Health and Death Risk and Income Decisions: Evidence from Microfinance

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Abstract

This paper examines the relationship between health and death risk and income decisions in rural Pakistan. Using data from a microfinance institution, we analyze how insurance against hospitalisation and accidental death influences the purpose of microcredit loans. After correcting for the endogeneity of insurance uptake, we find that individuals are more likely to maintain the same loan purpose as their previous loan if they are insured. The result suggests that households that are insured against hospitalisation and accidental death pursue less diversified income portfolios. This movement away from diversification may increase expected profits.

1 Introduction

Major illness and unexpected death are two of the most significant sources of risk facing poor, rural households. Both shocks can reduce household income by reducing labor productivity or labor supply and can require costly medical or funeral expenses. Though many households likely wish to insure against these risks, few households in poor countries have access to formal insurance (World Bank, 2001). Social networks can provide some informal insurance, but this insurance is unlikely to be complete. For example, Gertler and Gruber (2002) find that major illness is associated with significant drops in consumption in Indonesia.[1]

While consumption fluctuations constitute a welfare loss alone, the welfare loss from uninsured health and death risk may extend further. In the absence of insurance, individuals may increase savings or attempt to smooth income so that shocks can be more easily absorbed. Increasing savings and smoothing income can require allocating resources in a manner that reduces expected income.[2] This foregone expected income constitutes a second possible welfare loss. The 2001 World Bank Development Report calls particular attention to the relationship between risk and investment, noting that 'Reducing vulnerability to economic shocks, natural disasters, *ill health*, disability, and personal violence is an intrinsic part of enhancing well-being and encourages investment in human capital and in higher-risk, higher-return activities. This requires effective national action to manage the risk of economy-wide shocks and effective mechanisms to reduce the risks faced by poor people, including *health-* and weather-related risks' (2001, pp. 7, emphasis added).

Little research has addressed how health and death risk influences income decisions in developing economies.[3] One exception is Jalan and Ravallion (2001). They test for the impact of medical risk on liquid wealth share (a proxy for precautionary savings) and find it to be insignificant, but acknowledge that they have concerns about their measure of medical risk.[4] Given the position of health and death insurance on the current development agenda (see World Bank, 2001; Morduch, 2006), further knowledge of the impact of health and death risk on household income-generating decisions is important.

This paper contributes to the understanding of household responses to risk in poor rural economies by presenting evidence that individuals respond to a reduction in health

risk by taking on more income risk. We examine the impact of microinsurance against hospitalisation and death on the purpose of microcredit loans in rural Pakistan, an area known for high levels of health and death risk and high levels of income diversification. We hypothesize that if individuals respond to a reduction in health risk by taking on more income risk, then individuals will be less likely to diversify income and thus more likely to invest in the same activity twice in succession. We find that individuals are more likely to maintain the same loan purpose as the previous loan if they are insured. The finding suggests that individuals respond to a reduction in health risk by pursuing less diversified and hence riskier income portfolios. As diversification can require moving resources away from higher return sectors, this reduction in income diversification may lead to higher return income portfolios.

The paper proceeds as follows. Section 2 briefly provides information on health, mortality, and the economy in rural Pakistan and describes the microcredit and microinsurance programs of interest. Section 3 describes the data and the econometric specifications. Section 4 presents and discusses results. Section 5 concludes.

2 Background

Morbidity and mortality rates are high in rural Pakistan. Banerjee and Duflo (2007) analyze the World Bank Living Standard Measurement Survey data and find that 28 per cent of individuals in poor households in rural Pakistan have been sick within the past month. In the first National Health Survey of Pakistan (collected between 1990 and 1994), 65.1 per cent of respondents rated their health as poor or fair (Ahmad et al., 2005). The probability that an individual will die between the ages of 15 and 60 is 22 per cent

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for men and 20 per cent for women (World Health Organization, 2006). For comparison, the probability of dying between 15 and 60 is 14 per cent for men and 8 per cent for women in the United States.

Health insurance is rare in Pakistan. In 2003, out-of-pocket expenditures accounted for 71 per cent of total medical expenses in Pakistan, compared to 13.2 per cent in the United States. Partly as a result, per capita expenditure on health is low. In 2003, health expenditures were equal to 2.4 per cent of GDP in Pakistan, compared to 15.2 per cent in the United States (World Health Organization, 2006). Little data on insurance against death in Pakistan is available, and this is probably due to its absence.

This paper examines the behavior of individuals in rural Pakistan, an area where most individuals engage in some type of agriculture. One notable aspect of Pakistan's agriculture is that diversification is common. For example, the Pakistan Agricultural Census indicates that most crop-growing households also own some livestock. Fifty per cent of crop-growing households report owning at least one head of cattle, 51 per cent report owning a buffalo, 46 per cent report owning a goat, and 11 per cent report owning a sheep (Agricultural Census Organization, 2003). Kurosaki (1995, 1997) shows that this diversity reduces the variation of net profits of farming households in Pakistan. However, to the extent that diversification requires moving resources into lower return sectors, diversification can be costly. Although no study has estimated the loss from diversification between crops and livestock in Pakistan, Kurosaki and Fafchamps (2002) estimate the loss from diversifying across different crops. They estimate that farmers would respond to the elimination of all price and output risk by raising rice cultivation by close to 30 per cent, thereby increasing expected profits by 2 per cent.

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A second noteworthy aspect of Pakistan's agriculture is that households can concentrate the majority of their resources in either crops or livestock. The statistics listed above clearly leave room for some households to focus on farming, but there are also many households focusing on livestock. The Pakistan Agricultural Census reports that amongst the 9.98 million agricultural households in Pakistan, 33 per cent hold livestock, but no crops (Agricultural Census Organization, 2003). Pakistan agriculture appears to be split between households concentrating on crops and households concentrating on livestock.

This paper analyzes the behavior of clients of the National Rural Support Programme (NRSP). NRSP is one of the two largest microcredit organisations in Pakistan, with US$33.1 million in active loans and over 190,000 active borrowers as of June 2006 (The MIX Market, 2008). NRSP began its credit program, in its current form, in 1997.[5] The program operates in all of Pakistan's provinces, as well as portions of Pakistan-administered Kashmir.[6] Individuals typically apply for loans in groups, but they are not jointly liable and about a quarter of loans are given to a single individual. NRSP only approves loans for income-generating activities and each loan is categorised as for crops, livestock, or enterprise. The standard first loan amount is Rs. 10000 ($\approx$US$166) and subsequent loan amounts tend to increase slightly. The mean length of the repayment schedule is about nine months. Most individuals take out multiple loans across time. Among those who entered the credit program before 2006 and thus would have had sufficient time for a second loan, 70 per cent have taken out at least a second loan. The data will be described further in the next section.

NRSP began its insurance program in October of 2005 and implemented the program in all areas where credit services were being offered. Insurance costs Rs. 250 (≈US$4) and provides coverage for one year. Insurance covers hospital expenses or pays out Rs. 25000 (≈ US$400) in the event of accidental death. The mean successful claim amount for hospitalisation is Rs. 8341 (≈US$140).[7] Adoption of insurance amongst credit clients was substantial. Among loans given after the introduction of the insurance program, 35 per cent went to individuals with insurance. Insurance can be purchased regardless of whether or not an individual is a credit client.

3 Empirical Methodology

The purpose of this paper is to test the prediction that a reduction in health risk allows individuals to take on more income risk. The task is complicated by the fact that the data do not include complete information on income portfolios. However, the data do contain information on an individual's loan history with NRSP. To some extent, it is reasonable to expect past loan purpose to influence the current composition of the income portfolio. For example, durable assets, such as livestock, that were acquired in previous loans may persist in the portfolio for multiple time periods.[8] If previous loans impact the composition of the current income portfolio and heterogeneity in loan purpose across time is not exactly offset by heterogeneity in the allocation of non-credit resources, then observing individuals maintaining the same loan purpose across time is evidence of less income diversification.[9] This paper tests the prediction that a decrease in health risk allows household to take on more income risk by estimating the impact of health insurance on an individual's decision to maintain the same loan purpose. If insurance

leads to more individuals maintaining the same loan purpose, then it is evidence in

support of the theoretical prediction.

3.1 Data

The data come from the microcredit and microinsurance database of NRSP. The data from the credit database include information on loan date, loan purpose, field unit,[10] and National Identity Card Number (NIC No.) of the borrower. The insurance data include information on insurance date and NIC No. After merging the data using NIC No., each observation in the final data set represents a loan from the credit program and includes information on when and if the individual taking the loan received insurance. We construct three binary variables: Insurance, Access, and Maintained Loan Purpose. The variable **insurance** equals one if the individual taking the loan had an active insurance policy at the time the loan was issued.[11] The variable **access** equals one if the loan was issued after the start of insurance program. The variable **maintained loan purpose** equals one if the purpose of the loan was the same as the individual's previous loan. As this variable requires that the loan not be the first loan an individual received, we drop all first loans from the data. The final date set is quite large, consisting of 316,602 observations.[12]

Descriptive statistics are reported in Table 1.[13] The vast majority of loans are used for agriculture, and of these most are used for crops. Individuals maintained the same loan purpose ninety-three per cent of the time. Slightly over a third of observations represent loans that were taken out after the start of the program. Among these, the individual had an insurance policy in about half of the observations.

Table 1: Summary Statistics

Variable	Mean	St. Dev.	Min.	Max.	No Access	Access
Crops	0.828	0.377	0	1	0.837	0.812
Livestock	0.141	0.348	0	1	0.139	0.144
Enterprise	0.031	0.173	0	1	0.024	0.044
Access	0.354	0.478	0	1	0.000	1.000
Insurance	0.171	0.377	0	1	0.000	0.483
Maintained Loan Purpose	0.925	0.263	0	1	0.921	0.934
Loan Number	3.504	2.200	2	26	3.533	3.452
Month	7.438	3.477	1	12	6.898	8.423
Year	2003.5	2.365	1997	2007	2002.3	2005.8

The data come from the credit database and the insurance database of the National Rural Support Programme. There are 316, 602 observations.

Table 2 provides an initial indication that health insurance increases the probability that an individual maintains the same loan purpose. The table reports the proportion of individuals that took out a loan for crops, livestock, or enterprise conditional on the purpose of the individual's previous loan. The rows are stratified by insurance status and access status at the time of the new loan. Access will eventually serve as an instrumental variable for insurance. The numbers on the diagonals are placed in bold for emphasis. Note that individuals with insurance are more likely to take out a loan for the same purpose as the previous loan than are individuals without insurance. For example, the first numbers in the first column indicates that a 95.4 per cent of individuals *without insurance* that used the previous loan for crops took out their current loan for crops as well. The number increases to 96.7 per cent for individual *with insurance*. The same pattern holds across sectors. The bottom half of the table shows that the pattern also appears when individuals without access to insurance are compared to individuals with access to insurance.

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Table 2: Loan Purpose Conditional on Previous Loan Purpose

Prev. Loan	Status	Crops	Livestock	Enterprise	Observations
Crops	Not Insured	**.954**	.042	.004	218682
Crops	Insured	**.967**	.031	.002	46974
Livestock	Not Insured	.180	**.782**	.038	35146
Livestock	Insured	.128	**.830**	.042	5258
Enterprise	Not Insured	.112	.207	**.681**	8597
Enterprise	Insured	.102	.191	**.707**	1945
Crops	No Access	**.952**	.043	.004	173401
Crops	Access	**.964**	.033	.003	92255
Livestock	No Access	.202	**.765**	.033	26053
Livestock	Access	.123	**.830**	.048	14351
Enterprise	No Access	.138	.206	**.656**	4950
Enterprise	Access	.085	.203	**.712**	5592

This table reports the proportion of individuals that took out a loan for a certain purpose conditional on the purpose of their previous loan and their insurance status at the time of the current loan.

3.2 Econometric Specification

The probabilities listed in Table 2 provide some suggestive evidence that insurance increases the probability that an individual maintains the same loan purpose as the previous loan. However, the pattern could be driven by some unobservable time-varying factor correlated with the period after which the insurance program began. This issue can be addressed by estimating models with various time controls. In the results reported in the next section, all estimations are of the following form

$$maintained\ loan\ purpose_k = \alpha + \beta\ insurance\text{-}hat_k + \gamma T_k + \delta X_k + \varepsilon_k\ ,$$

where T_k is a vector of time variables, X_k is a vector of other control variables, and ε_k is a random error term. The time vector includes some combination of monthly dummy variables, a year trend, year dummy variables, and month-by-year dummy variables. The other control variables include field unit dummy variables and loan number dummy

variables. Field unit dummy variables are necessary to control for variations in the proportion of borrowers coming from each field unit across time. To the extent that individuals sort into homogenous groups by geography, the field unit dummy variables provide a coarse control for borrower characteristics.

Even upon controlling for bias from correlation with unobservable time effects, a source of bias in the OLS regression is that individuals that choose insurance are likely to be systematically different than individuals that do not. For example, if risk-averse individuals are both more likely to get insurance and more likely to change loan purpose, then the coefficient on insurance in the OLS regressions is biased negatively. To address this issue, access is used as an instrument for insurance.[14][15] The implementation of the insurance program by NRSP constitutes an external shock to credit clients that can be used as an exogenous source of variation to correct for biases from individuals endogenously choosing to take out an insurance policy. Importantly, the introduction of the insurance program appears to have been idiosyncratic. NRSP officials reported that the insurance program did not begin in response to some specific event that might also have influenced the behavior of credit clients (see correspondence in endnote).[16]

In the instrumental variable (IV) regressions, identification comes from the difference in the behavior of the population of borrowers before and after the start of the insurance program. The validity of access as an instrument depends on the extent to which time control variables can capture unobservable time effects associated with the period after the insurance program began. Due to collinearity, month-by-year dummies cannot be used in the instrumental variable (IV) regressions. This issued is discussed further in the next section.

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4   Results and Discussion

The top row of Table 3 reports OLS results. All estimations without field unit dummy variables indicate that insurance increases the probability that an individual maintains the same loan purpose. When field unit dummy variables are included, the result shrinks to around zero. This result suggests that the coefficient on insurance in OLS specifications that do not include field units is positive because individuals with insurance tended to live in areas where individuals, regardless of insurance status, were more likely to maintain the same loan purpose. Controlling for this geographic influence on individual behavior, the OLS results indicate that, if anything, insurance slightly decreases the probability an individual maintains the same loan purpose (see the OLS results reported in columns 6 and 7).

The second row of Table 3 reports IV results. The IV estimations yield consistently greater estimates than the OLS results. The result suggests that the OLS estimates are biased negatively; individuals that chose insurance were individuals that were less likely to maintain the same loan purpose. The result is consistent with a scenario in which risk-averse individuals are both more likely to choose insurance and more likely to diversify income (which, in this case, implies less likely to maintain loan purpose).

Upon the addition of field unit dummies, the IV coefficient falls but remains significant and positive. Since the inclusion of field unit dummies decreases the coefficient in both OLS and IV results, the most likely explanation appears to be that field units where individuals tended to maintain the same loan purpose grew that fastest

during the period after the start of the insurance program. Under such a scenario, both *individuals with insurance* and *individuals with access to insurance* would be more likely to live in areas where individuals tend to maintain the same loan purpose. Thus, the OLS and IV results would respond similarly to the inclusion of field unit dummy variables, just as is observed.

Ultimately, the best estimate for the influence of insurance on the decision to maintain the same loan purpose comes from the IV results in columns 6 and 7, where the instrumental variable approach serves to correct for selective uptake of insurance, month dummy variables combined with a year trend or year dummy variables serve to correct for unobservable factors correlated with the timing of the insurance program, loan number dummy variables control for unobservables correlated with borrowing experience, and field unit dummy variables provide a fine-scale control for geographic changes in the population of borrowers. When a year trend is used, the estimate indicates insurance increases the probably that an individual maintains that same loan purpose by 2.5 percentage points. When year dummies are used, the estimate indicates the effect is 2.1 percentage points.[17]

The impact varies across sectors. The IV estimation can be run for each of three subsets of the sample: observations where the previous loan had been taken out for crop, livestock, and enterprise. An IV estimation with month and year dummy variables indicates that when the individual had previously taken a loan for crops, insurance increased the probability that the following loan would be taken out for crops as well by .008. The corresponding numbers for livestock and enterprise were .09 and .18, respectively. These differences are indicated in Table 2 as well and reflect the pattern

Table 3: Dependent Variable: Maintained Loan Purpose

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
OLS RESULTS									
Insurance	.0225***	.0192***	.0286***	.0184***	.0212***	-.0000	-.0031*	.0170***	-.0072***
	.0017	.0017	.0018	.0018	.0018	.0016	.0016	.0019	.0017
R-Squared	.0010	.0403	.0412	.0478	.0557	.1927	.1942	.0702	.1991
IV RESULTS									
Insurance	.0268***	.0221***	.0679***	.0405***	.0466***	.0237***	.0209***	-	-
	.0035	.0037	.0053	.0068	.0068	.0049	.0062		
R-Squared	.0010	.0402	.0386	.0471	.0547	.1919	.1934		
Month Dummies		Yes	Yes	Yes	Yes	Yes	Yes		
Year Trend			Yes			Yes			
Year Dummies				Yes	Yes		Yes		
Loan Number Dummies					Yes	Yes	Yes	Yes	Yes
Field Unit Dummies						Yes	Yes		Yes
Month-by-Year Dummies								Yes	Yes

Notes: Standard errors are reported. One, two, and three stars indicate, 10, 5, and 1 per cent significance, respectively. All standard errors are clustered on loan group. N = 316, 602

that individuals engaging in livestock and enterprise are much more likely to switch loan purpose than individuals engaging in agriculture.

4.1 Explanations

There are a number of explanations for the positive and significant coefficient on insurance in the IV estimates. We consider four explanations.

1. Bias from unobservables correlated with the time after the start of the insurance program. One explanation is that there are unobservable factors affecting the credit program that are correlated with the time after the insurance program began that are not fully accounted for by the various time controls. If so, the coefficient on insurance captures this effect and not the actual impact of insurance. This issue is of greatest concern in the IV estimations because the instrument, access, was introduced universally at one moment in time. As such, loans where the individual had access and loans where the individual did not have access do not occur contemporaneously.[18] This issue cannot be solved entirely, but one way to examine the severity of the problem is to check if the inclusion of month-by-year dummy variables changes the results of the OLS regressions. Since both insurance and access are correlated with the same time period, we might expect the OLS estimates to change substantially with the inclusion of month-by-year dummy variables if some unobservable factor was driving the IV results. Comparing the OLS results in columns 4 and 5 to column 8 and 9 and comparing columns 6 and 7 to column 9, we see that substituting month-by-year dummy variables for month dummy variables and year dummy variables / a year trend does not drastically change the

estimation results. This result suggests that month and year dummy variables provide a reasonable control for time unobservables.

One particular concern is changes that were created by the Kashmir earthquake, which occurred after the insurance program was implemented. As mentioned earlier, all observations from the earthquake-affected region were dropped from the sample. However, if the effect of the earthquake spilled over outside the region, then the estimations could still confound the effect of the earthquake with the effect of insurance. A partial check for bias from the earthquake can be done by limiting the sample to southern Pakistan. A reasonable hypothesis is that any spillover affect would be weakest in the south, which is the area most distant from the earthquake. Estimations using only the 87,594 observations from southern Pakistan produce a larger coefficient on insurance than when using the full sample. For example, an IV estimation with the full set of controls and month and year dummy variables produces a coefficient of .052 when the sample is restricted to the south. While there may be other spatial factors that may have differentiated southern Pakistan from northern Pakistan, this results provides some evidence that, if anything, the effect of the earthquake is biasing the coefficient on insurance downward. Under such a scenario, the estimation results from Table 3 could be treated as a lower bound.

2. Insurance affects selection into credit sample. If insurance affects the decision of an individual to take out a loan, then selection could bias the results. Suppose that individuals who maintain the same loan purpose are risk-neutral and individuals who change loan purpose are risk-averse. If insurance increases the likelihood that a risk-neutral individual takes a loan relative to a risk-averse individual, then the estimated

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coefficient on insurance would be positively biased. If the opposite were true, then the estimated coefficient would be biased negatively.

There is no clear prediction on how insurance influences the population of borrowers. One could argue that risk-averse clients who are drawn to NRSP for the insurance program spill over into the credit program as well. As a result, the introduction of the credit program would increase the proportion of risk-averse individuals in the population of borrowers and the coefficient would be biased negatively. Conversely, one could argue that credit and insurance are substitutes[19] and therefore risk-averse individuals, who might be more likely to obtain insurance, are less likely to participate in the credit program after the introduction of insurance. Under such a scenario, the selection bias on the insurance coefficient is positive. Other selection scenarios could probably be described, including some that do not rely on underlying risk preferences, but the point here is that there is no clear prediction about the direction of the selection. One way to empirically check for selection bias is to interact insurance with a dummy for entry into the credit program after the start of the insurance program. Among the 54,197 observations where the loan recipient had insurance, 17,180 of the observations represent loans that went to individuals that entered the credit program for the first time after the insurance program started. It seems reasonable to expect that if a selection effect exists it would be strongest amongst the individuals who entered the credit system after the start of the insurance program.

Table 4 reports the estimates from two OLS regressions that include an interaction term between insurance and `late entry,' a dummy variable for entry into the credit program after the start of the insurance program. Both models include loan number

dummy variables and field unit dummy variables. Columns 1 includes month dummy variables and year dummy variables. Columns 2 includes month-by-year dummy variables. In both estimates, the coefficient on the interaction is insignificant. The result suggests that the estimations results are not being driven by insurance affecting selection into the credit program.

Table 4: Dependent Variable: Maintained Loan Purpose – OLS with Late Entry Interaction included

	(1)	(2)
Insurance	-.0050***	-.0092***
	.0019	.0021
Insurance x Late Entry	.0015	.0030
	.0034	.0034
R-Squared	.2092	.2136
Late Entry Dummy	Yes	Yes
Month Dummies	Yes	
Year Dummies	Yes	
Loan Number Dummies	Yes	Yes
Field Unit Dummies	Yes	Yes
Month x Year Dummies		Yes

Standard errors are reported. One, two, and three stars indicate 10, 5, and 1 per cent significance, respectively. All standard errors are clustered on loan group. N = 316,602.

3. NRSP behavior. Another explanation is NRSP may be more comfortable with less diversified income portfolios when individuals have insurance. As such, it might approve or encourage different loan behavior when the insurance program is in place. This is unlikely because NRSP's policy for loan approval does not include an evaluation of the diversity of an individual's income portfolio.

4. Individual behavioral response to insurance. In the absence of a source of bias, the result indicates an actual behavioral response to insurance. Specifically, insurance against hospitalisation and death increases the probability that an individual maintains the same loan purpose as their previous loan. The result is consistent with the prediction that individuals respond to a reduction in health and death risk by taking on more risk in their income portfolio through decreased income diversification.

5 Conclusion

This paper examines the behavior of individuals living in rural Pakistan, an area known for high levels of illness and death risk and high levels of income diversification. Using microcredit and microinsurance data from a prominent microfinance institution, we find evidence that insurance against hospitalisation and death increases the probability that microcredit clients maintain the same loan purpose across time. The finding suggests that individuals with health and death insurance pursue less diversified income portfolios. To the extent that diversification requires reductions of income, health insurance may indirectly lead to higher income levels. Accordingly, the benefits of policy interventions that increase social protection against major illness and death may include increased economic growth.

Appendix

Table 5: Detailed Purposes of Loan by Category

Crops	Freq.	Livestock	Freq.	Enterprise	Freq.
crop inputs	.419	cattle/buffalo	.283	karyana store	.249
fertilizer	.295	goats	.249	enterprise	.179
fertilizer + seeds	.086	fattening	.120	business	.095
seed	.059	livestock	.073	shop	.032
fertilizer + seed + pesticide	.044	livestock trading	.061	peter engine	.028
pesticide	.026	calves	.051	grocery shop	.026
fertilizer + pesticide	.025	calves fattening	.046	home shop	.021
fertilizer + seed + water	.013	goats + sheep	.028	land leveling	.011
cotton	.010	animals	.018	grocery store	.009
sugar cane	.003	sheep	.015	enterprise dev.	.009

This table lists the top 10 more specific loan purposes within each general category of loan purpose. This information is not used in the analysis, but is reported here to aid description of the data.

Notes

1. Townsend (1995) and Kochar (1995) find less evidence of an effect of health on consumption, but as Gertler and Gruber note, the studies only consider small changes in health status, not major unexpected illnesses.
2. See Dercon (2006) and Morduch (1995) for a review of risk-management and risk-coping in the absence of insurance.
3. A number of empirical studies have shown farmers' production choices depend on price and yield risk. Again, see Dercon (2006) and Morduch (1995) for a review.
4. They measure medical risk as the variation of the residuals from a regression of medical expenditures on a set of household variables.
5. NRSP almost uniformly assesses a 20 per cent service charge on loans. This practice did not begin until 1997.
6. The majority of operations are concentrated in the Punjab. Eighty-one per cent of loans were taken by individuals in the Punjab.
7. The variation in hospitalisation claim amounts is high. The standard deviation is Rs. 8503.
8. The assumption that livestock are persistent assets is not rare in the development literature. For example, Kurosaki and Fafchamps (2002) treat livestock as fixed assets in their analysis of Punjabi farmers.
9. We assume stated loan purpose is an accurate measure of loan use. The fungibility of loans (see Von Pischke and Adams (1983)) raises the possibility that stated loan purpose and actual loan use may differ. While loan use often cannot be observed, NRSP field officials believed that the vast majority of loans were used for their stated purpose.
10. NRSP operates its credit program through field unit branches. There are 152 field units.
11. Individuals can take out insurance policies for themselves or for relatives. This information is not completely recorded in the insurance data. In the final data, only around 1.5 per cent of the observations include information on relationship. Among these, the two largest categories are 'self' (88 per cent) and 'father' (10.4 per cent). We code insurance as a one regardless of whether the insurance was for the individual or a relative. Given within family risk-sharing, it seems reasonable to expect the impact of insuring a relative to be comparable to that of insuring oneself.
12. Some information from the original data was not used in the generation of the final set of observations. From the original credit data, we exclude all loans that went to individuals in non-rural areas. The loans

make-up about one-eighth of the credit data. Among the remaining loans we make the following additional drops. We drop all loans from a field unit inside any area that the United Nation's Humanitarian Information Center declared as affected by the 2005 Earthquake in Kashmir (regardless of whether the loan occurred after the earthquake). The loans make-up about 5 per cent of the credit data. We drop loans to any individual that at some point received a loan for a service charge rate other than 20 per cent. These constitute about 6 per cent of total loans. We drop less than 1 per cent of loans due to errors in the recording of the individual's NIC No. (either because of too few characters, the erroneous inclusion of alphabetic characters, or because the number missing entirely) and 2.3 per cent of insurance policies for the same reason.

13. We construct binary variables indicating whether a loan was used for each type of purpose and they are reported in the first three rows of the table. These variables are included to aid the description of the data, but are not used in the analysis aside from their implicit inclusion in the generation of the `maintained loan purpose' variable. NRSP also includes some more detailed information on loan purpose in the data. Table 5 in the Appendix lists the most common loan purposes within the categories of crops, livestock, and enterprise.

14. Individual fixed effects could also serve as a control for selective uptake of insurance. The IV estimation improves on fixed effect estimation by eliminating bias from time-varying idiosyncratic shocks. Individual fixed effects could be used in conjunction with IV, but are undesirable in this case as their inclusion would eliminate any information gained from comparing one individual to another, which is the primary source of variation in the data.

15. The specification used in the IV estimation is $maintained\ loan\ purpose_k = \alpha + \beta\ insurance\text{-}hat_k + \gamma T_k + \delta X_k + \varepsilon_k$, where $insurance\text{-}hat_k$ is the predicted value from a first-stage regression of insurance on access and the control variables.

16. Note the following email correspondence between the author and NRSP. *Question:* Was there a specific factor that led NRSP to start the insurance program in October of 2005 (as opposed to some other time)? For example, was there a time when a lot of credit clients were hospitalised which raised awareness of the need for health insurance? Did NRSP observe another organisation providing insurance and decide to start their own program? *Response of NRSP*: There was no factor of above type. NRSP intends to provide more financial services to its clients. In this respect, we found that the financial support for health services are lacking and needed by the community. In this connection, we started the Health Insurance policy.

17. When year dummies are used, identification is driven by loans given in the year 2005 and other years are included in the estimation to pin down the identification of month effects.

18. In econometric terms, the universal introduction of access rules out the use of month-by-year dummies in the IV regressions due to collinearity with the instrument.

19. NRSP's requirement that loans be used for income-generating purposes somewhat limits the substitutability of insurance and credit.

References

Agricultural Census Organization (2003) *Pakistan Agricultural Census* (Lahore: Government of Pakistan, Statistics Division).

Ahmad, K., Jafar, T., and Chaturvedi, N. (2005) Self-rated health in Pakistan: Results of a national health survey. *BMC Public Health*, 5(51).

Banerjee, A. and Duflo, E. (2007) The economic lives of the poor. *Journal of Economic Perspectives*, 21(1), pp. 141-167.

Dercon, S. (2006). Risk, insurance, and poverty: A review, in: S. Dercon (ed) *Insurance Against Poverty*, (Oxford: Oxford University Press), pp. 9-38.

Gertler, P. and Gruber, J. (2002) Insuring consumption against illness. *American Economic Review*, 92(1), pp. 51-70.

Jalan, J. and Ravallion, M. (2001) Behavioral responses to risk in rural China. *Journal of Development Economics*, 66(1), pp. 23-49.

Kochar, A. (1995) Explaining household vulnerability to idiosyncratic income shocks. *American Economic Review*, 85(2), pp. 159-164.

Kurosaki, T. (1995) Risk and insurance in a household economy: role of livestock in mixed farming in Pakistan. *Developing Economies*, 33(4), 464-485.

Kurosaki, T. (1997) Production risk and advantages of mixed farming in the Pakistan Punjab. *Developing Economies*, 35(1), pp. 28-47.

Kurosaki, T. and Fafchamps, M. (2002) Insurance market efficiency and crop choices in Pakistan. *Journal of Development Economics*, 67(2), pp. 419-453.

Morduch, J. (1995) Income smoothing and consumption smoothing. *Journal of Economic Perspectives*, 9(3), pp. 103-114.

Morduch, J. (2006) Microinsurance: The next revolution?, in: A. Banerjee, R. Benabou, and D. Mookherjee (eds) *Understanding Poverty*, (Oxford: Oxford University Press), pp. 337-357.

The Mix Market (retrieved April 20, 2008). http://www.mixmarket.org/en/demand/demand.show.profile.asp?ett=1071\&

Townsend, R. (1995) Consumption insurance - an evaluation of risk-bearing systems in low-income countries. *Journal of Economic Perspectives*, 9(3), pp. 83-102.

Von Pischke, J. and Adams, D. (1983) Fungibility and the design and evaluation of agricultural credit projects, in J. Von Pischke, D. Adams, and G. Donal (eds) *Rural Markets in Developing Countries,* (Baltimore: Johns Hopkins University Press), pp. 74-83.

World Bank (2001) *World Development Report 2000/2001* (Oxford: Oxford University Press).

World Health Organization (2006) *The World Health Report 2006 - Working Together for Health* (Geneva: World Health Organization).