

# **CENTER FOR ECONOMIC RESEARCH DISCUSSION PAPER No. 99-03.**

## **Village Banking And Maternal And Child Health: Theory And Evidence From Ecuador And Honduras**

Steven C.. Smith  
The George Washington University

Sanjay Jain  
The George Washington University

January 1999



**DEPARTMENT OF ECONOMICS**

Funger Hall, 2201 G Street, NW  
Washington, District of Columbia 20052

Phone: (202) 994-6150  
FAX: (202) 994-6147

Village Banking and Maternal and Child Health:  
Theory and Evidence from Ecuador and Honduras

Stephen C. Smith and Sanjay Jain  
George Washington University, Washington DC 20052

January 1999

JEL Classification Numbers: Primary: I12, and O17. Secondary: I32, J13, J22, and O16.

We would like to thank Jonathan Morduch, Anna Paulson, department seminar participants at Cornell, George Mason, George Washington and Maryland (College Park) universities, participants at the session on Micro Development, AEA annual meetings, Chicago, Jan. 1998, the Ninth IAFEP Conference, Univ. of Bristol, England, June 1998, and the NEUDC Conference, Yale Univ., Oct. 1998, for their helpful comments. We gratefully acknowledge the invaluable assistance of Project HOPE, especially Bettina Schwethelm, and Rosalia Rodriguez-Garcia and James Macinko of the GWU Center for International Health, with which Project HOPE contracted to design the program impact questionnaires on which the empirical part of the paper is based; financial support for data collection from the Agency for International Development to Project HOPE (cooperative agreement FAO-0158-00-2071-00) is also gratefully acknowledged. Address Correspondence to: Stephen C. Smith, Dept. Of Economics, 624 Fungler Hall, George Washington University, Washington DC 20052.

## Abstract

Many village banking institutions, such as the Grameen Bank, bundle micro credit together with health, education, or other social programs (“tie-ins”), so their effects are difficult to disentangle. The paper formalizes arguments on tie-ins by extending the agricultural household model to allow for a nontradable home-produced good (health) that cannot be substituted in the microenterprise production function, so consumption and production decisions are not “separable.” We find that the ‘net price’ of consumption and of time spent on health are lower than their market price; their opportunity costs are partly recouped via reduction in sick time and increased productivity given hours worked. But some participants constrained to participate in a health component may exhibit lower gains than in a conventional credit bank. Banks with tie-ins may gain economies of scope but lose comparative advantage. To determine the effects of tie-ins, we need experimental evidence. This paper uses financial and health data collected from mothers participating in Project HOPE’s Village Health Banks, in conventional credit-only village banks, and in neither type of bank, in (largely) rural Ecuador and urban and peri-urban Honduras. Effects on expenditures and breastfeeding incidence of health and credit bank participation were ambiguous. However, in Honduras, health bank participation was robustly associated with reduced conditional child diarrhea probability, while in no specification was credit bank participation found to reduce the conditional probability of diarrhea. In Ecuador, results were mixed but if anything supported a larger effect of the credit only banks. For Honduras, in all specifications health bank participants have significantly higher subsequent conditional probability of cancer screening, our proxy for formal health care. A much weaker effect was found for credit only participants. Similar but less pronounced effects were found for Ecuador. There is no clear link between tie-ins and performance of the banks themselves.

## Introduction

Microenterprise credit unions, or "village banking," has become perhaps the most prominent "fashion" in development policy in the 1990s. Credit has consistently been found to be a binding constraint for microenterprise development. Lack of credit particularly, though certainly not exclusively, affects women (microentrepreneur) borrowers, for reasons ranging from lack of property rights to local cultural practices; but lack of collateral is arguably the most important. Evidence suggests that mothers' income increases are more likely to be spent on nutrition and other health improving expenditures for children than fathers' income increases (e.g., Thomas, 1990, 1993; Pitt and Khandker, 1996). Thus, relaxing credit constraints for women has been viewed as a particularly powerful development policy tool.

Three related factors have made it difficult to relax credit constraints to women microentrepreneurs: First, poor microentrepreneurs almost by definition tend to have little or no collateral. Second, it is difficult for conventional lenders to determine borrower quality. Third, small loans are more costly to process per dollar lent.

Village banking seeks to solve these problems in part through the "collateral of peer pressure" (Smith, 1997, ch. 5). For example, in the case of the well-known Grameen Bank in Bangladesh, microentrepreneurs are organized into credit cooperatives, to which seed capital is lent. Before qualifying for a loan, each member is required to identify several other members or potential members willing to cosign loans with them. Typically, no repeat loans are approved until all members' accounts are settled. Members know the characters of the cosigning group members they select, and may be expected to join groups with members they believe likely to repay their loans. Thus the banks make use of the information "impacted" in the village or neighborhood

about who is a reliable and capable borrower, getting villagers to reveal this information in an incentive compatible way. At the same time, an implicit collateral is created by the pressure that members would be expected to place on other group member to repay funds. The good will of these relatives and friends of the borrower represents part of the borrowers' capital, which failure to pay the loan puts at risk. Finally, village banks extensively utilize volunteer member labor (as do some consumer cooperatives), thus lowering the bank's effective costs. The group loan format may also reduce transaction costs per loan; for example, mutual monitoring reduces the need for costly audits. Members reveal by participating that the value of the time thus spent is less than the value of the enhanced credit. Practitioners claim that village banking arrangements are more attractive to female than to male borrowers, and are in practice more effective among groups of women borrowers. The explanations would undoubtedly include a credit constraint that is more binding on women borrowers.

Empirically, village banks have an impressive track record, with a repayment rate typically well over 90%, and an unusually large capacity to become financially self-sustaining. However, development agencies and nongovernmental organizations (NGOs) typically play a significant role in establishing village banks. While NGOs' seed capital for initial loans is usually repaid, their time and other resources provided are not; and thus village banks do enjoy a significant subsidy (Morduch, 1998; Khandker, Khalily, and Khan, 1995). The success of village banking has led major development agencies to embrace the concept and expand funding. The Microenterprise Summit of February, 1997 is an important case in point (World Bank, 1997).

Recently, practitioners in many aspects of development have sought to tie their work with village banking. For example, Freedom From Hunger has attempted to integrate village banking

with its basic education programs in rural Thailand and elsewhere. A group of NGOs engaged in tie-ins between credit and other social development goals has recently begun an active “practitioners’ network” called the “Credit with Education Learning Exchange” (see e.g. Vor der Bruegge et al, 1997). The Grameen Bank has been a pioneer in tying social development goals with credit.<sup>1</sup> Such noncredit tie-ins, usually focused on education or health goals, are established partly out of a conviction that while removing credit constraints on microenterprises represents an unusually effective development strategy, it stops short of being the long-sought "silver bullet" for traditional sector development; proponents argue that it is necessary but insufficient as a development strategy.

The tie-ins are predicated on the assumption that raising family income is not sufficient to meet development goals such as ending malnutrition, reducing infant mortality, and increasing the education levels of girls. The basis for these claims is the observation that higher incomes do not necessarily lead to better education or health for mothers or their children, while the poorest of the poor are often unable to effectively utilize credit, in part because of poor family health. It is argued that many low income microentrepreneurs, particularly women, are too lacking in basic health services, and essential knowledge about health as well as about business practice, to successfully raise their families out of poverty with access to credit alone. They also argue that without such access, even mothers knowledgeable about health will be unable to break the cycle of poverty. Such observations suggest to practitioners an interdependency between income, health and education that is best dealt with through a simultaneous and integrated program strategy.

Of course, practitioners are also aware that development funders now consider village banking highly effective, and that funding such programs has become fashionable, so there is a

clear incentive to “package” their development programs in a way thought likely to appeal to funders. If only because of this incentive, claims of the effectiveness of program tie-ins must be evaluated carefully. The first goal of this paper is to formalize arguments in favor of integrating credit provision with other development services, to make clear their critical assumptions and logical foundations, and to establish a more rigorous framework for testing.

Although in the past three years, several NGOs working in the fields of education and of maternal and child health have developed programs to tie their work with microenterprise credit, there has been only the most sketchy of data to support such a diversion of resources. However, one NGO, Project HOPE, has collected data on their "Village Health Banks" program in Ecuador and Honduras. HOPE created new village banks both with and without a health education and services component, and collected data from both bank participants and nonparticipants, including some basic financial and health information. The credit-only banks operated for several loan cycles (almost two years) before a health component was added.<sup>2</sup> Thus, we have a unique social science experiment to provide an economic analysis of an emerging trend in development policy at an early stage. The second goal of the paper is to introduce the first economic evidence on the effectiveness of integrating village banking with noncredit tie-ins.

The remainder of the paper is organized as follows. In Section II, we consider arguments and evidence on village banking tie-ins. In Section III, we present our formal model. In Section IV, we describe the experiment and the resulting data set. In Section V, we report empirical results. In Section VI, we draw conclusions and describe plans for further work.

## II. Village Banking Tie-ins: Arguments and Evidence.

Better access to credit can have a positive effect on health and education. Econometric evidence suggests that growth patterns for children in landless households have been influenced by wealth shocks among credit constrained households (Foster, 1995). A 1989 UN study concluded that the harvest from an irrigated rice project in the Gambia reduced seasonal fluctuations in food availability and improved the nutritional status of children (see Marek, 1992). There is some evidence that lack of access to credit can result in lower school attendance and poorer educational outcomes (see esp. Jacoby, 1994).

Moreover, the literature on the income elasticity of the demand for calories indicates that increasing credit, and even increasing income, is not sufficient for broader social goals of development, and may indeed not be possible without complementary programs. Estimates of the income elasticity of the demand for calories in the literature range from approximately 0 to about 0.5, depending on the region and the econometric strategy (Bouis and Haddad, 1992; Behrman and Deolalikar, 1987; Subramanian and Deaton, 1996). If this relationship is very low, development policies that emphasize increasing credit, and even the incomes of the poor, without attention to the way these additional resources are expended within the family, may not lead to successful development, at least not very quickly.

Marek (1992) reviews numerous additional studies that indicate the elasticity of calorie consumption with respect to income is positive but well under unity. This less than proportional response is due to two factors: income is spent on other goods besides food, and part of the increased food expenditures is used to increase food variety without necessarily increasing the consumption of calories. The weight of the evidence is that income is not the sole determinant of

the consumption of calories. Seasonal fluctuations of both income and prices are important.

Note that even if income elasticities for calories are on the order of 0.3 to 0.5, as Subramanian and Deaton (1996) estimate, calories are not the same as nutrition; and nutrition of earners is not the same as nutrition of their children. An increase in income frequently allows families in developing countries to switch consumption from nutritious foods such as beans and rice, to nonnutritious “empty calories” such as candy and soda, which may be perceived as modern and a symbol of economic success. Parents may then fail to place restrictions on children’s consumption of such items or to require children to consume nutritious foods.

On the other hand the income elasticity of “convenience” foods is greater than unity (see Schiff and Valdes, 1990, Marek, 1992). Bouis (1991) found that intake of vitamins A and C is not positively associated with income in the Philippines and argued that consumer education was important. Moreover, morbidity does not necessarily decrease significantly with income (Bouis and Haddad, 1990; Kennedy et al (1992) ). Poor health (e.g. diarrheal diseases) can negate the health advantages of better nutrition. Von Braum et al (1989) found that diarrhea is associated with reduced nutritional status in the Gambia, even after calorie intake is controlled for.

Taken together this evidence shows that we cannot automatically expect income to rise among the absolutely poor after relaxation of credit constraints without improvements in their health status; and on the other hand, increases in income do not automatically result in improved health status.

Moreover, combining credit and health or education programs may allow for joint collection and use of information on villagers, among other spillovers. This is in addition to the advantages of sharing resources “under one roof.” These advantages might in principle be realized

through a joint venture rather than organizational integration, but such arrangements seem to be costly to implement, indicated by the fact that in practice NGOs almost never enter into them.

Proponents of integrating village banking with development public health also argue in effect that credit availability is an incentive for mothers to participate in health programs that generate externalities, or benefits of which the participants may be unaware. Further, proponents also argue that increased access to credit is not sufficient for improved health outcomes, because health knowledge and intentions, such as how to identify nutritious foods, may be lacking; and that credit provision may not be sufficient for improved incomes, because illness or malnutrition or other indicators of poor health, of either the mother or her children, may curtail labor market participation (Project HOPE, 1994).

However, there is an obvious counter-argument to the tie-in proposals. Non-financial responsibilities divert the attention of financial institutions from their comparative advantage; and a banking role causes health NGOs to lose their own comparative advantage. Despite potential complementarities in health and income *outcomes*, it is by no means clear that there are any complementarities in the *production* of health and credit. Many health benefits may result from increased income of program participants without other health interventions, or, if health interventions are needed at the same time as credit interventions are implemented, these interventions may be successfully implemented with parallel institutions. At the same time, regulations or incentives which pull an institution away from its comparative advantage may reduce overall efficiency even as they seem to be helping society to realize certain goals in the short run. In this view, the net economic benefits of conventional village banks would be greater than that of health banks, and health NGOs should focus on their comparative advantage in health

provision.

Moreover, it may be argued that at minimum, participants should be allowed to choose whether to participate in a credit-only bank, or a bank with a tie-in. Clients not in need of special services such as those of health banks, but able to get access to credit only through this source, might be worse off than if they participated in credit-only banks. Not only would such clients lose time participating in health education or other activities that could be productively spent working with their enterprises, but, under financial sustainability, any incremental costs of running a bank with tie-ins would ultimately be reflected in a higher interest rate paid by borrowers. The upshot of this argument is that services should either be supplied separately or at least that clients should be offered an opportunity to receive them separately.

In the following section, we develop a formal model designed to capture the effects of credit constraints and health human capital on household decision making, and to motivate the empirical analysis that follows.

### III. A model of microentrepreneurs with family health, consumption and leisure objectives.

In this section, we introduce a model of household decision-making, that extends on the agricultural household model of Singh, Squire, and Strauss (1986). As in the agricultural household model, we assume that households maximize utility by choosing consumption of leisure, a home-produced good (in our case, health), and purchased goods that are not produced at home. Specifically, we assume Cobb-Douglas utility of degree one homogeneity:

(1)

$$U = X_g^\alpha \cdot X_h^\beta \cdot X_l^\gamma$$

where  $X_l$  is the amount of leisure,  $X_g$  is goods consumption, and  $X_h$  is the health outcome of the household (to be made more precise below).

However, unlike the standard agricultural household model, we assume that the home-produced good, health, is not tradable. Its production is a function of two inputs, the amount of time spent on health-care activities, and goods consumption:

$$X_h = f(Z_h, X_g; K_h, \xi) \quad (2)$$

In equation (2),  $Z_h$  is the time the household spends on health activities, such as personal hygiene, breast-feeding children, cleaning house, preparing nutritious meals rather than convenience foods, and acquiring health knowledge; for simplicity, since we are modeling decisions of poor households, we assume that these services cannot be purchased on the market.  $K_h$  is the stock of ‘health human capital’, including ‘health knowledge’, that the household possesses, and  $\xi$  is a vector of household characteristics, including household asset stocks.

In effect, then, the household does not choose health directly – rather, the household’s

consumption decisions involve the selection of goods consumption, and the allocation of its time between leisure, health care, and income-generating activities.

The household's time constraint can be written as:

(3)

$$X_l + L = T - S(X_h) - Z_h$$

where L is the amount of time the household spends on labor, whether in its own enterprise or in the labor market, and  $S(X_h)$  is the amount of time lost due to sickness. Obviously,  $S'(X_h) < 0$ ; and we assume that  $S''(X_h) > 0$ .

Finally, the household faces a cash budget constraint - its spending cannot exceed its earnings. Income to the household comes from its profits in the household enterprise, from labor outside the household, and from its endowment, or unearned income:

(4)

$$p_g \cdot X_g + p_l \cdot X_l + p_l \cdot Z_h = p_l(T - S(X_h)) + \pi(N, X_h) + E$$

where the right hand side will be recognized as analogous to the "full income" of the household.

The household enterprise profit function can be written as:

(5)

$$\pi = \pi(N, X_h; c, P, w, K_b, \xi)$$

where N is the total labor employed in the enterprise,  $X_h$  is the health status of the household/entrepreneur, c is a measure of the availability of credit to the enterprise, P represents prices, w is the wage rate, and  $K_b$  is the stock of capital that the household possesses. Note that

we have implicitly assumed that labor markets are perfect, in that we do not distinguish between the household's own labor and hired-in labor in the production function. However, there is a household-specific element, the entrepreneur's health, which cannot be substituted in the enterprise's production function. Thus consumption and production decisions will not be 'separable' for the household.<sup>3</sup>

The household maximizes its utility subject to the constraints on its stock of time, its income, and the production function for health. Combining the constraints, we can write the household's problem as:

(6)

*Choose  $X_g, X_l, Z_h, N$*

to

$$\max U = X_g^\alpha \cdot X_h^\beta \cdot X_l^\gamma$$

subject to:

$$p_g \cdot X_g + p_l \cdot X_l - p_l(T - S(X_h) - Z_h) - \pi(N, X_h; c) - E = 0$$

We are interested in the effect of changes in credit availability, and in 'health human capital', on enterprise productivity, goods consumption, and health outcomes.

We begin by taking the first-order conditions (FOCs) for each of the household's decision variables,  $X_l, X_g, Z_h,$  and  $N$ . Omitting the condition for  $N$  (which simply requires that the value of the marginal product of  $N$  be equated to the labor wage), and using  $\lambda$  to denote the

Lagrangean multiplier, we can write the FOC for  $X_l$ :

(7)

$$\frac{\partial U}{\partial X_l} = \lambda \cdot p_l \Rightarrow \lambda = \frac{\gamma \cdot U}{p_l \cdot X_l}$$

The f.o.c. for  $Z_h$  has arguments other than the price of  $Z_h$  :

(8)

$$\frac{\partial U}{\partial Z_h} = \lambda \cdot (p_l + p_l \cdot S' \cdot \frac{\partial X_h}{\partial Z_h} - \frac{\partial \pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial Z_h}) = \lambda \cdot (N_Z')$$

where  $N_Z'$  is the 'net price' of  $Z_h$ . As in nutrition efficiency wage models, the 'net price' of  $Z_h$  is lower than its market price, for similar reasons. Part of the 'expenditure' on  $Z_h$  is recouped via the reduction in sick time (given by the second term in the brackets), and part is also recouped by the increase in enterprise profit caused by an improvement in the productivity of the microentrepreneur for a given number of work hours (the final term in the brackets).

(9)

$$\Rightarrow \frac{\beta U}{X_h} \cdot \frac{\partial X_h}{\partial Z_h} = \frac{\gamma U}{p_l \cdot X_l} \cdot (p_l + \frac{\partial X_h}{\partial Z_h} (p_l \cdot S' - \frac{\partial \pi}{\partial X_h}))$$

Note that if health status is used as a screen by conventional lenders then an additional term would appear in (9) further reducing the net price of health effort.

Using the definition of net price,  $Z_h$ , we may write the foc more conventionally as:

(10)

$$\Rightarrow \frac{X_h}{X_l} = \frac{\beta \cdot p_l}{\gamma \cdot (N'_z)} \cdot \frac{\partial X_h}{\partial Z_h}$$

Similarly, the ‘net price’ of goods will be lower than the market price, because of the positive impact of the goods consumption on the household’s health, with the consequent reduction in sick time, and increase in enterprise profits.

(11)

$$\frac{\partial U}{\partial X_g} = \lambda \cdot (p_g + p_l \cdot S') \cdot \frac{\partial X_h}{\partial X_g} - \frac{\partial \pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial X_g} = \lambda \cdot (N'_g)$$

where  $N'_g$  is the ‘net price’ of purchased consumption goods, so that we can again write the foc in more conventional form as:

$$\Rightarrow \frac{\alpha U}{X_g} = \frac{\gamma \cdot U}{p_l \cdot X_l} \cdot (N'_g) \quad \Rightarrow \frac{X_g}{X_l} = \frac{\alpha \cdot p_l}{\gamma \cdot N'_g}$$

(12)

We are interested in the impact of increases in  $K_h$  (health knowledge, or health human capital) on the endogenous variables, in particular the health outcomes,  $X_h$ , and goods consumption,  $X_g$ . Using  $\Psi$  to denote the budget constraint from equation (8), the effects of an exogenous change in  $K_h$  can be analyzed:

(13)

$$\frac{dX_l}{dK_h} = -\frac{\partial\Psi/\partial K_h}{\partial\Psi/\partial X_l} = -\frac{(S' \cdot \frac{\partial X_h}{\partial K_h} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial K_h})}{p_l} > 0$$

The numerator in (13) is negative, since  $S' < 0$  (sick time declines with improvements in health),  $\partial X_h/\partial K_h > 0$  (health outcomes improve with greater health human capital), and  $\partial\pi/\partial X_h > 0$  (household enterprise profits are increasing in the health of the entrepreneur). For the same reasons, the numerator in the following expression will also be negative, and since the ‘net price’ of goods is always positive, we show in (14) that  $X_g$  is also increasing in  $K_h$ .

(14)

$$\frac{dX_g}{dK_h} = -\frac{\partial\Psi/\partial K_h}{\partial\Psi/\partial X_g} = -\frac{(S' \cdot \frac{\partial X_h}{\partial K_h} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial K_h})}{p_l + p_l \cdot S' \cdot \frac{\partial X_h}{\partial X_g} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial X_g}} = -\frac{(S' \cdot \frac{\partial X_h}{\partial K_h} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial K_h})}{N'_g} > 0$$

Similarly, for  $Z_h$ ,

(15)

$$\frac{dZ_h}{dK_h} = -\frac{\partial\Psi/\partial K_h}{\partial\Psi/\partial Z_h} = -\frac{(S' \cdot \frac{\partial X_h}{\partial K_h} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial K_h})}{p_l + p_l \cdot S' \cdot \frac{\partial X_h}{\partial Z_h} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial Z_h}} = -\frac{(S' \cdot \frac{\partial X_h}{\partial K_h} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial K_h})}{N'_Z} > 0$$

Using equations (14) and (15) above, we can derive the sign of  $dX_h/dK_h$

(16)

$$\frac{dX_h}{dK_h} = \frac{\partial X_h}{\partial Z_h} \cdot \frac{dZ_h}{dK_h} + \frac{\partial X_h}{\partial X_g} \cdot \frac{dX_g}{dK_h} > 0$$

since all the terms on the right hand side are positive.

Similarly, we can examine the predicted changes in the endogenous variables as a result of exogenous changes in  $c$ , the availability of credit. While the impact of increased credit availability on income is straightforward - an increase in  $c$  raises household enterprise profits - the effect on health outcomes is less obvious. While the increase in goods consumption resulting from the increase in income from the enterprise should improve health outcomes, there may be a countervailing effect from the fact that, with increased income, and since leisure is a normal good, the household might increase its consumption of leisure too, to the extent that it spends less time on health care. It might appear that the net effect on health may be ambiguous, and might depend on the size of the (positive) 'income effect' on goods consumption, versus the 'substitution effect' of increased leisure 'crowding out' health activities. However, as we show below, the impact of greater credit availability on  $Z_h$  is unambiguously positive. The extra time spent on health care, and the extra leisure, both come out of the reduced sick time resulting from better health. Thus, in this formulation, the removal of credit constraints should lead to improved health outcomes even as the household might choose to consume more leisure. Note, however, that the effect of an increase in  $c$  on the total amount of time spent working is ambiguous - i.e., the household may have a backward bending supply curve for labor. Formally, the effects of credit are given by:

(17)

$$\frac{dZ_h}{dc} = -\frac{\partial\Psi/\partial c}{\partial\Psi/\partial Z_h} = -\frac{\partial\pi/\partial c}{p_l + p_l \cdot S' \cdot \frac{\partial X_h}{\partial Z_h} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial Z_h}} = -\frac{\partial\pi/\partial c}{N'_Z} > 0$$

(18)

$$\frac{dX_l}{dc} = -\frac{\partial\Psi/\partial c}{\partial\Psi/\partial X_l} = -\frac{\partial\pi/\partial c}{p_l} > 0$$

(19)

$$\frac{dX_g}{dc} = -\frac{\partial\Psi/\partial c}{\partial\Psi/\partial X_g} = -\frac{\partial\pi/\partial c}{p_l + p_l \cdot S' \cdot \frac{\partial X_h}{\partial X_g} - \frac{\partial\pi}{\partial X_h} \cdot \frac{\partial X_h}{\partial X_g}} = -\frac{\partial\pi/\partial c}{N'_g} > 0$$

Again, combining equations (17) and (19), we find that the sign of  $dX_h/dc$  is positive:

(20)

$$\frac{dX_h}{dc} = \frac{\partial X_h}{\partial Z_h} \cdot \frac{dZ_h}{dc} + \frac{\partial X_h}{\partial X_g} \cdot \frac{dX_g}{dc} > 0$$

Thus, our model suggests the following testable hypotheses: an exogenous change in the availability of credit (for example, via the establishment of a microcredit scheme), and in the availability of ‘health knowledge’ (for example, via the establishment of a ‘health bank’), should positively impact the amount of time spent on health care, and expenditures on consumption

goods, both of which should lead to improved health outcomes. The intuition is straightforward: since health is a normal good, the household's demand for it increases as the household becomes richer. As the household becomes healthier, and therefore has extra time available that was previously lost to sickness, this extra time is devoted partly to increasing  $Z_h$ , and partly to greater leisure.

Moreover, this improvement in household health outcomes, and in goods consumption, will decline as the household becomes richer, so that the household's consumption of leisure will increase at an increasing rate. The intuition here is that as the household becomes richer, the 'net prices' of  $X_g$  and  $Z_h$  more closely approximates their market prices. The divergence between the market price and the net price for  $X_g$  and  $Z_h$  reflects the fact that increases in  $X_g$  and  $Z_h$  cause an increase in  $X_h$ . This increase in  $X_h$  has two effects: it causes a decline in sickness; and it causes an increase in profit. However, as  $X_h$  increases, its impact on sickness and on enterprise profits gradually declines ( $S''$  is positive, and the second derivative of  $\pi$  with respect to  $X_h$  is negative). Mathematically, this can be seen most easily in equations (10) and (12) - the ratio of health to leisure, and goods to leisure, is falling, because the net prices,  $N_g'$  and  $N_z'$ , are rising with rising income.

So far, we have modeled the effects of the credit and health programs as simply affecting  $c$  and  $K_h$ . Implicitly, we have assumed that participation in these programs is costless to the household. However, as we point out in the discussion of the Project Hope program in the next section, membership in a health bank requires the household to spend some time in health training and other activities. In a situation in which households vary in their initial endowment of  $K_h$ , the time commitment entailed by the health component of the health bank may outweigh the possibly small benefits, for households that are already well-informed about health matters.

Formally, consider membership in a health bank as a ‘package’ that increases  $K_h$  and  $c$ , as before, but that also reduces  $T$ , the total time available to the household. Further, the increase in  $K_h$  varies across households and could potentially be very small. In that case, the change in the household’s consumption of, for example, leisure, as a result of membership in a health bank can be decomposed into three components, as in equation (21) below.

(21)

$$\Delta X_l = \frac{dX_l}{dT} \Delta T + \frac{dX_l}{dK_h} \Delta K_h + \frac{dX_l}{dc} \Delta c$$

In equation (21), each of the derivatives on the right hand side are positive. In the case of heterogeneous households who have different initial stocks of health capital, the change in  $K_h$  might be negligibly small, so that the aggregate of the first two terms on the rhs could be negative. In other words, this model suggests that participants with high initial health who are constrained to participate in a health bank may exhibit lower income gains than if they had been in a conventional credit bank. This may occur when participating in the “tie-in” health or education component represents a net cost, so that the overall positive effect of the credit component of the health bank is partially offset by the negative net effect (in lost labor time, for example) of the “tie-in” component.

In the following two sections, we will use the model developed in this section to motivate the study design and the econometric analysis.

## IV. The Experiment and the Data Set

### IV.1. Project HOPE's Village Banking Project

Historically, the private voluntary organization Project HOPE has focused on provision of improved public health and other health services for developing countries. HOPE's village banking and income generation project began in Ecuador and Honduras in August 1993. HOPE developed the project in part on the premise that their past maternal and child health programs were often limited in providing *sustained* improvements in health and nutrition because of constraints due to poverty. As HOPE (1993) put it, "poor families many times cannot afford the nutritious foods, medicines, health services, or environmental conditions they need for protecting their health." As a result, HOPE sought "to improve the health status of low-income mothers, and their infants and young children in Ecuador and Honduras, by creating 'village health banks' that combine loans and popular economic education with maternal and child health promotion activities."<sup>4</sup> HOPE argued that "the strengths of the health-bank approach over the traditional child survival approach include: 1) Village health banks seek to supply the *means* as well as the knowledge necessary to improve nutrition and health service utilization, and to promote health seeking behaviors; 2) Peer pressure and group solidarity are used as a means to encourage the practice of health seeking behaviors; and 3) Village health banks contain an element of financial sustainability." HOPE also believes that the availability of credit can act as an incentive for mothers to participate in maternal and child health programs that they would otherwise not participate in due to time and other constraints, despite their benefits.

The health banks provided credit and basic business skills to low-income women for use in productive activities. In addition, health promotion activities seek to provide individuals with basic health knowledge and access to basic health services. These may include basic hygiene,

maternal health, family planning, and women's preventative health care, as well as child survival interventions, including acute respiratory infections (ARI), Expanded Program on Immunization (EPI), control of diarrheal diseases (CDD), breastfeeding, and nutrition. The business and health education components of this project are intended to improve the benefits of increased income, and to reinforce behaviors conducive to sustained improvements in the health status and income of the family. Improved health status is at least implicitly also intended to improve efficiency on the job and to decrease time lost from work due to child illness.

Banks proceed according to “loan cycles,” each of which lasts for 16 weeks. In addition to credit and basic business information, the health banks also provided health promotion activities focusing on maternal and child health. The health interventions take the form of fifteen minute health lectures and other activities at each biweekly meeting of the bank, led by each bank’s health officer. All bank members are required to attend. Health messages for each cycle are printed in simple language on the reverse of each borrower's account booklet (a majority of participants have at least basic literacy skills). For each health bank, the health promotion component begins with the second cycle, as given in Table 1.

Table 1: Health Activities Across Cycles

Cycle 1:	No health-related activities
Cycle 2:	Maternal and women's health
Cycle 3:	Management of Acute Respiratory Infections (ARI)
Cycle 4:	Control of Diarrheal Diseases (CDD) and basic hygiene
Cycle 5:	Nutrition and management of child illnesses
Cycle 6:	Expanded Program on Immunization (EPI)
Cycles 7 and up:	Determined by the health needs/priorities of each bank.

In addition, each bank designates a member as its health officer, whose responsibility it is to monitor immunizations of children and women, record births and deaths, weigh children under two on a quarterly basis, and refer members to local health services for care.

Project HOPE estimates that the marginal cost of providing the health services they cover is about 6% of total program costs. This is in line with the 4-7% estimates of the education component reported by Freedom from Hunger for their rather different programs (Vor der Bruegge et al, 1997).<sup>5</sup>

#### IV.2. The Data Set.

HOPE conducted an experiment comparing conventional village banking with their health bank model. Women of fertile age (aged 15-49) without children under 2 (WFA), and women with children under two years of age (WC2) were surveyed in each of the two types of banks, first in June 1994 (the “baseline”), and again in June 1996 (the “follow-up”). In addition, HOPE surveyed women who met the study criteria but who were not members of either type of bank, nor in Project HOPE child survival programs.<sup>6</sup>

Although the original survey design was more thorough, the data actually collected had many limitations. Extensive information about the borrowers’ microenterprises was to be collected on the loan forms, but this was never coded or otherwise available for research. The questionnaires were to have included other information concerning family assets and health practices, including anthropometric measures of child health status, but either managers or field personnel arbitrarily omitted such items from data collection. Indeed the project provides a case study in difficulties for researchers working with personnel not on their payroll (despite being invited to ensure research quality). Nevertheless, a range of valuable information was collected in

both 1994 and 1996 surveys, reported in Table 2.

Table 2: Data used in the study, with variable names.

Consumption

Monthly total expenditures (MSUMEXP)

Monthly food expenditures (MALIMENT)

Indicators of family wealth and factors affecting health:

kitchen (KITCHEN)

log of number of rooms (LNROOMS)

trash collection (TRASH)

flush toilet (FLUSH)

dirt floor (DIRT)

whether the respondent has received a previous loan (PREVLOAN)

Indicators of child health:

incidence of diarrhea (DIARRHEA)

incidence of breastfeeding (BREASTFD)

Indicator of women's health:

cancer screening, which is done routinely in clinics, and so represents a proxy for visits to medical profession (CANCSCRN)

Demographic

community of residence (COMUNID)

log of age (LOGAGE)

log of education (LOGEDUC)

marital status (MARRIED)

whether there is a child under two (INFANT)

log of number of children living (LNCHILD)

whether any children have died (DECEASED)

Bank Types

Credit Only (CREDBANK)

Health Bank (HLTHBANK)

Credit bank at follow-up (CREDBFOL)

Health Bank at follow-up (HLTBFOL)

Data for total monthly expenditures and monthly food expenditures are reported by participants from memory, and so may be subject to measurement error. However, in developing country surveys, reported expenditures is generally considered more reliable than reported income. All values are converted to 1994 units of local currency. Project HOPE reports that the presence of diarrhea is the most reliable indicator of child health in Latin America. The activity of breastfeeding is considered a key health practice. HOPE considers the presence of cancer screening the best measure of maternal health in both Ecuador and Honduras, because it is done routinely in all health care visits at least once per year. If a respondent has not had cancer screening in the previous year, this generally indicates that she has had no regular contact with the medical profession for at least that long.

Sample means and standard deviations are found in Table 3. For Honduras we have a total of 1026 observations, and for Ecuador 1006 observations. A few of these included (usually very young) women without any children; these and a few other faulty observations were excluded from the sample, to yield a total of 981 for Honduras and 963 for Ecuador. (The availability of breastfeeding and diarrhea data only for the subsample with children under two, and the presence of some missing values, result in a lower total for some of the variables). About 42% of these respondents are from the sample with children under two (INFANT) in Honduras, and 44% in Ecuador. About 38% of the sample in Honduras and 43% in Ecuador are drawn from health bank participants, from 26 health banks in Honduras and 19 in Ecuador. About 10% of the sample in Honduras and 13% in Ecuador are drawn from credit only participants, from 5 credit banks in Honduras and 6 in Ecuador. Control group respondents are sampled from 26 communities with neither type of bank in Honduras, and 34 in Ecuador.

As seen in Table 3, the samples from the two countries are similar in many respects, but

there are differences, some reflecting the fact that the Honduras sample is drawn from urban slums, while the Ecuador sample is largely drawn from villages and rural areas. In each country about a fifth of the sample have at least one deceased child. About one-eighth in each sample have *previously* received a loan (defined as prior to joining the village bank in the case of participants, ever in the case of nonparticipants). Roughly two-thirds of mothers practice breast-feeding in both countries. However, in Ecuador about three-fifths of the mothers are married, but only about a quarter are in Honduras. Only 7% of the respondents' houses have dirt floors in Ecuador, compared with 22% in Honduras; and houses have significantly more rooms and are more likely to include a kitchen in Ecuador. About 30% benefit from trash collection in Ecuador, while only 17% do in Honduras. But 34% report flush toilets in Honduras, while only 17% do so in Ecuador. There are also differences in health status. In Honduras, 37% of the mothers with children under two reported that these children had diarrhea within the last two weeks, while 28% did so in Ecuador. Some 48% of respondents have received cancer screening in Ecuador, while 67% have done so in Honduras.

#### IV.3. Issues in Selection Bias.

There are three sources of possible selection bias in the sample: nonrandom choice of communities for bank placement, nonrandom placement of health banks versus credit only banks within these communities, and nonrandom selection of bank participants from within communities. In this subsection, we address each of these potential concerns.

There is a concern that nongovernmental organizations may place programs in communities where they believe the program may be more successful. Project HOPE representatives stated that the communities chosen for bank placement were not selected on the

basis of either positive or negative expected bank performance; rather they were “communities in need of assistance.” There is no reason to doubt this, but if the communities chosen were deemed “in need,” program placement may thus not have been random, and the programs may as a result have had either more or less measured impact than in a strictly randomized setting. Moreover, while control communities are supposedly similar, there is no record of any formal randomizing procedure used in the selection of the communities chosen for control group sampling. Thus, we first compare the initial characteristics of communities with banks with those of the control group communities.

In Honduras, there were no statistically significant differences in initial average expenditures comparing communities where a bank was placed with those not receiving a bank, nor were there any significant differences in initial average health or wealth indicators.<sup>7</sup> However, in the one exception, respondents in communities where a bank was to be placed were less likely at the 1% level to have received a previous loan than those in control group communities. Thus, there was apparently some tendency in Honduras for HOPE to start village banks in communities in which micro credit was *less* available.

In Ecuador, respondents in communities where banks were placed<sup>8</sup> had total expenditures that were on average 4.8% higher than those in control communities, while food expenditures were on average 2.5% higher; each difference is statistically significant at the 1% level. There were no significant differences in initial diarrhea incidence or breastfeeding rates, but respondents in these bank placement communities had a higher rate of cancer screening, significant at the 10% level, and a higher incidence of flush toilets, at the 1% level. On the other hand, there were no significant differences in the incidence of previous loans. But the danger of a more serious community selection bias is evident in Ecuador.

Once Project HOPE selected communities where banks were to be established, these communities were assigned one of the two types of banks on an essentially random basis.<sup>9</sup>

Among participants within communities, the danger of self-selection bias in the sample might be considered minimal, because both credit constraints and health needs are pervasive and the incentive to participate in a village bank, if available, is so high.<sup>10</sup> On the other hand, participants do have to cosign loans across the entire basic bank unit of about 25 borrowers. We do not have fully detailed information about how the bank groups were formed. Although HOPE states that groups were formed in communities on an essentially first come, first served basis, members may well have taken steps to exclude from membership those they considered to be poor risks. Indeed, as reviewed in the introduction, such a selection process is part of the conventional explanation of how village banks have functioned so effectively.

Thus, we next tested whether health status, wealth or expenditure predicted the decision to join a bank, by examining characteristics of the Honduras subsample that had a choice (that is, the sample of those from communities with a bank for which we had respondents who did not join).<sup>11</sup> The number available for the test was 253 for the full sample and 125 for the sample with children under two. We found that wealth and health status were not statistically significantly associated with the decision to join a bank. However, on average bank joiners did have about 2.5% less expenditures (in both total and food expenditures) than non-joiners, a difference that is significant at the 5% level. We are not concerned about this isolated finding because, as argued below, changes in health outcomes are those for which interpretations are unambiguous. Moreover, unlike health or wealth, expenditures can be changed quickly. These respondents were joining a village bank at the time of the baseline survey, and they knew they would be required to save as members; thus, the 2.5% difference may well reflect a very recent increase in savings.

Certainly, better off or potentially better off members were not being systematically selected for inclusion in the bank. Characteristics of the control group are thus closely matched with those of bank members in Honduras.

Taken together, this evidence suggests that selection bias is not a problem in Honduras but may possibly be in Ecuador. But as one further control against selection bias, in each country we separately examine the subsample of those joining banks. Thus, we will make two types of comparisons: between those in health and credit only banks excluding the nonparticipants, and between the health and credit banks (considered simultaneously) in relation to the control group.<sup>12</sup>

## V. Econometric Results.

In this section, we employ the data set to test the tie-in hypotheses examined in sections II and III.

To analyze the data, we begin by creating two dummy variables. The first (HLTHBFOL) takes a value of 1 if the respondent is a health bank member sampled at the follow up period. Analogously, the second (CREDBFOL) takes a value of 1 if the respondent is a credit-only bank member sampled at the follow up period. Then, for each dependent variable, two econometric strategies are used. In the first, we assume that the full sample is essentially homogeneous at the start of the experiment. Statistically significant coefficients on either of these dummy variables is taken as an effect of the bank, conditional on the wealth, public health, and social status indicators used as controls, as well as on the community fixed effects. Assuming no selectivity bias, the result should provide a conservative measure of program impact, because it omits possible indirect effects of the program on other wealth variables. Second, in addition to comparing bank participants with those in the control group, we directly compare health bank participants with

credit only participants. This has the drawback of reducing the sample size and restricting the reference group, but the advantage of offering a further control against selection bias of participants into the banks. As analyzed in the last section, this may have been a problem in Ecuador, though probably not in Honduras.

In each case, we consider results both with and without community fixed effects. There is a case for either formulation. On the one hand, we do wish to control for unobserved differences across communities. This may be particularly important if NGOs place programs in communities where they believe the program may be more successful. On the other hand, if the programs have positive spillovers across community residents, such as through demonstration effects, increased demand for labor or local services, increased competition in credit supply, and reduced spread of illness, then the use of community dummy variables may bias downward the estimated total effect of the program. Moreover, in each case we conduct tests both with and without instrumenting for expenditures, which the theory indicates should be an endogenous variable.

Finally, though available data are very limited, we conduct some comparisons of health and credit-only bank performance, such as loan delinquency ratios.

#### V.1. Impact on expenditures.

We first consider the effect of participation in the banks on expenditures. We control for several proxies for wealth, health, or both, including the log of the number of rooms in the house (LNROOMS), whether the home has a kitchen (KITCHEN), whether there is some form of trash collection (TRASHCOL), whether the home has a dirt floor (DIRT), whether there is a flush toilet (FLUSH), the (log of the) age (LOGAGE) and education (LOGEDUC) of the mother, her marital status (MARRIED). We also control for the log of the number of children who are her

own and others of her spouse or partner who are living with her (LNCHILD),<sup>13</sup> and include a dummy variable taking the value of 1 if any of her children have died (DECEASED) as an additional control for general health human capital conditions and past wealth. We control for period effects by including a dummy for time (FOLLOWUP), that takes a value of 1 if the observation is from the summer 1996 followup survey and 0 if from the 1994 baseline survey. Finally, we control for whether the respondent has a child under two (INFANT) and hence is a participant in our separate sample to examine impact on infant health.<sup>14</sup> In regressions in which we control for community fixed effects for expenditures, for the full sample respondents come from 58 communities in Honduras and 92 in Ecuador, while for the banks-only regressions there are 32 communities in Honduras and 28 in Ecuador.<sup>15</sup>

Coefficients on control variables that are statistically significant have the correct sign. Consider first Table 4, which presents regressions that include data from both bank and nonbank participants. In both countries, expenditures are higher among those who are married, are older and (less strongly) have more education, and more children, but not infants, have received a previous loan, and whose houses have more rooms. In addition, in the Honduras sample, those with fewer deceased children, who benefit from trash collection, do not have dirt floors, and were sampled at the follow-up, have higher expenditures. When we consider the banks-only sample (Table 5), we also find that those with kitchens spend less in Ecuador, perhaps because they can save by cooking more meals at home (the corresponding coefficients are also negative in Honduras, but in that case the effect is not statistically significant).

As seen in Table 4, considering the whole sample, when fixed effects are not included, there is a positive conditional effect on expenditures of both health and credit bank participation in Ecuador, but this effect disappears when fixed effects are included. Health bank participants show

marginally higher conditional total, but not food, expenditures at the follow up in Honduras, while credit bank participants reveal marginally lower expenditures, though this largely reflects the slight decline in food expenditures for the sample as a whole in Ecuador in the second period. The community dummy variables are jointly significant.<sup>16</sup>

As seen in Table 5, we find that there are some differences when we consider only bank participants (as a check against selection bias). In Honduras the positive expenditure effect of health bank participation is now significant at either the 1% or 5% level, and is substantial in magnitude. The positive expenditure effects in Ecuador, however, disappear completely. In fact, the results suggest that there may even be some expenditure decline (at least at the 20% significance level) for health bank participation in Ecuador (with no effects for credit bank participation).

The evaluation of this impact seems open to question. While higher expenditures on food, at least, must be considered a favorable outcome, and expenditures are a good proxy for income (and perhaps more reliable in this regard than reported income), it is not clear whether it is optimal for micro credit participants to be increasing general expenditures at an early stage. Instead, it may be better for them to invest larger amounts in their enterprises. Moreover, participants are required to save a fraction of each loan amount, and this would tend to depress consumption in the short run. Additional voluntary investment in the microenterprise may also be undertaken. Health measures are not subject to such ambiguities, and we turn to them now.

## V.2. Impact on child diarrhea incidence.

In Table 6, we present probit regressions on the probability of infant diarrhea for the Honduras and Ecuador samples, respectively, with four different specifications depending on whether we use fixed effects (FE), and instrument for expenditures (IV). In these regressions, we

use the subsample of mothers with children under two (INFANT). In Table 7, we present comparable regressions for the banks only sample. In predicting expenditures, we use a similar set of variables as used in the previous subsection, including, time, in the form of a dummy variable for follow-up respondents, and various wealth variables, which are endogenous in the long run but arguably not with respect to monthly expenditures, and nonlinear terms.<sup>17</sup> In the estimation of the probit equations, a positive coefficient is associated with a value of zero in the dependent variable.

Although fewer control variables proved statistically significant than for the regression on expenditures, and the pattern of significance was less consistent, where significance is found it generally tells a very plausible story. Consistently across specifications, those with a flush toilet have a lower probability of diarrhea in Honduras. The presence of trash collection has a similar impact, that is particularly significant in the Honduras bank only sample; the presence of a kitchen is also associated with lowered subsequent probability of diarrhea in that subsample. In Ecuador, more educated mothers and those with houses with more rooms have lower child diarrhea probability. Strangely, however, when the coefficient on deceased is significant, it is associated with a lowered probability of diarrhea incidence. Married mothers also tend to have a higher probability of child diarrhea in the Ecuador banks only sample. There seem to be no obvious explanations for these last two findings. The community dummy variables are jointly significant; again, we do not report their coefficients but they are available from the authors. Generally, the lack of a close correlation between illness and the wealth proxies may offer some confirmation of the hypothesis that health does not automatically improve with wealth.

In Honduras, health bank participants have significantly reduced conditional diarrhea probability at the follow up in all eight specifications. On the other hand, in no case do credit bank participants have reduced subsequent conditional diarrhea probability in the Honduras sample. In

Ecuador, health bank participation is also positively associated with lower conditional diarrhea probability; however, this impact is statistically significant in only two of the eight specifications. On the other hand, credit bank participants have a much larger reduction in conditional diarrhea probability that is statistically significant in seven of the eight specifications. Thus, the results reflect support for the tie-in hypothesis for urban and peri-urban Honduras but not for (largely) rural Ecuador. In Ecuador, there is instead evidence that village banking may lower child diarrhea, but that a health tie-in at best has no further positive effect.

### V.3. Impact on Breastfeeding Behavior.

Breastfeeding of children under two is considered a key health-enhancing behavior, but it has to contend with popular images of bottle feeding as a more modern alternative. There is some tendency in Honduras and Ecuador, as well as elsewhere in Latin America, for the lowest-income mothers to practice breastfeeding at higher rates than those in the income groups above them. Thus, as bank participants enjoy rising incomes, we might find reduced breastfeeding incidence. On the other hand, the health knowledge component of the health banks may more than counteract this effect.

Probit regressions on breastfeeding are presented in Tables 8 and 9. In both countries, the presence of more children is associated with a higher conditional probability of breastfeeding of infants in all specifications. In Ecuador, the presence of a dirt floor is associated with a higher conditional probability of breastfeeding, that is statistically significant in all eight specifications. In Honduras, this dirt floor effect is confirmed in three of the specifications. In Honduras, those mothers with higher expenditures generally have a significantly lower conditional probability of subsequent breastfeeding. The implication is that those who can afford to use formula instead of breastfeeding tend to do so. The other scattered significant coefficients tend to confirm this

wealth effect, except for the presence of a kitchen, which tends to be positively associated with breastfeeding. In Ecuador, older mothers have a lower conditional tendency to breastfeed; but more educated mothers have a higher conditional probability of doing so. The fact that these probits generally revealed that those with higher wealth and income have a tendency to breastfeed less offers some confirmation for the argument that health practices do not improve automatically with wealth.

In Honduras, health bank participants have higher conditional probability of breastfeeding at the followup, though this result is only marginally statistically significant, in just two of the specifications in the bank only sample. We may conjecture that the health banks may at least serve to arrest the local tendency to breastfeed less as members' wealth and incomes rise. There is no significant effect for credit bank participation in Honduras. In Ecuador, however, participation in either type of bank is associated with lowered conditional probability of subsequent breastfeeding. Thus, for Honduras, a knowledge effect may outweigh or at least balance an income effect for the health bank participants, but the reverse may hold in Ecuador.

#### V.5. Impact on maternal health.

In Tables 10 and 11 we present probit regressions on the incidence of cancer screening. Again, this indicator was selected because field experts state that those with virtually any contact with the health care system will receive such screening in these two countries.

First, expenditures are generally associated with a higher conditional probability of cancer screening. For the full sample, this effect is statistically significant for three of the four specifications in Ecuador and two of four in Honduras (though there is an opposite sign in one specification significant at the 20% level). However, in only two specifications is the coefficient significant for the banks only sample. Mothers who are married, who have more children, and

more education, and who have a kitchen, conditionally receive more health care in both countries consistently across specifications. In Ecuador, older mothers, and also mothers with children under two receive less care. Conditionally, women received less care in the later period in Ecuador but more in Honduras.

The conditional effect of bank participation on the probability of subsequent cancer screening for the Honduras sample is striking and uniform. In all specifications health bank participation is associated with significantly higher subsequent rates of cancer screening. For credit only participants, such an effect is also found, in four of eight specifications, in particular those without fixed effects; however in all four cases both the magnitude of the coefficient and the p-value are lower. Moreover, statistical significance disappears whenever fixed effects are included, and in two cases the parameters even change signs. Considering the two sets of results together, it seems likely that the strong health bank results reflect a health education effect. As a proxy, the results not only suggest that cancer screening has increased, but that its associated contact with the medical profession has increased as well.

These results are only partially confirmed for the Ecuador sample. Including both bank participants and nonparticipants in the regressions, there is a statistically significant increase in the conditional probability of subsequent cancer screening in three of four specifications for health bank participation. Credit only participation shows a similar effect, but it is smaller in magnitude and (weakly) significant in just two of four specifications. Presumably, this is an income effect. On the other hand, when the sample is limited to bank participants only, these findings are reversed for both types of bank. However, the incidence of cancer screening was significantly lower across subsamples in the follow-up period than in the baseline period in Ecuador; and we cannot control for this time effect with the banks-only sample. Thus, in this case, we place more weight on the

more encouraging findings from the full sample.

#### V.5. Impact of the Health Component on Bank Performance.

In our final research strategy we in a sense turn the analysis conducted so far on its head. That is, we consider the effect of adding the health component to the credit banks on banking indicators. The idea of this test is that if the tie-ins really are effective, they should lead to better projects, better loan repayment rates, faster accumulation of individual savings accounts, and other indications of positive bank performance.

Although the sample size is small and data are available for only one country, Honduras, we present results in part to introduce this evaluation strategy to the literature, and to encourage its use with other data sets in which banks differ in their use of tie-ins.

Of 20 available observations on credit only banks, 6 (or 30%) had at least one delinquent loan, while of 84 available observations on health banks, 27 (or 32%) had a delinquent loan; this difference was not statistically significant. As would be expected, the number of delinquent loans increased as later bank cycles were reached, but there were no discernable differences in patterns by cycle across bank types (through the last cycle for which we have observations on both bank types, cycle 5). We created as many plausible bank performance indicators as the limited available data allowed. These included the value of delinquent loans per member, delinquent loans as a fraction of internal bank savings or of external loans, savings per member, and external loans per member; after controlling for bank cycle, only in the case of external loans per member was the type of bank a significant explanatory variable (just within the 5% significance level with a t statistic of 1.99, reflecting higher external loan amounts per member for the credit only banks). Of course, the failure to find significant differences in bank performance may be due to the small available sample size.<sup>18</sup>

## VI. Conclusions

In this paper, we reviewed arguments for tying-in microenterprise credit with other services, notably health and education. We developed a theoretical model, in which households choose leisure, consumption, and health subject to credit and other constraints, and in which higher goods consumption can increase health and incomes. We found that the ‘net price’ of consumption and of time spent on health are lower than their market price; their opportunity costs are partly recouped via reduction in sick time and increased productivity given hours worked. But some participants constrained to participate in a health component may exhibit lower gains than in a conventional credit bank. We also argued that banks with tie-ins may gain economies of scope but lose comparative advantage. To determine the effects of tie-ins, we examined experimental evidence from Ecuador and Honduras, where data were collected from both credit-only village banks and banks with a health tie-in.

Results provide some evidence of benefits of tie-ins. Effects on expenditures of health and credit bank participation were ambiguous. However, in Honduras, health bank participation was robustly associated with significantly reduced conditional child diarrhea probability, while in no specification was credit bank participation found to reduce the conditional probability of diarrhea in the Honduras sample. In Ecuador, health bank participation was also positively associated with lower conditional diarrhea probability; however, this impact was statistically significant in only two of eight specifications. On the other hand, credit bank participation has a much larger impact that is statistically significant in seven of the eight specifications in that country. Thus, the results reflect support for the tie-in hypothesis for urban and peri-urban Honduras but not for (largely) rural Ecuador. In Ecuador, there is instead evidence that village banking may lower child diarrhea, but that a health tie-in at best has no further positive effect.

In Honduras, participation in the health bank is associated with higher subsequent conditional probability of breastfeeding, that is statistically significant in two of the specifications in the bank only sample. We conjecture that the health banks may at least serve to arrest the local tendency to breastfeed less as members' wealth and incomes rise. In Ecuador, however, participation in either type of bank is associated with lowered conditional probability of breastfeeding. Thus, for Honduras, a knowledge effect may tend to outweigh an income effect in the health bank participants, but the opposite effect may dominate in Ecuador.

For Honduras, in all specifications health bank participants have significantly higher subsequent conditional probability of cancer screening, our proxy for formal health care. A much weaker effect was found for credit only participants. It is likely that these findings reflect a health education effect for the health bank participants. For Ecuador, a similar effect was found only for the full sample; we argued that, in this case, results for the full sample will be more reliable than those of the banks only sample.

As noted earlier, the major obvious difference between programs in the two countries is that Honduras is an urban slum program, and Ecuador is a rural and village program (with a few exceptions in neighborhoods of a medium sized city).

Although much further work is needed, it is clear that credit tie-in programs cannot be summarily dismissed as an unproductive interference with the natural comparative advantage of institutions designed to provide credit to the poor.

## References

- Behrman, Jere and Deolalikar, Anil, "Will Developing Country Nutrition Improve with Income? A Case Study for Rural South India," *Journal of Political Economy*, 95, 108-38 (1987)
- Bliss, Christopher J., and Stern, Nicholas H., "Productivity, Wages, and Nutrition," in 2 parts, *Journal of Development Economics*, 5, 331-98, 1978
- Bouis, Howarth E., "The Determinants of Household-Level Demand for Micronutrients: An Analysis for Philippine Farm Households," mimeo, International Food Policy Research Institute (1991)
- Bouis Howarth E., and Lawrence J. Haddad, "Effects of Agricultural Commercialization on Land Tenure, Household Resource Allocation, and Nutrition in the Philippines," *International Food Policy Research Institute Research Report No. 79*, Washington: IFPRI (1990).
- Bouis Howarth E., and Lawrence J. Haddad, "Are Estimates of Calorie-Income Elasticities Too High? A Recalibration of the Plausible Range," *Journal of Development Economics*, 39, 2, 333-364, 1992
- Foster, Andrew "Prices, Credit Markets and Child Growth in Low-Income Rural Areas," *Economic Journal* 105, 551-70, 1993
- Goetz, A.M., and Sen Gupta, R., "Who Takes the Credit? Gender, Power and Control over Loan Use in Rural Credit Programs in Bangladesh", *World Development*, vol. 24, no. 1, pp. 45-63 (1996).
- Hossain, Mahmoub. "Credit for Alleviation of Rural Poverty: The Grameen Bank in Bangladesh." *International Food Policy Research Institute Research Report No. 65*, 1988. International Food Policy Research Institute. *1990 Report*. Washington, DC, 1990
- Jacoby, Hanan G., "Borrowing Constraints and Progress Through School: Evidence from Peru," *Review of Economics and Statistics*," 151-160 (1994)
- Kennedy, Eileen, Howarth Bouis, and Joachim Von Braun, "Health and Nutrition Effects of Cash Crop Production in Developing Countries: A Comparative Analysis," *Social Science and Medicine*, 35, 5, 689-687 (1992)
- Kennelly, Barbara. *The impact of income-generating activities on household nutrition: Literature review and summary*. The Freedom from Hunger Foundation, 1988
- Khandker, Shahidur, Baqui Khalily, and Zahed Khan, *Grameen Bank: Performance and Sustainability* Washington: World Bank, 1995
- Marek, Tonia. *Ending Malnutrition: Why increasing income is not enough*. World Bank

Technical Working Paper No. 5. Washington, DC, 1992.

Morduch, Jonathan, "The Grameen Bank: A Financial Reckoning," processed, Stanford, 1998

Osmani, S.R. "Limits to the Alleviation of Poverty through Non-Farm Credit," *The Bangladesh Development Studies* 17: 1-17 (1989).

Pitt, Mark, and Khandker, Shahidur, "The Impact of Group-Based Credit Programs on Poor Households in Bangladesh: Does the Gender of Participants Matter?" mimeo, Brown University (1996).

Pitt, Mark, and Khandker, Shahidur, *Household and Intrahousehold impact of the Grameen Bank and Similar Targeted Credit Programs in Bangladesh*, World Bank Discussion Paper 320, Washington: World Bank (1996)

Project HOPE, "Project HOPE's Village Banking and Income Generation Project," mimeo, 1994

Ravallion, Martin, "Income Effects of Undernutrition," *Economic Development and Cultural Change*, 38, 489-515, 1989

R. Rodriguez-Garcia, S.C. Smith, J. Macinko and B. Schwethelm "The Health-Development Link: Microenterprise Development for Positive Health Outcomes," *International Affairs Review*, 63-79, Spring 1996

Schiff, Maurice and Alberto Valdes, "Nutrition: Alternative Definitions and Policy Implications," *Economic Development and Cultural Change*, 38, 2, 281-292, 1990

Singh, Inderjit. *The Great Ascent: The Rural Poor in South Asia*. Baltimore: Johns Hopkins University Press, for the World Bank, 1990.

Singh, Inderjit, Squire, Lynn, and Strauss, John., "A Survey of Agricultural Household Models: Recent Findings and Policy Implications", *World Bank Economic Review*, vol. 1, no. 1, pp. 149-179 (1986)

Smith, Stephen C., *Case Studies in Economic Development*, 2d edition, Reading: Addison-Wesley, 1997

Stiglitz, Joseph E., "The Efficiency Wage Hypothesis, Surplus Labor, and the Distribution of Income in LDCs," *Oxford Economic Papers*, 28, 185-207 (1976)

Strauss, John., "Does Better Nutrition Raise Farm Productivity?" *Journal of Political Economy*, vol. 94, no. 2, pp. 297-320 (1986).

Strauss, John, and Thomas, D., (1995), "Human Resources: Empirical Modeling of Household and Family Decisions", chapter 34 in Behrman, J., and Srinivasan, T.N., (eds.), *Handbook of*

*Development Economics*, vol. IIIA; Elsevier, New York.

Subramanian, Shankar, and Angus Deaton, "The Demand for Food and Calories," *Journal of Political Economy*, 104, 1, 133-162, 1996

Thomas, Duncan, "Intra-household Resource Allocation: An Inferential Approach," *Journal of Human Resources*, 25, 4, 635-664

Thomas, Duncan, "The Distribution of Income and Expenditure within the Household," *Annales de Economie et de Statistique*, 29, 109-136 (1993)

UNDP, *Human Development Report*, New York: Oxford, various years

Von Braum, Joachim, Detlev Peutz, and Patrick Webb, Irrigation Technology and Commercialization of Rice in The Gambia: Effects on Income and Nutrition, *International Food Policy Research Institute Research Report No. 75*, Washington: IFPRI (1989)

Vor der Bruegge, Ellen, Jaon E. Dickey, and Christopher Dunford, "Cost of Education in the Freedom from Hunger Version of Credit with Education Program Implementation," *Credit With Education Technical Update No. 9*, July 1997

Wahid, A. *The Grameen Bank: Poverty Alleviation in Bangladesh*. Boulder, CO: Westview, 1993.

Wahid, A. "The Grameen Bank and Poverty Alleviation in Bangladesh: Theory, Evidence and Limitations." *American Journal of Economics and Sociology*. 53, no. 1 (1994): 1-15.

World Bank, *World Development Report: Investing in Health*, New York: Oxford, 1993

## Endnotes.

1. The Grameen Bank in Bangladesh, with over 1000 branch offices and about two million members, has long included a moral component in its training program, stressing the Bank's 16 principles, or "Decisions," to be adhered to by each member. These Decisions were formulated in a national conference of 100 female center chiefs in 1984. They emphasize modern values, including self-discipline and hard work, hygiene, refusal to participate in backward practices like demanding bridal dowries, and mutual assistance. Adherence to these principles and attendance at rallies featuring the chanting of the Decisions are not formal requirements for receiving loans, but they are said to have become effective, implicit requirements.
2. The study design called for maintaining the credit banks "uncontaminated" by the addition of any health component for a five year period; but in one indication of the difficulties of researchers in working with independent NGO staff, an arbitrarily decision was made by practitioners to add health components to the credit banks after five cycles.
3. We are abusing notation slightly by using  $X_h$  to refer to the "household's health", properly a vector, as well as the health of the "household entrepreneur", which may be a subset of that vector. That distinction will not be crucial, and to simplify the notation, we do not draw it.
4. In Ecuador, the UNDP estimates that 56% of the population lives in absolute poverty. In Honduras, 46% of the population is estimated to be absolutely poor. Inequality is also high in both countries. In Honduras the highest 20% of the population possess 63.5% of all income. Official figures are not available for Ecuador, but given the level of absolute poverty and a GNP per capita of US \$1,000 (nearly twice that of Honduras) inequality is also expected to be quite high. In Ecuador, more than half the working population is self-employed. A majority of entrepreneurs in Honduras are women, as are about one-third in Latin America as a whole.
5. These are informal estimates that should be examined further by independent researchers; the data are not currently available to us. Moreover, more than one program design has been used by HOPE, for example, providing health education directly, and training local bank representatives to train other members. In future research, we hope to be able to examine the comparative costs and impacts of these alternative strategies.
6. More details are found in section V-1, where the possibility of selection bias is considered..
7. Full details of these tests are not reported here to save space but are available from the authors.
8. Note that control respondents were sampled from communities without banks in Ecuador, so the community averages for that country are computed from among bank joiners only. Thus, these results can be considered less accurate than for Honduras.
9. When the decision was by HOPE's headquarters to create credit only banks as an experiment, a few health banks had just been established in both countries. HOPE indicates that at that point, the next 6 communities on the list of selected communities in each country were assigned credit only banks. Thus although the numbers are too small for statistical tests to be meaningful, there

seems to be no danger of selection bias between communities with credit only and health banks.

10. Pitt and Khandker (1996) account for the bias that may arise as a consequence of the self-selection of households into credit programs. They also point out the possibility that the placement of programs itself may be endogenous, and use community fixed-effects to control for that. Finally, they ask whether there is a differential impact (on the health outcomes of male and female children, for example) of program participation by men versus women. Evidence of such a differential impact (which they find) would suggest that credit is not perfectly fungible within the household, contrary to the claims of Goetz and Sen Gupta (1996). While these are important issues in their own right, in the programs we study, all participants are women. In addition to comparisons with the control group, we offer comparisons of participants in the two types of banks, both of which are subject to the same possible self-selection process. We also use community fixed-effects to control for unobserved differences across communities.

11. The analogous test cannot be performed for Ecuador, because in that country the control group respondents were selected only from communities without either type of Project HOPE bank.

12. Note that there is a tradeoff in using the banks only sample: the advantage of using the sample with bank members only is as an extra check against selection bias, but the disadvantage is that we cannot control both for bank at follow-up and for time, because of perfect multicollinearity; we also end up with a smaller sample size. Thus, results based on both samples will be presented.

13. We experimented with an alternative specification in which expenditures per capita were used as the dependent variable instead of including the number of children as an independent variable, and qualitative results were not affected.

14. Some of these variables may be endogenous in the long run, if not over the two year period of the study. Unfortunately, family background data (on respondents' parents, for example) intended to instrument for them were not ultimately collected. Other available data that might be used cannot be safely considered exogenous. This is a limitation of the study that cannot be overcome; it offers valuable lessons for future research.

15. For consistency and comparability we use the same set of control variables in each regression, though experiments suggest that reducing the number of variables has little qualitative effect.

16. We do not report their coefficients here but they are available from the authors

17. These regressions are available from the authors. Note that we do not include participation in the banks as an instrument. Food expenditures are used as an explanatory variable because of its anticipated impact on child health. Some regressions were run using predicted total expenditures rather than predicted food expenditures as explanatory variables for child health outcomes, but doing so did not make much qualitative difference in estimating the impact of bank participation.

18. Details are not reported here but are available from the authors.