Protecting the Poor through Community Based Health Insurance

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Abstract

Community based health insurance (CBHI) mechanisms seek to protect low income households from health related risks through mutual risk sharing at the community level. We construct a theoretical model that explains (i) the success of such schemes in extending protection to significant numbers of low income households, and (ii) the continued exclusion of the poorest of poor households from membership in such schemes. Our model shows that by curbing moral hazard, these schemes are able to make insurance an attractive proposition for lower income households. A part of their success is also explained by their ability to reduce administrative costs of operations. However, unless such schemes manage the impossible task of reducing such costs to zero, households beneath a cutoff income level will continue to remain excluded from insurance.

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1 Introduction

In this paper, we seek an explanation to the puzzle of the continued exclusion of the poor from formal insurance markets in developing countries. We use the setting of health insurance to analyze this question. We construct a theoretical model that shows how even in competitive health insurance markets, the presence of transaction costs and moral hazard can conspire to exclude low income individuals from the reach of formal insurance.[1] We then examine theoretically the success of one mechanism—Community Based Health Insurance (CBHI)—in partly circumventing this difficulty and extending coverage to poorer sections who are otherwise deprived of such coverage. But even such schemes have failed to extend coverage to the poorest of the poor in the communities they operate. We also provide an explanation of this phenomenon.[2] Our model therefore provides an understanding of the reach of financial protection against risks to the poor. But in a wider context, our model provides an insight into the exclusion of the poor from financial markets using standard economic theory. In particular, we do not need to ascribe any special preferences or behavioral characteristics to the poor in understanding their non-participation in financial markets. Somewhat tautologically, we find that it is the low income of the poor that forces them to exclude themselves from the formal insurance sector.

Given the lower tolerance to risk at lower income levels, the poor are especially vulnerable to adverse financial shocks. However, in many low income countries, the protection available to the poor from formal insurance mechanisms, either government backed or in the private sector, is very limited (Dror and Jacquier, 1999). Informal risk sharing measures, based on contributions from friends and relatives, exist but their effectiveness is limited due to the correlated nature of shocks faced within a family (Morduch, 1999; Roth, 2002). In this situation, *community-based insurance* or *micro-insurance* has emerged as an alternative risk protection measure for low income households. In such schemes, individuals of a similar socio-economic background in a geographically proximate area voluntarily pool resources to protect each other against one or more types of risk (Bennett, 2004).

Perhaps the two most serious form of financial shocks that can affect a low-income rural community are expenditures on health emergencies and weather conditions adversely affecting agricultural output. Since the latter type of shock is felt simultaneously across the entire community, it is unlikely that community based insurance can be effective in guarding against it. However, health related shocks, at least ones that are not epidemics, are felt independently by different individuals in a community. Risk pooling by members of the community can therefore provide adequate protection against such shocks. It is not surprising then that the most common form of community-based insurance that has emerged is community-based health insurance (CBHI).

The need for health insurance arises because of the poor condition of the public health service

[1] The focus of this paper is on the poor in developing countries. But our model is also valid as an explanation of the exclusion of the poor even in developed countries; for example over 25% of the population with annual income less than $25000 remained excluded from health insurance in 2009 in the United States (US Census Bureau, 2010).

[2] See Section 2 for an intuitive discussion of the motivation, structure and conclusions obtained from the model.

delivery mechanism in many poor countries, primarily due to the low resource mobilization capacity of governments in these countries (Preker et. al., 2004). Consequently, there is excessive reliance on private sector health care. For example, in India, private spending accounted for more than 80% of all health care expenditure during 1999-2001 and most of this expenditure is in the form of out-of-pocket payments (WHO, 2004). Xu et. al. (2003) estimate that in several developing countries, more than 3% of all households faced catastrophic health expenditures (i.e. exceeding 40% of income remaining after subsistence needs have been met). Peters et al. (2002) find that in India, the poor are far more likely to avoid going for hospital care; hardly surprising since 24% of all Indians hospitalized fall below the poverty line after they are hospitalized. Such figures are a clear indictment of the failure of formal mechanisms to protect the poor against health risks. Indeed, more than 90% of Indis's population and almost all its poor have no heath insurance coverage (Gumber, 2004). They also unambiguously bring out the importance of community based risk protection measures to guard against such adversities.

CBHI schemes have mushroomed all over the developing world.[3] While the precise institutional details of CBHI schemes may vary on a case by case, all of them rely on pooling of resources by community members through the prepayment of premiums. This is indeed the key distinction between such schemes and informal insurance mechanisms where the payment is made after the resolution of uncertainty rather than before (Ahuja and Jütting, 2003). Furthermore, they are designed with a not-for-profit objective to target poor households and treat the household rather than an individual as the unit of insurance (Ahuja and Jütting, 2003). These are the key differences between these schemes and market based insurance. A very prominent example of a CBHI scheme in India is the SEWA medical insurance fund (Kent Ranson, 2004; Kent Ranson et. al., 2006; Sinha et. al., 2007).[4]

Given the context that spurred the development of CBHI schemes, it is very important that we understand whether such schemes have succeeded in their goal of actually providing risk protection to the poor. This question has been extensively studied in the empirical literature.[5] The common finding of this extensive literature, summarized for example, in Jakab and Krishnan (2004) is that while these schemes have been able to extend formal sector health care to large number of people who would otherwise have been excluded, their benefits have failed to reach the poorest of the poor sections of the communities they operate in. Hence, those sections of the population who are most vulnerable to risk have not obtained any protection from this mechanism.

While the empirical literature provides substantial evidence, it fails to offer any conceptual understanding of the reasons behind this failure. In this theoretical exercise, we aim to provide such

[3]See Jakab and Krishnan (2004) for an extensive review of the performance of such schemes in different parts of the world.

[4]The Integrated Social Security Scheme of the Self-Employed Women's Association (SEWA) was started in 1992. This scheme provides a bundle of life insurance, health insurance and asset protection. See the cited papers for details of the working of these schemes. Due to regulatory provisions in India, SEWA does not provide risk protection itself but transfers the responsibility to a formal insurance company. It does, however, exercise responsibility for collecting premiums and processing claims.

[5]See Section 1.1 for a brief survey of this literature.

an understanding. To make the analysis tractable, we adopt the general approach of assuming away market imperfections created by lack of competition in the insurance market[6] and asymmetry of health related information between the insurer and the insured. While this is a somewhat restrictive assumption, it does create as conducive a situation as possible for an agent to take up insurance. Our main finding is that even in this ideal scenario, agents below a certain income level choose to opt out of insurance, whether that insurance is offered by the market or by the community. The community can, however, reduce that cutoff level, extending coverage to a greater range of individuals, but never bring it down to zero. Our finding therefore implies that the presence of transaction costs and the nature of the strategic interaction between the insurer and the insured are the two fundamental factors that drive out the poor from insurance. Factors like lack of competition and asymmetric information, if present, can of course make the insurance sector even more antagonistic to the poor. But their effect is at best contributory since even when their affect is mitigated by community based insurance, the poorest of the poor continue to be deprived from risk protection.

1.1 A Brief Survey of the Empirical Literature

Jakab and Krishnan (2004) reviews the empirical literature on the performance of CBHI schemes with respect to three parameters—resource mobilization, social inclusion and the provision of financial protection. They conclude that that such schemes "contribute significantly to the resources available for local health care systems, be it primary care, drugs, or hospital care". Their literature survey also finds mostly uniformly higher levels of utilization of health care services by members compared to non-members and reduced out of pocket expenses. For example, in the Niger delta (Diop, Yazbeck and Bitran, 1995), utilization increased by 40% while out of pocket expenditure declined by as much as 48%. These schemes therefore have been able to provide a fair degree of financial security to their members.

The primary focus of this paper is the issue of social inclusion of these schemes, i.e. their ability to attract poor and very poor households. From the literature survey of Jakab and Krishnan (2004), two salient findings emerge that highlight the success as well as the limitations of the CBHI schemes in reaching out to poorer households.

1. CBHI schemes have been successful in reaching a large number of low income households who would otherwise be denied any financial protection against the cost of illness.

2. However, CBHI schemes have not been able to reach the poorest and the socially most excluded households within a community.

Almost the entire literature reviewed by Jakab and Krishnan (2004) attest to the success of these schemes in extending health coverage to a significant proportion of the poor who would have been otherwise deprived of such care. However, doubts do emerge about the ability of these schemes

[6]This is not a very restrictive example in the context of a CBHI since such schemes behave benevolently and charge a premium sufficient to just break even.

to attract ultra-poor households. For example, Desmet, Choudhury and Islam (1999) find that in Bangladesh, the membership of these schemes consist mostly of the middle income and the poor. Ranson et. al. (2003) show that in India, these schemes have succeeded in enrolling a small proportion of their target population; and they also face difficulty in enrolling members from diverse groups. This indicates that members from deprived socio-economic status are left out of the purview of these schemes. The reasons cited by ultra-poor households for choosing to stay out of membership are their inability to afford the premiums and the lack of transport to access hospitals providing services under these schemes. Among more recent papers, Jütting (2004) finds the failure of these schemes to attract the lowest income households in Senegal. Kent Ranson et.al. (2005) and Sinha et. al. (2007) shows that under the SEWA scheme, in rural areas, poor households benefit much less than their more well-off counterparts although this difference is not so marked in urban areas.

While the impact evaluation and policy recommendation literature on CBHI schemes is vast, there has been very little theoretical analysis of these schemes. Pauly (2007) provides a theoretical analysis designed to guide the design of such schemes in developing countries. The paper argues that familiar problems of moral hazard and adverse selection should not prevent demand for insurance in developing countries. Given the substantial volume of out-of-pocket expenditure by the poor, there must be sufficient demand for insurance coverage even among poor communities' particularly if insurance is provided on competitive terms. However, beyond making the point that group insurance schemes can reduce administrative costs,[7] the paper does not provide any insight into why such schemes may or may not succeed in attracting poor households. The primary contribution of our paper is that it gives a precise understanding of why such schemes fail to reach out to the poorest.

Section 2 discusses the motivation of our theoretical approach and the results we obtain. In Section 3, we show how with moral hazard and transaction cost, the market mechanism fails to provide the optimal insurance solution. Section 4 then analyzes the impact of moral hazard and transaction cost on demand for insurance by the poor. In Section 5, we introduce the CBHI mechanism and show how it partially solves the problem of the exclusion of the poor from insurance. Section 6 concludes.

2 A Discussion of the Model

One can begin the study of problem of the exclusion of the poorest from insurance from several standpoints. For example, one can argue that the insurance industry is non-competitive so that they exercise in cream skimming and focus on richer clients. This argument, however, is not valid since insurers are allowed to charge different premiums from different individuals. Nor does this explain why a CBHI scheme, for example SEWA, is able to persuade those same private insurers to

[7] We use the terms administrative costs and transaction costs interchangeably. We interpret these costs as referring to for example, the wages that insurance companies need to pay their employees for administering these schemes while transacting with consumers.

extend coverage to poorer households. Instead, we assume that the insurance market is competitive so that firms would be willing to extend coverage to any section of society provided there is sufficient demand. We therefore start with the hypothesis that the problem of absence of insurance among poorer households is fundamentally a demand problem.

Why would poorer households refuse insurance coverage? The argument that they cannot afford the premium is somewhat facile unless we assume that in the event of falling ill, they choose not to use any medical care. If they do choose to avail of medical care, however minimal, then they would also be able to pay the premium as long as the premium is equal to the expected cost of the medical care. In fact, paying the premium in this situation would make any risk averse individual better off. This is a point that has also been made in Pauly (2007). If however, the premium charged is higher than the expected cost of the medical treatment, then some households may see that remaining uninsured provides greater utility than accepting insurance coverage. It would be a fair question to ask whether individuals with a lower income would be more prone to refuse insurance on this ground than one with a higher income. If so, then part of the success of CBHI schemes may lie in their ability to cut various administrative costs of insurance which enables them to reduce the margin of their premium requirements over the expected cost of medical treatment.

In order to show that costs can have an effect on lower income individuals wanting insurance, we work with a standard moral hazard model. We assume a multiple state world, each state corresponding to a specific health condition. Each state is realized with a certain probability which is the same for all individuals.[8] Risk averse individual agents can seek health care by paying the price and opportunity cost on every unit of health care they seek to consume. We interpret the opportunity cost as the income sacrificed by the individual in, say, visiting a hospital. We first consider the situation where, to cover the cost of the health care, individuals can choose to obtain insurance coverage from a competitive insurance market by paying a premium. The premium, however, can be more than the expected cost of the coverage they receive from the insurer. The difference is due to the administrative costs that insurers incur in providing insurance.

The specific type of moral hazard we consider is *ex post moral hazard*, i.e. the tendency of insured consumers to go for excess utilization of health care since they do not pay the full marginal cost of provision.[9] The best possible insurance contract—*the first best solution*—would maximize the ex ante utility of the consumer, i.e. the expected utility before the sick or healthy state of nature is realized. This is of course the full insurance contract, i.e. one in which the insurer bears the entire expenditure at the point of treatment. This contract is, however, liable to be sabotaged by moral hazard. The insured agent, after paying the premium for the optimal ex ante health care, faces the

[8]We therefore assume away any adverse selection problem. We focus on moral hazard since we believe this is a more fundamental problem. Adverse selection can be eliminated if accurate information about risk characteristics are available. Since a CBHI scheme serves a local clientele, it would be fair to assume that it would have a sufficiently accurate level of information about the risk features of its clients. On the other hand, moral hazard would exist even in a world with perfect information. Hence, moral hazard is a much more serious problem that CBHI schemes need to grapple with.

[9]This notion of moral hazard is different from ex ante moral hazard in which insured consumers may slacken effort required to keep them healthy. We focus on ex post moral hazard since it is unlikely that insured individuals would deliberately increase their chances of falling sick just because the insurer is paying the medical expenses.

incentive to choose a higher optimal ex post level of health care if indeed the realized state is one where he is sick. The solution to this is a *second best solution* that builds in incentive compatibility and usually involves the agent bearing a part of the medical expenses from his own pocket. Moral hazard therefore prevents the insurance market from providing complete risk protection. While this is well known, [10] we go further by demonstrating that the problem of incomplete insurance is more acute for poorer individuals. The lower the income of person, the greater is the share of medical cost that he has to pay at the point of treatment from his own pocket.

Our model departs from the existing literature on moral hazard by showing how the presence of administrative costs can drive low income households out of the insurance market. It is known that if administrative costs are zero, then even the second best solution would be preferable to being uninsured for all individuals, irrespective of the income level. However, as we show, if these costs are positive, there would be cutoff income level below which individuals would prefer to be uninsured than avail of the first best contract, even if that can be provided feasibly by the market. We call this cutoff level the *primary cutoff* and show that this cutoff is increasing in the administrative costs. Thus the poorest households remain outside insurance even with the best possible contract. The problem is made more severe by the fact that the market can provide only the second best solution which is inferior to the first best outcome. Hence, there exists an even higher cutoff income level–the *secondary cutoff* level—below which individuals choose not to take insurance.

We have therefore identified two problems that can push low income households out of the insurance market. Individuals below the primary cutoff level would prefer to remain uninsured even if the first best insurance contract is available. We call this group the *primary excluded group*. Individuals with income between the primary and the secondary cutoffs would avail of insurance if the first best contract is available. However, since the competitive market can only provide the second best contract, this group too exclude themselves from the insurance market. We call this group the *secondary excluded group*. The distinction between these two groups is important. If it is possible to eliminate moral hazard, then the secondary excluded group can be brought within the ambit of formal insurance. However, since administrative costs are positive, it would be impossible to eliminate the primary excluded group completely. Nevertheless, since the upper income limits of the two groups are positively related to the level of administrative costs, the size of the two excluded groups would shrink as the costs decline.

These observations suggest that a CBHI scheme can extend insurance to the secondary excluded group if it can eliminate moral hazard. We use a repeated game framework to show that a CBHI scheme can indeed curb moral hazard by punishing any deviation from the contracted level of health care by denying future membership. The repeated game argument we use is simple. The NGO administering the CBHI scheme offers its members the following implicit contract. It offers an insurance contract that guarantees the first best solution for all future time periods provided there is no deviation by the consumer to the ex post optimum.[11] If there is any such deviation,

[10] See Cutler and Zeckhauser (2000) for a review of the extensive theoretical and empirical literature documenting the prevalence of ex post moral hazard in health insurance.

[11] The CBHI scheme insures its members for the ex ante optimal level of health care which, in our model can be

the membership of the consumer is terminated which then pushes him back to the no insurance situation. The threatened punishment is sufficient to deter any momentary deviation for any sufficiently patient individual, i.e. an agent who values his future well-being sufficiently highly and hence has a high discount rate.

If in addition, the CBHI scheme is able to reduce its costs, then it would be able to reduce the premium it charges for any given level of medical care. It would then be able to bring in a part of the primary excluded group under formal insurance. Hence, in this model, the success of CBHIs in attracting poorer households is due to their ability to curb both moral hazard and costs.

We still need to explain why the poorest households continue to remain excluded from the CBHI schemes. We have identified the presence of administrative costs as the reason why the primary excluded group chooses to remain uninsured even if the first best solution is feasible. As long as these costs remain positive, the primary excluded group continues to exist even if the the CBHI scheme can provide the first best contract. The secondary excluded group can be covered by CBHI schemes due to its ability to control moral hazard. However, as income falls to the primary cutoff level, an individual needs to become arbitrarily patient in order to find it worthwhile to honour the first best contract. Such individuals would choose not to be members of the CBHI schemes. We therefore identify two reasons why the very poor remain excluded from these schemes. The poorest individuals–the primary excluded group–remains excluded because the CBHI scheme cannot eliminate administrative costs entirely. The lower end of the secondary group–the poorer individuals within this group–remain excluded since they would require patience of an arbitrarily high order in order to find it worthwhile to be members.

The idea that repeated interaction can curb moral hazard in insurance mechanisms is known.[12] It is also known from the microfinance literature the group interaction can mitigate individual level myopic behaviour.[13] Qualitatively, it is not difficult to see that in group based risk sharing arrangements like CBHI schemes, the threat of denial of future participation can be an effective deterrent on such deviation. For example, in their paper on micro-insurance, Dror and Jacquier (2001, page 10) make the point that "in sustained risk sharing arrangements like group micro-insurance schemes, the penalty for exploiting the group means exclusion from future benefits through blocks to re-entry into insurance". "This may be a very severe threat, particularly for persons who have no personal savings". Hence, the intuition provided by our paper about the deterrent effect that CBHI participation has on a member is not new. What is new, however, is the theoretical modeling of this effect which in turn allows us to uncover the mechanism of both the reach of these schemes to poorer households and the continued exclusion of the poorest households.

clearly calculated. We assume that such a scheme possesses an informational advantage over a market based scheme since the membership of the scheme consists of people from a small area who are well acquainted with each other. Therefore a CBHI scheme can detect any deviation from adequate to excessive medical expenditure by any individual in any state of health; an advantage that is denied to an impersonal market based insurance scheme. We idealize this scenario by assuming that the community is able to detect any deviation from the optimal solution perfectly while the market fails completely in detecting such deviation. The market therefore cannot offer the repeated contract that a CBHI scheme can offer.

[12] See Mailath and Samuelson, (2006) for a more detailed discussion and literature review on this topic.

[13] See Armendáriz and Morduch (2005) for a literature survey on this topic.

3 Moral Hazard: Model

We consider a model in which all agents have identical preferences and have the same susceptibility to different medical ailments. Individuals may however differ according to their wealth levels. Individuals are vulnerable to various medical problems. For simplicity, we assume there are n mutually exclusive medical conditions, where n is some large but finite number. An individual with medical condition i has utility function

$$u_i(x, w) = v_i(x, w) - c(x) \tag{1}$$

with two arguments; the level of medical expenditure x and the level of wealth w that remains for spending on consumption. We use the index i to indicate the severity of the medical condition with a higher i representing a more serious ailment. A given level of medical expenditure will yield greater benefit in a less serious ailment than in a more serious one. Hence, for given x and w, we have $v_i(x, w) > v_j(x, w)$ if $j > i$. We use the index 1 to denote the state of being healthy. Higher medical expenditure provides no additional benefit in this state; thus for any w, $v_1(0, w) = v_1(x, w)$ for all $x > 0$. The function v_i is increasing and concave in both x and w whereas $c(x)$ in increasing and convex in x with $c(0) = 0$. We interpret $c(x)$ as the opportunity cost the individual incurs in availing medical expenditure x.[14] The probability of being afflicted with medical condition i is p_i. By assumption, this is identical for all individuals.

Individuals have the option of buying health insurance from a perfectly competitive insurance market. We represent insurance plans by the sharing function $g(x)$ which specifies the amount of that the individual pays out of his own pocket at the time of receiving expenditure x. The insurance plan pays $x - g(x)$. The individual also needs to pay premium P for insurance coverage. Hence an individual with initial wealth Y has, after paying the premium and incurring medical expenditure $g(x)$, $Y - P - g(x)$ to spend on consumption. In this paper, we confine ourselves to a simple linear sharing scheme $g(x) = bx$, $0 < b < 1$. This is sufficient to capture the intuition about why the poor may choose to stay out of formal insurance.[15]

Without insurance, the individual has to bear the entire expenses of medical care himself. Hence, the expected utility of an individual with income Y in this situation is

$$U^N(Y) = \arg\max_{x_i} \sum_i p_i u_i(x_i, Y - x_i). \tag{2}$$

We denote the expenditure on each state in the no insurance situation by x_i^N.

For an insurance scheme to be feasible, it must be the case that the collected premiums be equal to the cost of the plan. In addition, we now assume that the insurer also incurs an additional cost

[14] As an example of a utility function, suppose $v_i(x, w) = f_i(x) + g(w)$ where $f_i(x) = a_i \frac{x^{1-\gamma}-1}{1-\gamma}$, $a_1 = 0$, $a_j > a_i > 0$ for $j > i > 0$ and $g(w) = \frac{w^{1-\gamma}-1}{1-\gamma}$. The cost function is $c(x) = qx$.

[15] The idea of a linear sharing scheme has been used, for example, in Zeckhauser (1970) to study the impact of ex post moral hazard in health insurance.

w in administering the insurance plan. This cost is independent of the size of the payment from the insurer to the insured. Hence, feasibility requires that the premium P be equal to $P(x, b, w)$ which is given by;

$$\begin{aligned} P &= P(x, b, w) \\ &= \sum_i p_i (x_i - b x_i) + w \\ &= (1 - b) \sum_i p_i x_i + w. \end{aligned} \tag{3}$$

We now distinguish between two situations depending on the way in which the constraint (3) is implemented. The first is the direct implementation of (3) by the insurer. In this, for any sharing coefficient b, the insurer determines the level of medical care for each condition, collects the premium accordingly and ensures that in the event of the realization of any medical condition, the insured patient adheres to the pre specified level of medical care. Clearly, it is vital in this case that the insurer be able to monitor precisely the intake of medical services by any insured individual. If such monitoring is not possible, then the insurer needs to rely on the indirect implementation of (3) by providing appropriate incentives to the consumer. In both cases, the problem for the competitive market, or a benevolent social planner, is to determine the optimal b that will maximize the welfare of consumers while respecting the feasibility constraint. Clearly, the maximum utility obtained from direct implementation is at least as great as the optimum obtained through indirect implementation.

3.1 Direct Implementation

We assume the insurer can monitor the intake of medical services in any ailment. For any sharing coefficient b, the insurer therefore specifies the level of medical care and collects premium accordingly. Upon the realization of any ailment, the insured patient consumes the agreed upon level of medical care by paying a proportion b of the aggregate expenditure. The insurer then pays back the remaining $(1 - b)$ proportion. If the patient deviates from the agreed upon level of care, the insurer refuses to pay its share of the expenditure. In equilibrium, therefore, the patient decides to consume the agreed level of care. What is the optimal level of b in this situation?

Since the constraint is being imposed by the insurer, this situation is equivalent to the patient choosing a level of care x given b to maximize the following utility function denoted U^D.

$$U^D(Y, b, w) = \arg\max_{x_i} \sum_i p_i u_i (x_i, Y - P(x, b, w) - b x_i). \tag{4}$$

Direct implementation seeks to maximize the *ex ante* utility level of the individual; i.e. the expected utility level before the true state of health of the individual agent is realized. Let us denote the maximizer of (4) $x^D(Y, b, w)$. It is fairly obvious that x_i^D rises as Y rises and falls as b and w rises. The competitive market then selects b that maximizes $U^D(Y, b, w)$. It is straightforward to show

that this optimum involves providing complete risk protection the the insured agent.

Proposition 3.1 *Let* $\tilde{b}(Y,w) = \arg\max_b U^D(Y,b,w)$. *Then* $\tilde{b}(Y,w) = 0$.

Proof. Consider $x^D = x^D(Y,b,w)$. By concavity of the utility function u_i,

$$\sum_i p_i u_i \left(x_i^D, Y - P(x^D,0,w)\right) > U^D(Y,b,w).$$

Due to risk-aversion, consumers are better off if they are able to consume $x^D(Y,b,w)$ at the premium $P(x^D,0,w)$ instead of incurring out-of-pocket expenditure share b at the point of treatment.

But by definition of $U^D(Y,b,w)$,

$$U^D(Y,0,w) > \sum_i p_i u_i \left(x_i^D, Y - P(x^D,0,w)\right).$$

Hence, the result follows. ■

We now denote $U^H(Y,w) = U^D(Y,0,w)$. This is the *highest* possible utility attainable under insurance. We call U^H the *first best solution* in the insurance market given income Y and cost w.

3.2 Indirect Implementation

We now consider the more realistic and interesting situation in which the insurer cannot monitor the level of medical care availed of by a patient. This is possibly because the number of medical conditions n is so large as to make effective monitoring prohibitively expensive. Hence, the level of medical care in any condition is determined independently by the insured patient instead of being specified by the insurer. The insurer therefore needs to rely on providing appropriate incentives to ensure that the constraint (3) is satisfied.

We consider whether the indirect implementation mechanism can implement the first best solution achievable through direct implementation. If this solution is not feasible under indirect implementation, then the maximum feasible utility with indirect implementation is necessarily less than the first best utility level.

An insured person pays his premium before the realization of the medical state. Hence, once a medical state is realized, the agent regards the premium paid as a sunk cost which no longer enters into his marginal calculations in deciding the optimal level of medical care. So, for any b, the agent in state i chooses medical expenditure given by

$$x_i^{EP}(Y,b,P) = \arg\max_{x_i} u_i(x_i, Y - P - bx_i), \tag{5}$$

where the superscript EP denotes the *ex post* choice of the patient given the premium P. We denote the resulting utility level in state i by $u_i^{EP}\left(Y,w,P^D(b),b\right)$.

Given the ex post behaviour of insured agents, is it possible for the market to provide the first best solution to a consumer? Suppose the market does seek to provide the ex ante utility

maximizer $x^D(Y,0,w)$ defined in (4) by charging the premium $P^D(Y,0,w) = P\left(x^D(Y,0,w),0,w\right)$. Since the premium, once paid, is a sunk cost. the ex post marginal cost faced by the agent is less than the ex ante marginal cost of his choice. This is the source of *ex post moral hazard* making the ex post choice $x_i^{EP}\left(Y,0,P^D(Y,0,w)\right)$ greater than the ex ante choice $x_i^D(Y,0,w)$. The premium $P^D(Y,0,w)$ therefore fails to cover the cost of actual medical expenditure thereby rendering the first best choice with $b=0$ unfeasible. We show this formally in the following proposition.[16]

Lemma 3.2 *Let $P^D(Y,0,w) = P\left(x^D(Y,0,w),0,w\right)$ be the premium that under direct implementation, covers the expected cost of the ex ante utility maximizer $x^D(Y,0,w)$ defined in (4). Then, for every state i, $x_i^{EP}\left(Y,0,P^D(Y,0,w)\right) > x_i^D(Y,0,w)$. Hence, the premium $P^D(Y,0,w)$ fails to meet the feasibility condition (3).*

Proof. Suppose the insurer charges the premium $P^D(0)$. For any state i, feasibility requires that the individual chooses $x_i^D(0)$ given by

$$x_i^D(0) = \arg\max_{x_i} \sum_i p_i u_i\left(x_i, Y - P(x,0)\right),$$

where the maximand is the right hand side of (4) with $b=0$. Differentiating (4) with respect to x_i and imposing $b=0$, we obtain the following condition that determines $x_i^D(0)$;

$$v_{i1}\left(x_i, Y - P^D(Y,0)\right) = c'(x_i) + \frac{\sum_j p_j^2 v_{j2}\left(x_i, Y - P^D(Y,0)\right)}{p_i} \tag{6}$$

The actual choice of the agent is, however, $x_i^{EP}(0,P^D(0))$ given by (5). With $b=0$, this choice is determined by the condition

$$v_{i1}\left(x_i, Y - P^D(0)\right) = c'(x_i). \tag{7}$$

All the partial derivatives, c', v_{i1} and v_{j2} are strictly positive. The left hand side of both (6) and (7) represent marginal benefit while the right hand side of both sides is the marginal cost. Since v_{i2} is strictly positive, the marginal cost in (6) is higher while the marginal benefit is the same in both equations. Hence, we must have $x_i^{EP}(0,P^D(0)) > x_i^D(0)$ for all $i>1$. For $i=1$, since the marginal benefit of medical expenditure is zero for all x, $x_1^D(0) = x_1^{EP}(0,P^D(0)) = 0$. The premium $P^D(0)$ therefore fails to meet the expected cost incurred by the insurer in providing $x^D(0)$. ■

3.2.1 Incidence of Moral Hazard

Moral hazard prevents the realization of the first best utility level $U^H(Y,w)$ at $b=0$. Instead of choosing $x^D(Y,0,w)$ at premium $P^D(Y,0,w)$, an individual consumes $x^{EP}(Y,0,P^D(Y,0,w))$ at

[16] Given the profusion of parameters in our demand and premium functions, we may abuse notation somewhat by suppressing some of these parameters in the proofs of various statements that follow. In general, we may suppress those parameters which are not significant in capturing the essence of the statement that we seek to prove. Thus, in Lemma 3.2, we suppress the the dependence of x^D, x^{EP} and P^D on Y and w. We extend the same trick to proofs of other statements as well without further qualification hoping that the context makes our meaning clear.

that premium. We now define the *incidence of moral hazard* at state i as the difference between the actual level of consumption at premium $P^D(Y,0,w)$ and the feasible consumption level at that premium.

$$M_i(Y,w) = x_i^{EP}(Y,0,P^D(Y,0,w)) - x_i^D(Y,0,w). \tag{8}$$

It is clear that higher is this incidence, the greater is the difference between the first best utility level and the maximum feasible utility level. We show that the incidence of moral hazard is more severe at lower levels of income, i.e. $M_i(Y,w)$ declines as Y increases.[17]

Lemma 3.3 *Let w be fixed. The incidence of moral hazard, $M_i(Y,w)$, declines as Y increases for all states $i > 1$.*

Proof. The ex ante optimal choice $x_i^D(Y,0)$ is determined by the system of equations (6) while the actual choice $x_i^{EP}(Y,0,P^D(0))$ is determined by (7). By concavity, as $Y \to \infty$, v_{j2} goes to 0. Hence, (6) approaches (7) as Y increases. Therefore, the solutions to both systems of equations too converge as Y increases. Thus, $x_i^{EP}(Y,0,P^D(0)) \to x_i^D(Y,0)$ or $M_i(Y) \to 0$ as $Y \to \infty$. ■

3.2.2 The Competitive Equilibrium

Given the incidence of moral hazard and the consequent unattainability of the first best solution, the best that can be achieved is a consumption level that respects the feasibility constraint (3). Given b, the out-of-pocket proportion of total expenditure, the vector of feasible choice, denoted $x^F(Y,b)$, is determined by the following system of equations.

$$x_i^F(Y,b,w) = \arg\max_{x_i} u_i\left(x_i, Y - P - bx_i\right) \text{ such that } P = (1-b)\sum_i p_i x_i + w. \tag{9}$$

Denoting $x^F = x^F(Y,b,w)$, the maximum feasible utility level under any b is

$$U\left(Y, x^F, b, w\right) = \sum_i p_i u_i\left(x_i^F, Y - P\left(x^F, b, w\right) - bx_i^F\right). \tag{10}$$

A competitive market selects b that maximizes (10). It is clear that the value of b depends upon the degree of incidence of moral hazard. The lower is this incidence, the closer b is to the first best value of $\tilde{b} = 0$. Therefore, given Lemma 3.3 (and footnote 17), the equilibrium value of b is a function of income and cost which we denote $b^*(Y,w)$. Hence,

$$b^*(Y,w) = \arg\max_b U\left(Y, x^F(Y,b,w), b, w\right). \tag{11}$$

We then define

$$U^F(Y,w) = U\left(Y, x^F(Y,b^*(Y,w),w), b^*(Y,w), w\right).$$

[17] It can also be shown that the incidence of moral hazard is higher the greater is w. However, most of our results seek to capture the affect of income on demand for insurance while keeping w fixed. So, we do not emphasize this result too much in our discussion.

This is the maximum *feasible* utility with insurance. It is obvious that $U^F(Y,w) < U^H(Y,w)$. However, given the declining incidence of moral hazard as income increases, as $Y \to \infty$, $b^*(Y,w) \to 0$ and $U^H(Y,w) - U^F(Y,w) \to 0$. If we interpret this difference as the *loss from moral hazard*, then it is clear that the competitive market imposes a greater loss on lower income individuals. We summarize this discussion in the following proposition.

Proposition 3.4 *Due to moral hazard, the maximum feasible insurance attainable in a competitive market, $U^F(Y,w) < U^H(Y,w)$, the first best solution under insurance. The first best solution is obtained under full insurance, i.e. with the proportion of out-of-pocket expenditure $b(Y,w) = 0$ for all income levels Y. However, full insurance is not feasible due to moral hazard. Instead, in a competitive equilibrium, the feasible level of out-of-pocket expenditure is $b^*(Y) > 0$, Moreover, $b^*(Y,w)$ declines as income increases. Hence, $b^*(Y,w) \to 0$ and $U^H(Y,w) - U^F(Y,w) \to 0$ as $Y \to \infty$.*

4 Exclusion of the Poor in a Competitive Insurance Market: Cost and Moral Hazard

Ex post moral hazard therefore reduces the maximum feasible utility level in a competitive insurance market from $U^H(Y,w)$ to $U^F(Y,w)$. We now examine how this factor, combined with the transaction cost component reduces the attractiveness of insurance for low income individuals. In particular, we examine how, for a given w, individuals with income level below a certain critical level refuse to participate in the insurance market instead preferring to remain uninsured.

We first show that with $w = 0$, the equilibrium outcome in a competitive insurance market is sufficiently attractive for any agent, irrespective of the level of income, to opt for insurance. In this situation, therefore, we see universal insurance coverage.

Proposition 4.1 *Let $w = 0$. Then for all income levels Y, $U^F(Y,w) > U^N(Y)$. Hence, the second best solution under insurance provides a higher level of utility than the utility from the no insurance option.*

Proof. It is easy to see that if $w = 0$, then for any Y, $x^F(1) = x^N$. It therefore follows that $U\left(Y, x^F(1), 1\right) = U^N(Y)$. But $U\left(Y, x^F(1), 1\right) = \min_b U\left(Y, x^F(0), 0\right)$. Hence, $U^F(Y,0) > U^N(Y)$. ■

The situation, however, changes completely when we have $w > 0$. Since the cost of administering an insurance is the same irrespective of the magnitude of insurance coverage, w as a proportion of income is much greater for lower levels of income than for higher levels. For income levels sufficiently low, this high relative cost is sufficient to negate any benefit provided by insurance as a risk mitigating measure. Formally, we establish the existence of an income level $Y_1(w)$ below which, even the first best solution under insurance an inferior alternative to the state of being uninsured.

Proposition 4.2 *Fix $w > 0$. There exists $Y_1(w) < \infty$ such that for all $Y < Y_1(w)$, $U^N(Y) > U^H(Y, w)$. Furthermore, $Y_1(w) \to 0$ as $w \to 0$.*

Proof. Note that $U^H(Y, w) = U^H(Y - w, 0)$. Let $Y \to \infty$. Then, $U^H(Y, 0) - U^H(Y - w, 0) \to 0$. For all Y, $U^H(Y, 0) > U^N(Y)$. Hence, by the limiting property, for Y sufficiently high, $U^H(Y, w) > U^N(Y)$. On the other hand, as $Y \to w$, $U^H(Y, w) \to U^N(0)$. Hence, for sufficiently low Y, $U^H(Y, w) < U^N(Y)$. So there would exist a cutoff income level Y_1 such for all $Y < Y_1$, $U^N(Y) > U^H(Y, w)$.

Consider $w = w_1$ and $Y_1(w_1)$. Let $w_2 < w_1$. Then, $U^H(Y(w_1), w_2) > U^N(Y(w_1))$. Hence, $Y_1(w_2) < Y_1(w_1)$. This establishes the second part of the result. ■

Individuals in the income range $Y \in (0, Y_1(w))$ are therefore isolated from the insurance market even if there is no moral hazard to render the first best contract unfeasible. Individuals in this group are deprived of insurance entirely due to the presence of the cost element w. We call members with income in this range the *primary excluded group* and $Y_1(w)$ the *primary cutoff income level*.

The first best contract is of course not feasible when the market has to rely on indirect implementation of the premium feasibility constraint. Ex post moral hazard constrains the market to offer the second best solution. The decision to acquire insurance is therefore made by comparing the second best outcome and the benefit from being uninsured; i.e. between $U^F(Y, w)$ and $U^N(Y)$. Since $U^F(Y, w) < U^H(Y, w)$, we arrive at a cutoff income level $Y_2(w) > Y_1(w)$ below which individuals would prefer to remain uninsured. We establish this formally in the following corollary to Proposition 4.2.

Corollary 4.3 *These exists $Y_2(w)$, $Y_1(w) < Y_2(w) < \infty$ such that for all $Y < Y_2(w)$, $U^N(Y) > U^F(Y, w)$. Furthermore, as $w \to 0$, $Y_2(w) \to 0$.*

Proof. By Proposition 4.2, $U^N(Y_1) = U^H(Y_1, w)$. But $U^F(Y_1, w) < U^H(Y_1, w)$. Hence, $U^N(Y_1) > U^F(Y_1, w)$. But by the same argument as in Proposition 4.2, for Y sufficiently high but finite, $U^F(Y, w) > U^N(Y)$. Hence, there would exist an income level $Y_2(w)$, $Y_1(w) < Y_2(w) < \infty$ such that $U^F(Y_2(w), w) = U^N(Y_2(w))$. Moreover, for all $Y < Y_2(w)$, $U^F(Y, w) < U^N(Y)$.

The second part of the corollary follows from Proposition 4.1. ■

By Proposition 3.4, the loss from moral hazard is relatively higher at lower levels of income. In the presence of administrative costs, this drives agents near $Y_1(w)$ out of insurance leading to a higher cutoff level $Y_2(w)$. We call this group of agents in the interval $(Y_1(w), Y_2(w))$ the *secondary excluded group* and $Y_2(w)$ the *secondary cutoff income level*.

We have therefore identified two reasons behind the exclusion of the poor from insurance in a competitive market. The disproportionately high impact of transaction costs on the poor creates the primary excluded group with $Y \in (0, Y_1(w))$. The transaction cost, coupled with the relatively high loss imposed by moral hazard on the poor creates the secondary excluded group. with $Y \in$

$(Y_1(w), Y_2(w))$. Therefore, the entire group of uninsured agents, given w, consists of individuals in the income range $(0, Y_2(w))$.[18]

5 Extending Protection to the Poor through CBHI: Controlling Cost and Moral Hazard

We attribute the failure of a competitive market to extend health insurance to the poor to (a) their relatively high costs of operations and (b) their inability to control moral hazard. As an institutional mechanism, the competitive market is restricted in its ability to curb either of these factors. Insurers in a competitive setting already operate at the lowest possible cost w thereby precluding any possibility of decreasing the size of the primary excluded group. Nor can the market curb moral hazard to shrink the size of the secondary excluded group since any attempt to offer a offer a payoff higher than $U^F(Y, w)$ tempts an agent to deviate to the unfeasible ex post best consumption choice. In principle, such moral hazard may be controlled by establishing a repeated contracting relationship with the insured agent wherein any such deviation is punished with denial of insurance in the future. However, given the impersonal nature of market relationships and the immense variety of possible medical conditions, it would be prohibitively expensive for an insurer to attempt to detect the true medical condition of a patient or to prescribe the correct level of treatment for any ailment. This constraint prevents the insurance market from establishing repeated relationships with its consumers.

In contrast to the market, CBHI schemes have been successful in including lower income sections in their communities. We have noted that such schemes act as a risk-sharing mechanism by pooling together resources of community members. Whether the scheme provides insurance itself or acts as an intermediary between an individual member and a formal insurance company, membership in the scheme is crucial in enjoying the benefits of risk protection it offers. Such schemes, by their very nature, consist of members from a closely knit community who would be very well acquainted with each other. In our opinion, this is the key factor that enables CBHI schemes to mitigate the effect of both factors—transaction cost and moral hazard—that conspire to exclude the poor from insurance.

First, since a CBHI scheme possesses better information about its clients than would be possible in an impersonal market setting, it can reduce transactions costs involved in for example, verifying credentials and health status of it members, collecting premiums, processing claims etc.[19] Secondly, such schemes can curb moral hazard considerably. Given its close knit character, the

[18] How does the primary and secondary cutoff levels depend upon the risk aversion of the individual? For example, in footnote 14, the level of absolute risk aversion increases as γ rises. With w fixed, $Y_1(w)$ falls as γ rises. A more risk averse agent derives greater benefit from full risk protection at all levels of income. Further, even a moderate level of risk protection is more valued by a more risk averse agent. Hence, even the secondary cutoff level declines as γ rises.

[19] Costs may be reduced not only in terms of money but also time. Thus, a CBHI scheme may be able to process reimbursement claims on health expenditure much quicker than an insurer in a market setting. To a poor individual for whom that expenditure is a very significant proportion his total income, this greatly enhances the attractiveness of a CBHI scheme vis-a-vis a market mechanism.

CBHI scheme would possess sufficient information to detect any deviation by its members from any contracted level of consumption. Membership of a CBHI scheme also entails the implicit punishment of revocation of membership following any serious violation of the terms of a contract. Hence, any deviation would compel an individual to surrender membership and remain uninsured in the future.[20] For a reasonably patient individual, this is a sufficient deterrent against any myopic deviation in the present. This ability to offer a level of benefit above $U^F(Y,w)$ confers upon such schemes the crucial advantage over a conventional market based insurance system.

We now formalize this intuition. First, we show that if members are sufficiently patient, then a CBHI scheme can curb moral hazard fully and offer the first best contract under the *grim trigger strategy*. Under this strategy, any deviation from the first best consumption level is punished by a perpetual denial of membership in future in the scheme.[21] Let δ be the common discount rate among the group members.

Theorem 5.1 *Let w be fixed. Consider a CBHI member with income Y, $Y_1(w) \leq Y \leq Y_2(w)$. There exists $\hat{\delta}(Y,w)$ such that for all $\delta > \hat{\delta}(Y,w)$, the contract that offers the first best solution for ever is a subgame perfect equilibrium under grim trigger.*

Proof. Consider an agent with income Y, $Y_1(w) \leq Y \leq Y_2(w)$. We need to check that the agent would not have the incentive to deviate from the first best outcome. Note that the decision to deviate will be made after experiencing a particular state of health. We therefore seek the condition that ensures that the consumer does not deviate in any such state.

Suppose the consumer is experiencing state i. Once the premium $P(Y,w) = P^D(Y,0,w)$ has been paid, the consumer faces the incentive to deviate from $x_i^D(Y,0,w)$ to $x_i^{EP}(Y,b,P)$. Denote by $u_i^D(Y,w) = u_i(x_i^D, Y - P(Y,w))$ the utility obtained in state i by adhering to the first best contract. Deviation results in utility $u_i^{EP}(Y,w) = u_i(x_i^{EP}, Y - P(Y,w)) > u_i^D(Y)$. In order for the consumer not to deviate in state i, we require

$$(1-\delta)u_i^D(Y,w) + \delta U^H(Y,w) \geq (1-\delta)u_i^{EP}(Y,w) + \delta U^N(Y). \tag{12}$$

The left hand side is therefore the target payoff needed to be sustained. The right hand side combines the reward from the momentary deviation with the punishment payoff of being deprived from insurance in perpetuity. In order for this inequality to hold, we require $\delta > \delta_i(Y,w)$ where

$$\delta_i(Y,w) = \frac{u_i^{EP} - u_i^D}{\left(u_i^{EP} - u_i^D\right) + \left(U^H - U^N\right)}. \tag{13}$$

[20] Since most CBHI schemes function among communities which are not reached by the insurance market, we assume that non members have to remain uninsured.

[21] In repeated games, there would be a large variety of equilibrium strategies that delivers the same payoff. We focus on the grim trigger strategy to obtain the payoff $U^H(Y,w)$ because it incorporates the most severe punishment that may be imposed for any deviation. Hence, the cutoff discount rate $\hat{\delta}_w(Y)$ at which grim trigger achieves the desired payoff level is the lowest such discount rate amongst all strategies that delivers the first best payoff as an equilibrium outcome. Focusing on grim trigger is therefore consistent with our general approach of modeling the most convenient economic environment for the poor to access insurance.

For $Y > Y_1$, $U^H(Y,w) > U^N(Y)$. Hence, for such Y, $\delta_i(Y,w) < 1$. Given the fixed w, define $\hat{\delta}(Y,w) = \max \delta_i(Y,w)$. Since the set of possible medical conditions is finite, this maximum exists. Then, for all $\delta > \hat{\delta}(Y,w)$, the consumer will not deviate from the first best level of medical treatment in any state of health.

We also need to check that membership would be withdrawn by the CBHI scheme following a deviation. This is trivially true since the scheme earns zero profit from members. ■

From Theorem 5.1, we conclude that under the *grim trigger strategy* a repeated contracting set-up can credibly deliver the first best solution in the insurance market provided the discount rate is sufficiently high. CBHIs provide the institutional arrangement that can enforce the repeated contract. It is due to feasibility of the repeated contract that such schemes can persuade the secondary excluded group to acquire formal insurance. However, the primary group, with income $Y < Y_1(w)$, continues to remain excluded as even the first best solution fails to be sufficiently attractive to them compared to the option of remaining uninsured. Unless costs are driven down to zero, the primary income cutoff level remains positive and a CBHI scheme would find it impossible to include the poorest of the poor.

Theorem 5.1 does not imply the existence of a common discount factor that would be sufficient to sustain the first best contract as a subgame perfect equilibrium at any income level Y between Y_1 and Y_2. Instead, it is fairly obvious that as Y falls towards $Y_1(w)$, the critical discount rate $\hat{\delta}(Y,w)$ that can sustain this equilibrium rises to 1. Hence, an individual with a lower level of income would need to be more patient to find it worthwhile to participate in a CBHI scheme. We formalize this insight in the following proposition.

Proposition 5.2 *For given Y between Y_1 and Y_2, let $\hat{\delta}(Y,w)$ be the minimum discount rate such that Theorem 5.1 holds. Then, for given w, as $Y \to Y_1(w)$, $\hat{\delta}(Y,w) \to 1$.*

Proof. Let w be given. At $Y_1(w)$, $U^H(Y,w) = U^{NI}(Y)$. Hence, from (13), $\delta_i(Y_1,w) = 1$ for all i. So, $\hat{\delta}(Y_1,w) = 1$. Further, as Y increases from Y_1, $u_i^{EP}(Y,w) - u_i^D(Y,w)$ decreases (by Proposition 3.4) and $U^H(Y,w) - U^N(Y)$ increases (by Proposition 4.2). Hence, as Y increases from $Y_1(w)$, $\delta_i(Y,w)$ and therefore $\hat{\delta}(Y,w)$ decreases. So, $\hat{\delta}(Y,w) \to 1$ as $Y \to Y_1(w)$. ■

Proposition 5.2 demonstrates that even within the secondary excluded group, an individual with a lower level of income finds it more difficult to derive benefits from a CBHI scheme. We note that we do not need to invoke any notion of poorer individuals having a lower degree of patience to explain this insight. Even with a common discount rate δ for all individuals, there would exist an income level $\hat{Y}(\delta,w) = \hat{\delta}^{-1}(\delta,w)$ such that individuals with income level $Y \in (Y_1(w), \hat{Y}(\delta,w))$ choose to stay out of insurance even when the first best contract is being made available.[22]

We may now summarize our results. Given w, a competitive market is able to provide insurance only to income levels $Y_2(w)$ and above. If a CBHI scheme does not affect transaction costs, it is

[22] Given δ, find Y such that $\hat{\delta}(Y,w) = \delta$. This gives $\hat{Y}(\delta,w) = \hat{\delta}^{-1}(\delta,w)$.

unable to reduce the primary of secondary income cutoffs. However, if it is able to control moral hazard, then it can increase the reach of insurance up to income level $\hat{Y}(\delta, w) \in (Y_1(w), Y_2(w))$.

Suppose, however, that the CBHI scheme only succeeds in reducing costs to w_2 from w_1 without curbing moral hazard. In this case, insurance does not extend beyond the secondary cut-off. But the new secondary cut-off $Y_2(w) < Y_1(w)$ thereby enhancing inclusiveness. This happens due to a decline in $b^*(Y, w)$ for all Y. The benefit $U^F(Y, w)$ obtained from the competitive equilibrium therefore increases reducing the secondary cut-off.

If the CBHI scheme is able to reduce costs as well as curb moral hazard, then the two effects are reinforced. Both the primary and secondary cutoff levels fall. In addition, $\hat{Y}(\delta, w)$ must also fall.[23]

We have therefore explained the first of the two stylized facts observed about the inclusiveness of CBHI schemes; their ability to extend insurance to lower income segments of the community. However, it is also clear that as long as the transaction cost w is positive and the discount rate remains bounded away from one, the lower limit of inclusiveness $\hat{Y}(\delta, w)$ achieved by these schemes must remain bounded away from zero. This explains the second stylized fact about these schemes uncovered in the empirical literature—their inability to extend membership to the poorest of the poor households.

5.1 Can Inclusion be Enhanced through Lower Utility

Proposition 5.2 shows that given a discount rate δ, a CBHI scheme that targets the first best utility level U^H as the subgame perfect payoff excludes individuals with income below $\hat{Y} = \hat{\delta}^{-1}(\delta)$. The question that arises therefore is whether it is possible to extend such schemes towards lower incomes by reducing the targeted payoff level to below U^H but still above U^N. Here, we argue that it is not possible. Any lowering of the targeted equilibrium payoff must necessarily increase the cutoff income level compatible with δ beyond $\hat{Y}$. This strategy therefore fails to enhance the economic inclusiveness of such schemes.

The first best utility is attained if $b(Y) = 0$ for all Y. The targeted utility level $U^T_{b(Y)}(Y)$ may be lowered by increasing b. The higher is b, the lower is $U^T_{b(Y)}(Y)$, with $b = 0$ and $b = 1$ corresponding to $U^H(Y, w)$ and $U^N(Y)$ respectively. First, we consider the situation where $b > 0$ is identical for all Y. Given discount rate δ, we use $Y(b, \delta)$ to denote the lowest income level that can sustain $U^T_b(Y)$ as a subgame perfect equilibrium under grim trigger. We want to see if for some $b > 0$, we have $Y(b, \delta) > \hat{Y}$.

First, let $b(Y) = \hat{b}$ such that at $\hat{Y}$, $U^T_{\hat{b}}(\hat{Y}) = U^N(\hat{Y})$. Thus, given $\hat{b}$, $\hat{Y}$ is the primary income cutoff level. Even an arbitrarily patient individual with income below $\hat{Y}$ would refuse to accept insurance at this parameter value $\hat{b}$. Furthermore, by the logic of Proposition 5.2, an individual needs to become arbitrarily patient as $Y \downarrow \hat{Y}$ to sustain $U^T_{\hat{b}}$. Therefore, it must be that given $\delta < 1$, $Y(\hat{b}, \delta) > \hat{Y}$.

[23] We do not establish this claim in great detail. But to appreciate the claim, note that if $\delta = 1$, then $\hat{Y}(\delta, w) = Y_1(w)$ which falls as w falls.

We already know that for $b(Y) = 0$, $Y(0, \delta) = \hat{Y}$. Hence, for any $b(Y) = b$ such that $0 < b < \hat{b}$, we must have $Y(b, \delta)$ such that $\hat{Y} < Y(b, \delta) < Y(\hat{b}, \delta)$. That is, the the cutoff income level increases monotonically as the out-of-pocket expenditure share increases uniformly from 0 to $\hat{b}$. It is also clear that increasing b beyond $\hat{b}$ cannot include lower income individuals since that just increases the primary income cutoff above $\hat{Y}$.

We therefore conclude at the given δ, for any $\tilde{Y} \in (Y_1, \hat{Y})$, $U^D(\tilde{Y}, b, w)$ cannot be sustained as a subgame perfect equilibrium for any $b > 0$. But then the same applies even for any variable out-of-pocket expenditure scheme $b(Y)$ such that $b(\tilde{Y}) > 0$. It therefore follows that an increase in the out-of-pocket expenditure share from $b = 0$ cannot enhance the inclusiveness of a CBHI scheme. There is no way that such a scheme can include any individual with income below $\hat{Y}$. We summarize this entire discussion in the following proposition.

Proposition 5.3 *Let w be given. For given δ, let $Y\left(b(Y), \delta\right)$ be the lowest income level that can sustain the out-of-expenditure scheme $b(Y)$ in a subgame perfect equilibrium under grim trigger. Let b^H be the particular such scheme where $b(Y) = 0$ for all Y. Hence, $Y\left(b^F, \delta\right) = \hat{Y}$. Then for any $b(Y) \neq b^H$, $Y\left(b(Y), \delta\right) > \hat{Y}$.*

6 Conclusion

We have analyzed a model of community based health insurance in order to understand the extent of the reach of such schemes amongst the poorest members of their communities. Our analysis reveals two factors that explain their success in reaching out poorer households: their ability to reduce operational costs by dispensing with administrative formalities, and their ability to control ex post moral hazard through community level supervision. We have found that these institutions may be able to include the entire secondary excluded group by eliminating moral hazard completely. However, a part of the primary excluded group, i.e individuals with the lowest income, continues to remain outside the membership of these groups unless they manage the impossible task of reducing administrative costs to zero. Further, given the natural limits on the degree of human patience, even some part of the lower income earning households in the secondary excluded group chooses to remain outside the purview of these groups. Hence, while managing to reach out to poorer households who may be excluded by the market, these schemes are unable to attract the membership of the poorest of the poor.

The analysis dispels the notion that the poor remain outside insurance due to their inability to understand the importance of insurance. Instead, they choose to remain out because given the cost inflated premiums, they find it better to remain uninsured under the standard maxim of utility maximization. If insurance becomes a more beneficial proposition, either through controlling costs or curbing moral hazard, then the poor are willing to seek risk coverage, as the success of CBHIs attest to. However, even if moral hazard is controlled, some of the poorest continue to opt out of insurance because in the presence of transaction cost, it takes patience of an arbitrarily high order to benefit from risk protection. This finding points to a general hypothesis that needs to be

investigated more; in the presence of transaction costs, the poor needs to be much more patient to provide evidence of "foresighted" behaviour. This might explain why, for example, the poor may find it difficult to save. It is not because they are less patient than their richer counterparts, but that they need to be much more patient to have the same savings rate.

This paper has not dealt with moral hazard on the side of providers of medical care, doctors and hospitals. In the presence of health insurance, service providers may be tempted to recommend excessively elaborate and expensive treatment to their patients. Given the asymmetry of medical knowledge, patients are compelled to rely on the medical advice of doctors. While an individual patient may be powerless to curb such moral hazard, it remains to be answered whether community level monitoring can achieve success in preventing such abuse.

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