the dependence of membership M_n and $u_{y,n}$ through (an estimated) correlation between $u_{y,n}$ and $u_{m,n}$. That is, we assume a joint normal distribution of $u_{y,n}$ and $u_{m,n}$ with a correlation of ρ:

$$\left(u_{m,n}, u_{y,n}\right) \sim \text{Bivariate Standard Normal } \left(0,0;\rho\right). \quad (8.4.8)$$

The normalization of variances to unity is possible since y_n^* and M_n^* are unobserved indices, with zero being the only critical value. Equations 8.4.4 through 8.4.7 can be estimated as a system of simultaneous equations with the village variable I_n playing the role of an exclusion restriction (instead of as an instrument in the two-stage least squares).

	No. of obs.	Mean or fraction	Stand. dev.
CDD village controls‡			
Municipal location*	174	0.017	0.131
Typical travel time to district office (in minutes)	172	38.67	22.82
Typical travel time to market (in minutes)	171	40.56	27.42
Number of households	176	121.7	146.7
Economic status of village relative to other villages in subdistrict (1,2,3)**	178	2.06	0.52
Development level of village relative to other villages in the district (1,2,3)**	177	2.08	0.518
Fraction of households with piped water supply*	176	0.049	0.179
Fraction of households with State-supplied electricity*	178	0.076	0.300
Fraction of households with members working in agriculture only	178	0.333	0.360
Fraction of households with members working in multiple occupations	178	0.504	0.367
Fraction of households engaged in cottage industries	178	0.001	0.012
Fraction of rice-farming households using government-promoted varieties	178	0.497	0.398
Households migrate of the village for labor*	175	0.943	0.233
Fraction of households with members working outside the subdistrict	173	0.290	0.237
Fraction of households that are members of an agricultural bank/cooperative	178	0.807	0.394
Use of a commercial Bank	178	0.236	0.423
Use of the agricultural Bank (BAAC)	178	0.865	0.343
Level of government aid relative to other villages in district (1,2,3)**	177	2.10	0.49
Village has assembly hall*	178	0.390	0.488
CDD data institutional presence			
Village has rice bank*	177	0.232	0.422
Village has buffalo bank*	178	0.146	0.353
Village has PCG*	178	0.112	0.316
GIS-predicted institutional presence			
Probability of village having rice bank	192	0.210	0.354
Probability of village having buffalo bank	192	0.134	0.299
Probability of village having PCG	192	0.125	0.281

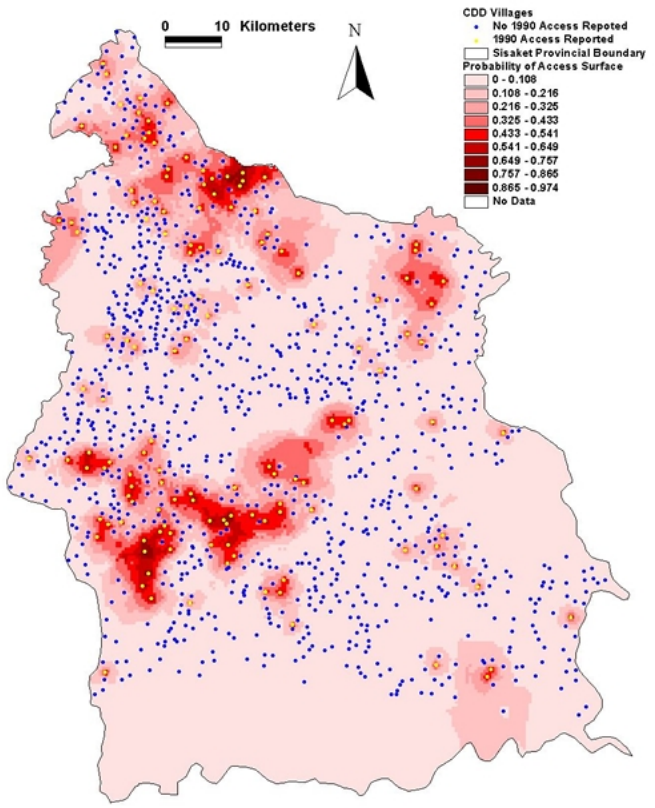
Notes: * Binary variable.
** Qualitative variable with 1 = above average, 2 = average, and 3 = below average.
‡ From over 650 variables, these 19 village control variables were examined (see Section 4).
All variables are for the year 1990.

[Table 8.4.2. Summary statistics of relevant Community Development Department village-level data. Source: Kaboski and Townsend (2005)]

The instruments are more likely to be uncorrelated with the error term in the impact equation with the inclusion of village level characteristics $Z_{j,n}$. Here we utilize subsets of the many possible relevant variables in the CDD data base: travel time to market, number of households, economic status of the village, etc. See table 8.4.2 for a more comprehensive list.

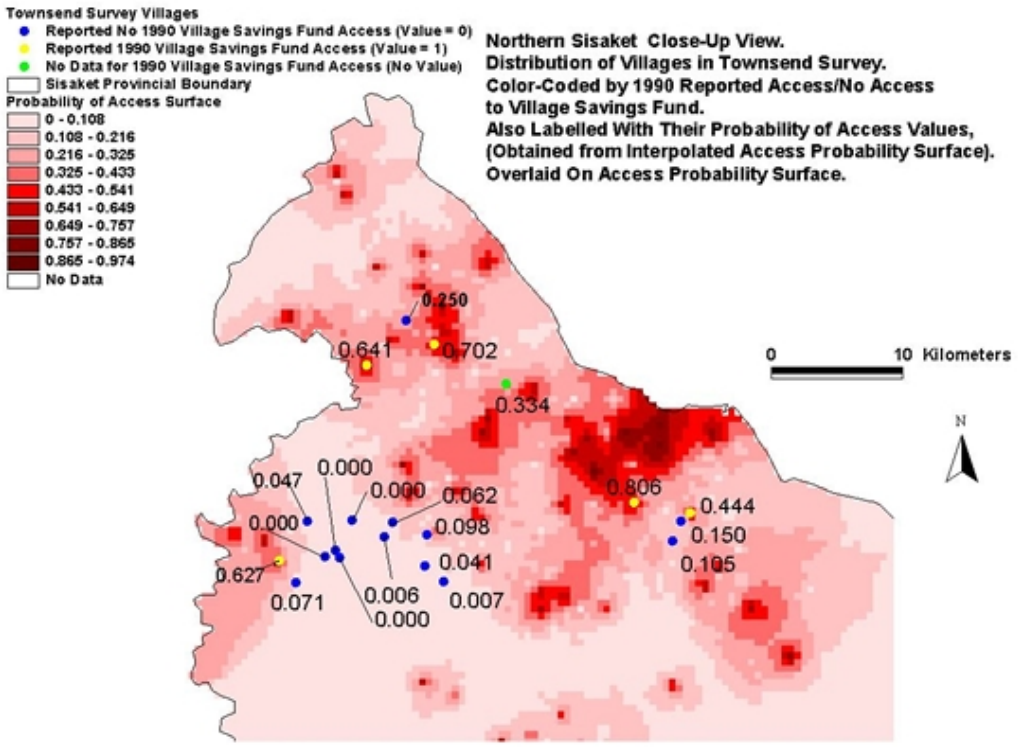
Various candidates are available for instruments. Among these is whether the institution of a specified type was operating in the village in 1992, according to the Key Informant interviews with headman. (The dependent variables are changes or events between 1992-1997). Another is the local or neighborhood average of the prevalence of that type of institution according to CDD data. Figure 8.4.3 displays a measure of local intensity which comes from averaging availability of that type of institution over all villages in a 10 km radius of every pixel, with weights that decline linearly with distance from the pixel. That 'propensity' score is assigned to villages in the Townsend Thai household data. Note in Figure 8.4.3 the potential difference between the point responses and the GIS assignment. Plausibly, the GIS measure picks up the activities of particular government officers or other exogenous supply side variables. A third candidate for an instrument takes the opposite tack: the 'surprise' variable which indicates that a village has a particular type of institution though others nearby do not, or vice versa. This specification allows the GIS average to be included in village controls $Z_{j,n}$ so that in effect, only the surprise is the excluded or instrumental variable.

Figure 1



1990 CDD Villages, Color-Coded by Those Reporting Access to Village Savings Funds Overlaid on Top of Interpolated Probability Surface

Figure 2



[Figure 8.4.3. Maps of surveyed villages in 1990. (a) Community Development Department Villages in 1990 and (b) Townsend Thai Survey Villages 1990. GIS/Instruments. Source: Kaboski and Townsend (2005)]

Outcome variable Membership by institution type	Number of members	Asset growth	Reducing consumption or input use in bad year	Starting a business	Changing jobs	Becoming moneylender customer
Any village institution 2SLS	367	0.2175 (0.3998)	0.1693 (0.1993)	0.1238 (0.1187)	0.0408 (0.1529)	−0.6338 (0.1335)
Any village institution Simultaneous MLE	367	1.7037 (0.0678)	0.7098 (0.3493)	−0.0302 (0.3725)	0.0183 (0.4216)	−1.3903 (0.1161)
Rice bank 2SLS	107	−0.3157 (0.3398)	0.2815 (0.1516)	0.1112 (0.1020)	0.0608 (0.1233)	−0.0517 (0.1192)
Rice bank Simultaneous MLE	107	−0.7212 (0.2051)	0.7917 (0.3117)	0.3430 (0.4231)	0.5320 (0.6036)	1.3191 (0.6506)
Buffalo bank 2SLS	13	−1.3584 (1.8823)	2.2932 (1.3029)	0.3474 (0.6836)	1.0805 (0.8022)	1.4900 (1.1835)
Buffalo bank Simultaneous MLE	13	−2.0419 (0.4190)	1.4777 (0.4332)	1.8044‡ (0.5217)	−1.0918‡ (0.2281)	−1.1848‡ (0.2194)
PCG 2SLS	68	0.7178 (0.6119)	0.0058 (0.3099)	0.0236 (0.1866)	−0.2944 (0.2140)	−0.0903 (0.1607)
PCG Simultaneous MLE	68	1.7798 (0.1183)	0.1671 (0.5641)	0.4082 (0.6244)	−0.4873 (0.8814)	−0.6680 (0.5120)
Women's group 2SLS	54	4.9670 (6.0915)	−18.1780 (59.5241)	1.5768 (2.4794)	1.4076 (4.2478)	−4.2552 (3.0400)
Women's group Simultaneous MLE	54	1.8805 (0.1132)	2.0672‡ (0.1057)	−0.0142 (1.2957)	2.1976 (0.7468)	−1.5887 (0.1285)

Notes: Shading indicates significance at 5% level. ‡ Estimate is significant, but MLE yielded an insignificant error correlation that approached perfect positive or negative correlation. The impact estimate is the coefficient on the membership variable in 1990. "Outcome variables" are the dependent variables in the outcome equation. Impacts are measured from 1991 to 1997. Other independent variables used as controls are head of household characteristics (age; age squared; years of education, sex); household characteristics (numbers of adult males, adult females, and children; total assets, total assets squared; membership/customer of commercial bank, agricultural bank, money lender) and village characteristics (average wealth; average wealth squared; average years education of household heads; fraction of households in rice farming as primary occupation, in multiple occupations, and in agriculture only; presence of a hall for village assembly; economic status relative to other villages in the *tambon*/subdistrict; and the relative level of government assistance that the village receives). In addition, the "asset growth" and reducing consumption" equations contain occupation dummies for the household head. The "becoming moneylender customer" excludes customer of moneylender as a right-hand side regressor. The wealth controls for "starting a business" use non-business wealth. The membership equation contains all of the control variables in the outcome equation as well as a dummy variable for the presence of the institution in the village in 1990 from the Townsend data.

[Table 8.4.4. Membership estimates using Townsend Thai key informant data, by type of institution. Source: Kaboski and Townsend (2005)]

Table 8.4.3 is an illustration of the results. Village institution (not distinguishing type) tends to encourage asset growth and lessen reliance on money lenders. By type, production credit groups, and especially women groups, are helpful. Rice banks and buffalo banks do not seem helpful, they actually seem to have perverse effects – again these are promoted by various ministries.

8.5 Evaluation with Panel

Similarly, one can make use of panel data to estimate the impact of commercial banks, BAAC, village funds, agricultural cooperatives, informal credit, and informal savings (rice in storage). The relevant equations are modified version of the safety net specification given earlier; here with idiosyncratic income change interacted with an instrumented version of membership.

$$\Delta c^{j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta \bar{A}^{j}_{t,t+1} + \eta \Delta hs^{j}_{t,t+1} + \xi \Delta Y^{j}_{t,t+1} + \psi Z_{ji96} + \gamma X_{j96} + \mu \Delta Y^{j}_{t,t+1} * Z_{ji96} + \nu \Delta Y^{j}_{t,t+1} * X_{j96} + \rho \Delta Y^{j}_{t,t+1} * M_{j96} + u^{j}_{t,t+1} \quad (8.5.1)$$

$$\Delta I^{*j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta \bar{A}^{j}_{t,t+1} + \eta \Delta hs^{j}_{t,t+1} + \xi \Delta Y^{j}_{t,t+1} + \psi Z_{ji96} + \gamma X_{j96} + \mu \Delta Y^{j}_{t,t+1} * Z_{ji96} + \nu \Delta Y^{j}_{t,t+1} * X_{j96} + \rho \Delta Y^{j}_{t,t+1} * M_{j96} + e^{j}_{t,t+1} \quad (8.5.2)$$

The membership equation in this notation is:

$$M_{j96} = \psi X_{j96} + \theta Z_{ji96} + \delta I_{j96} + \varsigma_{mj} \quad (8.5.3)$$

Geographic surprise:

$$Mj_{j} = \psi X_{j(96)} + \theta Z_{ji(96)} + \delta I^{*}_{j(96)} + \gamma \xi_{j} + \varsigma_{mj} \quad (8.5.4)$$

	HEAD*	P-value	TIME	P-value	GIS	P-value	Surprise	P-value
BAAC								
- Borrowing	.0869	(.0050)	.0675	(.0307)	.2115	(.0000)	.1363	(.0000)
- Savings	.0667	(.0313)	.0602	(.0540)	.2140	(.0000)	.1589	(.0000)
Commercial Banks								
- Borrowing	-.0209	(.4995)	-.0795	(.0108)	.0977	(.0016)	.0808	(.0090)
- Savings	.0558	(.0714)	-.0988	(.0015)	.0889	(.0041)	.0479	(.1222)
Agric. Cooperatives								
- Borrowing	.1062	(.0006)	.0045	(.8847)	.1818	(.000)	-.0518	(.0945)
- Savings	.1527	(.0000)	-.0013	(.9678)	.1897	(.000)	-.0379	(.2212)
PCG								
- Borrowing	.2186	(.0000)	-.0961	(.0020)	.1312	(.0000)	.0885	(.0042)
- Savings	.1943	(.0000)	-.0930	(.0028)	.1668	(.0000)	.0875	(.0047)
Informal sector								
- Borrowing	NA	-	.0174	(.5770)	.0098	(.7522)	.0988	(.0014)
- Savings (Rice)	NA	-	.1228	(.0001)	.0696	(.0244)	.0605	(.0506)

Notes: Surprise represents the Geographical Surprise instrument, GIS is the Geographical Information System instrument, TIME measures the travel time from the village to the district center and HEAD is the response of the Headman to questions about institutional presence. Frequent use is a dummy variable indicating whether the household had a particular type of transaction in 3 out of the 4 years n the panel.

[Table 8.5.1. Correlation of 1996 Instruments with Subsequent Frequency of Use. Source: Alem and Townsend (2006)]

Instruments	*BAAC*	*CBANK*	*AGCOOP*	*PCG*	*INFBOR*	*INFSAV*
OVERALL						
- Headman	.139***	.080	.158***	.173***	-	-
- GIS	.432***	.184**	.285***	.219***	-.222***	.020
- Time	.004***	.000	-.002*	-.002**	-.003*	.000
- Surprise	.245***	.095***	.179***	.363***	-.125***	.015
CENTRAL						
- Headman	.265***	-.006	.156***	.209***	-	-
- GIS	.379***	.094	.222***	.382**	-.277***	-.058**
- Time	.008***	.003	-.002	.000	-.008***	-.001
- Surprise	.300***	.163**	.102	.323***	-.184***	-.013
NE						
- Headman	.025	dropped	.110**	.193***	-	-
- GIS	.861***	.523***	.263***	.121	-.087	.187***
- Time	.006**	.003	-.007***	-.002	-.003	.002*
- Surprise	.202*	.086	.165***	.444***	-.175**	.110***

Notes: *** indicates 1% significant level, ** 5% and * 10%, respectively. SURPRISE represents the Geographical Surprise instrument, GIS is the Geographical Information System instrument, TIME measures the travel time from the village to the district center and HEADMAN is the response of the Headman to questions about institutional presence. BAAC is the Bank of Agriculture and Agricultural Cooperatives, CBANK is commercial banks, AGCOOP is Agricultural Cooperatives, PCG is village funds, INFBOR is informal borrowing and INFSAV is rice storage.

[Table 8.5.2. Coefficients of Instruments in the Membership Equation. Source: Alem and Townsend (2006)]

The instruments dated 1996 are time to the district center, the GIS average, the GIS surprise, and the headman response. These can be shown to have desirable properties. Many are significant in the membership equation (Table 8.5.2) and are correlated with measured, subsequent use of the institution in the panel, that is, there are changes in borrowing and/or saving in that institution or mechanism, 1997-2001 (Table 8.5.1). If neither criterion is satisfied, the instrument is dropped.

Change in Consumption on to (Level) Change in Income. Incremental Effect of PCG

		Region		Period		Central		NE	
	Overall	Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naive	-0.119	-0.206	-0.828***	0.117	-0.287	-0.335	0.008	-0.671	-0.867**
GIS Select	7.20***	-1.28	-	6.00**	13.0***	-2.72	-1.65	-	-
Headman	-2.79***	-1.60**	-4.81***	-3.42***	-2.12***	-2.83**	-0.052	-4.69***	-2.99*
Time to Center	-1.65	-	-	-4.86*	-7.81***	-	-	-	-
Surprise	-2.50***	-1.19	-2.00	-2.98***	-3.86***	-0.976	-0.234	-2.35	-2.28

Note: The table reports the coefficient of income change interacted with instrumented membership in equation (7). ***indicates 1% significant level, **5%, and * 10% respectively.

Investment Change on to Income Change (Scaled). Incremental Effect of the PCG

		Region		Period		Central		NE	
	Overall	Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naive	1.55***	0.773***	1.36*	-0.595***	1.51***	-0.129	0.759***	-0.098	1.36
GIS Select	-16.6***	-12.4***	-	-2.26*	-10.0***	-2.99	-9.43***	-	-
Headman	6.33***	2.00***	8.45**	-3.02***	5.55***	-1.34*	3.11***	-0.794	9.77*
Time to Center	12.5***	-	-	-1.90	9.50*	-	-	-	-
Surprise	1.54**	1.87***	5.00*	-2.51***	2.37***	-2.38**	1.82**	-0.498	5.22

Note: The table reports the coefficient of income change interacted with instrumented membership in equation (8). ***indicates 1% significant level, **5%, and * 10% respectively.

[Table 8.5.3. Source: Alem and Townsend (2006)]

Table 8.5.3. summarizes the tendency of PCG's (production credit group) and the informal sector to ameliorate income shocks, a negative coefficient with other things being equal, and Table 8.5.4 is a scorecard, rating various financial institutions.

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

[Table 8.5.4. Rating financial institutions. Source: Alem, unpublished]

8.6 A Structural Model of Credit Constraints and Impact of Village Funds

To reiterate, the Thai economy is not neoclassical and the ability to achieve benchmark standards is facilitated by the availability of financial institutions. But policy interventions do not completely overcome underlying obstacles. A structural model with credit constraints, with Joe Kaboski (2007), provides some interpretation of observed impact, and some caveats for the reduced form analysis of this chapter.

Our interpretation of the impact of the 1 Million Baht Program is that investment projects come in potentially large indivisible sizes, that with the introduction of the program some households borrow more to finance them, and that many reduce consumption. But for others not near a threshold, increased liquidity (a weakened borrowing constraint) means increased consumption and potentially lower savings (credit lowers the need for a buffer stock). Following Gourinchas and Parker (2002), imagine a Zeldes (1989)-like model but with investment, that is, permanent income has a component which is increased with investment but is subject to drift and a stochastic term, that the permitted size of investment is

random, that the upper bound on borrowing is related to permanent income, that there are as well transitory shocks to current income, and that liquid resources today is the sum of current income and past savings (if any). We conjecture that the effect of the village fund program can be captured by a surprise increase in the credit limit. That is, we use pre-intervention data to estimate the parameters of this structural model, then compare predictions to what actually happened. Consumption expenditures increase in the model, similar to the data, and more than the increase in per capita credit. This is evidence of credit constraints. Investment also increases though this effect is less salient and is sensitive to sample size and outliers.

We do presume, however, that investment size and the other shocks are unobserved to the econometrician. There is heterogeneity in impact, that is, non-linearities and non-monotonicities, unlike the presumed linear homogenous econometric treatment effect models with instruments which focus on an impact parameter. Of course the structural model does allow the analyst to understand this diversity and trace out the underlying distribution of gains.

8.7 Measuring the Impact of Financial Intermediation: Linking Theory to Econometric Policy Evaluation

Likewise, potential instruments, such as distance to commercial bank branches, or even randomized trials, which give some people access, do not necessarily have the presumed econometric properties in the context of modified structural models with unobserved heterogeneity. For example, in joint work with Sergio Urzua, we show that the models of occupation choice with an intermediated and non-intermediated sector, as detailed earlier, may have this property. Easier access may cause some but not all households to go out of business, as the not-so-talented but wealthy households find they have higher returns in the bank. Exogenous variation in treatment, or binary near-far categories, allow instrumented impact equations to give the local average treatment effect on income, the incremental income gain coming solely from those newly participating in the program. See Heckman and Vytlacil (2001), Imbens and Angrist (1994); Heckman, Urzua and Vytlacil (2006); Rubin (1974). But without further instruments for the other margins of choice, we cannot get also get the income gain solely from occupation switches induced by the program. The homogeneous treatment effect models either assume this kind of selection is negligible or that there are sufficient household and village observables to control for this selection. With this in mind we turn next to structural models with obstacles to trade and conduct policy experiments in that context.