

Financial Intermediation, Transfers and Commitment: Do Banks Crowd Out Private Insurance  
Arrangements in Low-Income Rural Areas?

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## I. Introduction

An important feature of countries that have not experienced sustained economic development is that a large proportion of the population participates in informal institutional arrangements that provide services that in developed countries are furnished by formal institutions. One important such service is the provision of income insurance. However, it is also thought that the performance of informal institutions in underdeveloped areas is constrained by the absence of formal contracts and a legal system that could serve to enforce compliance. In particular, the absence of these features of developed environments places significant barriers to trade across time and states of the world by reducing the ability of parties to commit to certain actions and thus results in inefficient allocations.

The existing empirical evidence suggests that while informal insurance arrangements involving interhousehold transfers do inhibit large fluctuations in consumption in the face of considerable income variability (Rosenzweig, 1988, and Rosenzweig and Stark, 1989), the proposition that insurance markets are complete has been rejected in the context of rural areas of low-income countries (Townsend, 1995; Morduch 1990; Foster 1994). In Foster and Rosenzweig (1995b), evidence is further provided that the presence of commitment problems is one reason why informal transfer arrangements do not, in themselves, provide complete insurance. This evidence would suggest that the formation and growth of formal institutions that is part of the development process might lead to the disappearance of informal institutional arrangements.

Existing empirical evidence on the relationship between the presence or characteristics of formal institutions that improve households' abilities to smooth consumption and informal insurance arrangements is scarce. One recent exception is Rosenzweig and Wolpin (1994) who show that in the United States the public provision of transfers to low-income families reduces only slightly family-based transfers. In this paper we assess the extent to which the introduction of financial intermediation in the form of formal credit institutions affects informal transfer arrangements among households in poor, rural areas using data from two South Asian countries. We modify the model of Thomas and Worrall (1995),

which characterizes risk-sharing arrangements under imperfect commitment, by incorporating the possibility that households facing risky incomes can both enter into transfer agreements and make use of liquid assets to smooth consumption. In particular, we assess the welfare gains compared to autarchy and complete asset illiquidity associated with different scenarios characterized by the presence or absence of commitment in transfer arrangements and the degree of asset liquidity. Simulation results based on the model show that a combination of transfer arrangements and liquid assets appears to be a substantial improvement over having liquid assets alone, at least given the limited liquidity being considered, although the additional gain from transfer arrangements, with or without commitment, fall when households have liquid assets compared to autarchy. However, the gains from being able to commit to transfer arrangements, which results in greater insurance, are significantly greater in the presence of liquid assets compared to cases in which households do not have access to financial institutions. Given that informal insurance arrangements are costly to undertake, these results suggest that while the introduction of financial intermediaries in part “crowds out” private transfer arrangements, the arrangements that survive will exhibit greater commitment and thus provide on average greater insurance.

Simulations are also used to assess how the behavior of transfers differs under the various commitment/liquidity scenarios in order to derive testable implications that can be evaluated using actual data. Based on these results in combination with estimates of transfer and savings decision rules from data on Indian and Pakistani households differentiated by whether they resided in villages proximate to formal credit institutions, we find support for the model. In particular, we find that savings are significantly greater and contribute more importantly to consumption smoothing in villages closer to banks, that in such villages there is a reduced incidence of private transfer arrangements, but such arrangements appear to provide significantly more insurance compared to those in villages with lesser savings opportunities, reflecting an increase in commitment in such arrangements. Overall, the insurance gains from financial intermediation thus appear to be enhanced by household transfer arrangements, although not among those households facing high costs of commitment.

## II. Theory

The structure of the model is as follows. It is assumed that there are two households  $i=1,2$ . In every period  $t$  each household  $i$  receives an income  $y_{it}=y_i(s_t)$  where  $s$  is the state of nature in period  $t$ . The utility functions for households  $i$  is assumed to be  $u_i(c_i)$  where  $c_i$  denotes consumption and  $u(\cdot)$  is increasing and concave. Households are assumed to live for  $T$  periods, to discount the future with discount factor  $\delta$ , and to maximize expected utility. For each household there is a set  $B_i$ , determined by the extent of financial intermediation available to that household, that dictates the extent to which it can transfer resources across time by borrowing and saving using a riskless asset with per period rate of return of  $r$ . For example, in the absence of financial intermediaries,  $B_i=\{0\}$  so that no borrowing or saving is permitted, while if households can borrow and sell assets  $B$  might take on the values  $\{-\Theta, 0, \theta\}$ , with  $\Theta$  setting the ceiling on borrowing and  $\theta$  the ceiling on the amount of resources that can be stored.

Given risk aversion, households will attempt to smooth consumption. With or without the possibility of savings, as long as incomes for any two households are not perfectly correlated, households can benefit through the sharing of resources within each period. Any pair of households would, in other words, be in principle able to devise a mutually beneficial contract dictating flows between the households in different states of the world, thus providing a form of insurance. As with the models of Coate and Ravallion (1993), Thomas and Worrall (1995), and based on the evidence in Foster and Rosenzweig (1995b) for households without access to formal credit institutions we begin with the case in which contracts are not enforceable. Thus enforcement of any contract must rely on the potential consequences for the two parties of violating the contract. In particular, it is assumed that if either of the households does not meet the terms of the contract then the household is excluded from further risk sharing and thus must consume at autarky levels in subsequent periods.<sup>1</sup> The task is to specify the set of

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<sup>1</sup>In order to avoid the unraveling of mutually beneficial behavior that arises in finite period repeated prisoner's dilemma type games it is assumed that the contract can provide for a positive payoff to both parties in period  $T$  that is achieved only if no violations in the contract have taken place before that period. As discussed below the value of the payoff is set equal to the infinite horizon expected discounted

contracts that can be supported in this way.

In general a risk-sharing contract in the context of this model can be characterized as a transfer function  $\tau_t(h_t)$  that dictates the (possibly negative) transfer from household 1 to household 2 and asset function  $\alpha_{it}(h_t)$  for each household. The asset function specifies the amount of assets that each household should hold, subject to B, if the contract is in force in period  $t$  after history  $h_t$ ,<sup>2</sup> where the latter is defined as the sequence of states up to and including the state realized in period  $t$ :  $h_t = \{s_1, s_2, \dots, s_t\}$ . The transfer and asset functions will depend both on the extent to which intermediation is available and on contract enforceability. There are four cases, denoted by superscripts C and I: with C=1, contracts are enforceable in that participants in transfer arrangements can commit to carrying out the plans, C=0 if contracts are not, and I=1 if the elements in B are not all zero and I=0 if there is no asset liquidity. Thus letting  $U_{it}^{CI}(h_t)$  denote the expected discounted utility given history  $h_t$  under the contract,

$$U_{it}^{CI}(h_t) = E_t \sum_{w=t}^T \delta^{j-t} (u(y_i(s_j) - \tau_w^{CI}(h_w) + R\alpha_{iw}^{CI}(h_w) - \alpha_{iw+1}^{CI}(h_{w+1}))) \quad (1)$$

When contracts are not enforceable, C=0, the assumption is that the contract is carried out only through the threat of reversion to autarchy. This implies that a given contract can be implemented only if for each history  $t$  the expected discounted utility from the contract is greater than that under autarchy, that is  $U_{it}^{0I}(h_t) \geq U_{it}^{AI}(a_{it})$  where  $U_{it}^{AI}(a_{it})$  denotes the expected discounted utility under autarchy given financial intermediation regime I if partner  $i$  should renege on the agreement in period  $t$  when he holds assets  $a_{it}$ .

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utility from full risk sharing given the stock of assets in period  $T$ . It is worth noting that the use of a finite horizon distinguishes this model from that used by Thomas and Worrall but is necessitated by the introduction of savings behavior into the model. For large  $T$  it may be shown that the solution from this problem will approach that in the infinite horizon case.

<sup>2</sup>Note that if contracts were fully enforceable the households would care about the overall level of savings in each state but not on how savings is distributed between the two parties; however, because the autarchic level of utility achieved by the households following a contractual violation will in general depend on the assets held by the households at that point in time the disposition of savings by each party will optimally be specified by the contract.

This constraint is known as an implementability constraint.

Solution to this problem is analogous to that for savings under autarchy (e.g., Deaton 1992) except that instead of applying backwards recursion to the expected discounted utility function for individual  $i$ , one applies backwards recursion to the constrained-efficient frontier  $W_t(V, h_t, a_{1t}, a_{2t})$  that characterizes in each period  $t$  and for each history  $h_t$  and household specific savings  $a_{it}$  the maximum level of expected discounted utility achievable by household 1 given the implementability constraints and given that household 2 receives an expected discounted utility of  $V$ . Thus

$$W_t(V, h_t, a_{1t}, a_{2t}) = \max_{\tau_w, \alpha_{1w}, \alpha_{2w} \forall w \geq t} U_{1t}^{OI}(h_t) \quad (2)$$

such that

$$U_{1w}^{OI}(h_w, a_{1w}, a_{2w}) \geq U_{1w}^{AI}(a_{1w}), \quad U_{2w}^{OI}(h_w, a_{1w}) \geq U_{2w}^{AI}(a_{2w}), \quad \text{and} \quad V = U_{2w}(h_w, a_{1w}, a_{2w}) \quad (3)$$

or equivalently

$$W_t(V, h_t, a_{1t}, a_{2t}) = \max_{\tau_p, c_{1t}, c_{2t}, V_{st+1}} u(c_{1t}) + \delta E W_{t+1}(V_{t+1}, h_{t+1}, R(y_{1t} + a_{1t} + \tau_t - c_{1t}), R(y_{1t} + a_{1t} + \tau_t - c_{1t})) \quad (4)$$

such that

$$u(c_{1t}) + \delta E W_{t+1}(V_{t+1}, h_{t+1}, R(y_{1t} + a_{1t} + \tau_t - c_{1t}), R(y_{2t} + a_{2t} + \tau_t - c_{2t})) \geq U_{1t}^{AI}(a_{1t}) \quad (5)$$

and

$$V = u(c_{2t}) + \delta E V_{st+1} \geq U_{2t}^{AI}(a_{2t}) \quad (6)$$

## II. Simulation

In order to evaluate the implications of differences in access to financial intermediation for

transfer arrangements as well to derive implications of these differences that may be tested using available data it is necessary to solve the maximization problems characterized by equations (4)-(6). While analytic solutions are not generally available, for a given set of parametric assumptions it is possible for relatively small  $T$  to compute the optimal decision rules numerically.<sup>3</sup>

The specific assumptions used to compute decision rules are as follows. It is assumed that there are four possible states  $s=\{1,2,3,4\}$  characterizing the income realization of a pair of transfer partners. Partner 1 receives an income of two in states 1 and 3 and four in states 2 and 4 and partner 2 receives an income of two in states 1 and 2 and an income of four in states 3 and 4. It is assumed that the states occur with equal probability so that the incomes of the two partners are independently distributed, with average income for each partner being 3. Note that in this environment, total income (of the two households) fluctuates as well as individual household income. Thus, only with perfect insurance would each household consume 3 each period. Single period utility is assumed to exhibit unit relative risk aversion ( $u=\ln(c)$ ), the discount factor ( $\delta$ ) is assumed to be 0.85 and the interest rate  $r=3/17$  so that  $R\delta=1$ .<sup>4</sup>

In order to examine the implications of the increased availability of financial intermediaries for transfer behavior in the absence of full insurance we consider two alternative specifications of the set  $B$  of possible asset positions held by each household. In particular, the absence of financial intermediaries is

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<sup>3</sup>Note that this contrasts with Thomas and Worrall (1995) and Foster and Rosenzweig (1995b) which construct policy functions for symmetric strategies in the context of an infinite horizon model. The infinite-horizon case is attractive for studying imperfect commitment because of the impossibility of using future benefits from cooperation to induce cooperative behavior in the finite horizon prisoner's dilemma-type games; however, the computational burden associated with extending the approach to the non-symmetric case with assets proved prohibitive. In this paper we finesse this difficulty by assuming that welfare at period  $T$  is dependent on whether or not the arrangement is still in force at that period. In particular, if the arrangement is still in force it is assumed that partners face a utility possibility frontier in the final period  $W_T(V)$  equal to that which would arise under full commitment without further changes in asset stocks, while if not they each receive a final period utility  $U_{iT}^{AI}$  equal to the expected discounted utility under autarchy without further changes in asset stocks.

<sup>4</sup>This discount rate is sufficiently low that implementability constraints bind and sufficiently high that there remains substantial risk sharing even in the presence of assets. Setting  $\delta R=1$  implies that asset transactions are used primarily for risk accommodation in the sense that no savings would be observed if income was fixed over time.

characterized by setting  $B=\{0\}$  and the presence of such institutions is characterized by setting  $B=\{-.5,0,.5\}$ . Neither of these characterizations should, of course, be taken literally. In the absence of financial intermediaries households still have opportunities for transferring resources across time through holding productive assets, storage of food stocks, or informal borrowing and lending and the combinations of savings and borrowing made possible by banks and cooperatives permit households to take on a wide variety of asset positions. Nonetheless, these stylized cases capture a key feature of the distinction between households with access to banks and those without such access: that there is an increase in liquidity in the sense that resources may be transferred across time with relative ease or at low cost.<sup>5</sup> For example, although households with land but without access to banks could in principle smooth consumption through buying and selling land, the transactions costs are likely to be high relative to the case in which land can be used as a form of collateral to establish a line of credit with a bank.

In solving the model an important simplification arises from the fact that the history of income shocks  $h_t$  only influences the efficiency frontier  $W_t(V, h_t, a_{1t}, a_{2t})$  through its effect on current income and assets. This result, which is a straightforward extension of that provided by Thomas and Worrall (1995) for the case without assets, follows from the fact that expected discounted utility under autarchy and thus the set of implementable transfers is only affected by the resources available at time  $t$ , i.e., the income and assets held by the two parties. Thus, while two different histories resulting in the same income and asset values will in general yield different points on the efficiency frontier, the frontier itself will not be affected. Consequently, the problem of solving for the optimal transfer and savings rules amounts first to determining the efficiency frontier for each set of income and assets in each period  $t$  and then tracing out the points on the efficiency frontiers that will arise for different initial conditions and income realizations.

Calculation of the efficiency frontier for the specified models proceeds as follows:

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<sup>5</sup>One feature of the presence of financial intermediaries that is not captured by this specification is that the effects may be asymmetric with respect to positive and negative asset positions: that households without access to banks can transfer resources across time through the use of buffer stocks but not through borrowing while households with such access can both borrow and save.



Step 1:  $W_T(V)^6$  and  $U_{iT}^{AI}$  are calculated for each possible set of asset stocks and income realizations

Step 2:  $U_{i,T-1}^{AI}$  and  $\alpha_{i,T-1}^{AI}$  are determined by choosing the savings decision for each asset position and income that maximizes expected discounted utility in that period.

Step 3:  $W_{T-1}(V)$  and  $\alpha_{i,T-1}^{CI}(V)$  are calculated for discrete values of  $V$  by solving the maximization problem characterized by equations (4)-(6) conditional on the expressions obtained for  $U_{i,T-1}^{AI}$  and  $W_T$ .

Step 4: A quadratic spline is used to construct the function  $W_{T-1}(V)$  as well as its derivative<sup>7</sup> using the evaluations of  $W_{T-1}(V)$

Step 5: Steps 2-4 are repeated for periods  $T-2$  to  $1$  with  $T=4$ .

The resulting decision rules are then used to simulate a data set starting from period 1 by taking random initial draws of assets and the utility of partner 2,  $V^8$ , simulating out a path of income realizations, and computing the resulting patterns of savings, transfers, and asset stocks under the alternative assumptions about the availability of assets and the presence of commitment problems. In particular, we consider combinations of cases, contrasted with perfect insurance, differentiated by (i) whether there are liquid assets (intermediation) and (ii) whether transfers are possible, and, if so, with and without the

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<sup>6</sup>The explicit dependence of  $W_T$  on income and assets has been dropped for notational simplicity.

<sup>7</sup>Obtaining explicit expressions for the derivative is helpful, because given asset stocks and income, and for each possible pair of savings decisions, the transfer in period  $t$  and subsequent utility for partner 2 given period  $t+1$  incomes,  $V_{t+1}$  solve

$$\frac{u'(y_{1t} - \tau_t - s_{1t})}{u'(y_{2t} + \tau_t - s_{2t})} = E_t(W'_{t+1}(V_{t+1}))$$

whenever implementation constraints are not binding.

<sup>8</sup>Initial assets were drawn independently for the two partners from the  $B$  assuming that each level had equal probabilities. Initial  $V$  was obtained by drawing a random variable  $x$  from the uniform, computing  $V=F(x)=\cosine((16*x-.5)^5+.5)*\pi/2$ . Under imperfect commitment when the resulting  $V$  was not implementable the closest implementable  $V$  was chosen. This function was chosen because it has the property of selecting starting points along the utility possibility frontier that are close to and symmetric about the 45 degree line.

implementability constraints.

Table 1 presents measures of the component of expected discounted utility at period 1 that accrues over the periods 1-3 ( $U_{i1} - \delta^3 U_{i4}$ , henceforth *net expected discounted utility*)<sup>9</sup> assuming both partners have initial asset stocks of zero and that the arrangement exhibits symmetry in the sense that average (across first period states) expected discounted utilities are equal for the two partners. It shows that access to assets, the ability to make transfers, and the ability to commit (i.e., to avoid the need for implementability constraints) influence the degree to which the partners are insured against income shocks and thus their achieved utility levels. The results also indicate that transfers not only play an important supplemental role in providing insurance even in the presence of liquid assets but that the role of transfers in providing insurance when intermediaries are present may be enhanced.

The first and last rows provide a reasonable metric for evaluating the relative (gross) welfare gains of the different scenarios. The first row shows the net expected discounted utility in the complete absence of mechanisms for insuring against income shocks, that is under autarchy and in the absence of liquid assets. Note that the net expected discounted utility for partner 1 in period 1 depends importantly on his income realization in that period and that the average utility across the first-period states is 2.674. The last row shows the net expected discounted utility under full insurance, when each household receives an income of 3 regardless of the state of the world that is realized. Full insurance yields a net expected discounted utility of 2.826 in each state.

Each of the other scenarios provides a net expected discounted utility somewhere between that achieved by these two extremes. The second and third rows of Table 1 illustrate the well-known result that assets play a useful but incomplete role in providing insurance. The second row presents the net discounted utility in the presence of assets (financial intermediation) but in the absence of any transfers,

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<sup>9</sup>Netting out the component of expected discounted utility accruing at period T removes differences in welfare arising directly from the assumptions made about the differences in payoffs in period T with and without a transfer arrangement in place in order to insure some risk sharing would take place in the absence of commitment as discussed in footnote 3.

Table 1  
Net Expected Discounted Utilities for Partner 1 under Alternative Scenarios<sup>a</sup>

	By State				Average	Relative Gain <sup>b</sup>
	y1=2 y2=2	y1=4 y2=2	y1=2 y2=4	y1=4 y2=4		
No Liquid Assets; Autarchy	2.541	2.808	2.541	2.809	2.674	.0
Liquid Assets; Autarchy	2.627	2.892	2.627	2.893	2.760	.567
No Liquid Assets; No Commitment	2.603	2.907	2.595	2.853	2.740	.429
Liquid Assets; No Commitment	2.686	2.992	2.533	2.912	2.781	.699
No Liquid Assets; Full Commitment	2.612	2.773	2.773	2.863	2.756	.534
Liquid Assets; Full Commitment	2.707	2.821	2.821	2.938	2.822	.969
Full Insurance	2.826	2.826	2.826	2.826	2.826	1.0

<sup>a</sup>Utility measures are net of discounted utility in final period (period 4). See text.

<sup>b</sup>Relative gain is the share of utility gain achieved under Full Insurance relative to No Liquid Assets and Autarchy that is achieved by specified scenario.

which shows that even the limited liquidity provided by allowing households to hold a limited set of net asset positions provides substantial insurance relative to the no assets case: fully 56.7% of the gain associated with full insurance is achieved in this way.<sup>10</sup> However, transfer arrangements, even if only implementable without commitment, provide an additional welfare gain under intermediation, of .021, with a gain of .062 with commitment.

Although transfer arrangements also play a significant role in accommodating risk they appear less effective as a whole than the ability to use assets, particularly with the expanded asset set considered in footnote 10. In the absence of liquid assets the full-commitment scenario yields 53.4% of the gain associated with full insurance while the necessity of relying on implementability constraints in transfer arrangements yields only 42.9%. Nonetheless, a combination of transfer arrangements and liquid assets appears to be a substantial improvement on assets alone, at least given the limited liquidity being considered. Transfer arrangements in the absence of commitment but with assets yield 69.9% of the gain associated with full insurance as compared to 56.7% for assets alone. When transfer arrangements can be made without relying on implementability constraints (with full commitment) and households also have liquid assets, 96.9% of the benefit from full insurance can be achieved.

Thus a combination of liquid assets and full-commitment transfers yields a net expected discounted utility that is quite close to that achieved under full insurance. The source of this difference is easily seen by examining the state-specific discounted utility figures: with liquid assets states 2 and 3 (when the partners have unequal incomes) yield different net discounted utilities because consumption decisions are tied to realizations of own income; however, with full commitment consumption decisions depend only on total income and assets of the partners and thus net discounted utilities are the same for

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<sup>10</sup>Further increasing liquidity by allowing households to hold net asset positions in the range -4 to 4 in .02 intervals increases this figure to 89.7% indicating, not surprisingly, that substantially greater insurance can be obtained with increased liquidity, although this figure still falls short of the figure of 96.9% that is attained in the presence of transfer arrangements with the limited asset space but full commitment.

these two states. The case in which partners cannot commit and must rely on the implementability constraint is intermediate between these two.

Comparisons of the combinations of consumption-smoothing mechanisms in Table 1 indicate how the presence of financial intermediaries affects the incidence of transfer arrangements and the type of arrangements. First, the additional gross gain from transfer arrangements, with or without commitment, fall when households have liquid assets compared to autarchy. Second, the gains from being able to commit in transfer arrangements are 2.56 times as big in the presence of liquid assets (.041) as they are when households do not have access to financial institutions (.016). Apparently the problems associated with implementing a transfer arrangement become greater in the presence of liquid assets, a result that presumably reflects the fact that the presence of liquid assets reduces the benefits from insurance through transfer arrangements.<sup>11</sup>

To use the gross utility gain results in Table 1 to assess how the introduction of asset liquidity affects the incidence and composition of transfers arrangements it is necessary to consider why we do not observe universally transfer arrangements with commitment given their greater insurance benefits. Presumably there is heterogeneity in the cost of setting up transfer arrangements of different types. In particular, suppose that individual  $i$  must pay a utility cost  $\kappa_i^C$  to establish a transfer arrangement of type  $C=\{0,1\}$  with and without commitment, respectively. Then the individual with asset liquidity determined by  $I=\{0,1\}$  for no intermediation and some intermediation, respectively, will choose the arrangement that yields the highest net utility

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<sup>11</sup>As Foster and Rosenzweig (1995b) point out, altruism between transfer partners, as might be present among member of the same family, operates to reduce problems of imperfect commitment. A potential implication of this result is thus that in the presence of financial intermediaries transfer arrangements are more likely to be based on family ties. Unfortunately, information on relationship to the transfer partner is unavailable in the data sets used in this paper. The ICRISAT data used in Foster and Rosenzweig (1995b) do have information on transfer partners but the small number of villages precludes an analysis of the consequences of financial intermediation for the nature of transfers.

$$\max(U^{II}-\kappa_i^1, U^{OI}-\kappa_i^0, U^{AI}),$$

and the distribution of different types of arrangements in a population will depend on the joint distribution of the  $\{\kappa_i^0, \kappa_i^1\}$ .

Suppose, for example, that  $\kappa_i^C = \bar{\kappa}^C + \gamma e_i^C$ , where the  $\bar{\kappa}^C$  are constants,  $\gamma$  is a scalar affecting the variance of the error, and the  $e_i^1$  are independent and identically distributed (across individuals and commitment types) extreme-value errors. Then, the probability  $P(C|I)$  an individual will choose to enter some type of transfer arrangement for a given level of intermediation  $I$  is given by

$$\begin{aligned} P(C|I) &= \frac{\exp((U^{II}-\kappa^1)/\delta) + \exp((U^{OI}-\kappa^0)/\delta)}{\exp((U^{II}-\kappa^1)/\delta) + \exp((U^{OI}-\kappa^0)/\delta) + \exp(U^{AI}/\delta)} \\ &= 1 - \frac{1}{1 + \exp((U^{II}-U^{AI}-\kappa^1)/\delta) + \exp((U^{OI}-U^{AI}-\kappa^0)/\delta)} \end{aligned} \quad (8)$$

which is, not surprisingly, increasing in the utility differences associated with commitment and no commitment transfer arrangements relative to autarchy. More significantly, the probability that an individual involved in a transfer arrangement will be under a commitment regime, is

$$P(1|C,I) = \frac{\exp((U^{II}-\kappa^1)/\delta)}{\exp((U^{II}-\kappa^1)/\delta) + \exp((U^{OI}-\kappa^0)/\delta)} = \frac{1}{1 + \exp((U^{OI}-U^{II}+\kappa^0-\kappa^1)/\delta)} \quad (9)$$

which is increasing in the difference between the commitment and no commitment utilities,  $U^{II}-U^{OI}$ . Thus if, as seen in Table 1, the additional utility associated with transfer arrangements with commitment in the presence of financial intermediaries exceeds that arising in the absence of financial intermediaries then a larger share of transfer arrangements in the presence of banks will exhibit commitment than will be the case in the absence of banks. Thus, areas with financial intermediaries will be characterized by a lower incidence of transfer arrangements but such arrangements will provide more insurance compared with areas without intermediaries.

### III. Estimation

The simulation results presented in Table 1 establish that transfer arrangements can be complementary with asset liquidity in terms of providing insurance and suggest that increases in financial intermediation, although they may reduce the incidence of private transfer arrangements as a source of insurance, alter the types of arrangements such that those that remain provide increased insurance. These results based on the model do not provide by themselves, however, implications for how transfer and savings behavior change as access to financial intermediaries increases and thus do not provide implications that can be tested using available micro-level data. In particular, we wish to know how we can identify when transfers are characterized by commitment under scenarios in which assets are liquid and not liquid.

Although given the complexity of the models considered it is unlikely that formal theoretical predictions can be generated that are themselves testable, the fact that the model, for a given set of parameter estimates, can be used to simulate out a path of transfers and savings for partners involved in these types of arrangements suggests an alternative approach. In particular, comparison of estimates obtained through application of a given estimation strategy to the actual data to estimates obtained by applying the same approach to simulated data generated according to alternative scenarios can help to distinguish among these alternative scenarios as well as to test the appropriateness of a given scenario.

While, given the approach taken, the selection of an estimation strategy is in some sense arbitrary, it is helpful in terms of interpreting the results to select a strategy in which parameter estimates are at least grounded in the structure of the model. Therefore we focus on estimates of linear approximations to decision rules for savings and transfers for which the relevant state variables are the history of past transfers and current incomes and assets. We also choose as a convenient but imperfect measure of history, the sum of past transfers (i.e., the "stock of transfer assets"). Let  $\tau_{it}$  denote the net transfers out by household  $i$  at time  $t$  so that the stock of transfer assets is

$$T_{it} = \sum_{t=0}^{t-1} \tau_{it} \quad (10)$$

Then the approximate linear transfer decision rule is

$$\tau_{it} = \beta_0 + \beta_1 T_{it} + \beta_2 y_{it} + \beta_3 y_{-it} + \beta_4 a_{it} + \beta_5 a_{-it} \quad (11)$$

where  $y_{-it}$  denotes the income of the household with which  $i$  is contracting to provide insurance. The savings decision rule may be approximated by a similar expression.

There are a number of problems with the estimation of equation (11) that must be addressed in practice. Most importantly, certain variables such as partner's income and the full history of past transfers will in general not be available. Some of these difficulties may be addressed in a straightforward fashion.<sup>12</sup> In particular, we assume that income  $y_{it}$  is the sum of a fixed anticipated component and, an unanticipated i.i.d. component,  $y_{it} = \bar{y}_i + \epsilon_{it}$ , model the correlation between the error terms as  $\epsilon_{it} = \rho \epsilon_{it} + u_{-it}$  and difference (5) over two consecutive periods to get

$$\Delta \tau_{it} = \beta_1 \tau_{it} + \beta_6 \Delta \epsilon_{it} + \beta_3 \Delta u_{-it} + \beta_4 s_{it} + \beta_5 s_{-it} \quad (12)$$

where  $\Delta$  denotes a forward first difference,  $\beta_6 = \beta_2 + \beta_3 \rho$ , and  $s_{it}$  and  $s_{-it}$  denote net savings at time  $t$  for individual  $i$  and his partner. While this procedure removes the fixed parts of  $T_{it}$  and  $y_{it}$  from the estimation, there remains an estimation problem even when the own shocks  $\epsilon_{it}$  and savings of both partners are observed because the idiosyncratic part of the shock  $u_{-it}$  will in general be correlated with the contemporaneous transfer  $\tau_{it}$  as well as with own and partner's savings. Thus one must use instruments as well as differences to estimate equation (5). A natural set of instruments are period  $t$  and  $t-1$  shocks which

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<sup>12</sup>Note that the partner's asset stocks are also unlikely to be known in practice. As these variables can not be treated in the same way as partner's income, we assume for the moment that such information is, in fact, available; the implications of the unavailability of partner's asset information will be explored below using simulated data.



predict transfers and are, by assumption, independent of  $u_{i,t}$  and initial values of own and partner's asset stocks.

Table 2 presents the results of applying this strategy to data simulated according to the above model. The top panel of the table shows estimates of the approximate transfer decision rules applied to data simulated using the model with and without liquid assets and with and without commitment, while the bottom panel shows the estimates of approximate savings decision rules with and without commitment. Note that since there is no possibility of saving under the no liquid assets model, no savings decision rule is estimated for that scenario.

The results in the first two columns of Table 2 conform to those obtained in Foster and Rosenzweig (1995) and indicate that, in the absence of mechanisms for savings and borrowing, the presence of commitment failures has significant implications for the coefficients on transfer assets ( $\beta_1$ ) and income shocks ( $\beta_6$ ). In particular, under full commitment there is no effect of the history of past transfers on current transfers and the coefficient on income shocks is .5 which corresponds to what might be expected under perfect income pooling and independent incomes<sup>13</sup>. In the absence of perfect commitment, however, transfers are negatively dependent on past transfers and less responsive to income shocks. The former indicates that there is an extent to which transfers operate as a kind of credit while the latter indicates that transfer insurance is less than that provided by full income pooling. Foster and Rosenzweig's results indicated that in areas without intermediation, transfer behavior conformed closely to the no-commitment regime.

The model indicates that when assets are liquid transfer decision rules incorporate both partners' asset positions. However, because available data sets do not provide information on transfer partner assets, results for the transfer decision rules with liquid assets are presented with and without controlling for partner's assets. The results indicate that the estimates of income and own financial asset effects on

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<sup>13</sup>Under perfect income pooling the transfer is half the difference between the incomes so  $\beta_2 = -\beta_3 = 0.5$  and under independence  $\rho = 0$  so  $\beta_6 = \beta_2 = 0.5$ .

Table 2  
 Estimated Savings and Transfer Decision Rules for Simulated Data  
 by Extent of Commitment and Access to Liquid Assets

Net Transfers Out						
	Without Liquid Assets		With Liquid Assets			
	Full Commitment	No Commitment	Full Commitment	Full Commitment	No Commitment	No Commitment
Assets			.451 (13.83)	.456 (12.49)	.179 (8.54)	.143 (5.14)
Partner's Assets				-.663 (8.80)		-.255 (6.09)
Transfer Assets	-.0170 (0.50)	-.127 (2.30)	-.221 (7.31)	.0586 (1.02)	-.578 (4.83)	-.398 (2.53)
Income	.506 (40.44)	.272 (40.38)	.517 (44.76)	.514 (39.91)	.198 (39.57)	.194 (36.70)
Constant	.0109 (0.90)	.00367 (0.54)	-.0125 (1.08)	-.00185 (0.142)	-.00178 (0.34)	.00236 (0.41)
Net Savings						
			Full Commitment	Full Commitment	No Commitment	No Commitment
Assets			-.821 (45.61)	-.822 (45.51)	-.839 (48.78)	-.813 (37.39)
Partner's Assets				.162 (4.35)		.182 (5.56)
Transfer Assets			.0870 (5.21)	.0186 (0.65)	.0645 (0.66)	-.00645 (0.52)
Income			.193 (30.21)	.193 (30.29)	.334 (81.44)	.336 (81.25)
Constant			.0324 (5.07)	.0298 (4.61)	.0510 (11.89)	.0480 (10.54)

<sup>a</sup>Absolute t-ratios in parentheses.

transfers are robust to the exclusion of partner's assets within both commitment regimes. For the no-commitment transfers, moreover, exclusion of partner's assets also does not importantly affect estimates of the transfer asset effect. The estimate of the transfer asset effect under the commitment regime, however, is biased negatively. This result is easily seen to be a consequence of omitted variable bias: the omitted variable in the differenced specification, partner's savings, is likely to be positively correlated with the level of transfers received by the partner in that period. While the resulting coefficient may thus be useful for interpreting estimates when the same procedure is applied to actual data, except in the case that the transfer arrangements are not influenced by partner's assets (either because  $\beta_5=0$  or because partners do not have access to liquid assets), a negative effect of transfer assets on transfers does not necessarily imply the presence of imperfect commitment as it does in the case in which there are no liquid assets.

When partner's assets are controlled for, a clear result from Table 2 is that transfer behavior within each commitment regime when households have access to liquid assets is quite similar to that in an environment without liquid assets in terms of the resulting coefficients on transfer assets and income - the structure of each type of transfer arrangement is not substantially affected by the presence of financial intermediaries except that financial assets of both partners affect transfer decisions. In particular, whether or not there are liquid assets, under commitment the transfer asset effect is not significantly different from zero and the income coefficient is close to .5 while in the absence of commitment the transfer asset effect is significant and negative while the income coefficient is substantially less than .5. It is also evident, as might be expected, that an increase in own financial assets results in an increase in transfers out, while an increase in partner's assets has the opposite effect. Interestingly the financial asset effects, like the income effects are smaller in the absence of commitment than they are under full commitment.

An implication of the model, as indicated by the welfare gains in Table 1, is that the composition of transfer arrangements changes as a result of increased asset liquidity, with more transfer arrangements being carried out with commitment. The results in Table 2 (columns two and three) suggest that if this is

the case then, based on data without information on partner's financial assets, income effects on transfers should be more positive <sup>14</sup> while transfer asset effects should be more negative in environments with financial intermediation compared to areas without liquid assets, given that in the latter no-commitment transfers are dominant, as found by Foster and Rosenzweig.

The second panel of Table 2 presents estimates of the savings decision rules with and without commitment. As might be expected there is a significant negative effect of own assets on savings, regardless of whether or not partner's assets are included in the specification. A comparison of the specifications with and without commitment contrasts interestingly with those for the transfer decision rules. In particular, while a unit increase in income is associated with a .336 increase in savings in the absence of perfect commitment, the same effect results in .193 increase in savings under full commitment. This presumably reflects the fact that since the insurance provided by transfer arrangements is less complete in the absence of commitment, savings play a more important role in this regard. Finally, the transfer asset effects on savings are small. Only in the case of commitment with the partner's assets excluded is a significant coefficient on transfer assets observed, but this clearly reflects the same omitted variable bias evident in the transfer decision rules.

#### IV. Data

To examine the role of imperfect commitment in determining transfer behavior and to show how this role is influenced by financial intermediation while taking into account heterogeneity among households, poses considerable demands on data: information is needed on asset flows, transfers, and income shocks over at least two consecutive comparable periods. We use two data sets from South Asia

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<sup>14</sup>Note that above we establish only that share of full commitment transfers among those making transfers increases. In combination with Tables 1 and 2, this implies that in a heterogeneous population the effect of a shock on transfers among those making transfers increases with intermediation. For reasonable parameter values, however, it may also be shown that the average effect of a shock on transfers (i.e., including those in autarchy, under no commitment, and under full commitment according to their proportion in the population) will rise. For example, for  $\delta=0.01$ ,  $\bar{\kappa}^1=0.025$ , and  $\bar{\kappa}^0=0$  and using the coefficient estimates in Table 2, it may be shown that the average transfer effect increases from .330 to .441 with the introduction of financial intermediaries.

that meet these criteria.

The first data set we use is from the National Council of Applied Economic Research (NCAER) Additional Rural Incomes Survey (ARIS), which provides longitudinal information on asset stocks and flows and on net transfers for 4,118 households from a stratified national probability sample of all rural households for the crop years 1968-69, 1969-70 and 1970-71. There is village-level information on the realization of an adverse shock as reported by an informed village member and on the presence of and distance to financial intermediaries including banks and cooperative credit institutions. In particular, 2731 (67%) of the 4081 households used in the analysis<sup>15</sup> (representing 61% of rural Indian households, given the stratification) were located in a village with a bank or cooperative within 5 km. The ARIS data were augmented with information from the NCAER 1981-82 Rural Economic and Demography Survey. This latter survey, which reinterviewed approximately two-thirds of the households interviewed in 1970-71 (those in which the household head had remained the same up through 1981), provides information on the assets inherited by the household heads prior to the 1968 round of the ARIS survey. This information is used to construct instruments to predict  $\tau_{it}$ , which include the initial-period adverse shock and that shock interacted with the inheritance variables (wet and dry land, animals, and farm equipment). Income shocks were estimated from the residuals obtained from the estimates of profit functions reported in Foster and Rosenzweig (1995a) using these data.

The second data set we use is from a recent survey carried out by the International Food Policy Research Institute (IFPRI), the Pakistan Food Security Survey. It not only is comprehensive in detail on financial transactions and contains information on bank proximity but it also contains detailed information on production that was collected in sufficiently closely-spaced rounds to identify specific crop stages (planting and harvesting) within each of two annual crop-cycles (Rabi and Kharif). The detailed nature of this information permits estimation of the "shock" component of income in the presence

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<sup>15</sup>Of the original 4118 households, 37 households had to be dropped due to missing data.

of credit market imperfections that importantly influence the allocation of agricultural inputs and makes it possible to test whether this shock is unanticipated at the time that input decisions are made.<sup>16</sup> As noted, estimation of the extent to which shocks influence transfers provides evidence on the extent to which transfers play an important role as a form of insurance.

The data were collected in twelve rounds and cover a sample of 926 households residing in 52 villages in three major wheat-growing provinces of Pakistan - Punjab, Sind and the Northwest Frontier Province - followed over the period July 1986 through September 1989. In addition, the survey elicited information, in the first and last rounds, on the proximity of each village to a bank (there were no changes in bank locations across the survey rounds).

Because information in the survey refers to the interval between rounds, with the exception of consumption information and some other variables, only four of the twelve rounds permit a reasonably precise identification of the relevant variables to estimate savings decision rules that account for the seasonal nature of agricultural production. These rounds permit estimates of savings decision rules for the harvest stage of the Rabi season that condition on asset stocks at the beginning of the corresponding planting period and the shock that is realized at the time of the harvest. Limiting the analysis to those households cultivating in the Rabi season and for which the relevant data are available yielded 371 households, of which 166 (45%) were proximate to the bank in the sense that the nearest bank was less than 5km away.

The two decisions we examine using both sets of data are net financial savings, that is changes in financial assets, including bank deposits and other financial instruments, and net transfers, that is net contributions of monies and food to friends and relatives (transfers). Table 3 presents means, standard deviations, and prevalence measures for both transfers and savings in the two samples stratified for each

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<sup>16</sup>Details of the computation of the shock, including estimates of the normalized Generalized Leontief profit function used to obtain the shocks, and the test establishing that the estimated shock is unanticipated at the time of the planting state are presented in Behrman, Foster and Rosenzweig (1995b).

Table 3  
Means, Standard Deviations, and Prevalence of Transfer and Savings  
from Two South Asian Longitudinal Data Sets

	India 1968-71 <sup>a</sup>		Pakistan 1985-88	
	Bank $\leq$ 5 Km	Bank $>$ 5 Km	Bank $\leq$ 5 Km	Bank $>$ 5 Km
Percent of Households with Non-zero Flows for 3 Year Period				
Financial Savings	34.2	20.2	29.0	15.0
Transfers	6.5	18.9	85.2	84.1
Gross Flows for 3 Year Period (Rs)				
Financial Savings	227.4 (1047) <sup>b</sup>	113.1 (507.0)	4516 (21588)	4306 (23710)
Transfers	20.6 (593.6)	34.3 (382.6)	5908 (14602)	3518 (11444)
Annual Agricultural Income	2454 (2927)	2065 (2584)	31891 (31382)	31498 (26738)

<sup>a</sup>Figures for India sample are based on net flows for each of 3 years while those for Pakistan are based on gross flows.

<sup>b</sup>Standard deviations in parentheses

data set by whether or not the village in which a household resides was located within five kilometers of a commercial bank or financial cooperative. All statistics are based on a three-year period. In both data sets, as expected, the percent of households with any financial savings over the three-year period is substantially lower in villages located more than five kilometers from a financial intermediary - the ratio of savings participation rates across the villages differentiated by access to financial intermediaries is 1.7 to one in the India data and almost two to one in the Pakistan sample.

Consistent with the welfare-gain simulations reported in Table 1, in the India data the proportion of households in villages proximate to a bank that received or provided transfers over the same period is less than 35% that in the villages with less access to financial institutions. Access to formal financial institutions does appear to reduce the participation of households in transfer arrangements. The difference in transfer participation rates across village differentiated by asset liquidity is almost nonexistent in the Pakistan data. However, transfers in that setting are dominated by remittances flowing from relatives of the sample households residing outside of Pakistan and are ubiquitous in the sample, with approximately 85% of the households receiving transfers. Such transfers do not in large part reflect insurance considerations. Indeed, average net transfers received are approximately 3000 Rupees in the Pakistan sample and are essentially zero over the three-year period in the India data, as would be expected when such transfers are responsive to income shocks. Because a large part of transfers in the Pakistan setting represent regular income flows, it is not possible to detect the influence of financial intermediaries on informal insurance arrangements without examining estimates of the transfer decision rules.

## V. Estimates from the Sample Data

### a) India

Table 4 presents estimates of the transfer and savings decision rules for the India panel. The estimates for financial savings indicate that savings play a role in smoothing consumption, but only in villages proximate to banks. Consistent with estimates from the simulated data, in those villages, net savings are greater when shocks are high and are lower when financial assets are large. In villages in



Table 4  
 IV Fixed-Effects Estimates of Transfer and Savings Allocation Rules,  
 by Bank Proximity: National Sample of Rural India <sup>a,b</sup>

	Net Transfers Out		Net Financial Savings	
	Bank ≤ 5k	Bank > 5k	Bank ≤ 5k	Bank > 5k
Net Transfer Assets (Rs)	-2.109 (1.61)	-.948 (9.07)	1.40 (1.28)	-2.16 (0.51)
Net Financial Savings (Rs)	.0104 (0.08)	-.00222 (0.02)	-1.05 (9.85)	.122 (0.02)
Value Farm Equipment (Rs)	-.00777 (0.04)	.0321 (0.49)	.203 (1.31)	-1.555 (0.59)
Value Animal Stocks (Rs)	.00560 (0.01)	-.0416 (0.15)	.119 (0.27)	2.91 (0.25)
Profit Shock	.0133 (1.92)	.008345 (2.08)	.019 (3.33)	-.0586 (0.36)
Constant	-28.35 (0.85)	-24.79 (1.67)	1117.18 (4.23)	600.17 (1.00)

<sup>a</sup>Analysis based on 4081 households, 2731 with a proximate bank, with three observations per household.

<sup>b</sup>All right-side variables except profit shock are treated as endogenous. Instruments include inheritance of land and other assets, adverse shock in initial period, and interactions of initial adverse shock with inheritance variables.

<sup>c</sup>Absolute asymptotic t-ratios in parentheses.

which households do not have access to banks, however, there is little evidence of financial savings playing any significant role. Thus, proximity to banks appears to be important in affecting the ability of households to use savings to smooth consumption.

The estimates also suggest that the presence of financial intermediaries increases the insurance role of transfers. In particular, the estimates of the shock effects on transfers and of transfer assets in villages in which households do not have access to banks are consistent with a regime in which transfers play an insurance role but partners are unable to commit - positive shocks induce transfers out but those households who in the past remitted more transfers out reduce current transfers for given profit shock. Thus in areas without a bank, implementability constraints evidently influence transfer behavior, with each additional Rupee that has been sent out in the past resulting in almost a one-for-one decline in additional transfers out given the shock. In villages with access to formal credit institutions, however, the positive shock effect on transfers is substantially larger than in the villages without banks, indicating that transfers are playing an enhanced insurance role. The negative transfer asset effect also is greater in those villages in absolute value. Both of these differences conform to the simulations in Table 2 (that exclude partner assets) that suggest that intermediation induces more transfer arrangements with commitment relative to those without commitment, a result consistent with the theory's implication that the welfare gains from commitment rise substantially when households can use assets to smooth consumption. Also conformable with the simulation estimates are the positive effects of financial assets on transfers and the effects of transfer assets on financial savings in villages with access to banks, but neither of these estimates are significantly different from zero.

#### b) Pakistan

A shortcoming of the India panel estimates is that because the data pertain to a calendar year some of the variation in savings behavior may actually occur prior to the time that the income shock was realized. As noted, the IFPRI Pakistan data set provides data with sufficient temporal disaggregation to construct measures of savings and profits for specific stages of agricultural production. An estimated

stage-specific profit function may then be used to construct an idiosyncratic shock measure that is relevant to the savings decision rule specific to the post-harvest period.

Transfer and financial savings decision rules for the Pakistan sample are presented in Table 5. As for the India data, it is evident that financial savings decision rules differ importantly by the presence of financial intermediaries. The income shock effect on net savings in the presence of banks is three times the effect in the absence of banks and there is a substantial effect of the stock of savings on savings only in the presence of banks. Thus, bank proximity importantly affects the ability of households to use assets to smooth their consumption in both rural Pakistan and India. The estimates of transfer decision rules in villages without banks, as for India, indicate that transfers play an important insurance role and appear to be transacted among partners who are unable to commit. In those villages, transfer assets have a negative and significant relationship with transfers out and income shocks have a significant and positive relationship with transfers made to others in conformity to the estimates from the simulated data under the scenario in which there is no commitment and households do not have liquid assets. In particular, the estimates indicate that in those villages a one hundred Rupee increase in the profit shock results in an increase in transfers out of 3.7 Rupees. Less consistent with the estimates from the India panel, the shock and transfers asset coefficients are similar across areas differing according to whether there is a bank nearby. However, both the profit shock and the transfer asset effects are less precisely measured in the sample of households in villages located near a bank.

## VI. Conclusions

In this paper we have used a model incorporating transfer behavior, savings and imperfect commitment to examine the implications of the presence of financial intermediaries for transfer behavior in developing countries using two longitudinal data sets. We found, as expected, that the introduction of financial intermediaries provides new opportunities for households to smooth income through saving and dissaving. While this change appears to diminish to some extent the magnitudes and prevalence of transfers, our results indicate that transfer arrangements continue to play an important role in helping

Table 5  
IV Fixed-Effects Estimates of Asset Accumulation Decision Rules in Post-Harvest  
Rabi Stage, by Bank Proximity: Villages in Rural Northwest Pakistan<sup>a,b,c</sup>

	Net Transfers Out		Net Financial Savings	
	Bank ≤5k	Bank >5k	Bank ≤5k	Bank >5k
Planting-stage				
Net Transfer Assets (Rs)	-.307 (1.37)	-.328 (4.34)	-.218 (1.93)	.088 (1.21)
Savings (Rs)	.063 (0.56)	-.028 (0.42)	-.574 (2.85)	-.023 (0.38)
Debt (Rs)	.099 (2.08)	.161 (1.57)	-.0239 (0.59)	.192 (2.03)
Food Stocks (Rs)	1.45 (1.93)	-.824 (3.19)	.0251 (0.03)	-.786 (1.47)
Inventory (Rs)	.111 (0.88)	.099 (1.10)	-.004 (0.05)	.014 (0.27)
Equipment (Rs)	.095 (2.04)	-.123 (1.61)	.608 (1.77)	-.200 (1.83)
Potential Labor Income (Rs/day)	195 (2.07)	-149 (1.45)	-20.6 (0.21)	-88.2 (0.81)
Harvest-stage				
Production Shock (Rs)	.023 (1.06)	.037 (2.17)	.090 (2.30) <sup>d</sup>	.029 (1.58)
Potential Labor Income (Rs/day)	-339 (1.90)	63.5 (0.44)	3.48 (0.03)	55.1 (0.39)
F(9,311)	3.43		2.05	
P-value	.000		.034	

<sup>a</sup>Analysis based on 371 households, 166 with a proximate bank, with two observations per household.

<sup>b</sup>All specifications include village x time dummies (not shown). These control for contemporaneous variation in wages and prices.

<sup>c</sup>All right-side variables other than village x time dummies are treated as endogenous. Instruments include initial crop-cycle state variables (other than the production shock), inherited assets, household composition, land ownership and village x time x land inheritance interactions.

<sup>d</sup>Absolute asymptotic t-ratios derived in parentheses.

agricultural households to smooth income fluctuations even in the presence of financial institutions. Indeed, because the introduction of financial intermediaries increases the value of full-commitment transfer arrangements, which provide relatively complete insurance, relative to no-commitment arrangements, the insurance role of transfers actually tends to be higher in the presence of financial intermediation.

The robustness of informal insurance arrangements to the presence of financial intermediaries is easily understood. While saving and borrowing can assist households in smoothing consumption in the face of income shocks, they do not actually provide insurance. A combination of income pooling through transfer arrangements and savings behavior thus provides households with less consumption variability than either alone. While informal arrangements among family members and other individuals may be importantly altered by the introduction of more formal mechanisms that meet some of the same needs, it appears that the informal arrangements, particularly those which are less vulnerable to problems of imperfect commitment, still have an important role to play.

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