Insurance design in the presence of safety nets

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ARTICLE INFO

Article history:
Received 30 September 2015
Received in revised form 10 February 2017
Accepted 3 March 2017
Available online 7 March 2017

ABSTRACT

Safety net assistance and insurance exist to manage risk and improve welfare. This shared goal may lead to crowding out. In a new approach, this paper analyzes the interaction of assistance with two dimensions of insurance design: level of coverage and types of risks covered. In a society of risk averse vulnerable individuals and risk neutral assistance providers, Pareto improvements in welfare are achieved through incompleteness in the types of risks covered. The results imply that safety nets promote demand for and the emergence of incomplete insurance. These results have a wide application to insurance markets where safety nets are available, including health care, disaster aid and social welfare.

1. Introduction

Safety net assistance exists to protect against hardship and can be found in health care, disaster aid, retirement pensions and social welfare. However, the presence of safety nets can lead to a Samaritan’s Dilemma (Buchanan, 1975). When safety net assistance provides protection against risk, individual demand for insurance against such risks may be limited (Coate, 1995). A commitment not to provide safety net assistance would lead to an alleviation of these inefficiencies. However, such a commitment may not be possible when faced with social need.

An alternative is to examine the way in which insurance is contracted. My paper explores two design aspects of insurance contracts. The first is the coverage level and the second is risk partitioning. The first is common to the literature (Coate, 1995, Kaplow, 1991, Lewis and Nickerson, 1989), while the second is new. Risk partitioning is defined as partitioning states into those that are covered by the insurance contract and those that are not. For clarity I term an insurance with risk partitioning as incomplete insurance. An increasing level of incompleteness refers to more states excluded from coverage. An example of incomplete insurance is an insurance contract that covers the destruction of a house in the event of a fire but not in the event of a flood. In this example, fire risk is in the set of covered risks and flood risk is in the set of risks that is not covered.

My findings demonstrate how incomplete insurance bridges the gap in insurance demand created by safety nets, by creating demand for incompleteness over completeness. The rationale of the result is driven by two factors. The first is that a safety net provides implicit subsidization of incomplete insurance but not complete insurance. The second is that there are decreasing marginal returns to completeness under full coverage. Each factor alone drives a wedge in the preference for incompleteness over completeness. When both factors feature in the insurance design, the effect on preferences is amplified.

These findings have implications for both the structure of insurance markets and for the inception of insurance markets. Firstly, the findings demonstrate that the supply of incomplete insurance can be a demand driven phenomenon. Further, and somewhat surprisingly, incomplete insurance can increase welfare of both the vulnerable party and providers of the safety net. To my knowledge, this demand side reason for the existence of incomplete insurance has not been identified in the literature. The reasons for the development of incomplete products have tended to rest on the supply rather than the demand side. For example, incompleteness alleviates risks faced by the insurer associated with adverse selection and moral hazard (Doherty and Richter, 2002), as well as covariant losses (Jaffee and Russell, 1997). In contrast, these findings show that in the presence of a safety net, a potential assistance recipient will prefer incomplete insurance over complete insurance, generating demand.

Secondly, the findings offer a method to Pareto improve welfare in the face of the Samaritan’s Dilemma. In situations where assistance crowds out insurance demand, an incomplete product improves welfare for both assistance recipients and providers. The
introduction of incomplete insurance aims to complement existing assistance by allowing the transfer of some risk and generates demand when none would otherwise exist. This can be a particularly useful policy tool to complement assistance programs or in new markets. For example, in the face of emerging risks that are only recently quantifiable, such as environmental and climate change risks, insurance markets can be slow to develop. Incompleteness can reduce the risk borne by the insurance provider and increase demand for insurance, while not neglecting the benefits of assistance.

The consideration of risk partitioning is new to the literature on safety nets and insurance. Previous studies have focused on the interaction between the coverage level of insurance, and assistance (Coate, 1995, Kaplow, 1991, Lewis and Nickerson, 1989).\(^4\) Coate (1995) analyzes a market with indemnity (complete) insurance and shows that the possibility of assistance leads to an individual either insuring their entire loss or not insuring at all. Lewis and Nickerson (1989) and Kaplow (1991) also examine the interaction of insurance and charity in the context of self-insurance and moral hazard, respectively. Lewis and Nickerson show that levels of self-insurance decrease under assistance availability, while Kaplow shows that moral hazard is generated by any positive amount of government assistance even if financed by lump-sum taxation. My analysis is distinguished from these existing models, by the additional examination of risk partitioning as a contractual component of the insurance design. By incorporating incompleteness through risk partitioning, this paper is the first to demonstrate that incompleteness has a large impact on insurance demand in the shadow of a safety net.

Section 2 of this paper provides a description of how the vulnerable party, donor and insurers are modeled. The timing of the model is also described, with an emphasis placed on the ex-post and safety net nature of assistance from the altruistic donor. Section 3 provides a summary of the insurance demand of the vulnerable party in terms of the two dimensions of incompleteness (coverage and risk partitioning) and the welfare impacts on the donor. These results are then extended to consider how the safety net changes the value of insurance, while Section 4 concludes.

2. Model of the interaction between assistance and insurance

The model measures welfare in an expected-utility framework and is simplified to include a vulnerable party who is at risk (denoted by the subscript \(v\)) and a donor (assistance provider) who is not at risk (denoted by the subscript \(d\)).\(^5\) The vulnerable party is risk averse, able to purchase insurance at an actuarially fair rate and receive assistance.

The donor provides assistance if it is of benefit to them and it is assumed that it is not of benefit to the donor to provide assistance if no risk materializes.\(^6\) As in Coate (1995), the donor is risk neutral and empathetic towards the vulnerable party. The assumption of the donor as risk neutral is not strictly necessary in the model, however it simplifies the calculations without losing insight. Here the donor is imagined as a government, organization or rich individual, in these cases risk neutrality is not uncommon. The implications of the donor’s utility function is that the donor prefers the vulnerable party to reach a safety net level of welfare. This is justifiable from a humanistic perspective, since such assistance has a moral foundation and can foster a stable society. Further examples are provided in Section 4.

The new innovation in this model is the second dimension of incompleteness, established by partitioning risks into a set that is covered and a set that is not. The probability of a risk being excluded is denoted by \(\gamma\), and represents the level of incompleteness in the insurance contract. For example, homeowner’s insurance is often contracted with a set of risks that are covered and a set that are not. In a standard contract, home damage due to fire and vandalism is often covered, but damage due to flood and earthquake are not. With the exclusion of flood and earthquake risk, home owners insurance is incomplete. The risks that are not covered are considered to be excluded and are expressed in the insurance contract through the exclusion clause.

Within the model, there are two probabilities of interest. The first probability is the probability of loss, denoted \(\pi\). The second probability is the probability of claim exclusion, denoted \(\gamma \in [0,1]\).\(^7\) The intersection of these probabilities creates three possible states: state one where there is no loss (probability \(1-\pi\)), state two where there is a loss and a claim is paid (probability \(\pi(1-\gamma)\)) and state three where there is a loss and no claim is paid (probability \(\pi\gamma\)). Within these states of the world, it is assumed that the donor may provide assistance in state two and state three only. When \(\gamma = 0\), the insurance is complete.

The order of decisions is important in determining the outcome of the model. For a fixed level of incompleteness (\(\gamma\)), the timing of decisions is as follows:

1. The vulnerable party chooses their level (\(z\)) of insurance coverage. This relates to the level of coverage, partial (\(z < L\)) or sufficient (\(z = L\)).
2. Nature chooses whether the risk occurs or not. That is, loss or no loss. In the case of a risk materializing, a cost of loss (\(L\)) is inflicted on the vulnerable party.
3. Nature chooses how the loss is incurred, that is whether the insurance claim is paid (for example, does the loss fall within the exclusion?).
4. The donor decides how much assistance (\(\tau\)) to provide.
5. The payoffs are concluded.

The main points of this sequence are that when the donor provides assistance they are aware of the level of income facing the vulnerable party and the state of the world, but when the vulnerable party chooses their level of insurance they are unaware of the future state of the world. In other words, the donor provides ex-post assistance and cannot commit to not providing assistance. In this model, the level of assistance depends on the individual’s level of insurance and the empathy of the donor. This implies an endogenous form of limited liability, thereby taking into account a range of assistance levels.

The vulnerable party has an income level \(y_v\) and the donor has an income level \(y_d\).

The vulnerable party has utility \(u(\cdot)\), where \(u’(\cdot) > 0\) and \(u''(\cdot) < 0\). Under incomplete insurance (\(\gamma > 0\)), the expected utility of the vulnerable party is defined as:

\[
E[u_v] = (1-\pi)u(y_v - \pi(1-\gamma)z) + \pi(1-\gamma)u(y_v - \pi(1-\gamma)z + z - L + \tau_d) + \pi\gamma u(y_v - \pi(1-\gamma)z - L + \tau_s)
\]

where \(\tau_s\) and \(\tau_d\) are the assistance provided in state two and three respectively.

\(^4\) Incompleteness in the coverage level is also known as partial insurance. In this paper, full coverage is referred to as sufficient insurance, to differentiate it from the second dimension of incompleteness, risk partitioning.

\(^5\) In Coate (1995) the vulnerable individual is termed the poor person and the donor is termed the rich person.

\(^6\) In Coate (1995) there is a government that allows transfers from the rich to poor, to ensure that this is true.

\(^7\) Note that \(\gamma\) is a conditional probability. That is conditional on a loss, the probability that the claim is excluded.
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