



Research article

Identifying and ranking the driving forces of social insurance by analytical hierarchy process: evidence from India



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ABSTRACT

Imperfections in the private market increase the scope of social insurance worldwide. Social insurance is designed to provide protection against heterogeneous risks. In a welfare state, consumer's demand for social insurance arises from the need for optimum policy coverage. Likewise, government intervention facilitates the insurance market by minimizing the effect of imperfect information and moral hazard. Designing cost and benefits of a policy, assessing the required level of risk to be taken and selecting integrated services (for example, medical care) are among the salient roles of the supplier. The present paper tries to find out the main drivers for social insurance in India. For this purpose, we have applied the Analytic Hierarchy Process (AHP) to determine the most important alternative among the different alternatives. The model consists of nine criteria and three alternatives. The results show that the consumer's demand is on the top of the hierarchy which signifies that the optimum policy coverage must be given due to consideration for mass administration of social insurance programs. The findings are important for policymakers in order to address consumer's needs so that enrollments in the insurance policies can be enhanced. The contribution of the study significantly includes the determination of a new set of study variables along with the application of the AHP methodology.

1. Introduction

With the advent of industrialization, the economic security of households started drawing the attention of policymakers. In a capitalist state, workers are paid for their skills and expertise. There are no other determinants of earning livelihood under such states (Iversen and Soskice, 2001). In such a system, risk in the labor market is inversely related to human skills. Workers who are highly skilled are able to earn more than low-skilled workers. The former requires less social protection than the latter. Moreover, to attain economic security, workers are required to maintain continuous money income, net income, income above the poverty threshold (limit varies in countries) and standard of living (Rejda, 2015). The sense of economic insecurity occurs with the fluctuations in income earnings, additional expenses, insufficient income and uncertainty in income. The fluctuations may result from the dynamics of personal, economic, legal, environmental and uncontrollable events. Structural changes in the economy affect people with covariant risk more

than those with idiosyncratic risk (International Labor Office, 2004). The fluctuations violate the consumption and saving patterns of households and thereby create an additional financial burden on individuals and the government. One of the mechanisms that can alleviate the effects of negative events and provide financial protection is insurance.

Insurance is the mechanism of transferring/shifting the risk from one entity to the entire group. Insurance is offered to provide security against the losses arising from risk (Vaughan and Vaughan, 2007). It neither reduces the probability of expected loss linked to the events nor the uncertainty related to the event itself. It indemnifies the loss caused by negative events. It is a tool of aggregating all the homogenous risks prevailing in the economy and reducing it by way of dispersing it to the community which reduces the individual cost. Moreover, it has been documented that some individuals are not willing to participate in insurance programs due to their incapability of assessing the risk of loss associated with a future event or the unavailability of a sound financial market. Individuals also opt for traditional ex-ante risk coping

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mechanism basically adopted in rural areas.

Given the fact that behavioral bias is present throughout the market, the insurance market is also plagued with the problem of information asymmetry and moral hazard (Akerlof, 1978). Parties conducting the transaction are never fully aware of each other's preferences. In a perfectly competitive setting, information stipulated by the seller is less likely to influence the amount of benefit received by the transacting parties since all the information required by the buyer is represented by the competitive price (Chiappori et al., 2006). Interestingly, the insurance market is characterized by the fact that the problem of hidden information which causes disequilibrium arises from the buyers' side. Indeed, insurance agents are always faced with a wide variety of insurance contracts under the single risk coverage profile. Such phenomenon ignores buyers' preferences. Hence, the market equilibrium would hardly exist since the buyer's taste and preferences do not directly impact the seller's payoff. There are plenty of proposals an insurer may offer to the clients with varied levels of coverage reflecting information asymmetry due to risk aversion. However, the level of risk aversion has no impact on the insurer's profit since the true risk which is conditional on the contract matters to the insurer (Rothschild and Stiglitz, 1978).

Competitive equilibrium in an insurance market can be derived if the individuals clearly stipulate all the relevant information to the insurers. By this, both the parties can benefit from the transaction. In the presence of imperfect information, high-risk individuals cause externality (Rothschild and Stiglitz, 1978). Hidden information leads the high-risk individuals to be pooled in a group of low-risk individuals. This results in the coverage provided to the high-risk individuals at the cost of low-risk ones. The information asymmetry triggers to bring about a mechanism of a single risk product without any varied level of coverage. Therefore, social insurance policies are designed to eliminate the problems highlighted in previous research works.

The idea of social insurance can be traced back to 1883 when the social unrest in Germany had led the chancellor Otto Von Bismarck to implement a new social security policy for health coverage of his workers. The benefit was very limited as compared to today's social insurance policies. In the current environment, social insurance covers range from unemployment, survivor, health, accident, and sickness etc. Moreover, social insurance programs are driven by government interventions in designing insurance policies by focusing on key parameters like redistribution, paternalism and market failure. One of the main motivations for implementing social insurance programs is government intervention in the insurance sector and is thought to be the redistribution, paternalism and market failure (Chetty and Finkelstein, 2013). There are several other factors given in Table 1 that have been studied including social risk, imperfect optimization, externalities, moral hazards, consumption smoothing, uncertainties, and few behavioral aspects like risk aversion, social influence. Unlike the Bismarck insurance system which is financed through contributions made by the workers, the Beveridge system is financed through payroll taxes. In short, the Bismarckian system does not redistribute the income among different classes of the society while the Beveridge system does (DICE Database, 2008). Beveridge system is adopted in most of the developed nations (Conde-Ruiz and Galasso, 2003). Conde-Ruiz and Galasso (2003) in their work reflect on

why the public expenditure is greater in the Bismarck system than that in the Beveridge system. They have classified the individuals into low, middle and high-income groups and found that these groups favor redistributive system, earning related system and private system respectively. In their empirically conducted cross-comparison of the countries in health care financing, Wagstaff et al. (1999) have argued that the need of social insurance is not inherited in the risk factor but by income level. The implication of mandatory social insurance policy is to redistribute income from low-risk individuals to high-risk individuals. The reason is a contribution that may not depend upon the risk or morbidity. As the contributions increase with income, posing the same risk may also cause high-income individuals to pay more than low-income individuals.

The objective of the present study is to identify the driving force which is most fundamental for social insurance policy implementation. The preceding section discusses the financial instruments to enhance economic security. Further, we have also explained the need for social insurance programs. Hence, we are interested to know how the social insurance schemes are derived in the market. Moreover, we have classified the drivers as being the stakeholders of social insurance. The importance of the present study lies in suggesting the development of a policy which is best suited for heterogeneous risk classes. There are issues of market imperfections and consumer risk classes. The present study puts forth the ideas that policymakers should implement while developing a social insurance policy. This study suggests that among the identified stakeholders, consumers' choice and preferences result as the essential driver of the social insurance policy.

The study begins withdrawing focus to the economic and social security needs of households. Further, the role of private insurance in fulfilling the need for security has been described. Subsequently, having described certain issues with private insurance, we have explained the concept of social insurance which seems to be an alternative approach to private insurance. In the following section, we have done a review of the literature to determine the factors (criteria) which demonstrate the different concept of social insurance. We have then described the drivers (alternatives) which are critical for social insurance policy implementation. The next section deals with the implication and analysis of the AHP for the present study. In the last section, we have discussed the findings and future research directions.

2. Related work

The literature of social insurance incorporates a long debate on the provision of optimal benefits for the welfare state (Feldstein, 1985; Chetty, 2006; Zhao, 2017). Several instruments like the tax, subsidy transfers, in-kind transfers, pension benefits, and social insurance are available to redistribute income (Cremer and Roeder, 2017; Sinn, 1996). If individuals are classified only on the basis of productivity and homogeneous preferences, a simple income tax instrument would be sufficient to achieve Pareto-optimality in the welfare state (Atkinson and Stiglitz, 1976). But a simple tax instrument is not applicable in the state of individual heterogeneity since individuals differ not only in their productivity but also in their risk type. Hence, the most important instrument

Table 1
Review based on AHP Methodology.

Year	Authors	Area of Application	Methods applied	Unit of Analysis
1991	Puelz	Insurance	AHP	Life insurance policy Selection
2008	Huang et al.	Life Insurances	AHP, Fuzzy Logic and Delphi Technique	Evaluation models for selecting life insurance policies
2008	Liberatore & Nydic	Healthcare	AHP	Review of healthcare Selection
2011	Kumar & Singh	Life Insurance	Data Mining and AHP	Life insurance product recommendation
2013	Azizi et al.	Insurance	AHP	Identification of influential factors of Insurance Cost
2015	Khan et al.	Health Insurance	AHP	Ranking of critical factors of private health Insurance
2016	Marcarelli	Health Insurance	AHP	Evaluation of healthcare policies
2018	Yazdi & Haddadi	Insurance and Knowledge Management	AHP	Ranking knowledge management factors in Insurance companies
2018	Ho et al.	Insurance and Sustainability	AHP and Fuzzy Delphi Method	Influential Factors of Sustainable development in insurance Industry

under the given situation is social insurance which considers the redistribution of income in the presence of heterogeneous risks types. In other words, social insurance can be provided to protect against any kind of risk which the private market cannot provide (Cremer and Roeder, 2017).

The need for social insurance can be classified on the basis of the level of risk and income. In the preceding section, we have already highlighted a relationship between the intensity of risk and individual productivity. Individuals are in a risky position when they are exposed to unemployment, sickness, and accidents. Under the divergent risk factors, stipulates the provision of social insurance. Negative relationships between productivity and risk have the desired impact of social insurance on supplementing an optimal income (Rochet, 1991). These assumptions are empirically tested in the area of health risk (Viscusi, 1994; Gerdtham and Johannesson, 2000; Cristia, 2009). In some cases of health insurance, negative correlation cannot be established like, for instance, in annuity contracts and cognitive disorder. The private insurance companies are placed at great risk as far as longer life expectancy is concerned. Therefore, in a fair private insurance market, social insurance is not preferable as far as the incentive constraints are concerned.

Income-based demands of social insurance are motivated toward maintaining equalities and redistribution in the society. The alternative of social insurance demand is reflected by the income effect (Moene and Wallerstein, 2001, 2003). The notion behind the effect is as the income increases, the demand for social insurance declines. Insurance is assumed to be a normal good. People purchase insurance like any other commodity. Ewald (1991) has also theoretically examined the impact of level of income and demand for social insurance. As such, people with less income demand less insurance than what they would with more income. In other words, as the distribution of income is closer to the mean, income inequalities will decline, and more people will be willing to purchase social insurance since such demands are boosted by the income effect.

Given the level of individual risk, the motive of income and redistribution effect (described in the following paragraph) can be seen as unilateral. Milanovic (1999) found that greater inequality in income supports the redistribution of income among the poor through social insurance benefits. On the other hand, social insurance policies are targeted at the people whose income unexpectedly declines due to layoffs (Moene and Wallerstein, 2003). Therefore, the factors which are likely to be the demand driver of social insurance are described as follows.

2.1. Redistribution

Redistribution is a mechanism of transferring resources from the haves to have-nots. Individuals are indifferent with the purposive structure of such a mechanism. Some people consider it crucial for the people who, although are hardworking, unable to maximize their consumption level due to high exposure to risk and vulnerability. On the other hand, such a mechanism has been considered controversial for poor and working groups (Esarey et al., 2012). The quintessential argument is to justify the objective of redistribution. Feldstein (2005) argues that the objective of social insurance policies is not to redistribute the income among the have-nots. However, in the United States, a fraction of the social insurance goes to the poor and majority of the fund benefits to the middle and high-income groups. These benefits are directly related to the previous earnings of the retirees and unemployed individuals. Further, he tries to classify between the individuals who are permanently poor and those who are temporarily poor. Social insurance could seem to be redistributive to those who are eventually poor due to sickness, disability, and unemployment and the benefits are paid to protect from the risk inherent in such events. Atkinson (1995) has arguably established the relationship between social insurance and redistribution by considering payroll taxes. Redistributive taxation includes social insurance as a public good that helps to boost the economy by considering the rich and poor as economic resources (Varian, 1980). On the other hand,

these resources are protected by the government budget which includes wider risk protection than that of private players.

2.2. Market failure

The presence of information asymmetry in the private market arises from the greater information held by one party over the other and this has led to the problem of adverse selection (Borch, 1981). The reason has been reflected upon by Feldstein (2005) who has conceptually formalized the idea of social insurance. The government is unable to distinguish between those who are actually poor in old age or due to unemployment and those who are intentionally playing with the system. In the former case, the reason might be the incapability of the people to foresee the risk by not saving enough for the future. Agents who are adversely selected by the private players disorient the market from the competitive equilibrium. This may inculcate huge loss to the private players and thereby restricting the policies from universal coverage. Another problem originating from asymmetric information is a moral hazard (Winter, 2000). In this case, the actions of individuals who have purchased insurance policies are not perfectly monitored. Agents start behaving irrationally which results in the disequilibrium in a competitive market. The problem has formed the need for social insurance in order to lessen the impact of information asymmetry.

2.3. Cost

Cost simply refers to how much contribution a person is willing to make for the social insurance scheme. In some countries, the contributions are mandatory below the threshold level of the income. The difference between social and private insurance policies is also based on the cost being incurred on a given risk. These costs are further segregated on the basis of mandatory and voluntary policies (Priest, 2003). It is expected that the cost of social insurance can be reduced to zero if the population is large and all are tax-payers (Arrow, 1978). Hence, the cost of social insurance to individuals is much less than that of private insurance.

2.4. Risk aversion

Individual's unwillingness of the deviation from the expected outcome is represented as risk aversion. The highly risk-averse individual is willing to pay in order to lessen the uncertainty about the future. In the presence of uncertainty, people are far more anxious about the negative event in the future than the favorable positive event (Loewenstein, 1999). The psychology behind such behavior is the desire for economic security. People dislike the negative outcome when they hold themselves responsible for the loss — that is, something better could have been done if the rational decision had been made (Sugden, 1985). Fischhoff (2003) called such a feeling as “hindsight bias” —an inclination towards the notion of occurrence of an event when experienced than predicting the outcome when the decision was being made. Hence, avoiding a decision is regretful and people tend to bear more cost by expanding the choice. High risk-averse individuals act rationally to avoid the risk of loss in the future.

2.5. Consumption smoothing behavior

Several Studies have examined the impact of risk and insurance on consumption smoothing (Morduch, 1994; Chetty and Looney, 2006; Kaltenbrunner and Lochstoer, 2010). Consumers smooth their income by distributing income upon different states of nature. Hence, saving is one of the ways to smooth consumption. Saving behavior is a possible mechanism that can reduce consumption fluctuation with variable income (Alderman and Paxson, 1994). Apart from this, environmental risk has led individuals to develop certain mechanisms to cope with the risk. The mechanisms include self-insurance, social insurance, and income

smoothing (Kazianga and Udry, 2006). There is stranded literature on these formal and informal arrangements of risk coping (Townsend, 1994; Alderman and Paxson, 1994; Jalan and Ravallion, 1999; Fafchamps and Lund, 2003). In risky environments, the financial constraints are obviously relevant for the efficiency of investment in physical or human capital. Less obviously, they also influence the welfare effect of redistribution policies (Bertola and Koeniger, 2007).

2.6. Social influence

In conventional economic theories, decision making of an individual is assumed not to be influenced by the societal and community norms. But the evidences from the real world are different on this ground. Social norms are developed in a society in order to maintain order in the actions of community members. Deviation from such rules may result in distress and may lead to punishment in some cases (Buzatu, 2013). Zelizer (1978) revealed that in the 19th century in the United States, the financial evaluation of life insurance and death had been initially rejected because it had supposed to convert the sacred event of death into an economic value. Owoo and Lambon-Quayefio (2013) studied the impact of social influence on national healthcare. Local area attributes may influence the functioning and practices of social healthcare. Common value, norms, and actions can significantly impact the communal actions. Members of the society share their opinions and experiences that patronize the actions conforming to the general expectations.

2.7. Externalities

This is a neighborhood effect. Externalities are a kind of market failure that originates from the production or consumption of goods and services by one party which has an effect on another (Eisenhauer, 1996). These effects are independent of the price mechanisms. The market system produces socially optimal goods which depend upon the beneficial and detrimental effects of externalities. Negative externalities, in particular, stem from a moral hazard which increases the probability of loss and consequently enhances the expected loss confronted by an insured and all those who bear the same probability distribution for losses (Eisenhauer, 1996). For example, driving less cautiously increases the probability of meeting with an accident. This also affects pedestrians and other nearby traffic with the same probability. Another instance of the externality effect can be drawn from the physical and fiscal externality (Chetty and Finkelstein, 2013). Presence of government health insurance may induce people to purchase less private insurance because government health support subsidizes the cost of medical treatment. Fiscal externalities can be stemmed from the Samaritan's dilemma (Buchanan, 1975). In a society, it presents the availability of charitable assistance for those who are facing unfavorable events ex-ante will have less incentive to purchase insurance ex-post (Herring, 2005). Likewise, inefficient underinsurance has an external effect on ex-post unconditional public transfers which deters the ex-ante insurance purchase. The unconditional transfers are made to provide protection to the risk of health, terrorism and natural catastrophic events. Therefore, social insurance enrollments are likely to be influenced by the number of prevalent externalities.

2.8. Benefits

Different countries have formulated social insurance policies according to the ability of the economic systems (Browning, 1975). For instance, in the US, a single social insurance scheme i.e. OASDHI is protecting individuals with different types of risk exposures. It covers risk exposed to old age, survivor disability and health (Vaughan and Vaughan, 2007, p. 210). But in developing countries like India and China, partial benefits have been provided under a single policy. In India, the government has laid down different schemes for the employees of both organized and unorganized sectors. For the organized sector, there are

basically three schemes which are The Employees' Provident Fund Scheme 1952, The Employees' Pension Fund Scheme 1995 and The Employees' Deposit Link Insurance Scheme 1976 (Shira, 2018). For the unorganized sector, the government of India provides cover through *Atal Pension Yojana* (Jaiswal, 2018). Likewise, in China, for pension insurance, the government has set up the State Council Decision on the Establishment of a Unified Basic Pension System for Enterprise Workers in 1997 for organized sector employees (*China's Social Security System*, 2014). In the private market, agents are able to purchase insurance policies according to a specific given risk. While social insurance programs in developed countries provide protection against different types of risk under a single head, in developing countries agents may be indifferent to choose the insurance policy.

The studies included in the literature survey, as discussed in the previous section, are conceptually and empirically grounded. The present study also identifies several behavioral factors impacting the demand for social insurance (Fenger, 2010; Arikian, 2013; Merouani et al., 2016). Though there is plenty of work done to identify the drivers of social insurance, we were unable to find a study which focuses on the demand drivers of insurance from its stakeholder's point of view. We have attempted a sort of cross-comparison between demand drivers of social insurance and its stakeholders. Along with the empirical techniques applied to the wide area of research in insurance, some qualitative work has also been found. There are several research papers (refer Table 1) which focused on to prioritize the factors critical for health insurance policy selection (Puelz, 1991; Huang et al., 2008; Azizi et al., 2013; Khan et al., 2015; Marcarelli, 2016; Yazdi and Haddadi, 2018). In insurance, AHP has been extensively used in the health care sector. Liberatore and Nydic (2008) have done a literature survey on the application of AHP in healthcare selection. Along with other methods used in decision-making problems, AHP has been applied to get optimum solutions (Kumar and Singh, 2011; Ho et al., 2018; Tabash, 2017). The problem is dealt with in the present study is similar to the above-cited problems. On the basis of certain demand drivers, the most influential stakeholder needs to be identified. The criteria selected for the study are not only comprised of behavioral attributes but also include some technical and mechanism-based drivers. Therefore, the present study is an initiative to configure the whole criteria of social insurance on a single platform.

2.9. Variables of the study

The preceding variables have the potential to influence the stakeholders in order to implement social insurance programs in the best way. We have essentially classified the phenomenon of social insurance on the basis of preceding variables. Further, an attempt has also been made to classify the stakeholders into three groups namely government, consumer and supplier (or provider). For the first alternative, we have interchangeably used mechanism based drivers for government-driven needs. The government intervention in the insurance market is to primarily draw a mechanism that can lessen the problem of moral hazard, information asymmetry and optimization failure in the insurance market (Diamond, 1977). However, Arrow (1978) defined the same phenomenon a little differently. He postulated that in a society, people are distributed with varying levels of risks, and the market to provide protection against those risks is absent. Hence, the welfare for the people who are willing to transfer their risk for a certain price will be reduced. In such a case, the government needs to intervene in the market. Therefore, to enhance social welfare, insurance needs to be provided to all risk classes. Arrow (1978) further added that with the provision of taxation, the indemnification of the losses is normally distributed to all the taxpayers. This implies that as the number of taxpayers increases, the unit burden reduces. The concept has also been defined by Scheve and Stasavage (2006) who argued that some governments adopted the policies which are likely to redistribute the income from rich to poor and provide protection against negative events while some give less attention to such measures. Several studies have explained the reason why some

governments seem interested in providing the redistributive function to the economy. These factors include inequality in the economy and labor market structure (Iversen and Soskice, 2001).

The second variable of the model is consumer driven needs of social insurance. Literally, almost all the need generation and satisfaction take place from the consumers' end. But the consumers in the present study are included in order to understand the stimulus driving the consumers to opt for social insurance policies instead of their private counterparts. Consumer choice of social health insurance, for example, is recognized as high quality and low cost (Kerssens and Groenewegen, 2005). Consumers may not be interested in the technicalities of social insurance schemes. They might be more interested in comparing two different insurance policies in real term. Cost and benefit of any insurance policy influence the consumer decision to purchase an insurance policy. Consumers are assumed to be price sensitive. The price of private insurance policies is costlier than that of the social insurance policies for the same benefit. So in this study, we try to assess how far the government, consumer and supplier driven needs affect the consumers' participation in the social insurance program.

The third variable of the study is supplier-driven needs. The way suppliers influence the implementation of the social insurance policy is considered here. A small distinction needs to be made here that in some studies, the government is represented as the provider and supplier of the social insurance policy. Designing cost and benefits of a policy, assessing the required level of risk that is to be taken, selection of integrated services (medical care) are among the salient roles of the supplier. Although social insurance policies are primarily designed by the government, yet in some countries, the policies are channeled through private players (McIntyre et al., 2003). The private players can somehow affect the demand for social insurance which is called supplier-induced demand (Grytten et al., 1995). The phenomenon is basically active in social health insurance, whereby for optimum risk coverage, insured may have to pay an additional amount of money that may result in a reduction in demand for health insurance (Kraft and Schulenburg, 1986). The effect of additional payments is compensated by the recommendations made by the physician. Hence, the supplier plays an active role in facilitating social insurance policies.

3. Methodology

Fig. 1 represents the framework of the study. The study begins with defining the rationale and concept of social insurance. After an extensive review of the literature, it is observed that certain factors continuously occur to describe social insurance and its outcomes. These selected factors are given in Table 2. We have called these factors criteria. Moreover, we have further identified the stakeholders of the social insurance program which includes government, consumer and supplier. These factors are named as variables of the study. Hence, the conceptual model of social insurance criteria and alternatives are represented hierarchically in Fig. 2. To examine the present case, we have applied a rank method, Analytic Hierarchy Process, developed by Saaty (1977).

The insurance domain is functionalized primarily with the participation of two key entities – the suppliers and the subscribers of

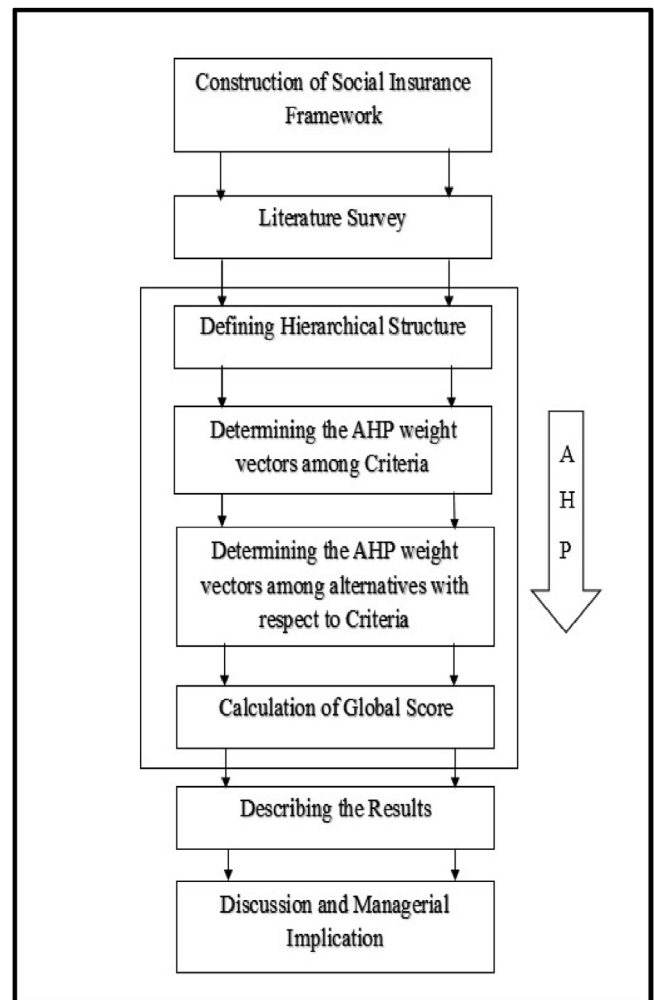


Fig. 1. Framework of the study.

insurance policies. Since they have been recognized as the most influential stakeholders, a sample of 178 respondents from Aligarh city, India, was drawn from these two broad reference groups. The experts' opinions of seventy-eight insurance policy-holders and 100 insurance industry professionals have been recorded through a questionnaire whereby each respondent is asked to assign a weight mentioned in Table 3 according to their preference. In order to arrive at a consensus, we have used the weight with the maximum occurrence. The values so determined serve as the input for AHP analysis carried out by using a template developed by Kumar and Ganesh (1996).

Table 2
Definition of the criteria.

Criteria	Denoted by	Description
Redistribution	Rd	Describe the function of a policy to redistribute the income into different age groups, income groups, generations etc.
Market Failure	MF	Reducing the information asymmetry and moral hazard problem
Cost	Co	Cost of a policy is low or high with reference to its benefits
Risk Aversion	RA	Defined as the human tendency to reduce a particular risk when exposed to that risk.
Consumption Smoothing Behavior	CS	Policy can smooth the consumption of individuals in different states of nature.
Social Influence	SI	Policies are being promoted by the individuals who already have it to those who do not.
Externalities	Ext	An insurance policy is influenced by the number of policyholders in the same program.
Benefits	Bn	Number of benefits provided in a given policy with respect to the cost of the policy

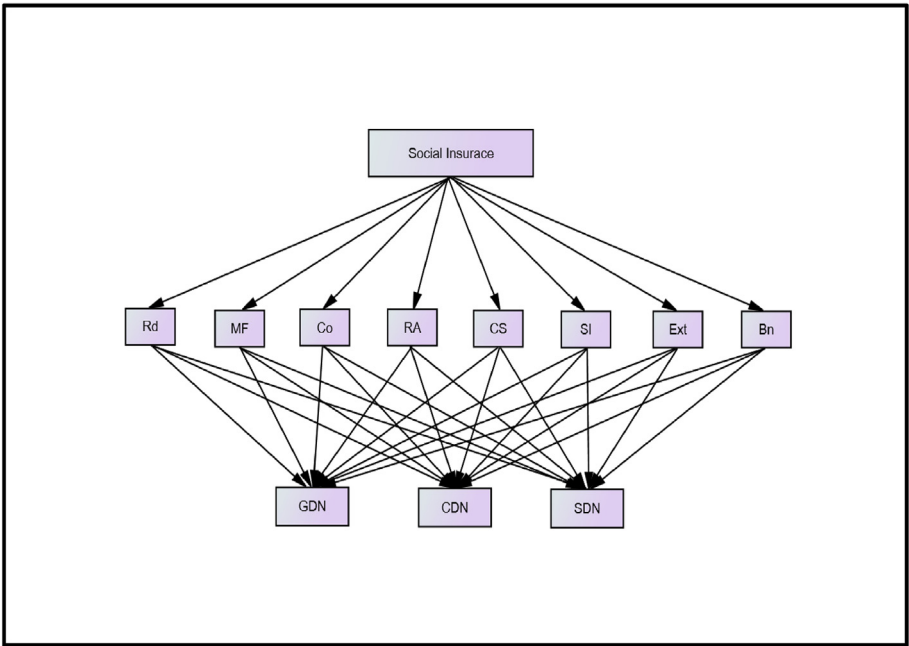


Fig. 2. AHP hierarchy.

3.1. Analytic hierarchy process

Analytic Hierarchy Process (AHP) is a Multi-Criteria Decision Making (MCDM) rank method developed by Saaty (1977, 1980). The AHP is a method based on the hierarchical analysis for the selection of a particular problem in elements of the hierarchy itself that are structured in levels. The AHP method helps to decompose the hierarchical problem and solve it partially and the combination of the partial solutions are again combined in order to get the overall solution of the initial problem. According to the AHP method, the elements of a problem (which are also called criteria) under analysis are distributed in a hierarchical structure from the total objective on top through criteria to alternatives on the lowest level. Alternatives show the final result of problem analysis, that is, weight values or global score in relation to the set objective. The AHP method enables decision-makers to structure a complex problem in the form of a simple hierarchy and assess a large number of quantitative and qualitative factors in a systematic manner. The following procedure of AHP is adopted from Kumar and Ganesh (1996):

- a) Decompose the problem hierarchically as given in Fig. 2.
- b) Compare pairs of each level with respect to every element in the next higher level using Saaty's nine-point scale (refer matrix 1). The local

priority vector is usually derived as normalized principle eigenvalue of the reciprocal component matrix.

$$= \dots\dots\dots, r_{ij}r_{ji} = 1 \begin{pmatrix} 1 & r_{12} & \dots & \dots & \dots & r_{1n} \\ r_{21} & 1 & & & & r_{2n} \\ \dots & \dots & \ddots & & & \\ \dots & \dots & & \ddots & & \\ \dots & \dots & & & \ddots & \\ r_{n1} & & & & & 1 \end{pmatrix} \tag{1}$$

- c) Use the eigenvector method for generating the priority vector at level with respect to every element in the next higher level. The normalized principal eigenvector corresponding to the principal eigenvalue of the pairwise comparison matrix gives the priority vector. Conditions are as follows
 - a. $a_{ij} = 1/a_{ji}$ for all i and j .
 - b. $a_{ij} = a_{ik} \cdot a_{kj}$ for all the other than j .
 a_{ij}, a_{ji}, a_{ik} and a_{kj} are pairwise comparison elements.
- d) The equation $Aw = \lambda w$ is iterated till a column vector w satisfying the Eq. (2). The normalized w column vector corresponds to the principal eigenvector of the matrix A . the iteration starts with an initial unit vector w , where A is a reciprocal square matrix, w is the principal eigenvector of A and λ is the principal eigenvalue of A .

Table 3
Nine-point scale and its description.

Values	Definition	Description
1	Equal importance	Two criteria contribute equally to the objective in the immediately higher level
3	Weak importance of one over another	Experience and judgment slightly favor one criterion over another
5	Essential or strong importance	Experience and judgment strongly favor one criterion over another
7	Very strong or demonstrated importance	A criterion is favored very strongly; its dominance demonstrated in practice
9	Absolute importance	The evidence favoring one criterion over another is of the highest possible order of Affirmation
2, 4, 6, 8,	Intermediate values between adjacent scale values	When compromise is needed
Reciprocals of the above judgments	If Criterion C_i has one of the above judgments compared to Criterion C_j , then C_j has the reciprocal value when compared to C_i	A reasonable assumption

Source: Saaty (1977).

$$Aw = \lambda_{\max} W, w = (W_1, W_2, \dots, W_n)^T \quad (2)$$

Where,

A = n -dimensional comparison matrix

$\lambda_{\max}$ = largest eigenvalue of A

W = eigenvalue corresponding to $\lambda_{\max}$

e) The consistency indices and ratios are measured using Eq. (3).

$$C.I. = \frac{\lambda_{\max} - n}{n - 1} \quad (3)$$

$$C.R. = \frac{C.I.}{R.I.}, \quad R.I. = \text{Random Consistency Index} \quad (4)$$

If CR which is calculated using Eq. (4), is less than 0.10, the inconsistency degree of the comparison matrix A is considered acceptable, and the eigenvalue w is used as a weight vector after normalization. Otherwise, the comparison matrix needs to be adjusted.

4. Results & discussion

The results show robustness in all the steps of the analysis as all the values are conforming to the recommended values. The value of the critical ratio should conform to the recommended value ($CR \leq .10$) which shows consistency in the weights in Tables 5 and 6. Table 4 shows the weights of the pair-wise comparison matrix assigned by the experts. Weights are further calculated to arrive at priority vectors W . The priority vector is the principal eigenvector of the matrix. It gives the relative priority of the criteria measured on the ratio scale. Table 5 shows the values for λ i.e. the principal eigenvalue of the matrix, CI — Consistency Index, and CR — Consistency Ratio which is obtained by applying the AHP method. The highest priority is assigned to consumption smoothing with 29 percent of the influence and the lowest priority is assigned to social influence with three percent of the influence. In the next step of the analysis, the experts try to determine the local pair-wise comparison matrices among all alternatives with respect to each criterion of social insurance. At this step, the same acceptance rules related to the CI and CR are applied as in Table 5. The values of the localized priorities w for each level of drivers are presented in Table 6. On the basis of the obtained values of the local priorities, global priorities are calculated for each alternative. Finally, Table 7 shows the values of the local and global priority of all three alternatives. The priority vector indicates that for driving social insurance program, consumer-driven forces are the strongest with 46 percent of the total score. Government-driven forces are the second with 36 percent score and upplier-driven needs are the least influential.

4.1. Government-driven needs

The findings are incongruence with the seminal work of Akerlof, 1978 and Rothschild and Stiglitz (1978). The results Table 6 shows that the highest weight among all the criteria is found in redistribution as well as market failure. The need of the day to implement social insurance policy is to enhance redistribution of income, reduce the imperfect information and moral hazard. Despite having exposure to the heterogeneous risk, social insurance needs to be provided in a redistributive manner. This may either come from distortionary income tax or lump-sum payroll taxes. The idea is to redistribute the income from those having a high risk to those having low risk. Redistribution is an important component of the welfare state which completes the idea of social

Table 4
RI values of a set of different orders.

n	1	2	3	4	5	6	7	8	9
RI	0	0	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Source: Kumar and Ganesh (1996).

insurance. Likewise, market failure requires government intervention to bring the equilibrium state. Cremer and Roeder (2017) justify this finding and argue that in social insurance setting, although redistribution can bring adverse incentive effect but also it can correct a market failure problem. All other criteria have little impact on government-driven demand for social insurance. The findings also follow the work of Feldstein (2005) in which it emerges that the primary motive of government intervention in the insurance market is not to redistribute the income. However, empirical results are contrary to this objective. The government-driven needs are secondary to the requirements of the social insurance programs. The implication of the results about other factors seems to be unsatisfactory for the government. The reason the other criteria emerge is due to the problem of adverse selection and moral hazard. For example, insurance premium or cost to the consumer and benefits are unregulated due to the threat of selecting the risk adversely. Likewise, the problem of moral hazard emerges with the unavailability of insurance for high-risk classes, or availability at high cost which reduces the incentive of the insurance company. Therefore, minimizing market failure can stabilize the cost and benefits of an insurance policy with which the consumer will realize greater benefits at a lower cost.

4.2. Consumer-driven needs

Consumer preferences are neither inclined toward the redistributive mechanism of the social insurance policy nor toward market failure. Basically, consumer demand for social insurance is mostly driven by the need for CS, level of RA, SI, and Bn. These criteria have scored high and exhibit similar weight assignment. The level of RA and CS patterns are highly associated with social insurance policies. Moreover, consumers tend to prefer social insurance policies when they are highly risk-averse and want to smooth their consumption in case of any vulnerability. This finding might not be applicable to the mandatory social insurance program. However, in low income and developing countries, there are certain government's subsidized voluntary insurance programs for which risk aversion may have a significant impact. The finding maintains conformity with the work of Chetty and Looney (2006). The local score of the cost pertaining to consumer-driven needs has comparatively lower influence than the RA, CS, SI, and Bn. Since in the presence of high-risk aversion and CS make consumers preferences less inclined towards the cost of an insurance policy. Though social insurance programs are not actuarially fair, yet enrolments are high due to mandatory program or low premium as against costly private insurance policies. Insurance premium has a significant impact on the insurance purchase decision. Therefore, it can be argued that the consumer might be interested in comparing the price and benefits provided by the different insurance policies. In the case of externalities, physical and fiscal are negatively correlated with the participation in the social insurance program. Availability of government-funded public hospitals and charitable care reduces participation in the insurance program. Samaritan's dilemma emerges when such externalities are encountered. It can be summarized that the risk-averse consumers are willing to participate in voluntary social insurance programs but that too is subject to the presence of externalities, especially in developing countries.

4.3. Supplier-driven needs

Cost and benefits of the social insurance policy have a greater impact on supplier-driven needs. Although in the presence of a perfectly competitive market where the suppliers are the price takers, the externality effect can influence the demand of the social insurance policy. In healthcare, consultation with a physician poses an external effect on the supplier-induced demand. Such demands are independent of the consumer's willingness to opt for an insurance policy. This result supports the findings of McIntyre et al. (2003). All other criteria have a negligible impact on the suppliers' need for social insurance policy. Market failure is a concern for a supplier but that is minimized through providing higher

Table 5
Pairwise comparison matrix.

Drivers	Rd	MF	Co	RA	CS	SI	Ext	Bn	Priority Vector
Rd	1	1	1/3	3	1/5	5	1	3	0.12
MF	1	1	1/3	5	1/3	7	3	3	0.17
Co	3	3	1	1	1/3	3	3	1	0.16
RA	1/3	1/5	1	1	1/3	1/3	1/3	1	0.06
CS	5	3	3	3	1	7	3	3	0.29
SI	1/5	1/7	1/3	1/3	1/7	1	1/3	1/3	0.03
Ext	1	1/3	1/3	3	1/3	3	1	3	0.10
Bn	1/3	1/3	1	1	1/3	3	1/3	1	0.07
Sum	11.86	9.00	7.32	17.33	2.99	29.33	11.99	15.33	1
$\lambda_{\max}$	8.82	CI	0.12	CR	0.08				

Table 6
Local pairwise comparison matrix.

Drivers/Criterion	GDN	CDN	SDN	Priorities
Rd				
GDN	1	5	7	0.73
CDN	1/5	1	3	0.19
SDN	1/7	1/3	1	0.08
	$\lambda_{\max} = 3.07$	CI = 0.03	CR = 0.06	
MF				
GDN	1	5	7	0.75
CDN	1/5	1	1	0.13
SDN	1/7	1/3	1	0.12
	$\lambda_{\max} = 3.01$	CI = 0.005	CR = 0.01	
Co				
GDN	1	1/3	1/3	0.14
CDN	3	1	3	0.57
SDN	3	1/3	1	0.29
	$\lambda_{\max} = 3.14$	CI = 0.07	CR = 0.12	
RA				
GDN	1	1/3	1	0.19
CDN	3	1	5	0.66
SDN	1	1/5	1	0.16
	$\lambda_{\max} = 3.03$	CI = 0.01	CR = 0.03	
CS				
GDN	1	1/5	1	0.16
CDN	5	1	3	0.66
SDN	1	1/3	1	0.19
	$\lambda_{\max} = 3.03$	CI = 0.01	CR = 0.03	
SI				
GDN	1	1/3	1	0.19
CDN	3	1	5	0.66
SDN	1	1/5	1	0.16
	$\lambda_{\max} = 3.03$	CI = 0.01	CR = 0.03	
Ext				
GDN	1	7	5	0.57
CDN	1/3	1	1/3	0.29
SDN	1/3	1/3	1	0.14
	$\lambda_{\max} = 3.07$	CI = 0.03	CR = 0.06	
Bn				
GDN	1	1/5	1/3	0.11
CDN	5	1	3	0.63
SDN	3	1/3	1	0.26
	$\lambda_{\max} = 3.04$	CI = 0.02	CR = 0.03	

Description: GDN — Government Driven Needs; CDN — Consumer Driven Needs; SDN — Supplier Driven Needs.

Table 7
Global priorities.

	Rd	MF	Co	RA	CS	SI	Ext	Bn	Global Score
Criterion/Priority Vectors	0.12	0.17	0.15	0.06	0.29	0.03	0.10	0.07	
GDN	0.73	0.75	0.14	0.19	0.16	0.19	0.57	0.11	0.36
CDN	0.19	0.13	0.57	0.66	0.66	0.66	0.29	0.63	0.46
SDN	0.08	0.12	0.29	0.16	0.19	0.16	0.14	0.26	0.18

cost policies in the private market or not providing insurance at all. The rationale for the result might be due to the act of supplier since social insurance policies are designed and priced by the government and suppliers are merely a channel which delivers the policy to the end consumers.

5. Conclusions

The policy implications are based on the types of government and economic strength. The results cannot be universally applied in all countries. For example, in a developed nation like the U.S., social insurance programs are financed through payroll taxes. Hence, one of the objectives is to redistribute the income from high-income individuals to needy ones. Along with the other benefits, the consumer need for social insurance in the US is also to get benefits in old age. But the results might not be applicable to developing countries. In the context of developing countries like India, income tax revenue is not sufficient to cover the cost of such welfare programs and the financing of social insurance policies is not based on payroll taxes. So, consumer preferences could be more applicable in such a scenario.

The idea of social insurance was developed long ago but the implementation is at the infancy stage, especially in India. There are several methods to study the major driving forces behind the social insurance policies in India but due to a lack of studies and unavailability of statistical data to provide sound information for different states of nature of social insurance, such qualitative methods are helpful. The paper thus describes the driving forces behind social insurance policies in India with the help of the AHP. The method uses the subjective assessment and the opinion of experts to apply and categorize different drivers and criteria for AHP in this area. The results of the AHP model can be generalized and applied. The results can also be empirically tested. From the literature review, it was observed that there exists a lack of relationships among the criteria identified for the study. Hence, the relationship between the variables is also tested. Assessing the externality effect of government-funded health care services on the participation of voluntary social insurance programs in developing countries can be one of the significant directions for future work. The results of the derived model can be very helpful for policy-makers and managers. With the prevalence of the different types of insurance models, this model can be helpful in providing insurance coverage to the masses.

The present study possesses a few limitations. From the conceptual

perspective, the criteria can be increased to give a greater depth. These criteria can be assessed by comparing the different models of insurance like mutual insurance, micro-insurance and social insurance itself as alternatives. From a methodological perspective, generally, the AHP method is limited over the ambiguous definition of the given criteria. Single eigenvector cannot accurately define the criteria which are vague in nature. Therefore, for a precise definition of the given criteria, triangular fuzzy numbers can be helpful in explaining the problem more unambiguously. An application of Fuzzy based AHP and ANP (Analytic Network Process) along with AHP can be a more comprehensive study and would provide more accurate results for the present model. The results can be acknowledged and compared altogether on the basis of applying these techniques simultaneously. In order to achieve optimal outcomes, the present phenomenon can be distributed into a new hierarchy in which the criteria should be classified according to the government, consumer and supplier's point of view and an alternative model among social insurance, mutual insurance, and stockholder based private insurance needs to be identified. For the purpose, AHP along with Data Envelopment Analysis can identify an optimal model of insurance.

Declarations

Author contribution statement

Zahin Ansari, Asif Akhtar: Conceived and designed the experiments; Wrote the paper.

Mosab I. Tabash: Performed the experiments; Analyzed and interpreted the data.

Samar H. Khan: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data.

Ebrahim Mohammed AlMatari: Contributed reagents, materials, analysis tools or data.

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