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# IMPACT ON SAVING VIA INSURANCE REFORMS

**AJIT RANADE**
**And**
**RAJEEV AHUJA**

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**INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS**
Core-6A, 4th Floor, India Habitat Centre, Lodi Road, New Delhi-110 003

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## Foreword

An important component of financial sector reform in India is the reform of the insurance sector. In the absence of adequate insurance mechanisms, people mostly self-insure through private savings. Greater availability of insurance products at competitive prices should be expected to alter this behaviour. This study by Ajit Ranade and Rajeev Ahuja attempts to examine the impact of insurance sector liberalisation in India on savings behaviour.

The authors find that as the economy moves from self-insuring to market based insurance, private savings go down with reforms. Even though their theoretical argument suggests that the impact of insurance reform on aggregate intermediation of funds (banks plus insurance) is ambiguous, the simulation results in the study indicate that intermediation also goes down. A comparison of pre and post reform insurance regime shows that consumer welfare and funds intermediation could be lower in an environment of probable insurance failures.

The paper's finding that insurance reform will not necessarily lead to higher savings and greater fund intermediation should make us think about what other complimentary policies are needed to achieve this result.

**(Isher Judge Ahluwalia)**
Director & Chief Executive
ICRIER, New Delhi

# 1 Introduction

Liberalising the financial sector (banks, insurance and securities) means letting market forces determine interest rates and allocation of credit. There are known limitations on how efficient this can be, due to problems of adverse selection. However as credit market imperfections are reduced, agents are better able to achieve consumption smoothing, i.e. transfer of their incomes between various states (contingencies) and also intertemporally. In this paper we are concerned with reforms in the insurance sector and the context is such reforms which are ongoing in India at the time of this writing[1]. Insurance liberalisation in India consists of several components which inlcude the dismantling of state monopoly, promoting competition, setting up of a statutory regulatory body, developing prudential and capital adequacy norms for private entry, setting up mechanisms to protect against insolvencies and bankruptcies, and so on.

The objective of financial reforms is to increase savings and improve its allocation and in the longer term promote growth. Hence an important issue is to study the effect of these reforms on savings, both short term and long term[2]. In fact one of the stated objectives of the Indian insurance reforms is to increase savings mobilisation. Since McKinnon (1973) and Shaw (1973) it has been understood that financial liberalisation would lead to greater mobilisation of savings for economic development and growth. But whether financial liberalisation actually does increase private savings is an empirical question. This is because the effect of interest rates on savings is itself theoretically ambiguous, and other aspects of financial liberalisation, such as increased household access to consumer credit or housing finance, might also work to reduce private saving[3]. On the other hand income growth spurred by financial reforms might contribute to increased savings. Hence the actual impact on savings depends on the relative strengths of these various effects.

In case of insurance, both life and non-life, the impact on savings of insurance reforms is primarily via the precautionary motive. In the following section 2 we have a detailed discussion of

[1]For a recent review of the Indian insurance sector and impending reforms see Ranade and Ahuja (1999).

[2]Financial reforms as they apply to banking have included interest rate deregulation, private sector entry, permissions to operate in mutual funds and other businesses, a reduction in the cash reserve ratio and a reduction in state's preemption of deposit savings (through a reduction in the statutory liquidity ratio (SLR)). The latter measure, a reduction in the SLR (which is an implicit tax on intermediation) has led to less financial repression.

[3]See Bandiera et al (1998) for a recent study of the impact of financial liberalisation on savings.

this linkage, and this is also the main focus of this paper. Our approach is to consider this linkage through a simple inter-temporal model. Since we are looking at the impact on savings and intermediation, an appropriate setting is a multi-period one, and for simplicity we consider a two period model. Also to keep the discussion focussed, we consider a stylized situation that depicts insurance reforms, namely wherein agents move from no access to insurance markets to some access. Thus we look at the impact of introducing insurance option in a hitherto "savings-only" economy. That is economic agents, due to insurance liberalisation move from self insuring to using insurance markets along with savings. This is arguably a crude depiction of the pre-reform Indian insurance scenario, since there are a number of insurance products, both life and non-life available from the state insurer. But nevertheless there are substantial areas such as health insurance, old age pensions, fixed term life insurance and household property and casualty products that are virtually absent. Insurance reforms are thus to be seen, among other things, as widening the product range[4].

In the first aspect of impact on savings in the presence of bank and insurance options, we find that in our model, total (precautionary) savings goes down (as expected) and even total intermediated funds, i.e. through banks plus insurance firms go down.

The second aspect of insurance reforms that we look at in this paper relates to the economy moving from state provided insurance to private provision of insurance by several competing players. Unlike the state owned firm, private firms can become insolvent[5]. We examine the impact on savings, intermediation and consumer welfare in this context. We find that here too in general intermediated funds go down, and consumer welfare tends to be lower under possible insurance firm bankruptcy as compared to probable bank failures.

The present paper is structured as follows. Section 2 contains a discussion of the linkage between savings and insurance. In section 3 we present a two period model to examine the impact of insurance reforms on savings. In section 4 is a comparison of the impact of probable insolvency and bankruptcy of insurance firms vis-á-vis banks. Section 5 concludes.

[4]In the paper we also examine the model wherein we see reforms as generally reducing the price of insurance due to increased competition. In that case it is not so much a question of going from no insurance to some, but from a high price regime to a lower price regime.

[5]The question of appropriate solvency and prudential regulation of firms is discussed separately in Ranade and Ahuja (2000).

## 2 Precautionary Savings and Insurance

Insurance services include provision of life and non-life cover. Life insurance is protection to a household against the risk of premature death of its bread-winner or against risk of unexpected longevity and outgrowing other sources of income[6]. Non-life insurance covers risks of illness, accidents, property damage and other such hazardous outcomes. Non-life insurance contracts are typically shorter in duration as compared to life insurance contracts.

A life insurance contracts being of longer duration typically have risk coverage as well as a bundled savings component[7]. This savings component of life insurance pits the insurer in direct competition with other financial institutions and savings instruments, such as bank deposits, equities and mutual funds.

During the course of insurance and overall financial sector liberalisation, as real rates of interest rise, typically the substitution effect (of decreasing current consumption, and hence increasing savings) is weaker than the opposing income effect, which tends to reduce savings. Furthermore as credit becomes more readily available this also reduces savings. In the context of insurance reforms as the precautionary motive is diminished due to availability of greater insurance options, this avenue also works toward reducing savings[8]. However any positive growth impact of financial reforms might increase incomes and hence savings.

Savings behavior is a function of preferences, technology, and demographics of the economy. Depending on these, the optimal inter-temporal consumption decisions would yield optimal savings. In reality, however, savings behavior is also affected by host of distortions present in an economy such as fiscal incentives for promotion of long-term savings, absence of risk sharing instruments, presence of liquidity constraint, compulsory savings in provident funds etc. Difference in savings across countries may be due to their basic differences, policy differences and availability of social insurance. In fact there is strong evidence that suggests that as social insurance (old age

[6]Such a risk of longevity is covered by insurance contracts which offer post retirement pension plans or annuities.

[7]The bundling together of risk coverage and savings is peculiar to life insurance, especially in developing economies. See Ahuja (1999b) for implications of bundling savings and insurance contracts.

[8]The long run impact of financial liberalisation works through the impact on the savings *rate*. The link between high growth rates and savings is well known from classical growth theory. Empirically, there exists a strong association between savings and growth both across countries and over time. While the debate on direction of causality between savings and growth is still an unsettled issue, the link between savings and growth is well recognized.

income and health insurance, unemployment insurance, disability benefits etc) increases, savings is likely to reduce. Table 2 gives some evidence on social insurance spending and gross domestic savings for a few OECD countries. Furthermore public and private provision of insurance which includes pensions and old age benefits are complements. In fact table 1 reports the data for insurance premia and public spending for social insurance, which shows a negative correlation of $-0.27$.. In the OECD countries gross public spending on social insurance takes up half of total government budgets and accounts for anywhere between a sixth and a third of GDP. Ehrlich and Zhong (1998) working with a sample of 49 countries over 29 years (1960-89) found pension benefits having a significant depressing effect on savings. In their econometric analysis they included pension portion of social security benefits, which includes old age, disability, and survivor benefits, relative to GDP as one of the independent variables. As dependency ratios decline, and an ageing population demands greater coverage, governments are trying to reduce their part in the provision of old age insurance by providing incentives to join private insurers. This has led to an increase in demand for life and health insurance which rises faster than the growth rate of GDP (see SIGMA (1998)). In the Asian economies the growth of insurance premia in both life and non-life segments is likely to be more than 15 percent.

Table 1: Insurance Premia and Public Social Spending

| Country | Life and Insurance Premium in 1996 (as a % of GDP) | Public Social Security Spending on Health-care and Pensions in 1995 (as a % of GDP) |
|---|---|---|
| France | 7.0 | 30 |
| Germany | 3.8 | 28 |
| Italy | 1.8 | 23.5 |
| Japan | 5.9 | 14 |
| Switzerland | 8.1 | 21.5 |
| United Kingdom | 7.8 | 22.5 |
| United Sates | 8.0 | 16 |

Sigma (1998)

The precautionary motive for savings is consistent with inter-temporal choice[9]. In a life cycle

[9] As Deaton (1992) points out, under the permanent income hypothesis, which essentially claims that consumption is nothing but an annuitised value of current human and financial wealth, precautionary savings have no role. This is

Table 2: Social Insurance and Savings in some OECD countries

| | 1980 | 1985 | 1990 | 1993 |
|---|---|---|---|---|
| **Denmark** | | | | |
| Gross domestic savings (% of GDP) | 20 | 22 | 25 | 24 |
| Total Social Expenditure(% of GDP) | 27.92 | 26.84 | 28.81 | 31.72 |
| **Germany** | | | | |
| Gross domestic savings (% of GDP) | .. | .. | .. | 22 |
| Total Social Expenditure(% of GDP) | 27.81 | 28.29 | 26.77 | 31.54 |
| **Netherlands** | | | | |
| Gross domestic savings (% of GDP) | 22 | 25 | 27 | 25 |
| Total Social Expenditure(% of GDP) | 30.04 | 30.73 | 33.09 | 34.09 |
| **Sweden** | | | | |
| Gross domestic savings (% of GDP) | 19 | 21 | 22 | 17 |
| Total Social Expenditure(% of GDP) | 31.69 | 32.91 | 34.02 | 40.59 |
| **United Kingdom** | | | | |
| Gross domestic savings (% of GDP) | 19 | 18 | 17 | 14 |
| Total Social Expenditure(% of GDP) | 20.41 | 24.13 | 23.21 | 27.21 |
| **United States** | | | | |
| Gross domestic savings (% of GDP) | 19 | 17 | 15 | 15 |
| Total Social Expenditure(% of GDP) | 17.38 | 19.35 | 21.29 | 23.32 |

Source OECD (1998)

theory of consumption, where assets are accumulated in the beginning and run down later, with no liquidity constraints and no uncertainty there is no room for precautionary motive to save. The only saving that occurs is toward consumption smoothing and asset buffering. If however liquidity constraints are likely to occur in a person's lifetime, with risk aversion, precautionary savings may be observed. Also as pointed out by Leland (1968), an increase in the uncertainty of future income, through say a mean preserving spread, a risk averse person with convex marginal utility will increase his savings. This too is precautionary savings. Even in life cycle models which do not have liquidity constraints, but wherein the income may go to zero, and consumers who have extreme risk aversion to zero income, we get back precautionary savings (see Carroll (1991)), and in fact an abstinence from borrowing despite absence of liquidity constraints. The precautionary motive can also be distorted by tax policy (Kimball and Mankiw (1989)). Finally even in a model of permanent income when old age pensions are accumulated in illiquid assets which are non-

mostly an artifact of the strong assumptions on utility function and the time discount rate that the permanent income hypothesis makes.

collaterisable, agents will have precautionary savings. There are however no reliable estimates of the share of precautionary savings in total savings for India. In table 3 given in the appendix we see that the gross domestic savings rate for India has been increasing slightly, but share of insurance premia in financial assets of households is virtually constant. Skinner (1988) argues that such precautionary saving may account for as much as 56 percent of total life cycle savings in the USA.

In the presence of income uncertainty and precautionary savings introducing an insurance option to hedge against uncertain income reduces savings. Insurance purchase decision in the presence of risk of future income loss is discussed by Dionne and Eeckhoudt (1984). They show that insurance and savings decision are separate in the sense that at actuarially fair price agent would always buy full insurance. This separation result is independent of the return on savings. In case of liquidity constraints Ahuja (1999a) shows that insurance demand is partial even if actuarially priced.

We model insurance reform as the transition of an economy from "savings-only" to jointly savings and insurance possibility[10]. We examine the behaviour of a representative agent who can self-insure, and compare it with the case where the agent, besides self-insurance option, also has access to buying insurance. In a two-period setting we show that total intermediated funds ie., amount set aside by agent for self-insuring as well as premium for buying insurance, goes down compared to self-insure only (or savings) option. Thus insurance liberalisation unambiguously leads to reduction in private savings in the short run, and total intermediated funds also go down. This result is robust even under an alternative way of modelling insurance reforms as moving from a public monopoly, high cost insurance to competitively provided low cost insurance.

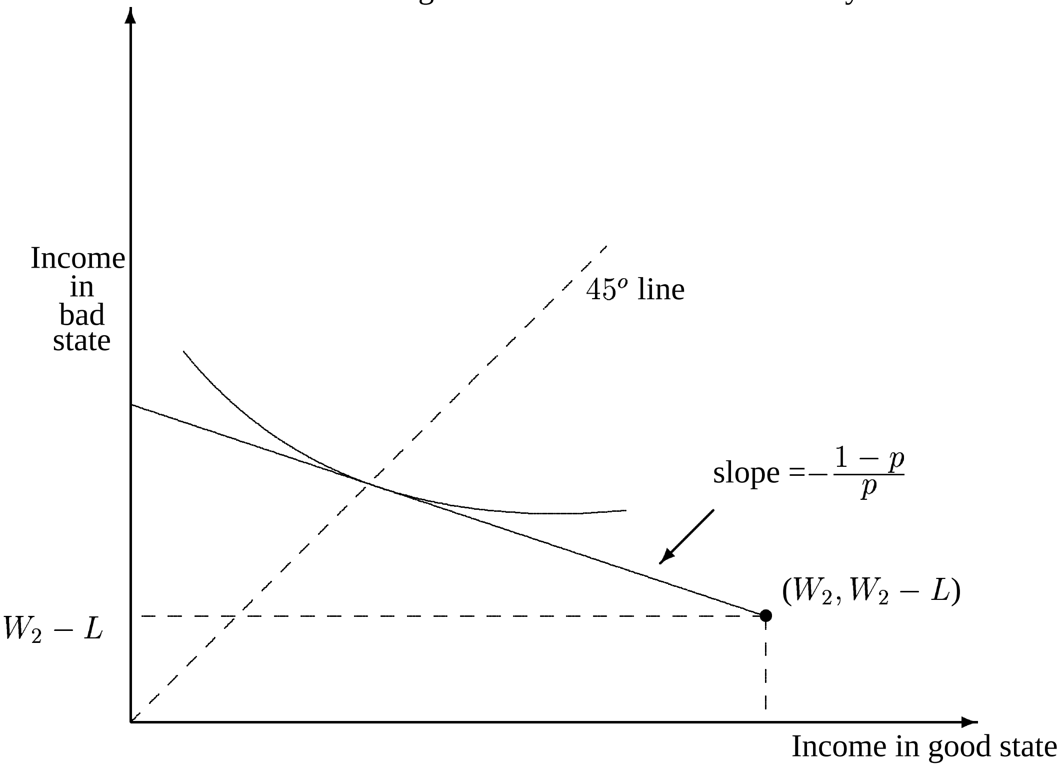
# 3 A Two Period Model

In this section we first consider the case in which an agent has savings option only, and compare the result obtained with the case where agent has both savings and insurance options available to her. We assume the expected utility maximising agent is risk averse, has a concave, twice differentiable utility function of money, $u$. The agent lives for two period, and leaves no bequests or debts, neither

[10] This is a stylized representation of reforms, as no doubt there is a considerable range of insurance options available even in pre reform period in India. But our objective is to bring out the differences in a setting of savings only and savings plus insurance.

does she inherit any wealth. In the two period model[11] we consider, the agent has income of $W_1$ in the first period. In the second period she has a random income that takes the value $W_2$ with probability $(1-p)$ and $W_2 - L$ $(W_2 > L)$ with probability $p$. The second period uncertainty is illustrated in figure 1.

Figure 1: Second Period Uncertainty




In figure 1 all the points in the positive quadrant represent income combinations in the two states. Thus all points along the 45 degree line represent equal incomes in both states, i.e. a case of full insurance wherein incomes are state independent. The point $(W_2, W_2 - L)$ represents the situation of the agent prior to any purchase of insurance. An actuarily fair insurance contract allows the agent to exchange some of her "good" state income i.e. $W_2$ to supplement her "bad" state i.e. $W_2 - L$. This is a linear exchange rate, which is the actuarily fair rate of $p$. Thus the line with slope $(1-p)/p$ is the actuarily fair price line, also called the "zero profit" line for the insurance company. From standard microeconomic theory we know that a risk averse person always buys full insurance at actuarily fair price (see Mas-Colell et al (1995)).

In the absence of insurance or savings, total expected utility of agent over both periods, denoted by $EU_1$, is given by:

[11]For a fuller discussion and justification for a two a period framework to analyse joint savings and insurance decisions, see Ahuja (1999a).

$$EU_1 = u(W_1) + \rho[(1-p)u(W_2) + pu(W_2 - L)]$$

where $\rho$ is the discount factor which we will assume to be equal to 1.

Supposing now the agent has an option of savings. For every unit saved (dis-saved) in the first period she gets back (pays) $R$ units in the second period. For simplicity we assume that $R = 1$.[12] The optimal savings is obtained by choosing $S$ so as to maximise $EU_1$ as follows:

$$\max_S \quad u(W_1 - S) + (1-p)u(W_2 + S) + pu(W_2 - L + S) \tag{1}$$

The first order condition is:

$$u'(W_1 - S) = [(1-p)u'(W_2 + S) + pu'(W_2 - L + S)] \tag{2}$$

Note that $S^*$ could be either positive, negative or zero. If $S^* < 0$, the agent borrows in the first period and repays the borrowed amount $(S^*)$ in the second period.

Most studies that confront the issue of precautionary saving focus on income uncertainty which is only one of the risks that household face. Income uncertainty could arise due to number of insurable risks and supply of insurance for such types of risk may not exists. This is the situation we characterise above.

Now if an insurance option, in addition to savings option, is available to the consumer, her utility would definitely go up, but her savings would unambiguously come down as the agent now substitutes insurance for savings or "self-insurance." Intuitively, it is easy to see why this happens. Purchase of insurance increases agent's welfare by reducing the randomness in her second period income. The increase in second period income is more than the reduction in her first period income due to payment of premium. With increased second period income, the agent would want to transfer part of it to the first period, thereby reducing her savings. This is formally shown below:

Assume now that the agent has two options available to her. She can save and/or buy insurance. The agent pays premium in the first period to protect herself against uncertain income in the second period. We assume savings and insurance markets to be independent. Savings and insurance decisions are now jointly made.

The insurance contract offered by an insurer is is of the following type:

[12] Given our purpose at hand, we suppress the interaction between interest rate $(R = 1)$ and time preference $(\rho = 1)$. This is a simplifying assumption and does not affect our results. However it is appropriate to remind the reader about the several papers which do indeed depend on the relationship between time preference ad the interest rate. Moreover any change in the real rate of return $R$ as a result of liberalisation of the insurance sector is an issue not address by this paper.

- buy any coverage $D(\leq L)$ at the actuarily fair price[13] $p$ in period 1; and
- receive the coverage $D$ in case of "bad" state in period 2.

Supposing the agent buys this contract. Optimal savings and insurance are determined as follows:

$$\max_{D,S} u(W_1 - pD - S) + (1-p)u(W_2 + S) + pu(W_2 + D - L + S) \tag{3}$$

The first order conditions assuming interiority of $D$ that are satisfied by the optimised value of savings and insurance demanded, denoted respectively by $\hat{S}$ and $\hat{D}$, are as follows:

$$\begin{aligned} pu'(W_1 - pD - S) &= pu'(W_2 + D - L + S) &(4)\\ u'(W_1 - pD - S) &= (1-p)u'(W_2 + S) + pu'(W_2 + D - L + S) &(5) \end{aligned}$$

These conditions together with the full insurance result at actuarially price, yield the following condition:

$$u'(W_1 - pL - \hat{S}) = u'(W_2 + \hat{S}). \tag{6}$$

Since income in the second period is up due to insurance, $\hat{S} < S^*$. But what happens to financial intermediation defined as sum of insurance premium and savings? That is, what happens to the relationship between $pL + \hat{S}$ and $S^*$? The effect of insurance option on financial intermediation is ambiguous. That is, insurance premium plus savings in the "insurance option" case could be higher or lower depending on the value of basic parameters.[14]

Interpreting insurance sector reforms as a case of moving from no insurance option to one where insurance option is available is not that unrealistic, if we take this as a description of those categories of insurance products which are unavailable prior to reforms.

## 3.1 Insurance Reforms as Decrease in Price

Another approach is to model insurance reforms as a decrease in the price of insurance due to increased competition. Thus we start with a situation that the agent has access to both savings and

[13] The fair price is $p$ since we are assuming that interest rate, the return on savings is $R = 1$. In general the actuarily fair price in a two period setting would be $p/R$.

[14] We can alternatively view the above setting as one in which the agent is liquidity constrained. Starting from a point where demand for insurance is nil, it is easy to show that the easing of liquidity constraint would lead to positive demand for insurance. Easing of liquidity constraints is one of the consequences of financial reforms.

insurance, but insurance is available (from the monopoly firm) at actuarily unfair price $q > p$. How would savings change as price of insurance falls to fair level? Starting from an actuarially unfair price, as the price moves closer to the fair price, the demand for insurance may not unambiguously go up. This is because of opposing price and substitution effects of change in price of insurance, on insurance and savings.

The model is then as follows:

$$\max_{D,S} u(W_1 - qD - S) + (1-p)u(W_2 + S) + pu(W_2 + D - L + S) \tag{7}$$

The first order conditions assuming interiority of $D$ are:

$$qu'(W_1 - pD - S) = pu'(W_2 + D - L + S) \tag{8}$$
$$u'(W_1 - pD - S) = (1-p)u'(W_2 + S) + pu'(W_2 + D - L + S) \tag{9}$$

Let the optimal values be $D^*$ and $S^*$. In this situation as price of insurance $q$ falls, whether $D$ and $S$ are substitutes depends on the second order conditions and various parameters such as risk aversion and convexity of the marginal utility of income. Detailed expressions are given in the appendix. The impact of a change in $q$ and on fund intermediation $S + qD$ is theoretically ambiguous because the impact on $S$ and $D$ itself is ambiguous. To measure the impact of changes in the price of insurance ($q$) on optimal values of $S$ and $D$ we differentiate equations (8) and (9) with respect to $q$, and define $u_1 = u'(W_1 - pD - S), u_n = u'(W_2 + S), u_a = u'(W_2 + D - L + S)$ to get:

$$\frac{\partial D}{\partial q} = \frac{(u_1' - qD^* u_1'')(u_1'' + (1-p)u_n'' + pu_a'') + D^* u_1''(qu_1'' + pu_a'')}{\mathcal{D}}$$

$$\frac{\partial S}{\partial q} = \frac{-D^* u_1''(q^2 u_1'' + pu_a'') - (u_1' - qD^* u_1'')(qu_1'' + pu_a'')}{\mathcal{D}}$$

(refer to the appendix for the definition of $\mathcal{D}$ and derivation of the above expressions.)

$\partial D/\partial q > 0$, if $p(q-1)u_1''u_a'' > u_1'(u_1'' + (1-p)u_n'' + pu_a'') - q(1-p)D^* u_1'' u_n''$. Similarly, $\partial S/\partial q > 0$ if $-u_1''u_a''D^* p(1-q) > u_1'(qu_1'' + pu_a'')$.

Signs of both the above expression depend on the signs of their numerator (because the denominator is positive) which in both cases is ambiguous. To get some sense of the impact of lower insurance prices on fund intermediation we use numerical simulations. We work with the following three utility functions:(a) $u(x) = 1 - \exp^{-\rho x}$ (b) $u(x) = \log x$ and (c) $u(x) = \sqrt{x}$. The results of the simulations are presented in figures 2 to 4. All of these simulations show that a decrease in the premium leads to a decrease in the amount of total fund intermediation. This result appears to

Figure 2: Fund Intermediation and Price of Insurance under insurance firm default: $u(x) = 1 - e^{-\rho x}$

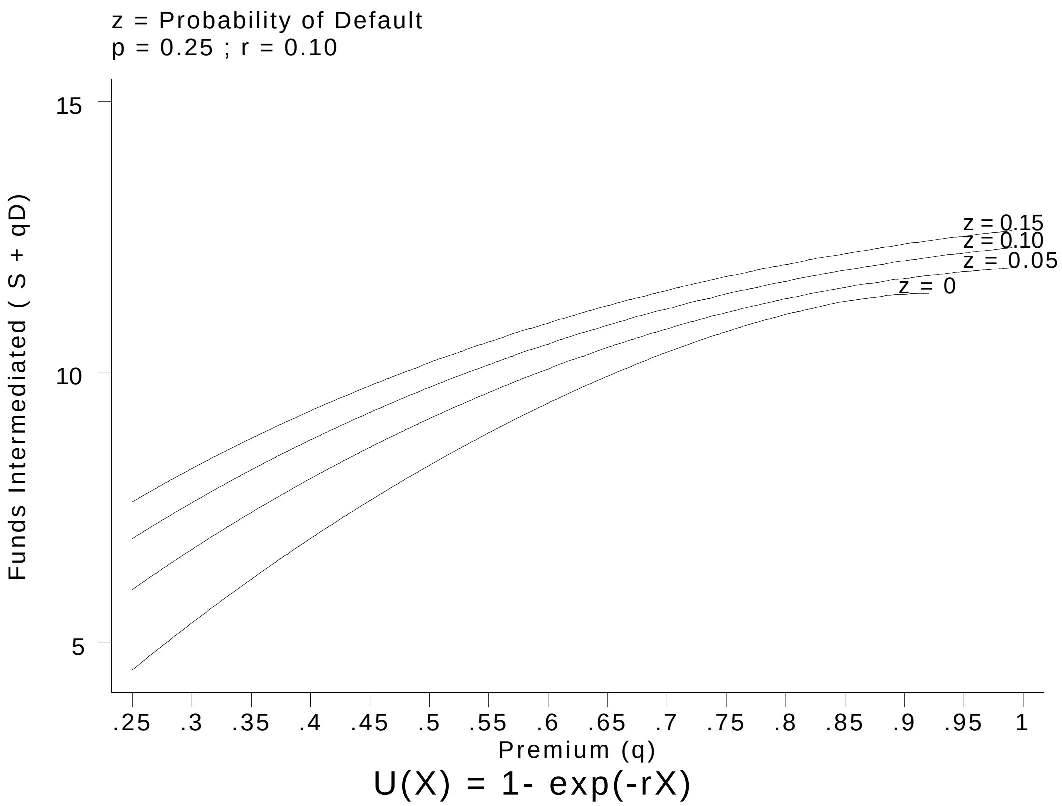


Figure 3: Fund Intermediation and Price of Insurance under insurance firm default: $u(x) = \log x$

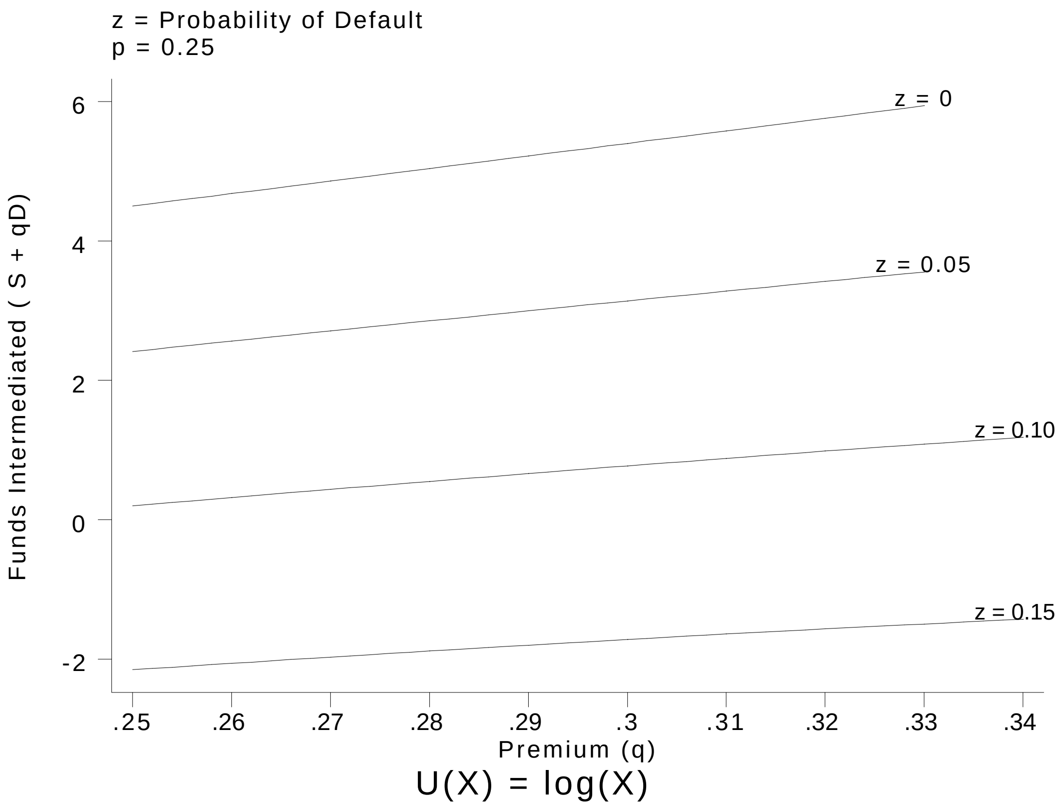
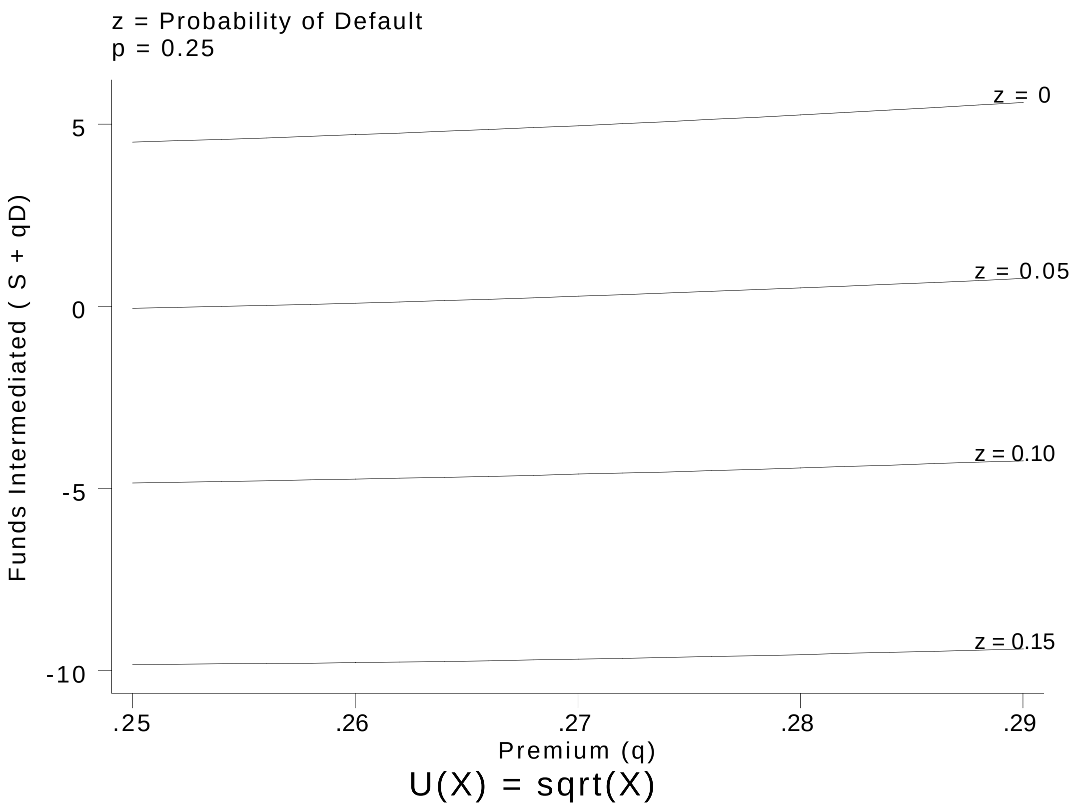


Figure 4: Fund Intermediation and Price of Insurance under insurance firm default: $u(x) = \sqrt{x}$



be robust, since it holds even with some small probability of insurance firm bankruptcy. A fuller discussion of bankrutpcy issues is in the next section.

Before concluding this section a note is in order. In the two-period setting that we consider above, we study the short-term or transitional effect of insurance market reforms on savings behavior. This model is not suited to capture some other effects that may be present in a richer setting. For example, the fact that borrowing or liquidity constraint reinforcing the effect of precautionary savings is not captured in a two-period setting.

# 4 Bankruptcy Issues

Insurance liberalisation will mean that there will be several players competing on price and other dimensions. Regulatory oversight is necessary, since price competition in insurance can make firms flirt with near insolvency in their efforts to gain customers. However the regulator cannot eliminate the finite probability that in any given period there may be few insurance firm bankruptcies[15]

In the presence of possible bankruptcy[16] an agent wishing to purchase insurance to hedge against an innate income randomness, has to reckon with an additional uncertainty of the insurer going bankrupt. In a more general setting of bank and insurance de-regulation leading to a more uncertain and competitive environment, there are finite probabilities that both bank (savings option) and insurance firm may go bankrupt.

We examine the impact of bankruptcy probability of insurance firms and banks on savings and consumer welfare. A bank failure implies that whatever is deposited with a bank is all lost. An insurance failure implies that coverage is not paid in the "bad state". In the following we use "bankruptcy" and "insolvency" interchangeably.

In a two period setting where a risk averse agent has the options of savings and insurance, we consider two cases: one, in which there is some risk of insurer being insolvent only, and the other where the bank could become insolvent only. For computation simplicity we do not consider the case when both can have non-zero default probability. This general case is handled through numerical simulation. We compare agent's purchase decision in these two situations. Let $z_1$ be the probability of a bank becoming bankrupt and $z_2$ be the probability of an insurance firm becoming bankrupt. The expression for expected utility is as follows:

$$\begin{aligned} EU &= u(W_1 - qD - S) \\ &\quad +(1-z_1)(1-z_2)[(1-p)u(W_2+S) + pu(W_2 - L + S + D)] \\ &\quad +z_1(1-z_2)[(1-p)u(W_2) + pu(W_2 - L + D)] \\ &\quad +(1-z_1)z_2[(1-p)u(W_2+S) + pu(W_2 - L + S)] \\ &\quad +z_1 z_2[(1-p)u(W_2) + pu(W_2 - L)] \end{aligned}$$

The above expression is maximised and the optimum values of $D$ and $S$ are chosen. The corre-

[15]In a recent report issued by Standard & Poor's Ratings Services, quoted by Mark Cybulski, the number of insurance company insolvencies jumped from 20 in 1998 to 35 in 1999 in the USA. The report also rates the financial strength of insurance and financial services companies, and predicts the number of insolvencies will continue to rise due to increased competitive pressure and unfavorable market conditions that will not likely change. Nevertheless, the 35 companies that failed represent only 1.2 percent of the 3,000 insurance companies doing business in the U.S. Insurance continues to be among the most financially strong industries in the U.S., according to Standard & Poor's. See `http://www.insure.com/index.html` for details.

[16]Bankruptcy law in India makes it very difficult for a company to actually close down. But from the perspective of the policy holder it suffices to hold on possibility that no reimbursement or payments may be forthcoming from the "bankrupt" firm.

sponding first order conditions assuming interiority of $D$ are

$$\begin{aligned}
\text{for } D: \quad qu'(W_1 - qD - S) &= p[(1-z_1)(1-z_2)u'(W_2 + D - L + S) \\
&\quad + z_1(1-z_2)u'(W_2 - L + D)] \\
\text{for } S: \quad u'(W_1 - qD - S) &= (1-z_1)(1-z_2)[(1-p)u'(W_2 + S) + pu'(W_2 - L + S + D)] \\
&\quad + (1-z_1)z_2[(1-p)u'(W_2 + S) + pu'(W_2 - L + S)]
\end{aligned}$$

The second condition gets simplified to:

$$\begin{aligned}
u'(W_1 - qD - S) &= (1-z_1)(1-p)u'(W_2 + S) \\
&\quad + (1-z_1)p[(1-z_2)u'(W_2 - L + S + D) \\
&\quad + z_2 u'(W_2 - L + S)]
\end{aligned}$$

Since the expressions are cumbersome, we report some numerical simulations to examine the impact of joint bankruptcy possibilities on fund intermediation and consumer welfare. These are shown in figures 5 to 10. Despite the theoretical ambiguity the results of these simulations are rather robust. Fund intermediation with joint possibilities of bankruptcies continues to go down as insurance becomes cheaper. This result reinforces the results of the previous section. Furthermore, consumer welfare (measured as expected utility) is higher under relatively weak and more bankruptcy prone banks than more bankruptcy prone insurance firms. That is, consumer welfare is higher when $z_1 < z_2$ instead of vice versa. This highlights the increased vulnerability to insurance failures rather than bank failures. In the following we strengthen this conclusion analytically.

Figure 5: Fund Intermediation and Price of Insurance with joint bankruptcy with different values of $z_1$ and $z_2$ $u(x) = 1 - e^{-\rho x}$

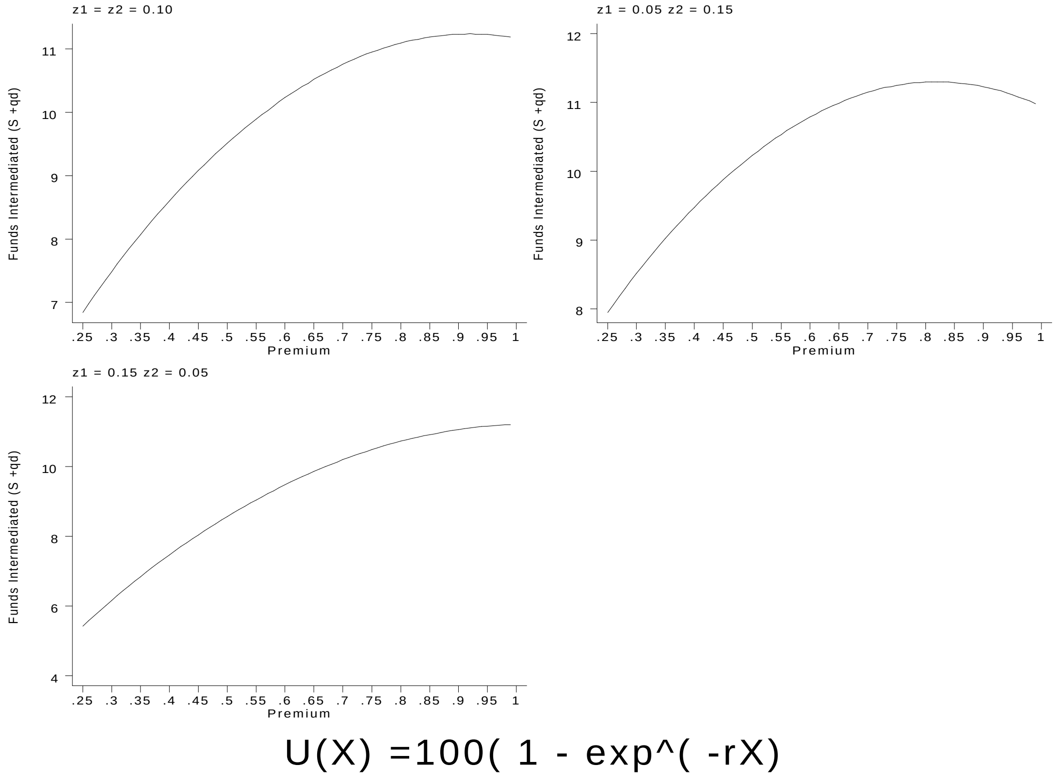


Figure 6: Fund Intermediation and Price of Insurance with joint bankruptcy with different values of $z_1$ and $z_2$ $u(x) = \log x$

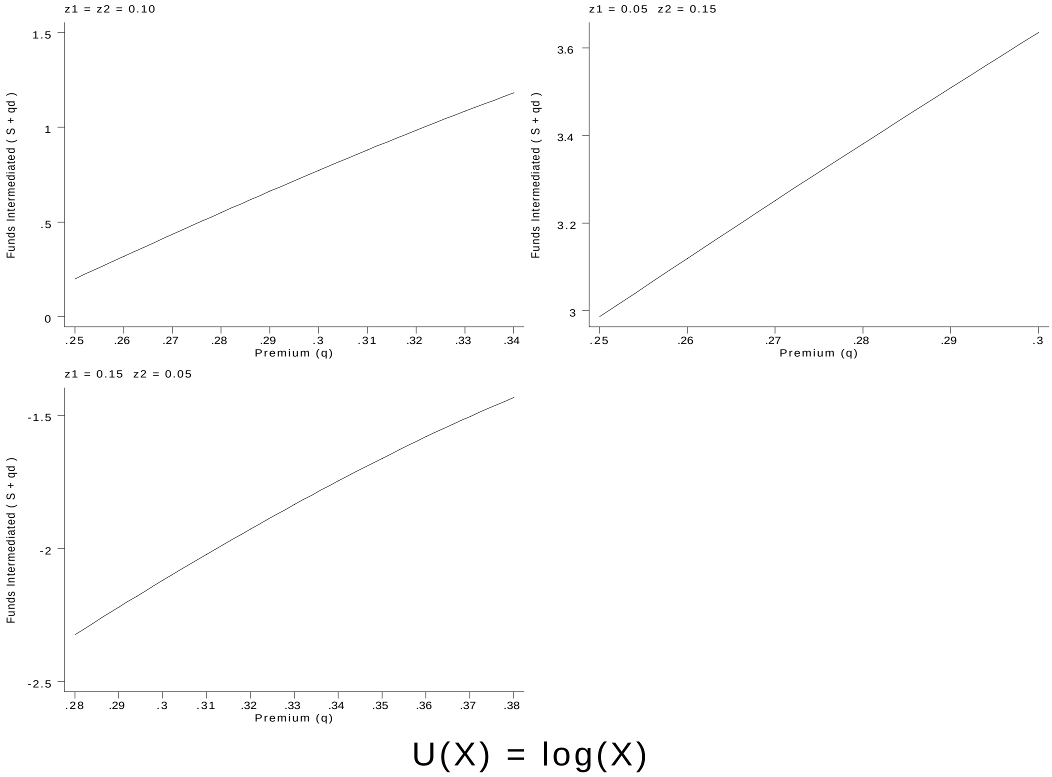


Figure 7: Fund Intermediation and Price of Insurance with joint bankruptcy with different values of $z_1$ and $z_2$ $u(x) = \sqrt{x}$

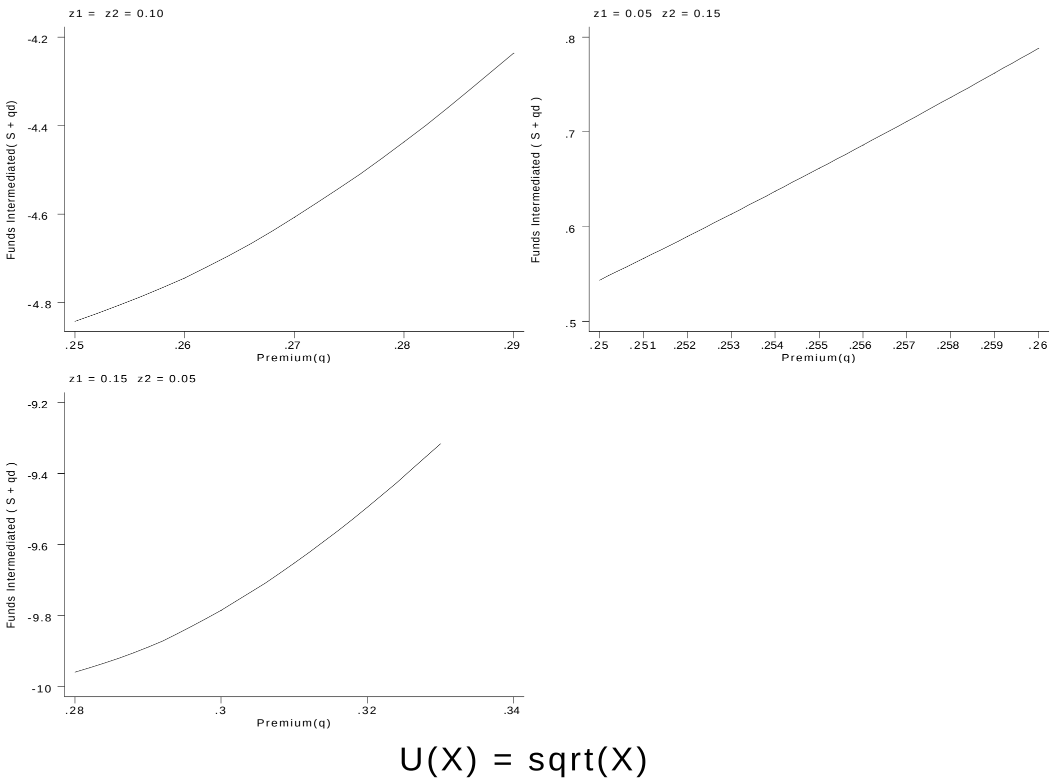


Figure 8: Welfare and Price of Insurance with joint bankruptcy with different values of $z_1$ and $z_2$
$u(x) = 1 - e^{-\rho x}$

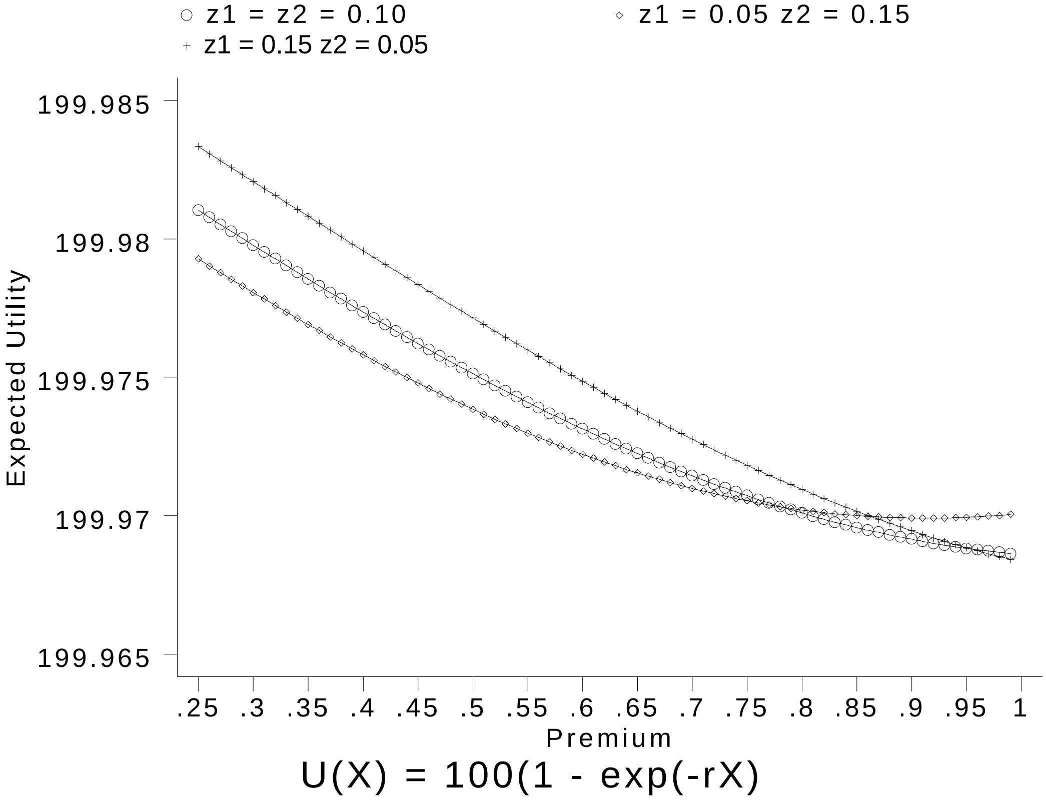


Figure 9: Welfare and Price of Insurance with joint bankruptcy with different values of $z_1$ and $z_2$
$u(x) = \log x$

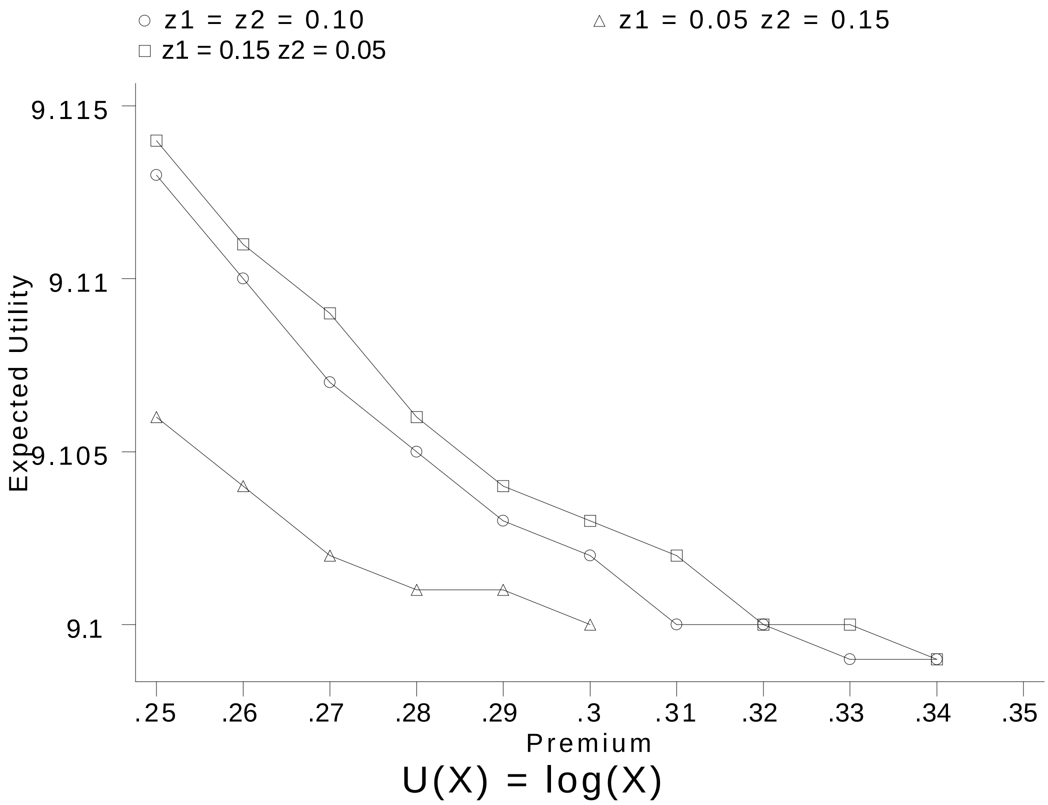
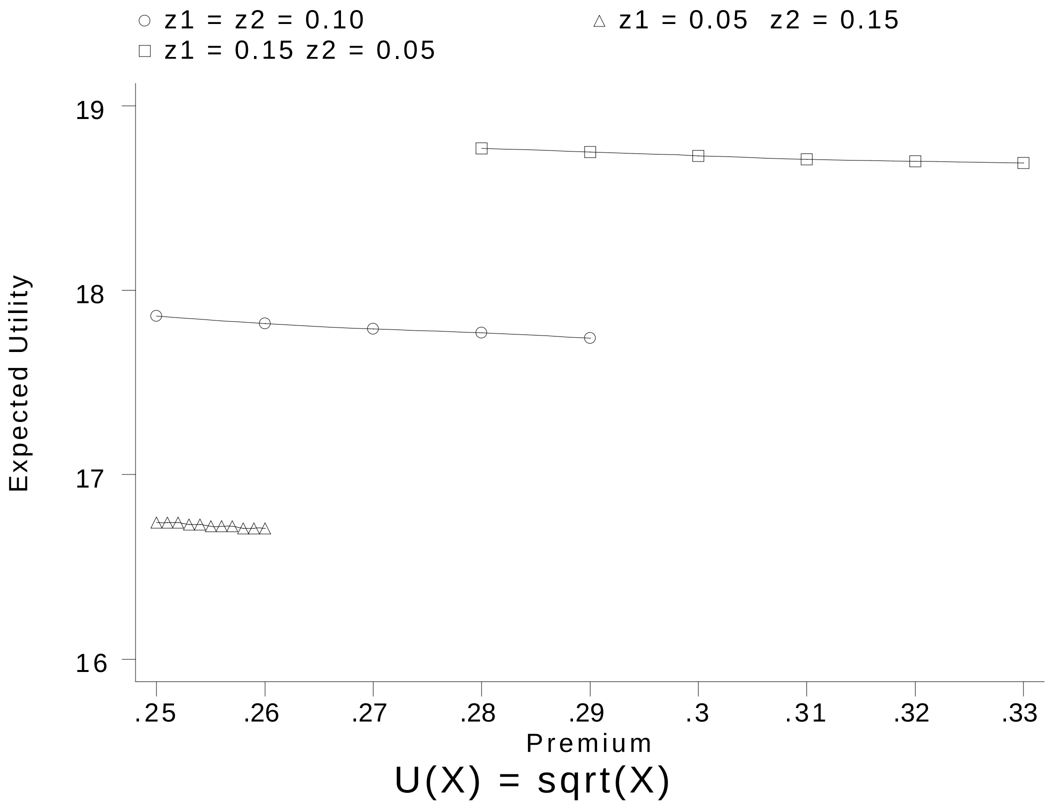


Figure 10: Welfare and Price of Insurance with joint bankruptcy with different values of $z_1$ and $z_2$
$u(x) = \sqrt{x}$



As the foregoing simulations suggest, consumer welfare seems to be more negatively related to insurance failures than bank failure. While the full analytical derivation is beyond the scope of the present paper, we deal with a special case. To simplify our analysis, and deal with an analytically tractable case we examine the equiprobable case i.e. $z = z_1 = z_2$ and furthermore compare the case when only bank can become bankrupt with the case when only insurance firm can become bankrupt.

### **4.1** PROPOSITION

*Let bank and insurance firm bankruptcy be equiprobable. Compare total intermediation of funds under probable bank-only failure and under insurance-only failure. Funds intermediation is lesser under the latter than the former.*

**Proof:**

We show this as follows:

Let $z$ denote the insolvency probability which is the same in both the cases.

**Case: When insurer becomes bankrupt**

$$\begin{aligned} \max_{D,S} \quad & u(W_1 - qD - S) + (1-p)u(W_2 + S) + (1-z)pu(W_2 + D - L + S)r \\ & +zpu(W_2 - L + S) \end{aligned}$$

The first order conditions w.r.t. $D$ and $S$ (optimal values denoted by $D^*$ and $S^*$) are:

$$\begin{aligned} qu'(W_1 - qD^* - S^*) &= p[(1-z)u'(W_2 + D^* - L + S^*) \\ &\quad +zu'(W_2 - L + S^*)] \qquad (10) \\ u'(W_1 - qD^* - S^*) &= (1-p)u'(W_2 + S^*) \qquad (11) \\ &\quad +(1-z)pu'(W_2 + D^* - L + S^*) + zpu'(W_2 - L + S^*) \end{aligned}$$

Substituting (10) in (11) yields,

$$\begin{aligned} (1-z)p(1/q - 1)u'(W_2 + D^* - L + S^*) &= (1-p)u'(W_2 + RS^*) \qquad (12) \\ &\quad +zpu'(W_2 - L + S^*) \end{aligned}$$

**Case: When Bank becomes bankrupt**

$$\begin{aligned} \max_{D,S} \quad & u(W_1 - qD - S) + (1-z)[(1-p)u(W_2 + S) + pu(W_2 + D - L + S)] \\ & +z[(1-p)u(W_2) + pu(W_2 + D - L)] \end{aligned}$$

The first order conditions w.r.t. $D$ and $S$ (optimal values denoted by $\hat{D}$ and $\hat{S}$) are:

$$\begin{aligned} qu'(W_1 - q\hat{D} - \hat{S}) &= (1-z)pu'(W_2 + \hat{D} - L + \hat{S}) \\ &\quad + zpu'(W_2 + \hat{D} - L) \end{aligned} \tag{13}$$

$$\begin{aligned} u'(W_1 - q\hat{D} - \hat{S}) &= (1-z)[(1-p)u'(W_2 + \hat{S}) \\ &\quad + pu'(W_2 + \hat{D} - L + \hat{S})] \end{aligned} \tag{14}$$

Substituting (13) in (14) yields,

$$\begin{aligned} (1-z)p(1/q - 1)u'(W_2 + \hat{D} - L + \hat{S}) &= (1-z)(1-p)u'(W_2 + \hat{S}) \\ &\quad - zpu'(W_2 + \hat{D} - L) \end{aligned} \tag{15}$$

Now, compare (12) and (15).

Evaluating (15) at $S^*$ and $D^*$ and comparing it with (12) suggests that $q\hat{D} + \hat{S} > qD^* + S^*$. Hence insurance and saving activity combined is less if there is risk of insurance firm becoming insolvent than if there is risk of bank becoming insolvent.

# 5 Conclusion

Insurance sector reform in India is likely to increase insurance demand in the country. However the experience of several countries with financial reforms has been that savings have tended to go either way. Using a two-period model we show that in the short run, absent any income or productivity growth, private savings go unambiguously down since market based insurance replaces savings hitherto meant for self-insurance (the precautionary motive). Thus insurance is likely to edge out the precautionary component of savings. Reliably estimates of the precautionary component of savings are hard to get. During the course of financial sector reforms there are several other avenues through which savings are likely to go down as well, such as easing of credit constraints, more provision of social insurance and so on, so it would be difficult to disentangle the effect of insurance reforms on savings reduction. However with liberalisation as the economy moves into greater income uncertainty and volatility, and income growth, this may offset the reduction in savings somewhat. We have also examined the issue of fund intermediation and welfare in the context of joint bankruptcy of banks and insurance firms. In such a case the insurance bankruptcies we find create greater vulnerabilities. Specifically we show in a comparison of equi-probable bankruptcy of insurance firms and banks, funds intermediation is lesser in an environment of probable insurance failures than bank failures, and consumer welfare is higher under the latter.

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# 7 Appendix: Second Order Conditions

Define $u_1 = u'(W_1 - pD - S), u_n = u'(W_2 + S), u_a = u'(W_2 + D - L + S)$

$$\frac{\partial E}{\partial D} = -qu_1' + pu_a'$$
$$\frac{\partial E}{\partial S} = -qu_1' + (1-p)u_n' + pu_a'$$

$$\frac{\partial^2 E}{\partial D^2} = q^2u_1'' + pu_a''$$
$$\frac{\partial^2 E}{\partial S^2} = u_1'' + (1-p)u_n'' + pu_a''$$
$$\frac{\partial^2 E}{\partial D \partial S} = qu_1'' + pu_a''$$

Second order conditions are:

$$\frac{\partial^2 E}{\partial D^2} < 0$$
$$\frac{\partial^2 E}{\partial D^2}\frac{\partial^2 E}{\partial S^2} - \left(\frac{\partial^2 E}{\partial D \partial S}\right)^2 > 0$$

Denote the left hand side of the second inequality above by $\mathcal{D}$. To find out how the optimal values of D and S (ie., $D^*$ and $S^*$) change with a small changes in $q$, we differentiate equations (4) and (5)

$$\begin{pmatrix} q^2u_1'' + pu_a'' & qu_1'' + pu_a'' \\ qu_1'' + pu_a'' & u_1'' + (1-p)u_n'' + pu_a'' \end{pmatrix} \begin{pmatrix} \frac{\partial D}{\partial q} \\ \frac{\partial S}{\partial q} \end{pmatrix} = \begin{pmatrix} u_1' - qD^*u_1'' \\ -D^*u_1'' \end{pmatrix}$$

Using Cramer's Rule we solve for $\partial D/\partial q$ and $\partial S/\partial q$.

$$\frac{\partial D}{\partial q} = \frac{(u_1' - qD^*u_1'')(u_1'' + (1-p)u_n'' + pu_a'') + D^*u_1''(qu_1'' + pu_a'')}{\mathcal{D}}$$

$$\frac{\partial S}{\partial q} = \frac{-D^*u_1''(q^2u_1'' + pu_a'') - (u_1' - qD^*u_1'')(qu_1'' + pu_a'')}{\mathcal{D}}$$

Table 3: Composition of Savings in India

| | 80-81 | 90-91 | 91-92 | 92-93 | 93-94 | 94-95 | 95-96 | 96-97 | 97-98* |
|---|---|---|---|---|---|---|---|---|---|
| GDS/GDP | 21.2 | 24.3 | 22.9 | 22.0 | 22.7 | 25.6 | 25.3 | 26.1 | 23.1 |
| Household Savings/GDS | 75.9 | 84.3 | 77.4 | 80.4 | 81.5 | 79.1 | 74.4 | 77.8 | 79.2 |
| *Composition of Household Savings (percent)* | | | | | | | | | |
| Share of Financial Savings (FS) | | | | | | | | | |
| in Total Savings | 39.41 | 45.34 | 56.82 | 52.39 | 63.15 | 55.73 | 45.49 | 52.65 | 56.30 |
| which consist of | | | | | | | | | |
| Currency | 7.4 | 5.7 | 7.5 | 5.3 | 8.9 | 8.1 | 7.9 | 5.2 | 4.4 |
| Net deposits | 13.7 | 10.2 | 13.3 | 15.9 | 21.9 | 16.5 | 12.5 | 23.1 | 25.0 |
| Shares and debentures | 2.0 | 7.7 | 14.5 | 11.1 | 9.9 | 8.9 | 4.3 | 4.0 | 1.3 |
| which consist of | | | | | | | | | |
| Private Corporate Business | 0.9 | 2.2 | 3.7 | 5.4 | 5.5 | 5.0 | 3.4 | 2.1 | 0.7 |
| Co-op banks & societies | 0.9 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.0 |
| Units of UTI | 0.1 | 3.1 | 8.3 | 4.5 | 3.1 | 2.0 | 0.1 | 1.5 | 0.2 |
| Bonds of PSUs | 0.0 | 0.5 | 0.5 | 0.1 | 0.3 | 0.1 | 0.1 | 0.1 | 0.1 |
| Other Mutual funds | 0.0 | 1.8 | 1.9 | 1.0 | 0.8 | 0.8 | 0.2 | 0.1 | 0.2 |
| Net claims on government | 2.6 | 6.7 | 4.1 | 2.8 | 4.1 | 6.6 | 4.4 | 4.5 | 7.8 |
| Life insurance funds | 3.9 | 4.9 | 6.1 | 5.4 | 6.1 | 5.6 | 6.3 | 6.0 | 6.5 |
| Provident and pension funds | 9.7 | 10.2 | 11.4 | 11.9 | 12.2 | 10.9 | 10.6 | 10.1 | 11.5 |
| Share of Life Insurance in FS | 9.98 | 10.74 | 10.66 | 10.35 | 9.73 | 10.12 | 13.94 | 11.44 | 11.6 |
| and | | | | | | | | | |
| Savings in Physical Assets | 60.6 | 54.7 | 43.2 | 47.6 | 36.9 | 44.3 | 54.5 | 47.4 | 43.7 |

Source: National Accounts Statistics (1999); * provisional