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by

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Abstract: Families in developing countries face enormous financial risks from major illness both in terms of the cost of medical care and the loss in income associated with reduced labor supply and productivity. We test whether access to microfinancial savings and lending institutions helps Indonesian families smooth consumption after declines in adult health. In general, results support the importance of these institutions in helping families to self-insure consumption against health shocks.

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Families in developing countries face enormous financial risks from major illness both in terms of the cost of medical care and the loss in income associated with reduced labor supply and productivity. Because of holes in public social safety nets and the lack of formal insurance markets in developing countries, families are forced to rely on private, informal insurance mechanisms such as drawing on savings, transfers, and credit.[1] However, recent evidence suggests that families relying solely on informal mechanisms are not very well able to insure consumption over periods of major illness (Gertler and Gruber, 2001).[2]

Financial savings and other assets, thus, often play a key role in insuring families' consumption against health crises center. One promising strategy to help families insure consumption is to make savings more convenient and improve access to credit (Morduch, 1999). Indeed, savings play a major role in insuring consumption in lifecycle theories (Deaton, 1992). Empirically, Gertler and Gruber (2001) show that Indonesian families with more assets are better able to insure consumption against major illness. More generally, Jalan and Ravaillon (1999) find that wealthier Chinese households are better able to insure consumption against income shocks. In addition, studies from India (Rosenzweig and Wolpin, 1993) and West Africa (Fafchamps, Udry, and Czukas, 1998) suggest that sales of livestock help insure consumption.

Battling the ideal of offering credit and savings plans, commercial financial institutions in developing countries are weak and do not adequately service the poor. These institutions are typically not conveniently located, require substantial collateral for loans, and impose large costs on savings (Morduch, 1999). In addition, nonfinancial savings mechanisms often involve substantial risks (for example, farm animals can get sick) and high transaction costs (for example, from pawning jewelry).

In contrast, microfinance programs such as the Grameen Bank in Bangladesh, BankcoSol in Bolivia, and Bank Rakyat in Indonesia hold substantial promise (Morduch, 1999). These programs are typically targeted at the poor and near poor, have alternatives to collateral for loans such as group lending and peer monitoring, actively promote savings, and provide a safe low-cost haven for savings.

In this paper, we examine the roles of both large commercial and microfinance institutions in helping families insure consumption against major illness in Indonesia, a developing country with financial features of special interest for this analysis. Indonesia is the fourth most populous country in the world, with tremendous cultural and economic diversity. From the end of the 1960s until the 1997 financial crisis, real per annual capita growth rate has been an impressive 3.9 %. Even after this growth, per capita incomes were still only $U.S. 880 per year in 1996 (Asian Development Bank, 1997). Moreover, few individuals are covered by health insurance other than the implicit insurance provided through the almost free but low-quality public health care system. Disability insurance is almost nonexistent.

Indonesia has a number of microfinance programs that provide financial services to low-income households. The most important of these is Bank Rakyat Indonesia (BRI), which lends to "better-off" poor and nonpoor households. BRI requires individual borrows to put up collateral, a policy that excludes the very poorest borrowers. However, BRI has pursued a strategy of setting up many small local branches where loan officers can get to know their clients and identify good credit risks. Collateral is often defined loosely, and the staff has discretion to

[1] See Morduch (1995 and 1999) and Townsend (1995) for reviews of the consumption-insuring literature.

[2] In fact, Cochrane (1991) shows that households in the United States are not able to fully insure consumption against major illness.

increase the loan size for reliable borrowers who may not be able to fully collateralize their loans. Loan officers typically start clients off with small loans and condition future larger loans on repayment rates. In 1996, BRI served 2 million borrowers with an average loan size of $1,007 and had a repayment rate of 98% (McGuire, 1998).

BRI also made savings a major part of its activities in 1986, before which time households had to save in accounts managed by Bank Indonesia (BI). Few BI branches are located in rural areas, where 80% of the population lives, and BI limits withdrawals from savings accounts to twice a month. In contrast, BRI offers unlimited withdrawals and offers a lottery where the chances of winning rise with the level of the deposit. By 1996, over 16 million households (one-sixth of all households) had a savings account with BRI. Account balances are fairly small, at about $184 on average (Yaron et al., 1998).

We begin this paper by testing whether Indonesian households are able to insure consumption against major illness shocks. Previous work has had mixed results, with smallest results tending to rely on self-reported morbidity. For example, Townsend (1994) has found that the percentage of the year that an adult male is sick has no impact on consumption. Kochar (1995) has modeled wage income and informal borrowing as a function of illness in the family, as measured by a member of the family experiencing a loss of work due to illness. She finds that illness to the male lowers wage income and increases informal borrowing during peak periods in the agricultural cycle, but that there are no effects during slack periods and no effects of female illnesses.

A key limitation of past work, however, is that the measures of health employed may reflect only small, and even potentially anticipated, changes in health status, not the kind of large unexpected major illnesses that may be difficult to insure. Even if families are able to insure frequent small illness shocks, they may not be able to insure the large rare shocks. This would imply that it is important to use measures of more severe illness in fully assessing the ability of households to insure consumption.

We address the potential shortcomings of previous work in this area by using measures of individuals' physical abilities to perform activities of daily living (ADLs). ADLs have been proven to be reliable and valid measures of physical functioning ability in both developed and developing countries, and distinguish the type of serious exogenous health problems that are likely to be correlated with changes in labor market and consumption opportunities (Stewart et al., 1990; Strauss et al., 1993). Gertler and Gruber (2001) use this measure in a different Indonesian data set and find that families are only able to insure about 40% of the costs of a major illness. We find results consistent and remarkably close to those of Gertler and Gruber.

In the next section, we test whether the reduction in consumption is a result of state-dependent utility or a result of an inability to insure the costs of illness. By observing the same household in two moments in time we can abstract from all permanent characteristics of the households that may affect ability to smooth consumption and induce spurious correlation. We also control for many observable time-varying characteristics of households. We reject state dependence across the board. One of the state-dependence tests is whether households with more assets have the same reduction in consumption as poorer households, which we reject in favor of the hypothesis that wealthier households reduce consumption by considerably less. This result is consistent with the theory that households that save more are better able to insure consumption against illness.

Finally, we estimate the effect of geographical proximity to financial institutions on consumption smoothing. An important difficulty in estimating the effect of credit availability on

consumption smoothing is that private profit-maximizing credit institutions are likely to be located in prosperous areas, making it difficult to interpret the estimated correlations. We use data on the location of both branches of private banks and of a microfinance institution, BRI. Because BRI targets less prosperous populations, the location of its branches is less likely to suffer from the endogeneity problem that may affect location of private banks. We show that households that are closer to financial intuitions are better able to insure consumption. We find that the estimated effect of being close to a BRI branch is similar to the estimated effect of being close to a commercial bank, suggesting that our results are not likely to be explained by endogenous location of credit institutions.

The remainder of the paper is organized as follows. In the next section we describe our basic empirical specification, the ADL index and report estimates of a simple model of consumption and health. In Section 2 we report the results of several state dependency tests. Section 3 we report estimates of the effect of geographical proximity to financial institutions on consumption smoothing. Concluding remarks and policy implications are in Section 4.

1. HEALTH AND CONSUMPTION

Empirical Specification

In this section, we test whether households are insuring consumption against unexpected costs of illness. Our empirical specification is based on the theory of full insurance, which casts consumption insurance in terms of interhousehold risk sharing (e.g., Cochrane, 1991; Deaton, 1994; and Townsend, 1994). In practice, however, our empirical specification follows the previous developing country literature in examining consumption *insurance*, either through mutual insurance with others or through self-insurance (i.e., savings). Indeed, our empirical tests do not distinguish between these two channels for consumption insurance. The key empirical insight of the theory of full insurance is that the growth in each household's consumption will not depend on changes in household resources that are uncorrelated with shifts in preferences once the growth in community resources has been taken into account.

Therefore, we can test whether families are able to insure consumption against illness by estimating the following equation:

$$\Delta \ln(\frac{C_{ij}}{n_{ij}}) = \alpha_j + \beta \Delta h_{ij} + \sum_k \lambda_k X_{ijk} + \varepsilon_{ij} \quad , \tag{1}$$

which is a regression of the growth in log per capita (nonmedical care) consumption for household i in community j against community fixed effects (α_j), the change in health (Δh_{ij}), a series of demographic controls (X_{ijk}), and a random error (ε_{ij}). Equation (1) regresses first differenced household consumption per capita against the change in health. We include demographic controls to capture other secular trends: the husband's and wife's age and education, and the change in log family size and family structure. If there is full insurance of illness, then there will be no effect of the change in health on the change in consumption, implying $\beta = 0$.

A major assumption of the insurance interpretation, however, is that the utility function is separable in consumption and health, and in consumption and leisure. As a result, the marginal utility of consumption does not depend on the state of health directly, nor indirectly through induced changes in leisure. If this is not true, then even with full insurance, the growth of consumption will vary with the state of health. That is, in the formulation above, Δh_{ij} will be

correlated with omitted preferences and thereby with the error term, biasing the estimated coefficient β in equation (1). An important feature of our empirical strategy is to test for such "state dependence" in consumption behavior. Indeed, this is a major purpose of this section. As we discuss in detail later, we find no evidence that state dependence explains our empirical results.

The model is a fixed-effects specification and as such, controls for unobserved heterogeneity. In particular, the first differencing sweeps out correlations from omitted unobserved household characteristics (such as preferences and health endowments) that confound identifying the effect of illness on consumption. We also control for province fixed effects (interacted with rural versus urban) to capture differences in regional price levels, weather, and so forth.

A related concern is idiosyncratic changes in household income that feed back into health; for example, a bad harvest or job loss that results in a deterioration of health (perhaps through lower nutrition or mental depression). However, our empirical results, presented in detail later, suggest that this alternative explanation does not account for our findings. In particular, the finding that the effects of illness on consumption are stronger for families who are not well insured is inconsistent with an idiosyncratic shock or with reverse causality driving the results.

Data and Measurement

We estimate the model with data from the Indonesia Family Life Surveys (IFLS).[3] The IFLS is a panel survey of over 7,000 households representative of 83% of the population and collected socioeconomic information including a detailed consumption module at household level and detailed information from individuals including health status measures. In addition, village officials were surveyed regarding local institutions including availability of commercial banks and microfinance programs.

The IFLS interviewed households in 1993 and again in 1997. Our sample includes all households with nonmissing variables with a husband and a wife, and where the husband was under age 60. There are 7,224 households in 1993, of which 6,742 can be matched in 1997. Raw self-reported consumption data appear rather noisy. In order to minimize measurement error in consumption, we trim the bottom and top 1 % in 1993 and 1997, and the bottom and top 1 % in consumption changes between 1993 and 1997. After trimming we are left with 6,353 observations. Of these, 4,480 observations have nonmissing values for all the relevant variables. After dropping single-headed households and households with heads over age 60, we are left with 3,281 observations. Results are similar when we included single-parent households in the sample.

The dependent variable for our analysis is the change in the log of monthly nonmedical consumption per capita. Consumption was measured using a 30-minute 57-item questionnaire covering a comprehensive list of food and nonfood consumption items. The questionnaire was developed based on Indonesia's 2-hour, 300-plus item consumption questionnaire used in their budget-expenditure survey, which is collected every three years as part of the 60,000 household National Socio-Economic Survey of Households (SUSENAS). Extensive pilot testing was used to aggregate the 300-plus item list to 57 items. The questionnaire collected both expenditures and the value of home-produced consumption for each of the 57 items. The 1993 IFLS log per

[3] See Frankenberg et al. (1993) Frankenberg and Thomas (2000) for detailed descriptions of the surveys.

capita consumption distribution closely matches the same distribution generated from the longer SUSENAS for the same geographic locations.

Consumption is in nominal per capita terms. However, we account for location-specific differences in inflation rates by including a separate intercept for the rural and the urban areas of each province. The means for consumption expenditures are shown in Table 1.

The key independent variable is the change in health, measured by an index of an individual's self-reported ability to physically perform activities of daily living (ADLs). These physical functioning measures are based on individuals' self-ratings of ability to engage in specific activities, not based on general assessments of illness symptoms. These self-reported physical functioning measures have been tested extensively for reliability (consistency between tests and interviewers) and validity (consistency between individual assessments of different skills). In the United States and South East Asia, they have been found to be reliable and valid self-assessments with a high degree of internal consistency (Andrews et al., 1986; Guralnik et al., 1989; Ju and Jones, 1989; Strauss et al., 1993; Ware, Davies-Avery, and Brook, 1980). They are routinely used in studies of labor supply in the United States (e.g., Bound,1991; Bound et al., 1995; Stern, 1989). In addition, in contrast to self-reported illness symptoms, these measures tend to be negatively correlated with income and education in both U.S. and low-income samples (e.g., Strauss et al., 1993; Smith and Kington, 1997; Gertler and Zeitlin, 2001).

The specific ADL questions in the IFLS survey were adapted from standard U.S. measures after extensive testing and modification to ensure that questions fit the local cultural context. To minimize measurement error, every adult in the household was interviewed directly and proxy responses were not accepted. The IFLS ADL questions consisted of ability to carry a heavy load for 20 meters; sweep the floor or yard; walk for 5 kilometers; take water from a well; and bend, kneel, or stoop. The responses to these questions on the survey were coded either as can do it easily (a value of 1), can do it with difficulty (3), and unable to do it (5).

The responses to these questions were then combined in accordance with the following algorithm developed for the RAND Medical Outcome Study (Stewert et al., 1990):

$$ADL\ Index_i = \frac{Score_i - Minumum\ Score}{Maximum\ Score - Minumum\ Score}$$

The ADL index takes on a value of 1 if the individual can perform all ADLs without difficulty and zero if the individual cannot perform any ADLs.

The means and standard deviations of the health outcome measures for the husband and wife are presented in Table 1b. On average, in our sample, the mean ADL index for the husband is 0.98 in 1993 and 0.97 in 1997 out of a possible 1. The percentage of husbands who have an ADL index equal 1 is 92 % in 1993 and 86 % in 1997. The decline is more pronounced for wives, for whom 83 % have an index equal to one in 1993 and 65 % in 1997. Within a cross section, there is no trend in the ADL index as people age from 20 to 60 for either husbands or wives.

Many respondents report changes in health status between 1993 and 1997. Figure 1 pictures the distribution of the nonzero changes in the ADL indices. Between 1993 and 1997, 12 % of the heads in the sample report a deterioration of their ADLs, 5 % report an improvement, and 83 % report no change. For wives, 29 % report a deterioration in their ADLs, 11 % report an improvement, and 60 percent report no change.

To interpret average ADL changes, the change in ADL index for an individual who in 1993 has no difficulty in performing all ADLs and fully loses the capacity to perform 1 activity of daily living out of 5 by 1997 would be -0.2. If he or she lost the ability to perform them all, then the change in the index would be –1. If he or she was unable to perform any of the ADLs in 1993 and then was able to perform all in 1997, the change in the index would be +1.

Despite their severity, changes in ADLs are often not permanent. There are many improvements, which reflects an important difference in the interpretation of ADLs in developed and developing country contexts. In wealthier and more developed countries such as the United States, limitations in the ability to feed oneself, bathe, and toilet indicate a severe incapacitation that would make one close to bedridden and may reflect long-term disability. However, in a developing country setting such as Indonesia, performing basic physical activities requires more ability than in developed countries. For example, bathing in much of Indonesia generally requires going to the river and bathing using a sarong (a large tubular-like fabric) to maintain modesty. This requires much more effort and coordination than bathing in one's house. Also, toileting requires the use of Eastern as opposed to Western toilets, which often are located outside the main living quarters. Hence, basic indicators capture less severe limitations in Indonesia than such indicators would in more industrialized nations. As a result, it is not surprising that people recover from basic limitations, suggesting that we are indeed measuring severe temporary changes in health as opposed to permanent deterioration. This is confirmed by the fact that effects are similar when we examine only decreases in the ADL index.

Although the ADL index is a more objective measure of health status than self-reported symptoms (see Gertler and Gruber, 2001), it may still contain a certain amount of subjective judgment. Fortunately, identification of the econometric models in this paper comes from changes in ADL between 1993 and 1997. To the extent that the subjective component in an individual's assessment of his or her physical capabilities is constant between 1993 and 1997, it is differenced out in our analysis.

In addition to the ADL index, we control for preference shifts associated with changes in family size or structure by including the change in log family size and a series of measures of the change in the share of the family that is male and female in age groups 0-5, 6-17, 18-49, and 50 plus. As noted above, we also control for other potential taste shifters that might be correlated with illness: the head's gender, age, education, and marital status, and the wife's age and education.

Results

The basic results are presented in Table 2. Model 1 replicates the basic model in Gertler and Gruber (2001), which uses the whole sample including households with single heads and heads over 60 years old. Gertler and Gruber estimate this model on a different Indonesian data set from 1991 and 1993. They estimate a coefficient on the change in the head's ADL index of 0.195, which is close to our estimate of 0.165.

Model 2 replicates this specification using our sample, which excludes single-headed households and households where the head is more than 60 years old. The coefficient on the change in the husband's ADLs increases slightly to 0.199. The increase in coefficient mostly reflects the fact that by placing a limit on the age range, we are focusing on younger heads that are more likely to be working and therefore lose more income when they become ill.

Finally, the last model reported in Table 2 adds the change in the wife's ADL index. Here, the coefficient on the change in the husband's ADL index increases to 0.219 and the coefficient on the change in the wife's ADL index is somewhat lower at 0.172. This gap is consistent with the fact that the males work more hours for pay and command a higher wage rate than do females. Therefore, a husband's illness represents a larger loss of income than when the wife experiences the same illness. An illness that reduces the ADL index by limitation to the husband reduces consumption by 2.4 percent, while the same reduction to the wife reduces consumption by 1.8 percent. If the illness causes the husband to go from being able to perform all activities to not being able to perform any, consumption falls by 22 percent. A similar illness to the wife reduces consumption by 17 percent.

The control variables show a reasonable pattern of effects. Consumption growth rates are higher for older and better-educated adults. Per capita log consumption changes fall with the change in log family size, indicating some economies of scale in consumption. There is no clear pattern to the coefficients on the changes in demographic shares, which are mostly statistically insignificant.

2. STATE DEPENDENCE TESTS

The fact that illnesses measured by ADL changes are very strongly associated with consumption changes suggests that they represent uninsured shocks to a family's opportunity set.. An alternative interpretation of our results is state dependence; that is, when adults' health declines, their preferences may change in ways that reduce consumption.

It seems unlikely that state dependence could account for the very large family consumption effects that we find, given that we are measuring illness to only one of the adults and that the average family size in our data is almost five. For example, if consumption is distributed equally across family members, a movement in intermediate ADLs from 1 to 0 would have to lower the husband's consumption by roughly 100 % to explain our result.

Of course, due to differential economies of scale and consumption patterns within the household, the head may account for more than 20 % of family consumption; thus, this result cannot conclusively refute state dependence as an explanation for our findings.

Moreover, the illness of the head may be correlated with illness to other family members so that the large percentage effect on family consumption reflects family-wide changes in tastes. This latter hypothesis is tested by including in our model changes in the ADLs of the wife. In fact, when we do so, we find that the coefficient on change for the head's ADLs actually slightly increases. This is to be expected as there is a very low correlation between the illnesses of the head and the wife (correlation = 0.10). While the magnitude of the estimated effect of ADL changes suggests that state dependence is not the main cause of our results, in this section we propose three more rigorous tests to demonstrate that state dependence is not driving our findings.

The Relative Effect of Husband and Wife Health

Our first test for distinguishing state dependence extends the results just presented to assess whether the health of the husband and the wife affects consumption in proportion to the amount they contribute to family income. If there is state dependence, then health should affect consumption regardless of the amount each individual works for pay. If the results are due to

lower incomes, not state dependence, then health should affect consumption in proportion to the individual's contribution to family earnings.

We examine this hypothesis by testing whether the change in the husband's ADL index has the same effect on change in consumption as the change in the wife's ADL index when weighted by their relative contribution to income. We use predicted male and female wages adjusted for age, education, and location (province interacted with rural or urban) to measure the husband's and wife's contribution to full income. The predicted wages are constructed based on regressions using the 1993 SAKERNAS Labor Force survey, which is a nationally representative survey of over 40,000 households. The sex-specific regressions included age, education and location (province interacted with rural versus urban location). The predicted wage from this regression was matched to all persons, regardless of whether or not they work in the market.[4]

Model 1 in Table 3 reports the results when the change in wage-weighted ADL indices is used in place of the change in unweighted indices. Recall that the estimated coefficient on the change in the husband's unweighted ADL index is about 25 percent larger than the wife's estimated coefficient. In contrast, the coefficient on the change in the wage-weighted husband's ADL index is almost identical to the coefficient on the change in the wife's wage-weighted ADL index. Weighting by the predicted wage moves the coefficients closer together. The results are similar if the weights are derived from 1993 imputed earnings (equal to 1993 actual hours from the IFLS times imputed wages from the SAKERNAS) instead of imputed hourly wages. The fact that health shocks weighted by relative earnings affect consumption in the same way suggests that health is operating through the budget constraint, not through state-dependent preferences.

As a benchmark for later analyses, Model 2 reports the coefficient on the sum of the changes of the wage-weighted husband's and wife's ADL indices. Consistent with the results above, each loss of one ADL by the husband or 1.25 ADL decline by the wife reduces consumption per capita by about 2.

Physical Laborers vs. Nonphysical Laborers

The assumption underlying our discussion is that illness affects consumption by lowering the earning potential of workers. Alternatively, state dependence acting through illness should reduce the food consumption of individuals who work in physically demanding jobs more than those working in nonphysical labor jobs. Intuitively, a disability lowers the calorie needs of someone who was harvesting crops but has less effect on a shopkeeper or office worker. Thus, a test of our view versus state dependence is to consider the effects of illness on physical labor workers relative to nonphysical labor workers.

To test this hypothesis, we interact the change in the wage-weighted ADL indices with whether the person had a physical labor job in 1993—the base year (Model 3). We define physically demanding jobs as laborers in construction, agriculture, and other occupations that require physical labor. The sample for this analysis is restricted to households in which the husband was working at least 20 hours in 1993.

The estimated interaction is small and insignificant for both the husband and wife. That is, the reduction in consumption is not largest for those performing physically demanding tasks in

[4] The valuation of nonmarket work at the market wage is only appropriate if labor markets clear. This assumption is supported for Indonesia by Pitt and Rosenzweig (1985) and Benjamin (1992).

1993, in contrast to the hypothesis that health effects operate on consumption by reducing the demand for food (that is, we provide no evidence that state dependence is important).

Self-Insurance

Our third test for state dependence is to assess how our effect varies with the ability of families to self-insure. If our results are due to inadequate insurance, families that are better able to self-insure should see a smaller effect of illness on consumption. Thus, a reduction in the labor supply or increase in medical care expenditures should not reduce consumption much for families with high assets and savings in the first period (1993). However, there is no reason why state dependence should be smaller for these well self-insured families.

Thus, if the effect of illness is much larger for poorly self-insured families, it suggests that these effects are operating through the budget constraint and not through state dependence. Our test therefore consists of including an interaction of illness with the indicator for ability to self-insure. A negative interaction would suggest that having self-insurance mitigates the effect of health shocks, which would be consistent with our hypothesis of imperfect insurance but inconsistent with state dependence.[5] Our measures of self-insurance are family assets and savings.

We investigate this proposition in Models 4 and 5 in Table 3. In Model 4, we interact the change in the sum of the wage-weighted ADLs with whether the household was in the top quarter of the asset distribution in 1993[6]. The interaction is negative and significant. Moreover, the estimated value of interaction completely offsets the main effect, suggesting that families in the top quarter of the asset distribution are able to fully insure consumption against illness. In Model 5, we interact the change in ADLs with another measure of baseline wealth—savings divided by consumption in 1993. Again, the interaction is negative and significant, implying that those households that have more savings relative to consumption are better able to insure consumption against illness shocks. The fact that there are sizable and significant negative interactions with baseline wealth and savings measures is consistent with our interpretation of the ADL change as measuring a shock to the budget constraint.

To summarize, we find that health shocks to both the husband and to the wife matter in proportion to their contribution to family earnings, that the effects of health shocks are the same for physical and nonphysical laborers, and that families with significant assets are unaffected by health shocks. Taken together, these findings strongly refute the contention of state dependence.

3. ACCESS TO FINANCIAL INSTITUTIONS

In this section, we address the question of whether access to financial institutions helps families insure consumption against health shocks. Financial institutions can help in a number ways. First, they can provide a safe and convenient vehicle for savings that can be used to maintain consumption in times of ill health. Second, to the extent that the expected real returns

[5] Morduch (1995) also discusses self-insurance as a means to maintain consumption.

[6] Assets are measured with substantial error and have substantial outliers. Thus, we use quartiles in the asset distribution. Assets include the value of land, jewelry, cattle, cars, tractors, dwellings, and savings. In 1993, assets were 40 percent of household consumption for the bottom quartile, rising to 12.8 times consumption for the top quartile.

are higher in savings accounts than in other assets (rice storage, bullocks, or gold jewelry), access to financial institutions may increase assets. Third, financial assets tend to be more liquid than others. Fourth, financial institutions finance the purchase of productive assets such as bullocks, which can be sold in times of illness. Relatedly, presence of a bank may facilitate the savings that provide the capital or collateral to buy a large productive asset such as a bullock.

Health shocks may be difficult to smooth using credit because few financial institutions will provide uncollateralized consumption loans, especially to individuals with whom they do not have a long-established relationship. Even with such relationships, new infusions of credit require collateral and a credible promise to repay the loan. Serious health shocks draw down collateral directly as families maintain consumption levels when income falls. In addition, illness depreciates the stock of human capital that well-informed lenders use to select borrowers.

For these reasons, we believe that financial institutions primarily help families insure consumption by facilitating the accumulation of savings both through savings accounts and the purchase of assets. Indeed, there is strong evidence from the last section that families that have substantial assets and those that have a high savings to consumption ratio are substantially better able to insure consumption against illness. This is also consistent with the general literature on consumption smoothing (e.g., Jalan and Ravallion, 1999).

Access

In a nation whose rural areas have no ATMs, distance to the financial institution measures the value of time spent making deposits and withdrawals. Given that these institutions are only open during "banking" hours and transportation is time-consuming, even short distances can greatly raise the cost of access to savings. Moreover, microfinance institutions such as BRI engage in community outreach programs whose effectiveness diminishes the further away one lives from the institution.

Access to financial institutions also affects the ability of households to borrow. With default risk, lenders' willingness to provide credit depends in part on borrowers' collateral and on lenders' information about the borrowers' ability to repay. In less-industrialized nations such as Indonesia, formal capital markets are highly imperfect. With transaction costs and information that declines with the distance between the lender and borrower, the location of a bank can have a large effect on credit availability. Moreover, BRI depends on intimate knowledge of the borrower as part of its "collateral" requirements for loans.

We evaluate the effect of distance from the household to large commercial banks and to microfinance programs. However, we focus much of our attention on the microfinance programs because they are typically targeted to segments of the population that usually do not have access to credit or savings institutions, especially the poor. Moreover, microfinance programs can be more easily facilitated into poor areas by government action than the other types of institutions.

Indonesia has a number of microfinance programs that provide financial services to low income households. The most important of these is BRI, which lends to "better-off" poor and nonpoor households. BRI requires individual borrows to put up collateral, a policy that excludes the very poorest borrowers. However, BRI has pursued a strategy of setting up many small local branches where loan officers can get to know their clients and identify good credit risks. Collateral is often defined loosely, and the staff has discretion to increase the loan size for reliable borrowers who may not be able to fully collateralize their loans. Loan officers typically start clients off with small loans and condition future larger loans on repayment rates. In 1996,

BRI served 2 million borrowers with an average loan size of $1,007 and had a repayment rate of 98 % (McGuire, 1998).

This level of savings is not trivial from an insurance point of view. The average value of BRI savings accounts is large enough to help families insure consumption against major illness for close to half a year. From the estimates in Section 2, the effect of the head of the household going from being able to perform all ADLs to none reduces household consumption by about 22 %, which translates into about $34 per month. Average BRI savings, therefore, would be able to maintain household consumption levels for about 5.4 months

BRI supervises another program, Bank Kredit Desa (BKD), which lends to the poorest households and does not require collateral. The scale of loans is small, averaging about $71, and BKD had over three-quarters of a million borrowers in 1994. BKD allocates funds through village-level management commissions led by village heads. These local commissions utilize the local information and enforcement mechanisms of group-lending schemes, while retaining an individual lending approach. They are able to exclude the worst risks, and BKD encourages savings at BRI banks. Successful BKD borrowers graduate to larger scale loans from BRI.

The distribution of access to these intuitions in reported in Table 4. While almost all households in the sample have access to BRI, about half the sample have not used a large commercial lender. Similarly, about half the sample do not have access to a BKD institution. Of those households that had access, about 22 % have a BRI institution in their village, about 24 % have a commercial bank in the village (urban areas), and about 90 % have a BKD in their village.

Access and Savings

Table 5 reports the association between assets and distance to these institutions. Each row of the table reports the coefficients from a regression of the log of assets in 1997 in the first panel and the probability of having a savings account in the second panel. In both cases, the closer households are to both large commercial and microfinance programs, the more assets they have and the more likely they are to have a savings account.

While these results are consistent with the hypothesis that access to financial institutions helps families save, we are unable to ascribe a causal interpretation to these results. We are concerned that the financial institutions are more likely to locate in wealthier areas than in poorer areas. In this case, we would be confounding the financial institution's decision of where to locate with its effect on savings and wealth accumulation. To investigate this concern, we examine the regressed financial institutions' distance from the households against wage rates. Because actual wage rates may be endogenous to banking proximity, and are available only for those employed in the formal sector, we use the predicted wage based on age, education and location.[7] Table 6 reports the results of those regressions.

Neither commercial banks nor microfinance institutions are significantly more likely to locate in areas with high predicted wage rates. While this result may be expected for the microfinance institutions, it is more surprising for commercial banks. As expected, commercial banks and BRI are more distant from rural than from urban rural households. These results lend some credibility to our assumption that localization of credit institutions is not endogenous.

[7] We use the predicted wages described above in the section on the relative effect of husband and wife health.

Access and Insuring Health Shocks

We now assess the effect of access to financial institutions on the ability of households to insure consumption against illness. We do so by adding the interactions between the change in ADLs and dummies for the distance to financial institutions . We estimate a separate model for each financial institution, including all the controls for age and education of the head of the household, age and education of the spouse, family composition, as well as two dummies for distance from the credit institution. By including dummies for distance from the credit institution we are absorbing differences across villages in change in consumption that may be correlated with distance and could introduce spurious correlation.

The results are reported in Table 7. For households located within 1 kilometer of a financial institution, health shocks have substantively and statistically significantly smaller effects on consumption than for households living 10 kilometers or more from a financial institution.

While all of the models suggest that households situated closer to financial institutions are better able to insure consumption against health shocks, the most convincing evidence is from the model with distance to BRI branches. As we saw above, BRIs are widely dispersed throughout the nation, with no concentration in more advantaged areas. For communities with a BRI branch, health shocks have no effect on consumption. In contrast, the loss of an ADL in areas not served by a BRI branch lowers consumption by 2 to 3 %.

As noted above, in the mid-1990s, the mean BRI account was around $184 (Yaron et al., 1998), while 3 % of a typical household's consumption was about $4 per month. Thus, it is plausible that savings, even the relatively small accounts common in BRI, were useful for smoothing consumption.

We perform three robustness checks on these models. First, results are similar if we control for the region with 300-enumeration area fixed effects instead of dummies for each province interacted with rural verus urban. As expected, with fewer degrees of freedom, standard errors increase slightly. Second, as noted above, results are similar if we include single-parent households. Third, one possible explanation for our results is that communities without banks are remote in general, so health shocks matter more. On the one hand, we have seen that BRI branches are not located in particularly advantaged or disadvantaged places. At the same time, they are more likely to be in district capitals. (The 300 districts in Indonesia are a bit more important than counties in the United States.) Controlling for distance to the district capital and its square does not alter the basic results, although standard errors increase and some results lose statistical significance.

4. CONCLUSIONS

Nobody would be surprised at the result that families in the United States without a checking or savings account are unusually vulnerable to unfavorable health shocks. Similarly, nobody would be surprised that families in a less urban and less industrialized nation such as Indonesia that live far from a financial institution are less likely to have a savings account. Nevertheless, it is somewhat surprising how important access to financial institutions is in helping families deal with adverse health shocks. In this study, families that live far from a financial institution will suffer greater losses in consumption than will families living nearer the institutions. Importantly, this result does not appear to be due to financial institutions locating themselves near the advantaged, as the microfinance provider BRI does not follow that pattern.

Several tests indicate that these correlations are probably not due to state-dependent preferences where people who become disabled prefer to consume less. If we see low consumption due to lower desire to eat, for example, the effect should be strongest for those who engage in physical labor. In contrast, we find effects for both those engaged in work with and without physical labor before the health shock. Moreover, we see no effects of health on consumption for those with high initial assets and those living near a financial institutions. These results are consistent with self-insurance, not state dependent preferences. Similarly, the possibility of an omitted variable reducing both health and consumption would not explain why the correlations between health changes and consumption changes are so much lower near financial institutions.

Traditionally, governments interested in helping families prepare for adverse shocks have used subsidies, mandates, or direct government provision of health insurance and disability insurance. On the one hand, no policies should be based on a single study. On the other hand, if these findings are replicated in other settings, the policy implication is clear: Government promotion of microfinance and microsavings programs can be useful in addition to tools traditionally used.

The good news is that BRI's small lending and deposit program apparently does not require much subsidy (or perhaps any, as argued by Yaron et al., 1998), in spite of the diseconomies of scale from handling very small deposits and loans. At the same time, most microfinance programs do not cover all their costs. A small subsidy to help cover the fixed cost of enrolling each household may help to expand the share of households that have financial assets. These assets, in turn, may be quite useful in protecting families against the adverse effects of almost-inevitable reductions in health, employment, or harvests, or other shocks to income and needs.

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Table 1a: Means and Standard Deviations of Household Level Variables (N=3281)

	1993	1997	Change
Monthly Household Total Consumption Per Capita (Rupiah)	52,372 (43,605)	84,143 (69,059)	31771 (55433)
Assets (Rupiah)	2781946 (7,393,346)	5020260 (11,094,098)	2235111 (10529372)
Savings Account (=1)	0.245 (0.430)	0.252 (0.435)	0.007 (0.506)
Number of Household Members	5.024 (1.910)	5.647 (2.088)	0.623 (0.915)
Proportion of Members Male age 0-5	0.075 (0.120)	0.052 (0.096)	-0.022 (0.117)
Proportion of Members Male age 6-17	0.140 (0.156)	0.140 (0.148)	0.000 (0.137)
Proportion of Members Male age 18-49	0.227 (0.129)	0.235 (0.133)	0.008 (0.116)
Proportion of Members Male age 50+	0.059 (0.114)	0.067 (0.109)	0.008 (0.068)
Proportion of Members Female age 0-5	0.071 (0.118)	0.050 (0.096)	-0.021 (0.117)
Proportion of Members Female age 6-17	0.136 (0.153)	0.139 (0.145)	0.002 (0.136)
Proportion of Members Female age 18-49	0.241 (0.118)	0.249 (0.125)	0.008 (0.111)
Proportion of Members Female age 50+	0.048 (0.106)	0.054 (0.105)	0.006 (0.069)
Household is in Rural Area (=1)	0.564	0.574	0.049 (0.107)

Table 1b: Means and Standard Deviations of Characteristics of Head and Spouse (N=3281)

	1993	1997	Change
Male Head of Household			
ADL Index	0.986 (0.097)	0.981 (0.096)	- 0.010 (0.127)
Proportion Reporting Any ADL Limitation	0.076 (0.266)	0.141 (0.348)	0.064 (0.382)
Proportion reporting increase in ADL index			0.053 (0.225)
Proportion reporting decrease in ADL index			0.123 (0.328)
Predicted Hourly Wage Rate (Rupiah)	6.483 (0.451)		
Age	40.38 (9.831)	---	---
Not completed Primary Schooling (=1)	0.108	---	---
Completed Primary School (=1)	0.552	---	---
Completed Junior High School (=1)	0.130	---	---
Completed Senior High School (=1)	0.163	---	---
Some College (=1)	0.047	---	---
Female Head of Household			
ADL Index	0.962 (0.122)	0.936 (0.117)	- 0.026 (0.161)
Proportion reporting any ADL limitation	0.168 (0.374)	0.347 (0.476)	0.179 (0.562)
Proportion reporting increase in ADL index			0.111 (0.315)
Proportion reporting decrease in ADL index			0.294 (0.455)
Predicted Hourly Wage Rate (Rupiah)	5.912 (0.487)		
Age	35.27 (9.373)	---	---
Not completed Primary Schooling (=1)	0.191	---	---
Completed Primary School (=1)	0.558	---	---
Completed Junior High School (=1)	0.122	---	---
Completed Senior High School (=1)	0.111	---	---
Some College (=1)	0.018	---	---

Table 2: Regressions of Change in Log Household Per Capita Consumption

	Model 1	Model 2	Model 3
Δ in Husband's ADL Index	0.165 (0.053)	0.199 (0.078)	0.219 (0.085)
Δ in Wife's ADL Index	---	---	0.172 (0.064)
Head is Female (=1)	- 0.009 (0.866)	0.043 (0.228)	0.723 (0.589)
Head's Age	-0.019 (0.004)	-0.016 (0.012)	-0.016 (0.012)
Head not completed Primary School	-0.032 (0.026)	0.049 (0.034)	0.025 (0.037)
Head completed Primary School	-0.072 (0.037)	0.025 (0.045)	0.043 (0.048)
Head Completed Junior High	-0.072 (0.039)	0.019 (0.047)	0.013 (0.049)
Head Completed Senior High	-0.097 (0.056)	0.003 (0.065)	0.031 (0.069)
Spouse's Age	0.003 (0.003)	-0.003 (0.010)	-0.007 (0.011)
Spouse not completed Primary School	-0.021 (0.026)	-0.073 (0.029)	-0.056 (0.031)
Spouse completed Primary School	-0.014 (0.039)	-0.063 (0.043)	-0.049 (0.045)
Spouse completed Junior High	0.017 (0.045)	-0.037 (0.049)	-0.020 (0.051)
Spouse completed Senior High	-0.015 (0.082)	-0.069 (0.085)	-0.084 (0.089)
Head's Age Squared	0.0002 (0.0000)	0.0001 (0.0001)	0.0001 (0.0001)
Spouse's Age Squared	-0.0000 (0.0000)	0.0000 (0.0001)	0.0001 (0.0001)
Δ in # of Household Members	-0.423 (0.046)	-0.634 (0.067)	-0.660 (0.071)
Δ Share of males age 0-5	0.341 (0.172)	0.586 (0.213)	0.203 (0.290)
Δ Share of males age 6-17	0.607 (0.159)	0.790 (0.203)	0.403 (0.284)
Δ Share of males age 18-49	0.668 (0.151)	0.909 (0.197)	0.518 (0.287)
Δ Share of males age 50+	0.465 (0.148)	0.615 (0.212)	0.122 (0.314)
Δ Share of females age 0-5	0.464 (0.172)	0.677 (0.217)	0.0351 (0.292)
Δ Share of females age 6-17	0.625 (0.158)	0.704 (0.208)	0.384 (0.285)
Δ Share of females age 18-49	0.557 (0.151)	0.609 (0.204)	0.356 (0.281)
Δ Share of females age 50+	0.284 (0.149)	0.397 (0.220)	0.161 (0.567)
Within R-Squared	0.075	0.095	0.095

Notes: Model 1 replicates Gertler and Gruber (2001). Models 2 and 3 exclude households whose heads are age 60 or over and whose head's are single. All models are estimated with province*rural or urban fixed effects. Sample size 3281. Standard errors in parentheses.

Table 3: State Dependence Tests

	Model 1	Model 2	Model 3	Model 4	Model 5
Δ in Husband's Wage Weighted ADL Index	0.367 (0.164)		0.282 (0.281)		
Δ in Wife's Wage Weighted ADL Index	0.382 (0.137)		0.339 (0.152)		
Δ in Sum of Husband & Wife's Weighted ADL Indexes		0.376 (0.100)		0.474 (0.115)	0.392 (0.103)
Δ in Husband's Weighted ADL x Husband Had a Physical Labor Job in 1993			-0.009 (0.307)		
Δ in Wife ADL x Wife Had a Physical Labor Job in 1993			-0.071 (0.189)		
Δ in Sum of Weighted ADL x Highest 1993 Asset Quartile (=1)				-0.404 (0.228)	
Δ in Sum of Weighted ADL Index x 1993 Savings/Consumption					-0.048 (0.023)

Notes: Each column reports the results from a separate regression whose dependent variable is the Δ in Log Monthly Per Capita Consumption. In addition to the variables reported in the table, the regressions also include all of the variables used in the models reported in Table 3. Models 4 and 5 have the main effect on asset quartile (Model 4) or savings / consumption 1993 (Model 5). Model 3 uses observations only for which the husband or wife was working for pay in 1993. Sample size 3281.

Table 4: Distance From Household to Financial Institutions

Institution	Share of Households this Distance Away			
	0-1 Kilometers	2-10 Kilometers	10+ Kilometers	Sample Size
Commercial Bank	0.337	0.445	0.217	1,737
Bank Rakyat Indonesia (BRI)	0.386	0.523	0.090	3,280
Bank Kredit Desa (BKD)	0.925	0.065	0.009	1,125

Notes: Each column reports the results from a separate regression whose dependent variable is the Δ in Log Monthly Per Capita Consumption. In addition to the variables reported in the table, the regressions also include all of the variables used in the models reported in Table 3. Models 4 and 5 have the main effect on asset quartile (Model 4) or savings / consumption 1993 (Model 5). Model 3 uses observations only for which the husband or wife was working for pay in 1993.

Table 5: Regressions of Log Assets and Existence of a Savings Account on Distance to Savings/Credit Institutions

	Institution is 0-1 Kilometers from Village	Institution is 2-10 Kilometers from Village
Dependent Variable = Log Assets		
Bank Rakyat Indonesia	0.410 (0.166)	0.270 (0.157)
Bank Kredit Desa	1.137 (0.654)	0.815 (0.676)
Commercial Bank	0.170 (0.156)	0.031 (0.149)
Dependent Variable = Household Has a Savings Account (=1)		
Bank Rakyat Indonesia	0.114 (0.028)	0.060 (0.027)
Bank Kredit Desa	0.167 (0.141)	0.097 (0.147)
Commercial Bank	0.103 (0.037)	0.047 (0.034)

Notes: Each row in this table reports the results from a separate regression. The dependent variables are the Log of Assets in 1997 and whether the household has a savings account in 1997. The omitted category is that the institution is located more than 10 kilometers from the village. In addition to the variables reported in the table, the regressions also include gender, a quadratic in age and education of the husband and of the wife, and controls for the 1997 family composition similar to the ones in Table 2. All standard errors are robust to heteroskedasticity and adjusted for clustering of the observations into enumeration areas.

Table 6: Regressions of Distance of Bank From Household

	Commercial Banks	BRI	BKD
Head's Predicted Wage	-.663 (0.954)	-0.392 (0.483)	-.265 (0.175)
Rural	8.339 (1.642)	4.999 (0.693)	0.215 (0.269)
Constant	7.860 (6.583)	3.938 (3.266)	1.975 (1.230)
R-Squared	0.32	0.26	0.09
Sample Size	3280	1737	1125

Notes: Each column reports the results from a separate regression whose dependent variable is the distance in kilometers of the financial institution from the household in 1997. The regression also includes province fixed effects. All standard errors are robust to heteroskedasticity and adjusted for clustering of the observations into enumeration areas.

Table 7: Effect of Distance to Savings/Credit Institutions

Dependent variable is the Δ in Log Monthly Per Capita Consumption.

	BRI	BKD	Commercial Bank
(Sum of Δ in Wage Weighted ADL Indices) x (Institution is 0-1Km from Village =1)	0.011 (0.191)	0.520 (0.182)	0.173 (0.284)
(Sum of Δ in Wage Weighted ADL Indices) x (Institution is 2-10 Kilometers from Village =1)	0.515 (0.154)	0.589 (0.624)	0.365 (0.207)
(Sum of Δ in Wage Weighted ADL Indices) x (Institution is > 10 Kilometers from Village =1)	0.679 (0.305)	1.494 (1.163)	0.861 (0.376)

Notes: Each column is a separate regression. The regression also includes the variables in Table 3 and two dummies to control for distance from credit institution. Standard errors are in parentheses. For each regression, equality of the three coefficients can be rejected at the 1 percent level.

Figure 1: Distribution of Nonzero Changes in the ADL Index