An Evaluation of Safety Nets and Financial Institutions in Crisis and Growth*

Mauro Alem and Robert M. Townsend*

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Abstract

The theory of the optimal allocation of risk and some unusual panel data on financial transactions are used to assess the vulnerability of key demographic groups, hence the potential need for safety nets, both during a financial crisis and then in a recovery period, in Thailand. Likewise the major formal and informal financial institutions are assessed in crisis and growth, not based on ratios and non-performing loans, but rather by their risk-reallocation impact on households and small business owners. Idiosyncratic shocks, that is, household and regional shocks, are shown to be large even during the macro crisis/recession. Wage earners and those in agriculture suffered lower declines in income than anticipated, but these low wealth occupations had uncovered idiosyncratic risk, in contrast with business owners who suffered large declines in income on average but were well-covered in idiosyncratic risk. Age and gender are not good predictors of exposure, but the poor are always especially vulnerable. Surprisingly, beyond the use of rice as a buffer stock, the poor are shown to have had greater access and more effective use of formal credit. A government development bank and agricultural cooperatives are shown to be particularly helpful (in the Northeast and during the crisis, for example). The rich relied relatively more on informal borrowing and lending, on village-level financial institutions (helpful in the Central region and during the crisis, for example) and on commercial bank saving accounts (helpful in the Northeast and during the recovery period, for example). More generally the methods developed in this paper allow for any country with sufficient data a comprehensive evaluation of the effectiveness of formal and informal financial institutions.

1. Overview

* Inter-American Development Bank and University of Chicago, respectively. Email correspondence to mauroa@iadb.org and rtownsen@uchicago.edu, respectively. We are very much indebted to the National Institute of Health, the National Science Foundation, the Ford Foundation, the University of Chicago, for research support, and to Kaveh Hemmat, Ananth Ramanarayanan, Carlos Perez-Verdia and John Felkner for able research assistance. Helpful comments from participants of the MIT development lunch group, the Chicago econometrics workshop, and the IMF conference on structural reforms and poverty, and especially from Joshua Angrist, Abhijit Banerjee, Esther Duflo, Michael Greenstone and Joe Kaboski, are all greatly acknowledged.

During the financial crisis in Asian countries such as Thailand, macro-economic aggregates were used to portray the health of the impacted economy. Negative GDP growth was taken to indicate a fall in household welfare, for example, just as it is presumed that during the current recovery welfare is improving. Thus, initially, just after the devaluation of the Baht, high interest rate policies were implemented to encourage foreign (re)investment, and then, in the recession, monetary and fiscal policies were made more expansionary. On top of this, as commercial banks and finance companies were thought to be culprits in instigating the crisis, financial sector reforms were also implemented. The focus was on key indicators presumed to be necessary for sound financial systems: increasing capital adequacy ratios and reducing non-performing loans. Finally, as yet another addition, safety net policies presumed that particular groups or sectors might be more vulnerable than others to downturns, if not to the adverse effects of tight policy. Thus, a government agricultural development bank, the BAAC, was to be used as an engine of growth, and a government saving bank was to be used to promote village funds and small household business.

From this discussion several points deserve emphasis. First, macro aggregates can present a misleading picture. Underneath the so-called representative consumer and macro aggregates lie a rich variety of household/business experiences and idiosyncratic, village, and regional shocks. Second, macro policy, financial sector reform, and safety nets work in varying degrees through the financial system, sometimes through the very same financial institutions. Yet, these policies were implemented without a common conceptual framework. Indeed, there has been little theory-based assessment of financial institutions and safety net policies. These points lead to the obvious strategy and the purpose of this paper: explicitly incorporate the diversity of shocks and use the theory of an optimal allocation of risk-bearing as a benchmark to evaluate both safety nets for potentially vulnerable groups and the formal and informal financial institutions offering the potential of credit and insurance.

We make use here of a relatively unusual data base, the Townsend Thai data, a panel of approximately 960 households, including about 200 running their own businesses. The data start in May 1997, just prior to the onset of the crisis, through 2001, that is, through the current recovery. With five years of data there are four years of time differences, two in the crisis and two in the growth/recovery period. The data are gathered from households and small businesses in two distinct areas: two relatively wealthy provinces in the Central region near Bangkok and also two relatively poor provinces in the semi arid Northeast. The data contain not only the measurements of consumption, investment, and income necessary to carry out the standard risk-bearing tests, but also wealth and key regional and demographic variables to assess the safety net issue. Further, the data record the actual use of formal and informal financial institutions and mechanisms by type, both borrowing and saving, so we can see which devices for which types of households help account for the difference between consumption and income (consumption smoothing) and which help to keep investment steady in the face of shocks to cash flow (investment smoothing). Further, we can use the rest of the transactions data directly to gauge the role actually played by *informal* markets and institutions in alleviating idiosyncratic risk. Finally, to correct for endogeneity and

selection problems, we overlay this Townsend Thai data set onto baseline 1996 village level census data from the Community Development Department (CDD) and make use of a Geographic Information System (GIS). We thus have a large number of village characteristics which can be used as controls and spatial variables which can be used as instruments to measure impact. These instruments are shown to be correlated with actual observed use in the 1997-2001 transactions data[1].

The principal findings are as follows. Idiosyncratic shocks, that is, household and regional shocks, are shown to be large even during the macro crisis/recession. Wage earners and those in agriculture suffered lower declines in income than anticipated, but these low wealth occupations had uncovered idiosyncratic risk, in contrast with business owners who suffered large declines in income on average but were well-covered in idiosyncratic risk. Age and gender are not good predictors of exposure, but the poor are always especially vulnerable. Surprisingly, beyond the use of rice as a buffer stock, the poor are shown to have had greater access and more effective use of formal credit. A government development bank and agricultural cooperatives are shown to be particularly helpful (in the Northeast and during the crisis, for example). The rich relied relatively more on informal borrowing and lending, on village-level financial institutions (helpful in the Central region and during the crisis, for example) and on commercial bank saving accounts (helpful in the Northeast and during the recovery period, for example).

These findings offer an interesting comparison and contrast with the existing literature. McKenzie (2003) analyzes the impact of 1994 Mexican devaluation, using cross section (non-panel) household income and expenditure data, 1994-1996. He finds a wide, negative impact on most groups, though the less educated, rural, and agricultural workers suffered lower drops in income. Consistent with McKenzie (2003) we find that wage earnings dropped by less than business profits and that the crisis had a perverse effect on incomes of the wealthy in the central region. However, the rich did manage to smooth well. On the other hand, the poor in this study, particularly wage earners and those in agriculture, and those in the Northeast, were particularly vulnerable to idiosyncratic shocks, both during the crisis and after. Attanasio and Szekely (2004) also find absence of insurance against idiosyncratic, relative wage changes in Mexico in the 1990's, using synthetic cohorts, and as with McKenzie (2003) argue that much of the impact of idiosyncratic and aggregate shocks takes the form of a changing composition of expenditures, toward food staples.

Few studies have panel data, leaving some of the inferences problematic. Frankenberg, Smith and Thomas (2003) use the Indonesian FLS panel and find as here a tremendous variety in the effects of shocks during the Asia crisis. While a majority suffered declines, some households experienced income growth. McKenzie (2004) uses an urban panel from Buenos Aires and finds, in contrast, severe aggregate shocks and substantial common wage and income drops in construction, manufacturing, and

[1] As a robustness check, we create a parallel synthetic cohort from a more comprehensive national level income and expenditure survey, the Thai SES, and present in footnotes the analogue results where data permit for the same provinces.

commerce. The emphasis in this and other country studies is on real impacts. Frankenberg et al (2003) find that those with income drops shift toward consumption staples, and McKenzie (2004) finds drops in labor hours and participation in self employment.

The detailed nature of the expenditure and labor surveys in Mexico, Indonesia, and Argentina offer a particular advantage. Here in contrast we have an unprecedented level of detail on financial transactions through the crisis period and in the recovery which followed, setting this paper apart from most other literature. Skoufias (2003) does argue that in the Russian crisis some households responded to adverse shocks such as unpaid salary and unemployment with transfers and borrowing, though this is not coupled with his work with the consumption and income panel (that shows that the poor and those in rural areas were more vulnerable). Here we show that much, but not all, of idiosyncratic risk is insured, and link quantitatively the use of a variety of devices to consumption and investment financing deficits. Effective insurance, or conversely residual vulnerability, varies by occupation, wealth, and region. We also use the pre-crisis 1997 benchmark data, and supplementary village census data, to find instruments which help to predict membership/customer of each of the formal financial intermediaries and use of informal devices (supplier's credit, rice stocks), and we show these instruments are correlated with subsequent actual transactions in the 1997-2001 period. We are thus able to conduct a rigorous econometric theory-based evaluation of Thailand's financial sector. The data and analysis overturn many presumed stereotypes in the literature. Though remittances are important for most groups, formal credit seems particularly effective for the poor, while the rich are reliant on informal networks.

The paper is outlined as follows. Section 2 describes the data used in the analysis. In Section 3 we try to explain the variation of household income by macro/aggregate and occupation-specific shocks, respectively. A large residual variation in income remains, and a discussion of idiosyncratic shocks is presented. The benchmark of the optimal allocation of risk is introduced in Section 4, together with a discussion of the co-movement of the aggregates in consumption and investment. Section 5 compares the vulnerabilities of typical target groups during crisis. The assessment of financial institutions is introduced in Section 6. Finally, Section 7 presents some concluding remarks.

2. Data

The panel data used in this paper come from a project funded by the National Institute of Health, the National Science Foundation, and the Ford Foundation – see Townsend et al (1997). An initial cross sectional survey was fielded in May 1997, before the crisis that began with the devaluation of the Thai baht, in July 1997. Two regions were chosen deliberately, namely, the more developed Central region and the relatively poor, semi-arid Northeast. Within each region two provinces were chosen deliberately as each had at least one county that had been sampled in all previous rounds of the larger Socio Economic Survey. In the Central region the provinces of Chacherngsao is adjacent to Bangkok and contains an industrial corridor that makes its way to the Eastern

seaboard. The province of Lopburi is in the fertile central valley north of Bangkok. In the Northeast the province of Sisaket is the poorest in Thailand according to provincial product data, and Buriram represents a transition province as one moves west back toward Bangkok.

Within each province 12 tambons or sub-counties were chosen at random (see Binford, Lee and Townsend (2004), forthcoming). Within each tambon four villages were chosen at random from an enumeration of villages available from the CDD, and within each village 15 households were chosen at random from a listing held by the headman. In addition to the household questionnaire, survey instruments were designed for the headman of each village, soliciting in particular a retrospective village history of the use of formal and quasi-formal financial institutions.

With the advent of the crisis, funding from the Ford Foundation allowed a resurvey one year later, May 1998, of one third of the original sample, and this was continued with NICHD funding into subsequent years, here through 2001[2]. For the Townsend Thai resurvey panel, 4 tambons were chosen at random from the original 12 of each province[3]. Otherwise, the same villages and the same households were selected for re-interviews. The target number of household was 960 or 240 in each province. The actual response rate for this 1997-1998 pairing is relatively high, for example, 98.2% of the target 1997 households respond again to the survey. Likewise there were successful re-interviews of 96.2%, 97.1% and 96.5%, for the other pairs of years. Table A.1. in the appendix contains a summary of key variables used in the data analysis.

We note that income is measured as the difference between gross income and gross expenses, solicited from the household for each occupation category separately: business, agriculture, fish/shrimp, and farming (including livestock). Likewise all physical assets held at each interview data are solicited along with purchase date and value at that time. Discrepancies in ownership across interviews are checked and reconciled with the households directly. Depreciation rates, e.g., 10%, can be applied to create retrospective panel data on wealth. There are in addition direct questions on land sales and acquisitions, the major asset in many cases (this is not depreciated). Consumption is measured by a solicitation of 13 items[4] that best predict aggregated non-durable consumption expenditure in the larger more comprehensive SES survey. In practice 50-80% of the variation can be explained by these 13 items. A price index for each of the four provinces was created by the average price of the inter-quartile, 25-75% range of purchases and sales of the key consumption items for which both quantities and values were recorded.

[2] Note that a pair of years in this Townsend Thai data, for example 1999-2000 really means interviews conducted in May 1999 and May 2000. Thus, 8 months of this 12-month interval lies in the preceding pair of years, 1998-1999. So when we compare the Townsend Thai data to the SES data, for example, we should as a first approximation backdate one year.

[3] With the exception that one tambon was set aside for a separate intensive monthly survey..

[4] Grain, milk and milk products, meat, alcohol consumed at home, alcohol consumed away, tobacco, gasoline, ceremonies, house repairs, vehicle repairs, educational expenses, clothing and meals away from home.

Membership or customer of the various financial institutions was solicited in the 1997 interview, along with a retrospective history. Hence we know in principal if a household was using a commercial bank in the 1996 base line year, for example. We also have measurements of all financial transactions (borrowing, lending, saving) with the formal sector (type of institution, e.g., Bank for Agriculture and Agricultural Cooperatives (BAAC), village funds such as Production Credit Groups (PCG), commercial bank) and with the informal sector (output purchaser, money lender, friends, relatives, store owner). There are also data on remittances and the use of rice in storage. See Table A.2. in the appendix.

The advantage of the Townsend Thai data is that one can create a panel data set consisting of these and other variables. Sample size makes the analysis possible for general stratifications: region (Central and Northeast) and pairs of years (Crisis and Recovery). We also stratified the analysis by wealth, occupation, and financial provider, but data is not enough to carry out the analysis of these stratifications for each province or each particular year. Another disadvantage is that the data are not nationally representative (four provinces and not urban). Furthermore, striking results from any one database can always be dismissed as measurement error. For these reasons, we replicate some of the analysis when possible using a pseudo-cohort panel constructed from the SES and report on similarities and significant differences.

We employ the CDD data, which consists of comprehensive review of virtually all villages in the country, to obtain controls for village characteristics. Table A.3. in the Appendix presents a list of the village characteristic variables used in the analysis. They include economic status of the village, number of households, fraction of household working multiple occupations, fraction of households using government promoted seed varieties, etc. Instruments for membership of formal and informal institutions are obtained from three different sources: 1) headman's responses regarding the availability of credit in the village from various specific financial institutions, 2) travel times to district centers as measured in CDD data and 3) GIS-calculated probabilities based on nearby, CDD neighborhood averages that a village will have each of the various financial institutions.

3. The Variation of Household Income

3.1. Macro/Regional Shocks

Here we construct, from the panel data, numbers that might be comparable to the national income numbers. We compute for each surveyed household in the Townsend Thai data its income level and then deflate by the measured province price level. We then add up these income numbers and divide by the sampled population to get the aggregate per capita real income and then look at changes in that aggregate. As with the national income numbers, income did fall initially and started to recover in the following years.

More representative of the surveyed population however is a display of medians, Table 1. For the central region, the numbers show the biggest drops in the crisis years,

1997-98, and a substantial recovery in the end. In the Northeast, the 1997-98 and 1999-2000 pairs were bad and the recovery anemic[5].

Histograms not shown here reveal much dispersion even within provinces in a given year. One thus wonders if the differences in mean values are significant. This then is the question of whether the macro crisis is strongly evident in these micro household (and small business) data. Regressing the change of household income onto time specific fixed effects, we find in Table A.4 that in the aggregate and in the Central region both the 1997-1998 and 1999-2000 pairs of years are found to be significantly bad. The Northeast also had a significantly bad year in 1999-2000 but in means 1998-99 was a good year. The real point however is that the explanatory power of macro shocks is low[6]. In the Townsend Thai data these fixed effects yield only 1% as an adjusted R^2 (or less).

3.2. Occupation

The high contribution of errors to overall variance can be partially explained. One evident factor is occupation-specific differential income growth[7]. A household *j* overall income change $\Delta Y^j_{t,t+1}$ over pairs of years *t* to *t+1* is regressed onto the amount of base year income attributable to the corresponding source of income, $Y^j_{0,i,t}$, where sector *i* indicates wage, business, agriculture, financial, fish/shrimp or other sources.

$$(1) \qquad \Delta Y^j_{t,t+1} = \beta D_{t,t+1} + \sum_i \xi_i Y^j_{0,i,t} + \varepsilon^j_{t,t+1}$$

Tambon-level fixed effects, $D_{t,t+1}$, are included in these regressions on the hypothesis that there might be spatial variation determining income change even controlling for occupation sources. Table 2 provides an overall summary for the four provinces, reporting by rank order, from positive to negative coefficients, the occupation variable names.

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[5] The numbers for the analogue SES data show an initial rise in income in the 1996-1998 period, though as noted this is not directly comparable to the 1997-98 Townsend Thai data. The SES then shows similar and substantial drops overall and by region for 1998-1999, more severe in the northeast, and likewise a recovery in 1999-2000, overall and by region, but the recovery is higher and more dramatic than in the Townsend Thai data.

[6] In the SES, it is 5-9%. Recall that the SES, as a synthetic cohort, is an average over households in each cell in given year, and so by construction cohorts eliminate what might be idiosyncratic variation. In this sense the SES R2 numbers are pushed up. On the other hand, measurement error pushes the R2's down in general, especially so the actual, not-averaged Townsend Thai panel. Comparability is also clouded by the difference between the number of households in the Townsend Thai data versus the number of cohorts in the SES. The lower the sample size the higher the R^2, ceteris paribus.

[7] Households are not completely diversified across income sources. For example, 33% to 40% of the surveyed households have wages and salary as the largest income source, 34%-38% have agriculture, and 4-8% have business. (Also, for these households the specific occupation sources constitute the bulk of all income but not 100%). The reader should be forewarned, however, that business income can be negative in a given year. Many businesses do make losses, especially during the crisis period. Thus the fraction of primary income "business households" at 6% is much lower than those whose head says that running a business is the primary occupation, at 22%.

We can see that households reliant on wage earnings in the base year do not do as badly as many of the others, that is, coefficients are in the middle to upper half of the rank order of coefficients, ranking better than farmers and business owners with exceptions in the last year and in Sisaket in 1997-98. This comes as a surprise since much of the safety net policy was based on the presumption that there would be much unemployment and unpaid wages, that is, wages and remittances were forecasted to fall, bringing down rural incomes. On the other hand, the coefficient for business tends to be close to the bottom of the list, except in the last year, something which was anticipated in policy discussions. Agriculture tends to lie toward the center or lower part of the list, but its exact position moves about depending on the province or the year. There is little pattern in income from financial sources. Consistent with the finding on wages, and contrary to expectations, remittances are often at the top of the list[8,9]. Government transfers are sometimes helpful, but not always.

There remains much household-specific, idiosyncratic movement of income even within occupations. The point is that we should be careful not to confuse the movement of mean income of an occupation with the movement of income of a household specialized primarily in that occupation. This undercuts the notion of targeting by occupation groups[10]. Put differently, insurance for some groups might yet be needed. Later we shall see if some occupation groups do better than others in this regard[11].

We are also interested in income variation for potentially vulnerable groups. We regress real per capita income change onto a vector of household demographic characteristics: age, gender, education and wealth. Other than wealth, very few of the characteristics are significant predictors of income change. The wealthy do typically have negative income change and this seems to be driven primarily by the crisis in the central region. But in the relatively poor Northeast, the wealthy do better than low-asset households in generating positive income change during the crisis[12].

3.3. Idiosyncratic Shocks

[8] We can repeat these calculations in percent changes. That is, we regress the percent change in income of each household for each pair of years onto the fraction of base year income attributed to the various principal occupations. The results are not inconsistent. There is a tendency for wage earners and agriculture to move up in the list.

[9] The SES data confirm via point estimates many of these patterns, e.g., the recovery of business relative to wage earnings in the last year, though not much is significant, due perhaps to low sample size.

[10] In the language of commodity options there is not a strong basis.

[11] In search of other systematic factors with influence over household income change, we looked specifically at geography, at geo-political units. Indeed, the income regressions include, as noted, tambon fixed effects, and in other regressions we allowed (separately) for changwat or village fixed effects. These location effects are often significant in the growth or income change regressions. Indeed, without them, some of the income categories change or lose significance. However, relatively little of the overall variation is explained by the location variables themselves, whatever the degree of aggregation.

[12] Age is a positive predictor of income change in the Northeast region during the crisis. For the SES analogue rural sample, age is predictor of positive income change in the central region, and nothing else is significant.

What might be the cause of residual variation in income change? Households were asked for their own assessment of whether they were experiencing good or bad years, to name the cause of any self-reported fall in income. The top two causes for each household are coded. Table 3 illustrates the results for one of the years, 1998-1999, though the text below contains a discussion of patterns and magnitudes over all years.

Drought is named in 1997-98 year as one of the most important causes of income shortfalls for 35%-78% of the households, and the average is 68% if Sisaket's relatively low 35% is excluded. Drought continued its importance in 1998-99, especially in at 52%, and also now in Sisaket at 55%, but lower in Buriram at 16%. Drought is also less important for the remaining years, with the exception of Lopburi in 1999-00 and Sisaket in 2000-01. Floods are the next most important adverse event, named in particular in the Northeast interviews: Sisaket in 1998-99 and 2000-01 at 29%-33% and Buriram 2000-01 at 22%. Flooding is named less often in the central region, reaching a maximum of 10% of those responding in Chacherngsao in 2001. We thus have in the sample period a classic example of the semi-arid tropics as represented by the Northeast: drought and floods are often coincident across tambons even within the same province in the same year. Drought alternates in incidence between Buriram and Sisaket in 1998 and 1999. Other agricultural shocks, such as pests, and other reasons for low crop yields, are common across all provinces and all years.

Layered on top of these regional agro-climatic shocks lie the macroeconomic shocks. Working fewer days is named by 26% of the households in the Lopburi 1998 interview, also l8% in 1999, and averages around 10% in the latter years of the sample. Complaints of low prices for output (agriculture, fish, or business) are commonplace most of the years, peaking perhaps in 2000 and falling by 2001. High prices of inputs are also important much of the time, perhaps greatest in 1998, and a perpetual complaint in Chacherngsao. High investment costs are an important complaint in the central provinces.

Below the regional and macro shocks lie idiosyncratic, household-specific shocks. They should not be under-emphasized. A prime example would be reported instances of expenses due to illness. These can average 2% to 7% of the sample depending on the province and year, but reach 13% and 24% of households in Chacherngsao and Lopburi in 1999-2000. Apart from drought, illness is the most frequent complaint in Lopburi in that year, and we have noted earlier that income shortfalls were prevalent there at that time. Death in the family is also mentioned in some provinces in the last two years[13].

4. The Optimal Allocation of Risk-Bearing

[13] The 1999 special SES crisis survey also asked these types of questions, though households indicate yes or no to each item on a pre-specified list of shocks, so the response rates are not directly comparable. Still drought and flood are the most commonly mentioned problems, though followed closely by price/cost of agricultural production. Macro shocks which take the form of job loss and reduced wages are somewhat named by 22-27% of the households (though not in all provinces). Decreased income from business is salient in the Central region, as it was in Chacherngsao for the Townsend Thai data.

To assess how well existing safety nets and formal financial system of Thailand functioned during the crisis and the recovery years, we use an extreme but useful benchmark of the literature. The basic idea is that households and small businesses should be immune from idiosyncratic shocks, once one controls for aggregate shocks. It is as if income over all households were pooled together in every period and then reallocated among the households according to their initial wealth. The common fixed effects, indicating the time-varying size of the pool of resources, should capture the effect of common aggregate shocks, whether they be negative as in the crisis, or positive, as in the recovery. Thus, in a regression of household-specific consumption onto time fixed effects and household-specific income shocks, the idiosyncratic income coefficient should be zero. Household specific effects capture wealth differences, and these are netted out in taking first differences. These regressions are now standard and there is much discussion of the derivation in the literature: see Alderman and Paxon (1994), Altonji-Hayashi-Kotlikoff (1996), Altug and Miller (1990), Attanasio and Davis (1996), Cochrane (1991), Deaton (1990), Mace (1991), Ravallion and Chaudhuri (1997), Townsend (1994), for example[14]. We thus study the following regression equation:

$$(2) \qquad \Delta c^{j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta\ \Delta \overline{A}^{j}_{t,t+1} + \eta\ \Delta hs^{j}_{t,t+1} + \xi\ \Delta Y^{j}_{t,t+1} +\ u^{j}_{t,t+1}$$

Here the dependent variable $\Delta c^{j}_{t,t+1}$ is the change in per capita household *j* consumption. The first term, $D_{t,t+1}$, is the common fixed effect, capturing common movement in consumption in the risk-sharing group, say from *t* to *t+1*. The group here in the notation is imagined to be the entire sample, but one can create time dummies for various possible sub-groups, of which households living in the same tambon (sub-county) is the most compelling apriori and used below. The next terms are a demographic variables. $\Delta \overline{A}^{j}_{t,t+1}$, an index capturing changes in the number, age, and gender of the members of household j relative to the risk-sharing group, and $\Delta hs^{j}_{t,t+1}$ measures changes in household *j* size. The next term is household *j* income change, $\Delta Y^{j}_{t,t+1}$, which should enter with a zero coefficient in theory but typically will not.

Likewise, investment in business and farm assets should be determined by efficiency considerations, and the aggregate shocks, and not by household specific, idiosyncratic income movements. The Pareto problem is easily expanded to allow inter-temporal production and other ways to carry wealth over time. See Townsend (1995), for example. The first-order conditions would equate the marginal cost of resources used today, the rental price of capital times the marginal utility of foregone income today, to the sum of marginal revenue products under the household production function over states and dates weighted by marginal utilities of income in the future. But, as is

[14] There are maintained assumptions, of course especially in using cross sectional data. Utility is time separable and the consumption function is separate from leisure. There may be preference shocks but these are supposed to be orthogonal to socio-economic shocks. Households have common utility functions with common risk aversion and common time discount rates. Consumption is aggregated and enters the utility function in within-household per person terms. Specific functional forms such as exponential utility deliver the closed form solutions such as equation (2) in the text.

standard, the marginal revenue products of all inputs should be equated over all households *j*, e.g., the user or rental cost of capital should be equated to the common marginal revenue product. Thus capital in use in the period would be related to contemporary and future marginal utilities of aggregate income, again captured by time-specific effects, common over all households or risk-sharing group. Of course the level of capital in use would be related to the technology used by household *j*, as capital should be allocated to where it is most productive.

Further we can imagine that there are capital adjustment costs so that the current level of capital K_j of household *j* would distinguish technologies and thus investment per unit capital over the subsequent year would be normalized, that is, $I_j^* = I_j/K_j$, becomes the natural dependent variable[15]. Income $Y_j^* = Y_j/K_j$ would be similarly normalized. Taking first difference then yields, as in the finance literature, as derived by Samphantharak (2003) for example, an investment regression with a counterfactual cash flow term[16]. For simplicity here we retain the same variables and functional form of the consumption equation (2), though clearly the coefficient values would not be identical:

$$(3) \qquad \Delta I^{*j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta\ \Delta\overline{A}^{j}_{t,t+1} + \eta\ \Delta hs^{j}_{t,t+1} + \xi\ \Delta Y^{*j}_{t,t+1} + \ e^{j}_{t,t+1}$$

Of course, if we do not control adequately for technology shocks with common fixed effects and controls, then a high change in income, $\Delta Y^{j}_{t,t+1}$, today may simply reflect high future value from a particular type of investment, and a positive coefficient on that variable in equation (3) would not be evidence of a liquidity effect. So as regards investment the results must be interpreted with some caution[17].

4.1. Movement of the Aggregates

Though the variables, $D_{t,t+1}$, in the consumption and investment regressions are common time specific fixed effects, in theory they represent the movement of aggregate consumption[18]. It is useful first to see directly how much movement there is over time in measured average consumption and then see how much common co-movement there is over households date by date.

The median per-capita real consumption numbers do show negative growth in the first three years, and finally a recovery in the fourth. The numbers are -.13, -.07, -.06 and +.05. Curiously, this pattern in consumption is displayed in both the Northeast and central regions separately. Thus, if consumption were used as a measure of the crisis, and

[15] Note that two consecutive year are required to construct this variable.
[16] In practice it takes three annual observations to create this first difference. Thus, there are fewer observations during the crisis than after.
[17] We did some robustness checks distinguishing agricultural from business investment but this did not materially influence the results. Still, one would assume that being a customer of a financial institution in the base 1996 year would not be associated with lower valuation of future returns over the sample period. Thus, if we find a negative coefficient on the interactive term in the analysis of financial institutions below, it seems likely associated with amelioration of a liquidity effect.
[18] Again, the utility function is assumed to be separable in consumption and leisure.

for us, in the theory, it does represent aggregate risk, we would say that the first year was the most severe in both regions, by a large order of magnitude, and the last year was the best year in both regions. The central region shows a diminishing decline with eventual recovery, somewhat consistent with its income numbers, but so does the Northeast which previously offered a more mixed income picture.

If we use simple time dependent fixed effects in the panel for household consumption as if the whole sample were the risk-sharing group, then we find there is a significant negative fixed effect initially, 1997-98, and also 1999-00, as reported in Table A.5 in the Appendix. The effect of the crisis in reducing mean consumption is evident in both the central and Northeast regions separately. In addition the central region has a positive coefficient in the last pairs of years, the recovery. Overall, there is more common movement in consumption across households than in income. The adjusted R^2 on these regressions is higher than on income change[19]. Still, there is a lot of variation left to explain, and we shall turn to that momentarily, in the risk analysis section below[20].

Recall the theory also implies co-movement in investment. Agricultural investment is positive and nontrivial in the aggregate numbers, suffering a drop only in the 1998-99 period. Business investment was positive for nontrivial segments of the population from 1997-98, with many households starting new if low-scale businesses at that time, but overall business investment turns dramatically negative in the 1998-99 and 2000-01 periods. Many households do not invest in these sectors in a given year. Thus we aggregate agricultural and businesses investment in the analysis below, though clearly the theory would want us to distinguish different technologies (we distinguish results when possible in footnotes when appropriate).

In a regression of household specific investment onto common time effects, Table A.6 in the Appendix, we find that 1997-1998 and 1999-00 have a significant and positive fixed effect, overall and by region. The last 2000-01 pair is also significant and positive overall and in the Northeast and almost significant at conventional levels in the Central region. The fixed effect is negative in 1998-99 and significant in the Central region. The R^2's on these fixed effect regressions for investment are comparable (slightly higher) than those for consumption[21].

In sum, the movement of aggregate consumption and investment seemingly tells a story of the Thai national crisis. But, there is in fact little common movement across

[19] Note that the percent of variation explained, though low, reaches 4%.
[20] The SES data also show an initial drop in consumption in both regions 1996-98, but the fixed effect is not significant – again, the interval includes the last year of several decades of high growth. On the other hand, the recovery from 1999-2000 is quite significant, overall and both regions. Finally, the adjusted R^2 in these SES regressions is now relatively high, from 66 % to 81%; apparently much of the movement in cohort average consumption can be explained by these simple fixed effects. This is of course not unlike the prediction of the benchmark risk-sharing model, but, then again, the cohorts do mask unmeasured idiosyncratic variation. Again the comparison is blurred by the fact that the number of households is different from the number of cohorts, but the relative gain in the explanatory power of fixed effects going from income to consumption is greater in the SES.
[21] Unfortunately, we have no analogue in the SES for a robustness check here.

households in this panel data. There is slightly more common movement in consumption if we allow tambon-time fixed effects, but explained variation remains low. We use these fixed effects in the regressions (2) and (3), but focus our attention in the analysis on the coefficients of the income variables.

5. Safety Nets and Target Groups

We begin with the basic equations (2) and (3), but now we create a vector X_{j96} of initial, base year household j characteristics and include them in the regression equations not only in levels but also interacting with the income shocks $\Delta Y^{j}_{t,t+1}$ to see if these characteristics lower the exposure to idiosyncratic risk (have a negative coefficient), or raise vulnerability (a positive coefficient). We can in addition decompose income change by source (agriculture, wage earnings, business, etc). The vector X_i includes the safety nets variables, that is, age, gender, education, and wealth. In sum, the modified regression equations are:

$$(4) \qquad \Delta c^{j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta\ \Delta\overline{A}^{j}_{t,t+1} + \eta\ \Delta hs^{j}_{t,t+1} + \mu\ X_{j96} + \xi\ \Delta Y^{j}_{t,t+1} + \\ + \nu\ \Delta Y^{j}_{t,t+1} * X_{j96} + u^{j}_{t,t+1}$$

$$(5) \qquad \Delta I^{*j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta\ \Delta\overline{A}^{j}_{t,t+1} + \eta\ \Delta hs^{j}_{t,t+1} + \mu\ X_{j96} + \xi\ \Delta Y^{*j}_{t,t+1} + \\ + \nu\ \Delta Y^{j}_{t,t+1} * X_{j96} + e^{j}_{t,t+1}$$

The first row of Tables 4 and 5 present the results for OLS regressions of equations (4) and (5) for the entire sample and distinguishing regions and crisis from recovery. The other rows in each table come from running regressions including age of the household head, an indicator for female-head, education of the head, and wealth of the household. We imagine in these tables that the tambon is the common risk sharing group, so there is a vector of time dummies $D_{t,t+1}$, one for each tambon.

Those in the central region, near Bangkok, tend to suffer more from consumption sensitivity to income fluctuations than those in the Northeast. There is also some evidence (although not statistically significant) that sensitivity of consumption to shocks, hence missing insurance, was more acute during the crisis in the central region than after. The same is true for sensitivity of investment to cash flow in the central region. Overall, though, unlike consumption, investment is more sensitive to cash flow in the Northeast, particularly so after the crisis, suggesting a chronic problem there.

The patterns by wealth, the last line of the table, are salient. The coefficients are always negative, so high wealth households do better, over regions and time periods. Conversely low wealth household are more vulnerable to idiosyncratic shocks. In investment the patterns are similar; wealth helps to reduce sensitivity to cash flows. For the most part, the more educated household do better in consumption (only significant in the Northeast) and in investment (though the sign is perverse overall). There is some weak evidence the more educated did worse in the crisis, as the coefficients on

education are never significant in the central region during the crisis and are positive and significant in investment during the crisis the Northeast. Other key safety net variables appear with very mixed signs. The groups that might be supposed to be more vulnerable are not, though again there are exceptions. Female headed households appear more vulnerable in consumption in the Northeast after the crisis, but are less vulnerable in investment, particularly in the Northeast. Older household heads do consistently worse in consumption smoothing, but surprisingly better in investment over periods and regions,

In contrast, as regards occupation and source of income, there are striking findings (Table 6). Business owners are able to smooth consumption well overall and in both regions, reducing exposure to idiosyncratic risk to a low number[22]. Business owners, however, are not able to smooth investment, especially so after the crisis. Fluctuations in wage earnings appear to have a high association with fluctuations in consumption for wage earners in the Central region during the crisis. Investment appears quite sensitive to income for wage earners overall. Thus, in sum, coupling with what we have learned above in Table 2, business income drops on average but idiosyncratic income movements are covered in consumption. Conversely wage income does not fall much on average, but idiosyncratic movements are not covered. This makes the point that average income movements by group are a bad metric for making judgments about vulnerability.

Consumption in the Northeast is vulnerable to shocks in agricultural income. Investment is also vulnerable to these shocks with the exception of Northeastern households after the crisis. Another vulnerable occupation group in consumption (and investment) are the shrimp farmers in the Central region. This group has high wealth. But note that otherwise wage earners and those in agriculture are among the low wealth groups, and these groups seem more vulnerable. Conversely business owners have higher wealth, and on average they are less vulnerable. The point is that low wealth occupations (farmers and wage earners) seem more vulnerable than high wealth occupations (business). Again, wage earners in the Central region were especially vulnerable in during the crisis whereas their Northeastern counter parts suffered more in investment in the recovery period.

6. The Use of Financial Instruments and Institutions

Table 7 reports the percentage of households who used a particular object or mechanism in at least three out of the four pairs of years[23]. We distinguish the poorest 30% of the population by total wealth in 1996, the middle 40% and the richest 30%.

[22] Negative, in fact, as if overdone, but this should not be taken literally. This finding in the Townsend Thai data emerges as well in the SES data.

[23] For robustness we tried fewer years, two, and more years, all, but the results are not sensitive. The data do not record levels or measured changes in cash and jewelry from year to year. Rather an indicator variable is created for the responding 'yes' to the questions of whether they have cash or jewelry in the house and these are converted to changes. We do not test for significant differences in the columns as in the end we do not believe that frequency of use is the correct metric, anyway. See the analysis below.

By frequency the poor do seem to lack access to formal credit. Specifically if we look at the line marked Formal Borrowing, we see that overall 29.6% of households recorded a transactions with commercial bank, BAAC, or village institution in at least three out of four years. But the number is lower for the poor, 24.7%, than for the rich, 31.2%. Likewise, the poor seem here more reliant on remittances, rice storage, livestock sales, informal borrowing, and cash. The rich apparently use formal credit, informal lending, savings in financial institutions, household and productive assets, and jewelry.

Within many of these categories we can distinguish the use of particular financial institutions, as showed in Table 8. Anywhere from 16% to 38% of the surveyed household recorded a savings transaction with the BAAC, with variation across provinces, and 11% to 32% recorded a borrowing transaction. In particular, the number of households borrowing from the BAAC is especially large in the relatively poor Northeast (Buriram and Sisaket). In contrast, for commercial banks the numbers are 15-40% for savings – with the large percentages corresponding to the more developed Central provinces (Lopburi and Chacherngsao) – but at most 2% for borrowing. Agricultural Cooperatives serve a small segment of the market, 4-16% in savings and 2-9% in borrowing, and village level financial institution, PCG from 4-8%. These village institutions are more frequently used for saving than borrowing. Transactions in informal debt are prevalent, from 21% to 32%, and within this money lender use runs from 2% to 10%. From 20% to 65% of the surveyed households have transactions in rice in storage, particularly high in the Northeast.

6.1 Household Financial Accounting

However, we can go further based on our measures for consumption, investment and income. We can write the household *j* budget equation as a measure of the consumption deficit (consumption minus income) on the left hand side. Current expenditures are composed of consumption, non-capital inputs used in farming or other activities, and workers hired by the household, all of these valued at current prices. Revenues are composed of output quantities at market prices and salaries earned from the sale of labor. The financing of the consumption deficit, reflected on the right hand side of the budget equation, is composed of net borrowing, net loan repayments received, remittances and gifts, decreases in stored goods or savings, capital assets sales and, finally, decreases in cash holdings. The equation itself is after all an identity, even if certain items are not well measured in the data, or, as in the case of cash, not measured at all. Likewise, we can move the change of productive assets (agricultural, business and ponds) to the left hand side and consumption to the right and ask how the various devices smooth the differences between investment and income[24].

6.2. Partial Correlations

We compute the partial correlation coefficient of each device separately with the consumption deficit, consumption less income, and the investment deficit, investment

[24] We could include both consumption and investment on the left as well, but consistent with the rest of the paper we look at consumption and investment separately.

less income[25] in Table 9, one device at a time. Overall, by this metric, receipt of government transfers and informal arrangements – remittances and the use of informal borrowing – show up as most positively correlated with the consumption deficit (along with household assets and rental/financial income). As regards investment, informal borrowing is most helpful along with formal borrowing, government transfers and formal savings.

More to the point, when distinguishing by wealth, some of the stereotypes begin to disappear. The poor are the only significant users of overall formal credit in consumption and investment. Agricultural cooperatives are most helpful to the poor for consumption and the BAAC and, again, Agricultural Cooperatives help the poor smooth investment. In contrast, PCG's, a village-level micro credit institution, are most helpful to the rich in consumption and the middle group in investment.

The middle class and the rich show up as users of informal credit. Informal borrowing is particularly strong for rich in investment, primarily credit from store owners. The middle class are helped in investment and consumption by moneylenders. The poor are helped in the informal sector by relatives in consumption and store owners in investment (only). Remittances help all groups in consumption, but point estimates are lower for the poor. Remittances help only the middle group in investment.

Consistent with conventional wisdom, savings accounts are helpful to the rich in consumption, commercial bank savings accounts in particular for the middle and rich, though for the rich and investment, the movement of commercial bank accounts is seemingly perverse[26]. The poor are helped in consumption by Agricultural Cooperatives savings accounts, though in investment the movement is seemingly perverse. Conventional also, rice storage and the timing of household asset transactions help the poor and middle segments to smooth consumption. But the timing of livestock transactions hurts the poor and middle group in consumption, and the timing of household assets is negatively correlated with the deficit for the poor and middle segments in investment.

The timing of government transfers helps the poor and middle group to smooth investment, and all groups benefit with respect to consumption, but the relatively rich are surprisingly the bigger beneficiaries of government transfers in consumption smoothing.

We have also checked whether there is a pattern in partial correlations by time period, during the crisis and after. We report the results here one institution at a time, though we suppress the tables to save space. For commercial banks, there is no interpretable pattern with respect to consumption deficits, but there is some evidence that

[25] In principal we could create a relative mean square error measure of tracking and see how close the use of an object is to the magnitude and use of a device. However, a large part of the deficit (both in consumption and investment) remains unexplained. This is consistent with findings in Samphantharak-Townsend (2004), who find a prominent role of cash holding in their study using monthly observations for a sub-sample of the Townsend Thai annual panel used here.

[26] This may reflect a portfolio management strategy in which commercial savings accounts are withdrawn and used for other purposes (i.e. lending). See Samphantharak-Townsend (2004).

commercial banks borrowing helped investment after the crisis (though the movement of saving is perverse). The BAAC seems especially helpful in consumption smoothing in the Northeast during the crisis, while in investment there is no pattern. For Agricultural Cooperatives, there is a marginally significant coefficient (at 14% significance level) with respect to investment during the crisis. The consumption deficit is correlated with PCG use both during and after the crisis and in investment during the crisis. We shall revisit the results indirectly in the next section, and especially in the summary section at the end of the paper.

6.3. Instrumental variable and households/village controls

We instrument as described below for membership of a particular financial institution in 1996, M_{j96}. We then estimate the impact equations (2) and (3) but including controls for individual, X_{j96}, and village characteristics as well as the instrumented versions of membership. The impact equation are thus:

$$(6) \quad \Delta c^{j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta\ \Delta\overline{A}^{j}_{t,t+1} + \eta\ \Delta hs^{j}_{t,t+1} + \xi\ \Delta Y^{j}_{t,t+1} + \psi\ Z_{ji,96} + \gamma\ X_{j96} + \\ + \mu \Delta Y^{j}_{t,t+1} * Z_{ji96} + \nu\ \Delta Y^{j}_{t,t+1} * X_{j96} + \rho\ \Delta Y^{j}_{t,t+1} * M_{j96} + u^{j}_{t,t+1}$$

$$(7) \quad \Delta I *^{j}_{t,t+1} = \beta_{t,t+1} D_{t,t+1} + \delta\ \Delta\overline{A}^{j}_{t,t+1} + \eta\ \Delta hs^{j}_{t,t+1} + \xi\ \Delta Y *^{j}_{t,t+1} + \psi\ \ Z_{ji,96} + \gamma\ \ X_{j96} + \\ + \mu \Delta Y^{j}_{t,t+1} * Z_{ji96} + \nu\ \Delta Y^{j}_{t,t+1} * X_{j96} + \rho\ \Delta Y^{j}_{t,t+1} * M_{j96} + e^{j}_{t,t+1}$$

Here the X_{j96} is an expanded vector of household j characteristics including those of the safety net analysis such as age, wealth, gender, and also other demographic terms (number of adult males, adult females and children). Here also Z_{ji96} is a vector of characteristics for village i of household j. From the Townsend Thai data we include average wealth of the village and average education. We also include measured CDD village characteristics such as fraction of households with piped water and state supplied electricity, number of households with migrants outside the village, whether there is a village assembly hall, fraction of households in agriculture, in cottage industries, in paddy production, and fraction receiving government assistances, and with multiple occupations. See Table A.3. in the Appendix. Note that the X_j and Z_{ji} are all dated 1996 and all entered in both levels and interacted with income change. The goal is to have as many controls as possible for consumption and investment change to extract out the incremental smoothing effect of membership in an institution.

The membership equation in this notation is:

$$(8) \quad M_{j96} = \psi\ X_{j96} + \theta\ Z_{ji96} + \delta\ I_{j96} + \varsigma_{mj}$$

We thus include the household and village attributes X_j and Z_{ji}, as factors likely to determine membership as well as an instrument for membership I_{j96}, ideally an exogenous factor that affects the decision to become a member of a financial institution and is correlated with membership interacted with income change, the key variable measuring the reduction in idiosyncratic risk, but is uncorrelated with the error term in

(6) and (7). We use a simple regression equation, in essence a linear probability model, granting that the predicted value for membership takes on a continuum of values, some above one and below zero.

We also used other variables for individual membership, and instrumented them as well, as just indicated. The results are similar to those reported in the text. We take as an indicator of household membership not reported membership but whether the household had savings or borrowings in the institutions in question in the 1997 interview – see Table 8. As households are much more likely to save in commercial banks than to borrow from them, savings is a key indicator of having a relationship. Likewise, banks may be more inclined to lend to households with savings, and indeed the BAAC requires the opening of a savings account in order to disperse funds from borrowing. The BAAC is also engaged as well in an extensive deposit mobilization program. Savings are also used for village level institutions. For Production Credit Groups, deposit mobilization is a key goal, and indeed a PCG is more likely to be acquiring savings from its target population than lending relative to other village funds (see Kaboski and Townsend (2004)).

6.4. Instruments

We employ several candidates as instrument. Each has its strength and limitations and they are not mutually consistent. These will be employed in equations (8) one at a time. We feature instruments based on geographic variation as in Card (1995).

Headman Response: The key informant of a particular village in the Townsend Thai survey answers retrospective questions delivering the history of institutional use, in particular the presence of a named institution in the base year, 1996. That is, were there any households who were clients or used the institution. This seems likely correlated with whether an individual is a member, particular so for institutions that operate at the village level only or institutions that target or expand at the village level (not for Commercial Banks for example). This instrument is not available for informal borrowing or savings.

Time To District Center: The CDD has its own estimate of travel times from the village to the District Center. These are used as instruments for all formal institutions, though it is questionable apriori if there is relevance in this for village funds. For example, Commercial Banks might be supposed apriori to operate near district centers, and the BAAC may target poor farmers far off the main road.

Geographic Information System (GIS): We also created from CDD data another instrument for membership that indicates institutional presence in 1996. Headmen of all villages in Thailand are asked in the CDD survey whether anyone in the village has access to credit from each one of several named institutions (village funds, commercial bank, agricultural cooperatives, and trader or supplier of inputs (as a proxy for the informal)). As all villages in each of the survey provinces have been vectorized in a GIS, we can use the responses from nearby villages in 1996 to create weighted membership

variable for each of the villages of the Townsend Thai survey[27]. The GIS variable has several advantages. First, the response of any given headman may be inaccurate, so with presumed spatial correlation, the averaging is removing some measurement error. Indeed, we can impute values to villages that otherwise are missing headmen responses. Second, there may be supply side variation. For example, village funds (PCG) are promoted by energetic local officials responsible for tambons or amphoes.

Geographic Surprise: We also use as an instrument not the GIS predicted level of access but rather the surprise or innovation in access, i.e., villages predicted to have access but do not and conversely those predicted to not have access but do – see Kaboski-Townsend (2004). Technically we modify the selection, membership equation (8) and replace it with:

$$(9) \qquad Mj_j = \psi X_{j(96)} + \theta Z_{ji(96)} + \delta I^*_{j(96)} + \delta \xi_j + \varsigma_{mj}$$

Here $I^*_{j(96)}$ is predicted access for village i of household j created from the GIS system and ξ_j is the difference between that predicted value and the actual one recorded in the CDD data. The GIS predicted value is now also included as an additional control in equations (6) and (7), not previously included in the analysis with the other instruments. This is a reason to restrict attention to one instrument at a time. Note also the coefficient is the same on the surprise and predicted variable in the selection equation (9), and so the actual CDD variable is entered in the selection equation. But the identifying variable is now the surprise in access, presumed to be uncorrelated with the error terms in (6) and (7).

6.5. Properties of the Instruments

Table 10 reports the correlation coefficients between each of the four instruments and an indicator of actual use of the financial institution. This indicator is a binary measure of frequency of use, specifically whether the household used in at least three out of four of the pairs of years[28].

Note that, overall, the correlation is particularly high for the BAAC and village funds (PCG), less so for commercial bank, and lowest for the informal sector. Agricultural Cooperatives have high correlation as well, but there are some mixed results. The correlation is positive and significant always for BAAC and village funds, for each and every instrument, significant with two exceptions for commercial banks, and significant in 4/6 of the cells for the informal sector. (Only the "surprise" does well in the "informal borrowing" line but all the applicable instruments are correlated with use of rice buffers.

[27] Specifically every pixel is assigned a number by weighting the nearest 12 villages to the center of the pixel, the weight falling inversely with distance. Thus every village, including those of the Townsend Thai data, can be assigned an indicator. The weights and number of villages used were chosen to produce non-trivial variation, between zero and one, so that on average there is neither too little nor too much damping. Robustness checks with alternative specifications were performed.

[28] Again robustness check for other indicator and actual use was performed.

Table 11 reports in turn the coefficients (and statistical significance) of the instruments in the selection/membership equation in each of the formal and informal mechanisms, both for the overall sample and distinguishing Central region from Northeast. We see that all the instruments are significant for the BAAC (one exception), Agricultural Cooperatives (two exception) and PCG's (three exceptions). In contrast for commercial banks only two instruments were successful in predicting membership overall, and by region there is only one instrument each left to use[29]. Note that the correlations of the instruments are negative for informal borrowing

With respect to the instruments themselves, we find that GIS and Surprise are significant predictors of membership overall and by region. Headman and Time to district center are weaker instruments in general, and are unsuccessful to predict membership of Commercial Banks and use of informal savings and borrowing, with very few exceptions.

6.6. Financial Institutions Assessment

We now turn to the assessment of the impact of financial institutions. We find that commercial banks are somewhat helpful, though the results are mixed (Tables 12 and 13). In consumption, overall, the signs are negative and significant for one of two remaining instruments. Commercial banks are helpful in the Northeast, though there is only one significant instrument there. These results are stronger for investment, and, in addition, it seems that commercial banks were more helpful after the crisis. Put differently, commercial banks may have been operating under internal or external policy constraints during the early crisis years. This could be consistent with the overall climate on lending, but further research is needed. We are not aware that commercial banks have been evaluated in this way.

In contrast the BAAC (Tables 14 and 15) does well almost uniformly in consumption smoothing overall, and particularly so in the Northeast and during the crisis. Also in contrast with commercial banks, the results for investment are slightly weaker overall, and loose interpretation when stratifying by region and period. There is a peculiar positive and consistently significant sign in the central region after the crisis, for example. The results for the BAAC are not inconsistent with an internal operating system which stresses risk contingencies (see Townsend and Yaron (2001)).

Agricultural Cooperatives, like the BAAC help in consumption smoothing, overall and in the Northeast during the crisis, but there are exceptions (Tables 16 and 17). These Cooperatives also help in investment sensitivity during the crisis, but there are again perverse signs overall and by region.

[29] Curiously the surprise variable for informal borrowing is negatively related to membership - being an outlier and having informal credit relative to neighboring villages is a negative predictor of its use, as if informal credit is a function of the region, not the village per se. Below, we do not report impact results for instruments which are not significant in Table 11.

PCG's seem with one exception to help in consumption smoothing overall, and remarkably relative to the other institutions, this shows up consistently for virtually all stratifications (by period and region – Tables 18 and 19). In investment, in contrast, there is consistently more help from PCG's during the crisis than after (both regions). The smoothing capability of PCG's is consistent with Kaboski and Townsend (2004), who further identify helpful policies.

In summary then, for the more formal financial intermediaries, commercial banks seem less effective during the crisis, especially for investment, but there may have been compensation, so to speak, from Agricultural Cooperatives and PCG's in investment. The BAAC does particularly well with respect to consumption smoothing in the Northeast in the crisis years, as well. By region three out of four of these formal or quasi-formal providers does well in the Northeast while PCG's do consistently well overall.

With respect to the informal sector, it seems that informal credit was helpful after the crisis in consumption, and for investment helpful in the central region both overall and after the crisis (Tables 20 and 21). The Northeast is not helped, apparently, by informal credit.

In contrast, rice storage (Tables 22 and 23) seems helpful for consumption smoothing in the Northeast overall and especially in the Northeast during the crisis period. Rice storage may have been helpful for investment in the central after the crisis, but there are few instruments.

We have also stratified by wealth and hence checked for differences in impact (though not by region or time period simultaneously). Most of the instruments are not significant in the membership equations, so we save space and do not report the tables. Suffice it to note that commercial banks seem helpful in consumption for the middle group and in investment for the middle and upper group. Likewise we find that the BAAC is not helping the upper group in consumption and not helping the middle and upper group in investment. (No instruments are significant for the poor, so we cannot infer anything positive for them). There is weak evidence that the PCG are helping the rich in consumption smoothing, and stronger evidence that PCGs are helping the middle and upper groups in investment. There is also weak evidence that Agricultural Cooperatives are helping the poor in consumption. These results are striking in similarity to the partial correlation transaction tables reported earlier.

7. Summary and Concluding Remarks

The principal findings are as follows. First, as with the macro aggregates, the first two years after the 1997 crisis correspond with drops in income and other key variables, and the last year of the data corresponds with a recovery, especially so in the central region. But despite the prevalence of aggregate shocks in income, consumption and investment, idiosyncratic shocks abound. Part of this can be explained by distinguishing income source and occupation group. For example, incomes did not drop on average for wage earners and those receiving remittances, unlike the presumptions which underlay

safety net targeting. Business on the other hand did suffer income drops. Still, within each occupation category there remains considerable idiosyncratic variation, evident in the histograms of income change. Thus an analysis of the optimal allocation of risk is appropriate for these data.

The analysis of risk-sharing indicates that households and businesses in the central region suffered more from exposure to idiosyncratic risk, and inability to smooth consumption, especially during the financial crisis. With respect to investment, households and business in the poor Northeast did worse, but more so after the crisis, suggesting a more chronic structural problem there. There is little pattern by age, and gender of the household head, groups which are typically thought of as in need of safety net targeting. The least educated are more vulnerable, but there are exceptions during the crisis. The most salient finding is that wealth does matter, and the poor are uniformly more vulnerable in both consumption and investment. By occupation, wage earners generally and those in agriculture in the Northeast seem vulnerable to shocks, in both consumption and investment, and surprisingly business owners much less so. Wage earners are vulnerable during the crisis in the Central region. This is consistent: low wealth occupations (farmers and wage earners) seem more vulnerable than high wealth occupations (business). An exception occurs for those households in the shrimp business, a relatively large agro-business in the Central region.

Stratifications by wealth and a frequency-of-use analysis with transactions data seem to confirm a stereotypical picture of the literature: the poor lack access to formal credit and insurance markets and are more reliant on remittances, moneylenders, and the informal sector. They seem also more reliant on rice storage and livestock sales. The rich have access to formal credit and use informal lending, savings in financial institutions, and household and productive assets. However, when the transactions data are coupled with the consumption, income, and investment data, a strikingly different pattern emerges. Partial correlation coefficients of consumption-income deficits and investment-income deficits with the various potential smoothing devices show that the poor segment of population are heavy users of formal credit, for both consumption and investment smoothing. Informal borrowing is used more by the middle and upper wealth groups. Likewise remittances, though used by all, seems relatively more important to the middle and upper wealth groups. What remains of the stereotypical picture of the literature is that the poor (and middle) segments are users of rice storage and the rich use savings in formal institutions. Meanwhile, government transfers, while helpful to the poor and middle groups in investment smoothing, seem more helpful to the rich in consumption smoothing.

With these data and the theory of the optimal allocation of risk bearing we conduct an analytic assessment of each of the major financial institutions in the country. We find for example that commercial banks offer limited assistance. The middle and upper classes do seem to use savings accounts to smooth consumption, running down savings when there is a gap between consumption and income. It also appears from an instrumental variable analysis that commercial banks may have helped to smooth consumption overall, especially after the crisis and especially in the Northeast, but the

greater impact of commercial banks in the instrumental variable analysis is with investment, especially after the crisis and again in the Northeast. The inference is that it is among the richer households in the Northeast that commercial banks savings is particularly helpful. Commercial bank lending is available to few households, though again there are hints in the transactions data of helpfulness in smoothing cash flow in investment after the crisis.

In contrast the government operated Bank for Agriculture and Agricultural Cooperatives (BAAC), and other Cooperatives directly, both do quite well in facilitating consumption smoothing. In the transactions data we find that both borrowing and saving with Agricultural Cooperatives are helpful in consumption smoothing for the poor. With regard to investment, the BAAC and the Agricultural Cooperatives appear again to help the poor. In the instrumental variable analysis the BAAC and Agricultural Cooperatives appear to have been helpful in consumption smoothing overall and in the Northeast during the crisis, and effective, to a lesser extent, in smoothing investment, though with mixed signs after the crisis in the central region. Thus the BAAC and Agricultural Cooperatives share with commercial banks an effectiveness in the Northeast but differ on target/clients and the timing, more helpful during the crisis than in the growth period afterward.

Village level quasi-formal financial institutions are prevalent in Thailand. We find that unlike the other formal institutions, Production Credit Groups (PCG's) are helpful in consumption for virtually all regional and time period specifications. As regards investment, village funds do less well but seem particularly helpful in smoothing variable cash flow in the central region during the crisis. In the transactions data movements in PCG credit and saving accounts do help smooth consumption overall, though significant only for the rich with respect to consumption and the middle group with respect to investment. Thus PCG's like the BAAC and the Agricultural Cooperatives help more in consumption than investment, and are helpful as well in counteracting the retrenchment of commercial banks during the crisis. PCG's are distinguished by universal help across both regions, but unlike the BAAC and Agricultural Cooperatives appear to have clients which are relatively rich.

An analysis of the informal sector is highly relevant to the safety-net issue as there would seem to be the potential for the informal sector to step in and fill the gaps in risk reallocation not served by the formal sector, by wealth class and period. Recall that the poor have been shown to be more vulnerable almost always. In the transaction data informal borrowing is helpful overall in consumption but significant under stratifications for the middle class only, not the poor. Money lenders in particular serve the middle segment of the market. Related, in the instrumental variable analysis, informal credit is helpful, but only after the crisis.

In investment the poor are again more vulnerable overall. The instrumental variable analysis of investment indicates that the informal sector was helpful in the central region overall and after the crisis (but again, not during). The transactions data back this up. They show that informal borrowing is helpful overall all but significant for

the middle and rich only, again with money lenders serving the middle segment. Remittances help only the middle segment also. Storeowners credit help the rich (and to a lesser extent the poor, an exception). The conclusion again is that the informal sector helps the wealthier groups The informal sector is not effective in the Northeast, and related again, the informal sector is not particularly helpful to the poor, the group which is most exposed on average to idiosyncratic risk.

In contrast, informal savings in the form of buffer stocks is helpful in smoothing consumption for the poor. That is, in the transaction data, movement of rice stocks helps the poor and middle wealth segments of the surveyed population. Related, household durables are purchased by the poor and middle class at times of surplus and sold in times of deficits. In the instrumental variable analysis rice buffers are effective in the Northeast during the crisis. In contrast, livestock and productive assets in business and agriculture move counter to the smoothing of consumption deficits. And in the investment equations themselves the movement in household durables is again at odds with investment smoothing.

We conclude with a brief comment on what we believe to be the strengths of paper and directions for further research. On the positive side we have shown how to conduct a rigorous assessment of financial institutions, based on the theory of the optimal allocation of risk-bearing, looking at the impact on households and small business. This is distinct from the evolving regulatory framework, e.g., Basel II, which uses financial ratios and loan performance as the basis for evaluation. We are pleased that the 1996 instruments we use in our econometric assessment of impact can be shown to be correlated not only with membership in 1996 but also with subsequent transactions in the panel data. On the other hand, we assess one institution or device at a time whereas households may be using various individually imperfect mechanisms in combination. Likewise, the benchmark standard of full risk sharing is too strong, and subsequent research would need to incorporate information, commitment problems and other potential obstacles to trade. Though we believe we have documented some of the essential micro-underpinnings of the Thai economy, distinguishing idiosyncratic vs. aggregate shocks, wealth, region, time period, occupation, and access/use of formal and informal institutions and markets, a needed next step is to construct macro models which help explain the movement of the aggregates based on those micro underpinnings.

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LIST OF TABLES AND FIGURES

Table 1: Real (per capita) Median Income Growth

	1997-98	1998-99	1999-00	2000-01
All Sample	-.18	.01	-.07	.05
By Region				
Central	-.26	-.06	-.04	.10
Northeast	-.15	.10	-.11	-.01
By Province				
Chacherngsao	-.22	-. 09	-.01	.08
Lopburi	-.29	-.04	-.07	.13
Buriram	-.28	.12	-.12	.04
Sisaket	.09	.09	-.07	-.02

Table 2: Level Change Household Income regressed on Base Period Income by Source, Equation (1).

	Chacherngsao	Lopburi	Buriram	Sisaket
1997-98	Fish* _Remittances _Govt transfers _Wages* _Financial _Agriculture* _Business* _Rentals*	Fish* Govt transfers Remittances _Wages* _Agriculture* _Financial* _Business* _Rentals	Rentals Financial _Remittances _Wages* _Govt transfers _Agriculture* _Business* _ Fish	Govt transfers* Rentals* Remittances _Agriculture* _Wages* _Business* _Financial* _Fish*
Adjusted R^2	.45	.52	.43	.37
1998-99	Financial Remittances _Rentals _Fish _Wages* _Agriculture* _Business* _Govt transfers	Govt transfers* Remittances Financial _Wages* _Agriculture* _Rentals _Business* _Fish	Govt transfers Fish Remittances Financial _Wages* _Rentals _Agriculture* _Business*	Fish* Rentals* Financial _Wages _Remittances _Agriculture* _Business* _Govt transfers
Adjusted R^2	.32	.25	.24	.22
1999-2000	Rentals Remittances _Wages* _Business* _Financial _Agriculture* _Fish* _Govt transfers	Remittances Govt transfers _Wages _Agriculture* _ Financial _ Rentals _Business* _Fish	Rentals* _Wages _Financial _Agriculture* _Remittances* _Govt transfers _Business* _Fish	Fish Remittances _Wages _Govt transfers _Rentals _Agriculture* _Business* _Financial*
Adjusted R^2	.27	.29	.25	.27
2000-01	Rentals Fish Business Financial _Wages* _Agriculture* _Govt transfers _Remittances	Business* Agriculture Financial _Wages _Remittances _Rentals _Fish _Govt transfers	Rentals* Govt transfers _Remittances _Wages* _Agriculture* _Business* _Financial* _Fish	Fish Rentals Remittances* Business* Govt transfers _Wages _Agriculture* _Financial*
Adjusted R^2	.14	.08	.16	.13

Notes: _ indicates Negative coefficients, * significant at 10%, Coefficients are ranked in descending order. Agriculture: Rice, Corn, Vegetable or Orchard Farming and Other Crops, Raising Chicken/Ducks or pig/cow/buffalo and Other Livestock; Fish: Raising Fish or Shrimp; Wages: Wages and Salaries; Business: Rice Mill, Store, Mechanic/Repair Shop, Hair Salon/Barber, Restaurant/Noodle Shop, Trading and Other Business; Rentals: Payments from Land or Other Rentals, Roomers/Boarders; Financial: Interest on Savings, Income-Loan Repayment, Proceeds from ROSCA and Dividends; Government Transfers: Government Assistance, Scholarships or Grants and Retirement Compensation, Remittances: Remittances from Relatives or Friends and Gifts. Tambon fixed effects are included.

Table 3: Reason for Bad Income – Number and % of Households, 1998-1999.

	Chacherngsao	**Lopburi**	**Buriram**	**Sisaket**
11 Flood	17 (10.63%)	0	18 (10.71%)	56 (28.72%)
13 Drought	83 (51.88%)	17 (10.76%)	27 (16.07%)	107 (54.87%)
15 Pests	9 (5.63%)	44 (27.85%)	3 (1.79%)	11 (5.64%)
17 Other reason low crop yield	40 (25%)	49 (31.01%)	27 (16.07%)	100 (51.28%)
19 Fire	0	0	0	10 (5.13%)
21 Low price of output	52 (32.5%)	58 (36.71%)	85 (50.6%)	29 (14.87%)
23 High input price	49 (30.63%)	19 (12.03%)	12 (7.14%)	20 (10.26%)
25 Education expenses higher	8 (5%)	3 (1.9%)	2 (1.19%)	6 (3.08%)
27 Need extra money for ceremony	5 (3.13%)	0	0	10 (5.13%)
29 Lower income due to retirement	0	0	0	0
31 High investment costs	12 (7.5%)	12 (7.59%)	5 (2.98%)	13 (6.67%)
33 Expenses due to illness	4 (2.5%)	4 (2.53%)	4 (2.38%)	6 (3.08%)
35 Building expenses higher	0	0	0	4 (2.05%)
37 Death in family	0	0	0	0
39 Worked fewer days	23 (14.38%)	29 (18.35%)	7 (4.17%)	13 (6.67%)
41 Bad year for hh business	48 (30%)	10 (6.33%)	10 (5.95%)	14 (7.18%)
43 Lost money from gambling	0	0	0	0
45 Unable to repay debts	4 (2.5%)	3 (1.9%)	10 (5.95%)	8 (4.10%)
Other	8 (5%)	18 (11.39%)	3 (1.79%)	9 (4.62%)

Table 4: Change in Consumption onto Change in Income (Levels). Incremental Effect.

				Central		Northeast	
	Overall	Central	Northeast	Crisis	Recovery	Crisis	Recovery
Overall	.057***	.109***	.004	.112***	.082***	.013	.003
	(.000)	(.000)	(.832)	(.000)	(.001)	(.675)	(.919)
Age	.047***	.019	.291***	.019	.012	.254***	.391***
	(.001)	(.275)	(.000)	(.499)	(.620)	(.000)	(.000)
Female	.014	-.065	.315**	-.193	.091	.227	.815***
	(.849)	(.468)	(.031)	(.178)	(.437)	(.252)	(.001)
Educ	-.009	-.001	-.070***	.007	.011	-.046***	-.121***
	(.206)	(.894)	(.000)	(.663)	(.452)	(.017)	(.000)
Wealth	-1.3e-12***	-7.8e-07***	-6.3e-06***	-1.1e-06**	-7.3e-07	-5.4e-06***	-8.8e-06***
	(.000)	(.013)	(.000)	(.021)	(.135)	(.000)	(.000)

Notes: The table reports the coefficient of income change interacted with household characteristics in Equation (4). Line 1, overall, reports the coefficients from OLS regression and lines 2-5 report the coefficient from Median regressions with age, female, education and wealth run jointly. Tambon-specific fixed effects are included in the regression equations. *** indicates 1% significant level, ** 5% and * 10%, respectively. P-values in parenthesis.

Table 5: Investment Change on to Income Change (Scaled). Incremental Effect.

				Central		Northeast	
	Overall	Central	Northeast	Crisis	Recovery	Crisis	Recovery
Overall	2.28***	.068***	2.84***	.103***	.068***	.044	2.84***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.193)	(.000)
Age	-.980***	-.083***	-.624***	-.080***	-.091***	-.049**	-.649***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.040)	(.000)
Female	-1.80***	.048	-1.96***	-.185***	.183***	-.856***	-2.23***
	(.000)	(.201)	(.000)	(.000)	(.005)	(.000)	(.000)
Educ	.229***	-.042***	-.265***	-.008	-.052***	.050***	-.350***
	(.000)	(.000)	(.000)	(.619)	(.000)	(.006)	(.000)
Wealth	-5.7e-05***	-4.1e-06***	-2.1e-05***	-3.5e-06***	-2.1e-06**	-1.1e-05***	-1.5e-05**
	(.000)	(.000)	(.000)	(.001)	(.043)	(.000)	(.044)

Notes: The table reports the coefficient of income change interacted with household characteristics in Equation (5). Line 1, overall, reports the coefficients from OLS regression and lines 2-5 report the coefficient from Median regressions with age, female, education and wealth run jointly. Tambon-specific fixed effects are included in the regression equations. *** indicates 1% significant level, ** 5% and * 10%, respectively. P-values in parenthesis.

Table 6: Vulnerability by Income Source and Principal Occupation.

				Central		Northeast	
CONSUMPTION	Overall	Central	NE	Crisis	Recovery	Crisis	Recovery
By income source							
Agriculture	.597***	.059	.875***	-.007	.157	.768***	.069
Fish farmers	.264**	.310**	.172	.368	.186	-.874	-.242
Wage	1.12***	1.29***	.343	1.71***	.425	.103	.808
Business	-.317***	-.245**	-.242**	-.186	-.238*	-.530***	-.022
INVESTMENT							
By income source							
Agriculture	-2.64***	.201***	-2.49***	.475***	.181***	1.13***	-2.47***
Fish farmers	-1.64*	.791*	1.93	-2.21*	.920*	10.0	-2.98
Wage	6.90***	.203**	7.03***	.504***	.221*	.475	7.03***
Business	-.059	.302***	2.31***	.016	.666***	-.092	2.70***

Notes: The table reports the coefficients of the income change variable by source in Equation (4) and (5). Tambon-specific fixed effects, demographic index and household size are included in these regression equations. No interactions of income change with household characteristics are included. *** indicates 1% significant level, ** 5% and * 10%, respectively. P- values in parenthesis.

Table 7: Use of Financial Device by Wealth

	All	**Poor**	**Middle**	**Rich**
Rental/Financial Income	**.178**	.084	.196	.237
Government transfers	**.041**	.069	.026	.035
Formal borrowing	**.296**	.247	.310	.312
Informal borrowing	**.252**	.260	.252	.245
Informal Lending	**.137**	.121	.134	.165
Remittances	**.479**	.554	.512	.359
Formal savings	**.492**	.377	.518	.591
Rice storage	**.609**	.645	.607	.607
Livestock	**.375**	.420	.386	.341
HH assets	**.208**	.169	.203	.231
Productive assets	**.124**	.035	.119	.223
- Agricultural assets	**.021**	.017	.026	.022
- Business assets	**.070**	.004	.072	.144
- Ponds	**.000**	.000	.000	.000
Cash Holding	**.927**	.939	.936	.907
Jewelry	**.400**	.230	.419	.522

Notes: The table reports the percentage of households in the sample for whom the index of frequency of use (at least 3 out of 4 years) takes on the value 1. The sample is stratified by wealth, where poor, middle, rich represent the 30% , 40% and 30% of the sample respectively.

Table 8. Use of Financial Institutions and Informal sources by Province.

	Lopburi	Chachoeng.	Buriram	Sisaket
Poor (bottom 30% of overall sample)	10%	18%	32%	52%
Middle (40%)	37%	44%	38%	42%
Rich (top 30%)	53%	38%	30%	16%
BAAC (% of customers)	14%	40%	35%	29%
- % with positive savings	16%	35%	38%	25%
- % with positive borrowings	11%	25%	32%	30%
Commercial Bank (% of customers)	40%	36%	16%	18%
- % with positive savings	40%	36%	15%	18%
- % with positive borrowings	2%	1%	0%	0%
Agric. Cooperative (% of members)	21%	13%	6%	21%
- % with positive savings	16%	10%	4%	10%
- % with positive borrowings	9%	7%	2%	8%
PCG (% of members)	8%	5%	4%	8%
- % with positive savings	7%	4%	2%	8%
- % with positive borrowings	1%	0%	0%	2%
Informal Debt (% of users)	30%	21%	19%	32%
Moneylender (% of users)	6%	2%	7%	10%
Rice Storage (% of users)	22%	33%	64%	65%

Table 9: Partial Correlation Coefficients of Consumption and Investment Deficit with Frequency of Use.

	Consumption				Investment			
	All	Poor	Middle	Rich	All	Poor	Middle	Rich
Rental/Financial Income	.057***	.053	.040	.050	.016	.015	-.017	.025
	(.001)	(.011)	(.160)	(.131)	(.370)	(.644)	(.544)	(.456)
Government Transfers	.212***	.070**	.145***	.266***	.042**	.085***	.061**	.043
	(.000)	(.034)	(.000)	(.000)	(.017)	(.011)	(.033)	(.192)
Remittances	.091***	.062*	.101***	.090***	.028	.048	.051*	.024
	(.000)	(.062)	(.000)	(.006)	(.112)	(.145)	(.076)	(.468)
Formal Borrowing	.038**	.104***	.022	.034	.043**	.366***	-.002	.042
	(.029)	(.002)	(.456)	(.304)	(.014)	(.000)	(.930)	(.209)
- BAAC	.027	.047	.009	.029	.004	.091***	-.011	.016
	(.124)	(.158)	(.762)	(.380)	(.845)	(.007)	(.707)	(.623)
- Agric. Cooperatives	.020	.083**	.004	-.009	-.003	.340***	.017	.011
	(.272)	(.013)	(.889)	(.792)	(.885)	(.000)	(.565)	(.746)
- Commercial Bank	.012	dropped	.024	.020	-.004	dropped	-.029	-.007
	(.479)	-	(.410)	(.557)	(.824)	-	(.316)	(.828)
- PCG	.067***	.024	.034	.099***	.031*	-.006	.053*	.031
	(.000)	(.439)	(.242)	(.003)	(.082)	(.858)	(.066)	(.348)
Informal Borrowing	.063***	.008	.060**	.031	.138***	.011	.050*	.129***
	(.000)	(.807)	(.038)	(.347)	(.000)	(.739)	(.083)	(.000)
- Moneylender	.053***	.017	.103***	.017	.024	-.014	.062**	.022
	(.003)	(.606)	(.000)	(.604)	(.170)	(.688)	(.031)	(.517)
- Neighbor	.004	-.023	-.011	.035	.003	-.020	-.014	.003
	(.819)	(.489)	(.701)	(.300)	(.865)	(.558)	(.635)	(.927)
- Relative	.035**	.056*	.046	.017	.028*	.008	.033	.033
	(.051)	(.097)	(.112)	(.604)	(.093)	(.822)	(.253)	(.327)
- Store Owner	.052***	-.008	.017	.030	.179***	.054*	.030	.185***
	(.003)	(.803)	(.566)	(.374)	(.000)	(.105)	(.308)	(.000)
Lending	.026	.035	.040	.037	-.028	-.042	.020	-.025
	(.141)	(.286)	(.170)	(.260)	(.112)	(.210)	(.489)	(.442)
Formal Savings	.032*	.008	.034	.061*	.039**	.011	.037	-.041
	(.075)	(.810)	(.232)	(.067)	(.028)	(.731)	(.193)	(.222)
- BAAC	.005	-.020	.005	-.007	-.005	-.027	.027	.002
	(.782)	(.554)	(.874)	(.844)	(.775)	(.423)	(.346)	(.948)
- Agric. Cooperatives	.001	.065**	.014	.008	.016	-.068**	.005	.020
	(.962)	(.051)	(.620)	(.820)	(.382)	(.042)	(.869)	(.557)
- Commercial Bank	.058***	.017	.060**	.119***	-.069***	.051	.012	-.067**
	(.001)	(.608)	(.034)	(.000)	(.000)	(.128)	(.679)	(.045)
- PCG	.013	.040	-.022	.063*	.013	.033	.030	-.004
	(.455)	(.233)	(.441)	(.061)	(.466)	(.328)	(.309)	(.897)
Informal Savings/Rice	.011	.063*	.063**	.039	.013	.019	.044	-.033
	(.523)	(.058)	(.029)	(.239)	(.481)	(.565)	(.127)	(.320)
Household Assets	.056***	.060*	.051*	.027	.001	-.101***	-.069**	.010
	(.002)	(.070)	(.077)	(.415)	(.952)	(.002)	(.017)	(.769)
Livestock	-.043**	-.092***	-.080***	.007				
	(.015)	(.006)	(.006)	(.823)				
Productive Assets	.011	-.050	-.043	.035				
	(.526)	(.133)	(.133)	(.297)				

Notes: Frequent use is a dummy variable indicating whether the household had a particular type of transaction in 3 out of the 4 years in the panel. P-value in parenthesis.

Table 10: Correlation of 1996 Instruments with Subsequent Frequency of Use.

	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 11: Coefficients of the Instruments in the Membership Equation (8)

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 12: Change in Consumption on Change in Income. Incremental Effect of Commercial Bank

	Overall	Region		Period		Central		NE	
		Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naïve	-.044	-.012	.397***	.025	-.147	.094	.043	.286	.773***
GIS Select	-1.51*	-	-5.08***	-.278	-5.55***	-	-	-3.83*	-5.56**
Headman	-	-	-	-	-	-	-	-	-
Time to Center	-	-	-	-	-	-	-	-	-
Surprise	-1.31	.171	-	-.531	7.01***	1.00	1.34	-	-

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

Table 13: Investment on to Income Change (Scaled). Incremental Effect of the Commercial Bank.

	Overall	Region		Period		Central		NE	
		Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naïve	-.866***	.219***	-.852	.151**	-.939***	.159	-.001	.374**	-1.23
GIS Select	-15.6***	-	-8.44*	-.969	-11.9***	-	-	-.584	-7.64
Headman	-	-	-	-	-	-	-	-	-
Time to Center	-	-	-	-	-	-	-	-	-
Surprise	-13.7***	6.60***	-	5.75***	-25.0***	1.04	-3.35*	-	-

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 14: Change in Consumption on to Change in Income. Incremental Effect of the BAAC

	Overall	Region		Period		Central		Northeast	
		Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naïve	-.129**	.118	-.616***	-.022	-.246***	.272*	.016	-.849***	.052
GIS Select	-.681*	-.045	-3.66***	-.757	.552	-.307	.544	-5.07***	-.852
Headman	-1.26***	.028	-	-1.57*	.456	-.340	.686	-	-
Time to Center	.618	.483	-2.96*	1.82*	2.92***	.712	.166	-8.16***	3.91*
Surprise	-1.43**	1.07	-5.66***	-3.11**	-.590	.067	2.31	-8.73**	-2.83

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

Table 15: Investment on to Income Change; (Scaled). Incremental Effect of BAAC.

	Overall	Region		Period		Central		Northeast	
		Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naïve	2.16***	.558***	1.27***	-.270***	2.19***	-.264**	.600***	.409***	1.87**
GIS Select	-2.60***	.813*	5.14*	.779**	-2.42***	-.259	1.66***	.308	6.45
Headman	-.511	2.89***	-	-.082	-1.62	-.333	2.20***	-	-
Time to Center	-4.67***	2.69***	6.21	.709	-3.55**	.082	3.54***	2.49	6.13
Surprise	13.5***	8.29***	18.4***	5.01***	12.5***	1.20	6.88***	3.86	20.5*

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 16: Change in Consumption on to Change in Income. Incremental Effect of the Agric. Cooperatives

	Overall	Region		Period		Central		Northeast	
		Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naïve	-.051	-.162	-.961***	-.080	-.171	-.324	-.065	-.441	-1.92***
GIS Select	.250	-.245	.023	.158	-.326	-.107	-.092	1.00	-2.53*
Headman	-.919**	.432	-3.40	-.620	-.975	.032	.456	-6.55**	5.65*
Time to Center	-1.43	-	2.59*	-4.22*	-6.77***	-	-	7.13***	-3.42*
Surprise	-.237	-	-11.4***	.311	-1.25	-	-	-10.4***	-13.9

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

Table 17: Investment on to Income Change; (Scaled). Incremental Effect of AgCoop.

	Overall	Region		Period		Central		Northeast	
		Central	NE	During Crisis	After Crisis	During Crisis	After Crisis	During Crisis	After Crisis
Naïve	1.04***	.787***	1.09*	-.165**	.949***	.173	.655***	-.248	1.51
GIS Select	5.32***	2.69***	8.39***	-1.29***	4.84***	-1.51	2.73***	-.082	8.91**
Headman	3.51***	4.30***	4.08	-1.66**	.877	1.02	4.68***	-.920	2.52
Time to Center	10.8***	-	-5.44	-1.64	8.23**	-	-	-2.18	-5.37
Surprise	4.19***	-	3.72	-1.00*	3.52**	-	-	-.159	10.6

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

	Overall	Region Central	NE	Period During Crisis	After Crisis	Central During Crisis	After Crisis	NE During Crisis	After Crisis
Naïve	-.119	-.206	-.828***	-.117	-.287	-.335	.008	-.671	-.867**
GIS Select	7.20***	-1.28	-	6.11**	13.0***	-2.72	-1.65	-	-
Headman	-2.79***	-1.60**	-4.81***	-3.42***	-2.12***	-2.83**	-.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***	-.976	-.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.

Table 19: Investment Change on to Income Change (Scaled).Incremental Effect of the PCG.

	Overall	Region Central	NE	Period During Crisis	After Crisis	Central During Crisis	After Crisis	NE During Crisis	After Crisis
Naïve	1.55***	.773***	1.36*	-.595***	1.51***	-.129	.759***	-.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***	-.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**	-.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 20: Change in Consumption on Income Change (Level). Incremental Effect of Informal Debt

	Overall	Region Central	NE	Period During Crisis	After Crisis	Central During Crisis	After Crisis	NE During Crisis	After Crisis
Naïve	.023	.079	-.255*	.079	-.275***	.103	-.019	.017	-1.13***
GIS Select	.395	.161	-	.461	-1.53**	1.04	-.993	-	-
Headman	-	-	-	-	-	-	-	-	-
Time to Center	-1.10	-.522	-	-3.23*	-5.19***	-.770	-.179	-	-
Surprise	1.03	.757	-1.17	1.85	-1.59	1.71	-1.15	-4.61	3.39

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

Table 21: Investment on to Income Change. Incremental Effect of Informal Debt.

	Overall	Region Central	NE	Period During Crisis	After Crisis	Central During Crisis	After Crisis	NE During Crisis	After Crisis
Naïve	-.600***	.255***	-1.42***	.549***	-.984***	-.390***	-.148**	-.240*	-1.50*
GIS Select	-9.44***	-2.74***	-	2.97***	-8.10***	3.53***	-2.68***	-	-
Headman	-	-	-	-	-	-	-	-	-
Time to Center	8.30***	-2.91***	-	-1.27	6.31*	-.088	-3.83***	-	-
Surprise	3.50**	2.54***	-4.62	3.77***	.981	-.227	-.374	-2.05	-10.5

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 22: Change in Consumption on Change in Income. Incremental Effect of Rice Storage.

	Overall	Region Central	NE	Period During Crisis	After Crisis	Central During Crisis	After Crisis	NE During Crisis	After Crisis
Naïve	.355***	.190	-1.37**	.381**	-.518	.173	-.222	-.737	-1.61**
GIS Select	-	.776	-1.82	-	-	5.00	-.478	-3.34	5.17*
Time	-	-	-11.3*	-	-	-	-	-31.2***	14.9*
Surprise	-	-	1.85	-	-	-	-	7.33	-5.39

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

Table 23: Investment on to Income Change. Incremental Effect of Rice Storage.

	Overall	Region Central	NE	Period During Crisis	After Crisis	Central During Crisis	After Crisis	NE During Crisis	After Crisis
Naïve	-.653	-.324	-1.46	.002	-.666	-.119	.386	.025	-1.51
GIS Select	-	-13.2***	4.07	-	-	17.0***	-12.9***	-1.02	10.9
Time	-	-	23.7	-	-	-	-	9.51	23.4
Surprise	-	-	7.35	-	-	-	-	3.25	16.8

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

APPENDIX A

Table A.1: Summary Statistics, 1997

Variable Description	# of obs	Mean	St.Dev.
Household Characteristics (total 960)			
Household Consumption (Bahts)	924	90964	151241
Household Investment (Bahts)	429	13960	96630
Household Income (Bahts)	927	76119	232359
Age of Head	912	51	14
Age of Head Squared	912	2812	1456
Gender of Head (1 if Male)	912	.75	.43
Years of Schooling of Head	904	4	2.86
Household Wealth (in Baht)	924	62670	115217
Household Wealth Squared (in Baht)	924	1.72e+10	6.78e+10
Household Size (members)	923	4.6	1.9
Number of Male Adults	923	1.4	.93
Number of Female Adults	923	1.6	.77
Number of Children (age<18)	923	1.6	1.2
Village Characteristics			
Mean Wealth in Village (Bahts)	64	63039	45536
Mean Wealth in Village Squared (Bahts)	64	6.0e+09	8.6e+09
Mean Education in Village (years)	64	4.01	1.04

Table A.2. Summary Statistics on Financial Transactions. (flows or changes)

	%HH+	Years*	25%	50%	75%	St.Dev.
Deficit (cons-inc)	100	4.0	-13000	4795	23460	154465
Rental/Financial Income	53	2.0	125	975	5000	12000
Gov't Transfers	19	1.8	500	1325	2700	50400
Borrowing	84	2.8	-4525	60	5800	35800
- Formal Borrowing	51	2.4	-3000	720	6950	27000
- Informal Borrowing	62	2.1	-5000	-450	2500	30300
Lending	38	2.2	-22500	-7600	-2500	61300
Remittances	82	2.7	1200	4300	10900	18600
Savings	90	3.5	-1600	-100	1800	43500
- Formal Savings	79	2.7	-450	-25	1250	70000
- Rice Storage	67	3.2	-1500	-420	750	3800
Asset trade	94	3.0	-14700	-3700	250	120000
- HH Assets	86	1.9	-6100	-1600	-250	19200
- Livestock	24	2.1	-2500	1250	6250	19200
- Land/Ponds	21	1.3	-17500	-4000	15000	300000
- Productive	69	2.4	-260	600	6500	117400

Notes: + percent of households with a recorded transaction.
* Mean number of years that the financial transaction is carried out by the household out of the 4-year panel data.

Table A.3. Village Characteristics, CDD 1996.

Village Characteristics	# obs	mean	St.dev.
Fraction of Farmer Households	64	.245	.283
Fraction of HH w/Multiple Occupations	63	.491	.345
Assembly Hall in Village (1 if yes)	64	.438	.500
Access to Water Services (1 if yes)	62	.355	.482
Access to Electricity (1 if yes)	63	.984	.126
Fraction of HH exclusively in Paddy Production	60	.279	.369
Fraction of Farmers growing government promoted varieties	63	.561	.371
County Status relative to Province(1,2,3)*	64	2	.435
Member migrates to work? (1 if yes)	64	.354	.221

* Qualitative variable with 1=above average, 2=average, and 3=below average

Table A.4: Regressing Household income change onto time-specific fixed effects

Time Dummies	All Sample Coefficient	P-value	Central Coefficient	P-value	Northeast Coefficient	P-value
TOWNSEND-THAI Data						
1997-98	-1120.163	0.016	-2516.863	0.002	153.652	0.754
1998-99	395.854	0.392	-881.836	0.269	1596.774	0.001
1999-00	-1800.597	0.000	-2099.467	0.008	-1512.011	0.002
2000-01	603.138	0.191	753.864	0.342	459.218	0.349
R2	0.0054		0.0084		0.0091	
Prob>F	0.0001		0.0009		0.0003	
Obs	3618		1756		1862	

Table A.5: Regressing Household Consumption Change onto time-specific fixed effects

Time Dummies	All Sample Coefficient	P-value	Central Coefficient	P-value	Northeast Coefficient	P-value
TOWNSEND-THAI Data						
1997-98	-4873.324	0.000	-5332.876	0.000	-4446.596	0.000
1998-99	363.001	0.374	1480.457	0.016	-694.506	0.200
1999-00	-905.69	0.026	-953.273	0.117	-859.524	0.114
2000-01	593.106	0.146	1026.804	0.091	167.893	0.758
R2	0.0382		0.0436		0.0349	
Prob>F	0.0000		0.0000		0.0000	
Obs	3623		1771		1852	

Table A.6: Regressing Household Investment onto time-specific fixed effects

Time Dummies	All Sample Coefficient	p-value	Central Coefficient	P-value	Northeast Coefficient	p-value
TOWNSEND-THAI Data						
1997-98	3860.084	0.000	4306.129	0.000	3422.472	0.000
1998-99	-468.128	0.153	-1140.926	0.024	186.333	0.655
1999-00	1580.115	0.000	1628.293	0.001	1533.446	0.000
2000-01	827.785	0.011	780.082	0.122	874.886	0.036
R2	0.0424		0.0443		0.0410	
Prob>F	0.0000		0.0000		0.0000	
Obs	3771		1864		1907	