# Some Policy Lessons from Marketing Monsoon Onset Insurance in Tamil Nadu, Uttar Pradesh and Andhra Pradesh, India[1]

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## Introduction

Agricultural activity is inherently risky due to pest or disease-induced harvest failure, price volatility in commodities markets, or extreme weather events, such as droughts and floods. Smoothing consumption across years or seasons is a significant challenge for agrarian households in developing countries. Parchure (2002) estimated that in India about 90% of variation in crop production levels is caused by variation in rainfall levels and patterns2. In response to this problem, an innovative index-based weather insurance was developed, in which the payment schemes are based on an exogenous publically observable index, namely local rainfall. This mitigates problems such as moral hazard and adverse selection and eliminates the need for in-field assessments, lowering the cost of providing insurance. This research studies the demand for, and effects of, offering formal index-based rainfall insurance through a randomized experiment in an environment where informal risk-sharing networks exist.

This paper will be organized by first summarizing evidence of the existence of informal insurance networks and the extent of such informal exchanges in community level financial management. It will then provide information regarding the interaction of the informal and formal insurance markets, assessing the demand for the product. Finally, it will discuss the main policy implications of the research, including the impact of various marketing techniques, variations in basis risk and the impact of price subsidies on take-up of the product.

## Evidence of informal insurance networks

The absence of formal insurance among poor rural populations does not mean that the poor are uninsured. There is a large literature documenting the mechanisms and assessing the effectiveness of informal risk-sharing schemes (such as caste-based networks) among rural populations in poor countries, particularly in India (Mazzocco and Saini, forthcoming; Townsend, 1994; Ravallion and Dearden, 1988; Rosenzweig, 1988; Rosenzweig and Stark, 1989). Previous research has shown that farmers exposed to erratic rainfall have adopted a range of mechanisms to cope with this risk, including both informal and

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[1] This policy paper complements another academic paper produced on the basis of this research program, titled "Selling Formal Insurance to the Informally Insured" by A. Mushfiq Mobarak and Mark Rosenzweig (Mobarak and Rosenzweig, 2012).

[2] In a household survey conducted in Andhra Pradesh, 89% of surveyed rural landowners cite drought as the most important single risk they face (Gine et al. 2008).

formal risk management strategies. For example, many rural households implicitly insure each other through gifts and loans to cope with agricultural risks.

However, these studies generally find that risk-sharing is incomplete, which in turn leads exposed farmers to choose low-risk and lower-yield production methods, instead of riskier but more profitable alternatives (Rosenzweig and Binswanger, 1993; Carter and Barrett, 2006). In addition, covariance of rainfall-related income shocks, affecting everyone in the same geographic area, limits the effectiveness of community-level risk-pooling and social safety nets (Townsend, 1995; Ravallion & Dearden, 1988; Rosenzweig, 1988; Platteau 1991; Rosenzweig & Stark, 1989; Hazell, 1992). The effectiveness of caste-based networks in smoothing consumption may be hindered due to several factors. Since the income shocks as a result of a widespread natural disaster are not idiosyncratic but aggregate shocks, the ability of a network to smooth consumption across all members becomes jeopardized.

**The market for formal insurance**

Are rural households underinsured? In order to answer this question, it is important to ask if formal rainfall insurance constitutes a "missing market." It is plausible that rural farmers have well-developed informal mechanisms that limit their demand and need for formal insurance products.

In India, the take-up rates for index insurance products are extremely low even when actuarially-fair rainfall insurance contracts are offered (Cole et al, 2008). According to the recent estimates, insurance penetration in India stands at 4.7 percent. Yet, 90 percent of the Indian population, and 88 percent of the Indian workforce are not covered by any formal insurance (Mukherjee, 2010). In theory, an optimally designed weather index-based insurance product can address many market failures, mitigate underinvestment in more profitable agricultural technology, and increase productivity even among risk-averse individuals (Barnett et al., 2008).

One long-standing hypothesis explaining thin formal insurance markets in poor populations is that pre-existing informal risk-sharing arrangements in place that either reduce the demand for formal insurance or prevent formal markets from being established. Arnott and Stiglitz (1991) develop a model with moral hazard showing that if formal insurance providers and informal risk-sharing communities are both incapable of monitoring risk-taking, then informal risk-sharing schemes will drive out any formal contracts. On the other hand, if informal communities are better able to monitor risk behaviour than formal insurers, then both formal and informal insurance contracts can coexist and increase welfare. Moral hazard under imperfect monitoring plays an important role in this analysis. Index-based weather insurance contracts are not subject to moral hazard concerns, so the extent to which informal risk-sharing affects the demand for index insurance remains an open question, both theoretically and empirically3.

[3] This information is drawn from Mobarak and Rosenzweig (2012).

**Main Policy Implications**

In this section our discussion focuses on the policy implications of the research study. The randomized component of our research design allows for high-quality measurement of both price and marketing treatment effects in insurance take-up. We also investigate the impact of basis risk on household purchase decisions through a randomized allotment of Automatic Weather station (AWS) installation locations (within village vs. outside village). Our approach thus combines quasi-randomized basis-risk variation, and designed (randomized) variation in the offer and price of a formal insurance contract, to assess how basis risk and informal risk sharing interact in conditioning the demand for formal index insurance.

It is also important to highlight the significance of our sample demographics as it adds much relevance to the policy implications discussed in this document. Our treatment sample, for which all households received marketing of the index-based weather insurance 'Delayed Monsoon Onset' product, is primarily composed of households engaged in agricultural production, either as cultivators or agricultural labours. Amongst cultivator households (ie. households for which farming is identified as the primary occupation for the head of household) total landholdings averaged just under two acres (1.95 – see Graph 1). Even for cultivator households who purchased the insurance product, the average land holdings remains low (1.91 acres per household). This indicates that the majority of cultivator households within our sample, including those who purchased insurance, are small land-holding farmers.

In this research study innovative methods of marketing and product distribution were utilized in order to ensure the insurance product was offered to all sample households. Trained marketers conducted door-to-door household visits, with a minimum of two visits per household, in order to ensure access to the insurance product for all research participants. Traditionally most agricultural insurance products, index or yield based, are offered through banks as a bundled product (along with an agricultural loan). Bundling the agricultural insurance with an agricultural loan allows for cost effective distribution of the insurance product and protects both the bank and farmer from the risk of loss associated with poor seasonal output. However, as a primary means of product distribution 'bundling insurance' often neglects the demands of small scale farmers who may use semi-formal or informal lending channels to finance their seasonal agricultural investments. Also, as per our knowledge, an index-based weather insurance product has never been formally offered to households whose primary means of income generation is agricultural labour – or non-farming agrarian households.

This therefore makes our analysis and policy considerations particularly relevant to low income households in rural agrarian communities, especially small scale farmers and agricultural labourers. The demand demonstrated through our research reflects a largely untapped market of customers traditionally excluded from the formal insurance market. Although the policy recommendations cited below are applicable across customer segments, it should be noted that they hold particular relevance for households involved in both small scale farming operations and agricultural labour activities.

**An Untapped Market - Demand for index-based weather insurance amongst agricultural labourers**

An innovative feature of our research study was offering the index-based weather insurance product to households engaged in agricultural labour activities as a primary means of income generation. Like cultivators, these households are dependent on seasonal weather patterns to generate their employment opportunities (for example, the arrival of the yearly monsoon initiatives the start of the Kharif season). The hypothesis then is that these households should also display a demand for an index-based weather insurance product which can protect the household against delays or loss in their expected employment.

Our research confirms this demand, as indicated in Table 1. The table summarizes purchasing data (by occupation) from two of our research locations (Andhra Pradesh and Uttar Pradesh). It indicates that there was an almost equal demand for the insurance product amongst cultivators and agricultural labourers (43% and 40% respectively). This is in spite of the fact that farmer households typically have on average 25% higher incomes (Mobarak and Rosenzweig, 2012). However, it is important to note that households which cited cultivation as their primary occupation purchased on average ~2.5 times more insurance than labourer households – and their average purchase price (including discount) was ~2 times larger (see Table 2). Clearly, cultivator households have a stronger and more significant demand for the insurance, but this does not negate the visible demand for a weather-based risk-coping mechanism amongst agricultural labourer households. This divergence in unit demand may be a clear reflection of the households income or capacity to ensure, or it may instead be a reflection of the real or perceived coverage required for the households' optimal protection. As labourer households do not engage in the same kind of business investments as cultivator households, their required cost coverage or "pay-out" demand may be less.

But the implications of a low unit take-up rate (per household) extend beyond an assessment of market demand. They have real meaning for any feasibility discussion surrounding the provision of insurance for low income agrarian households. The cost of marketing insurance door-to-door is high, as observed in other industries like microfinance. When a yearly per household policy purchase is between Rs. 80 to Rs. 300 (mean purchase price in our sample was Rs.119 including subsidies) any private business model can be difficult to maintain. In the long run, if index-based weather insurance was to be targeted to low income agricultural households, either small land holding farmers or agricultural labourers, public sector support may be required to balance the high transaction costs.

**Implications of basis risk on product demand**

One major disadvantage of index-based weather insurance is the presence of basis risk, or the potential for discrepancies in measurements taken at a reference weather station, and the realized weather parameter (for example, rainfall), taken at a farmers plot. As these measurements may not always perfectly correlate, the purchaser faces a risk in paying for a product that may not insure against his real losses.

In India, the number of existing rainfall stations used to calculate payments and payouts is limited, as of course installation is limited by the extent of public financing and private investment. Only a small proportion of the potential client population is proximate to a rainfall station, and the potential for basis risk is thus high. In India, the common coverage area for an index-based insurance contract is at the

Block level, which provides a reasonable proxy for any farmers realized rainfall. But discrepancies occur, and micro-climates exist – and farmers consistently prove doubtful of index-based rainfall contracts. Clarke (2011) shows in a model incorporating basis risk that even when actuarially-fair index insurance contracts are offered to farmers who are not liquidity constrained, those farmers will not purchase full insurance.

What is the effect of basis risk on take-up of index-based weather insurance? 4 This study provides an interesting perspective to the question by investigating the effect of increased basis risk across different informal risk-sharing networks. We do this by first developing a method to estimate how the characteristics of jatis (informal risk sharing networks) affect the extent to which household losses are indemnified and how, in turn, different rates of indemnification affect risk-mitigation. For example, networks with members in more diverse occupational fields may be better equipped to insure a subsector of their population (farmers) when an aggregate weather induced shock is realized; similarly with networks who have greater diversity in the location of their members.

The survey data used in our study provides information on household-level losses from distress events as well as village-level inter-temporal rainfall variation. We are therefore able to identify the extent to which each caste (network) indemnifies individual losses and losses from adverse weather events. That is, we are able to test whether and by how much jatis provide a form of informal index insurance (perhaps, for example, based on the publically observable rainfall in a village) for their members and the effect of these implicit risk-sharing contracts on the take-up of insurance across varying degrees of basis risk.

We find that introducing basis risk creates a complementary between informal risk sharing and the gains from index insurance: communities that are better able to insure individual losses may have a greater demand for index insurance. In other words, the negative effects of basis risk on the demand for index insurance are attenuated among those more informally insured. This study shows that in the absence of basis risk, farmers choose full-coverage, actuarially-fair index insurance, independent of the community's ability to informally insure against idiosyncratic losses.

Therefore, in lowering the potential basis risk associated with the index measurement, demand for the formal insurance product is enhanced independent of the communities' inherent risk sharing structure. In looking for ways to increase acceptance and usage of formal index-based weather insurance amongst rural communities it seems that improving the measurement accuracy of the product and lowering the effective basis risk, or more simply put - reducing the coverage area for any individual rainfall measurement station, could be a potentially simple and effective solution.

Of course this makes sense, demand for a product should increase as the product improves and becomes more tailored to customer needs; but to what extent? What is the optimal coverage area for an Automatic Weather Station? Graph 2 provides some insight to this query. The graph illustrates the purchase pattern of sample households in relation to the households self-measure of the distance to their reference AWS. This distance measurement is then a useful proxy for the basis risk considered 'acceptable' by each household in their decision to purchase the insurance product. As shown (graph 2) the majority of individuals who purchased insurance believed they were within a distance of 10 kilometres of their reference AWS. In fact, the drop in customers' willingness to purchase insurance once the

[4] This information is drawn from Mobarak and Rosenzweig (2012).

reference AWS is believed to be greater than 10 kilometres distance is dramatic. Although this is clearly an imperfect mapping of customer demand in relation to perceived basis risk it does provide useful insight into the relationship.

**Implications of Marketing Treatments – The impact of marketing delivery on the take-up of insurance**

Can the way in which a product is marketed affect take-up? This question is particularly relevant for products like index-based weather insurance when customer exposure to the product is historically low. Previous research studies have tested this idea on various dimensions – either by varying the way in which the weather insurance product was marketed or by bundling the product with additional products or services. Gaurav et al. (2010) examine the effect of providing a financial literacy training program to randomly chosen farmers (out of a total sample of 600 farmers) in three districts of Gujarat state in India. They find strong evidence that financial education module increased the demand for the insurance product by 5.3 percentage points. Cole et al. (2010) test the importance of trust as a barrier to take up by varying product endorsement by a "trusted local agent." The trust manipulation involves sometimes having a representative of an NGO who is "well known and trusted" by the villagers accompany their insurance marketer to declare that the marketer is trustworthy.

In our study experimental 'marketing' treatments were randomized for households and varied through a combination of 'normal', 'historic', 'return', and 'gamble' scripts. These scripts refer to the way in which the product was marketed to each household, or variations in what the customer was told when being briefed on the product. The 'normal' treatment referred to the way the insurance product generally would have been marketed where the households simply received the basic product information. The 'historic' treatment provided households with rainfall records, generally ranging from 1990 to 2009, including when and by how much the monsoon rains were delayed annually and the amount they would have received in previous years for each unit if they had purchased the insurance product. 'Return' referred to the treatment group which were told that the marketer would return next year to the household marketing the same product. The 'gamble' treatment marketed the product not as an insurance product but as a financial product. These variations in the marketing script were also delivered in combination, for example, a household could receive a combination script of historic+return+gamble in which the product would be marketed as a financial product, historic rainfall and payout data would be provided to the household and the household would be told that the product would also be offered in the following year. This section will emphasize those treatments which had a significant impact on our results and their policy implications.

We find that across the three states the "gamble" marketing effect is significant at the 10% level, as opposed to the regular or "normal" marketing treatment, and increases take-up by 3 percentage points. This may reflect customer trust in insurance, signifying an aversion to labels such as "insurance". Customers appear more willing to buy the same product when the product is not directly tied to the insurance label. Perhaps with increased interaction and trust building between rural customers, particularly low-income agricultural households, and insurance companies this demand biased can be reduced.

Another critical marketing technique was the presentation of historical data at the time of purchase. We find that its impact on take-up is significant, particularly when combined with price subsidies. For instance, receiving a 75 percent discount by itself (with no particular marketing techniques employed from the eight combinations previous mentioned) increases take-up by 37 percentage points, while also providing relevant information on previous rainfall patterns contributes additional 12 percentage points to the take-up rate (for the net effect of 49 percentage points). This indicates that additional product information, particularly information that highlights historic payouts and allows the customer to assess the likelihood of a payout, will positively impact demand. This result may reflect increased consumer confidence or an improved understanding of the product structure – perhaps eliciting similar effects as the bundled financial literacy training discussed in Gaurav et al. (2010).

**Reasons for not purchasing insurance – Evidence from non-purchasers**

In order to further understand the demand constraints for index-based weather insurance we asked all sample households who did not purchase insurance 'why?' The results proved informative. As expected the primary reason for not purchasing insurance cited amongst non-agricultural households (i.e., households not directly involved in agricultural production) was 'no need'. However, for all agricultural households— which includes those involved in both cultivation and agricultural labour work – the primary barrier to purchasing insurance, as indicated by the respondents, was having current liquidity constraints (i.e. insufficient current cash holdings).

In Uttar Pradesh this reason was cited by over 50% of non-purchasing respondents, while in Andhra Pradesh and Tamil Nadu, it was closer to 40%. Other demand constraints commonly cited as causes of low-take up, such as 'not trusting insurance' or having a premium price which is 'too expensive' were highly insignificant, together compromising only 13% of responses.

One way to combat the negative impact of household liquidity constraints on formal insurance take-up would be to market the insurance to farmers during seasonal periods when income is high, for example the end of the Rabi season. In fact, marketing campaigns targeted during the Rabi season could significantly benefit farmers for two reasons: first, as the farmers would have 'cash on hand' from the sale of the Rabi crops their liquidity constraints would be reduced. Secondly, as this would also be the time when farmers are making planting decisions concerning the Kharif crops they could consider their insurance coverage while making their investment decisions. This is significant as knowledge of owning insurance can potentially alter their choices regarding which crops to cultivate (i.e. perhaps a more expensive but higher-yielding crop).

However, it is highly likely that the way in which the product was marketed to sample households (ie. door-to-door sales) impacted the reason for 'non-purchase'. Although all households received a minimum of two household visits in order to optimize their purchasing opportunity, limitations persist. A marketing and distribution structure which allowed prospective clients greater flexibility in making their purchase, either through increased visitations, remote payment systems or local purchasing stations, could potentially have a large impact on the demand for insurance amongst low-income agrarian households.

**Pricing – The impact of subsidies on take-up of index-based weather insurance**

In previous studies on the demand for weather based insurance price has been identified as the major constraint to take-up of the product. Cole et al. (2010) offer rainfall insurance to a sample of farmers in three Indian states, varying the price of insurance policies, and find the demand to be highly price-sensitive, with estimated price elasticity between -0.66 and -0.88.

In our experiment each household faced a 10% chance of receiving no discount, and a 30% chance of receiving each of the other three levels of discounts (10%, 50%, 75%). The fraction of sample households that ultimately received each level of discount is detailed in Table 3. Furthermore, in order to encourage households to purchase multiple units of insurance, we offered quantity or "bulk" discounts of 10%, 15% or 20% off the total insurance premium if the households purchased 2, 3-4, or 5+ units of insurance respectively. Unlike the simple pricing discounts, these bulk discounts were not randomly assigned.

Table 4 presents summary statistics on insurance take-up at the different (randomly assigned) price points. Overall, roughly 40% of all households purchased some insurance and of those, 38% purchased multiple units of insurance, with 17% purchasing 5 units or more. Figure 1 shows that both the take-up rates and the number of units purchased were greater at the higher levels of discounts. The average price paid per unit of insurance in the sample, accounting for the various discounts, is Rs. 80.

Overall, we find that the size of the discount has a large and significant effect on insurance take-up, and the effect is increasing monotonically with the relative size of the discount. Across the three states, drawing a 50 and 75 percent discount increases the probability of an insurance purchase by between 14 – 36 and 36-63 percentage points, respectively, relative to not receiving any discount. This is a sizeable effect, considering an average take-up rate of 40 percent. Therefore, price subsidies remain a strong tool for incentivizing usage of formal insurance contracts.

This may be particularly true for low-income agrarian households, like those in our sample, as their available income for products such as index-based weather insurance may be low. If encouraging the adoption of weather based insurance products by low-income agricultural households is identified as a key social development goal, the provision of price subsidies may remain the most direct route for encouraging take-up.

**Conclusions**

The observations made from this research study raise several important policy questions: Are rural households formally underinsured? Specifically, does formal rainfall insurance constitute a "missing market," or is it the case that rural farmers have well-developed informal mechanisms that limit their demand and need for formal insurance products? Furthermore, if insurance markets are not superfluous and should be promoted, are subsidies an efficient strategy for encouraging take-up? Using randomized experiments in rural areas in three Indian states, Andhra Pradesh, Uttar Pradesh and Tamil Nadu, this study sought to understand why Indian farmers exposed to rainfall risks have low demand for formal index-based insurance that mitigates those risks. Our main hypothesis was simple: farmers may be reluctant to purchase formal insurance contracts simply because they are already informally insured. While price and non-price determinants of insurance demand have received some attention in prior studies, the role of informal traditional risk management arrangements, i.e. implicit insurance through social networks, has not been explored empirically. In our research we find that pre-existing informal risk-sharing arrangements, such as membership-by-birth in jatis in India, are clearly important institutions that condition the demand for formal insurance.

We also explore both price and non-price determinants of demand such as the role of subsidies and the level of basis risk in influencing demand. We find that both are significant and effect take-up of formal insurance contracts. In theory, an optimally designed index-based insurance product can address many of the common insurance and credit market failures, mitigate underinvestment in agricultural technology, and increase productivity even among risk averse individuals (Barnett et al., 2008). In regards to basis risk, we also find that it has differing effects on demand across informal social networks (jatis), dependent upon the networks ability to indemnify both idiosyncratic and aggregate risks. However, the issue of basis risk, or the potential mismatch between the rainfall-index-based payouts and the actual losses incurred by the policy holder, remains and constitutes a serious demand and supply constraint for the industry. Therefore the establishment of secure and accurate measures of rainfall are crucial to the future success of index-based insurance market.

Lastly, this research study explores the demand for index-based weather insurance amongst customer segments which have traditionally had limited access to formal agricultural insurance products, namely small scale farmers and agricultural labourers. As the adoption of weather insurance has major welfare implications (income smoothing, risk mitigation) it is important to examine the demonstrated demand of these households as well as actively support policy discussions which discuss the feasibility of integrating these customer segments into the mainstream insurance market.

**APPENDIX**

Figure1

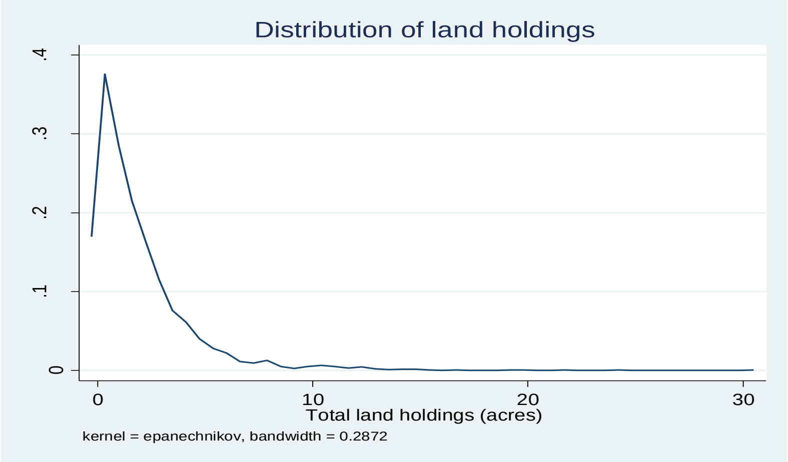


Figure 2

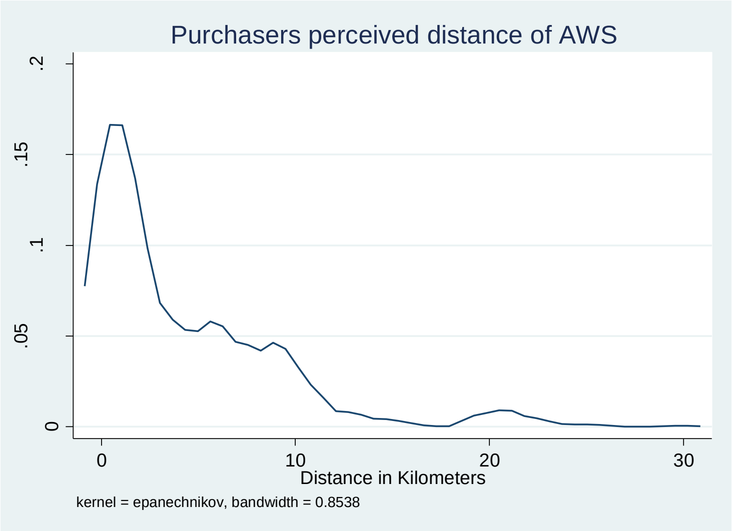

Figure 3

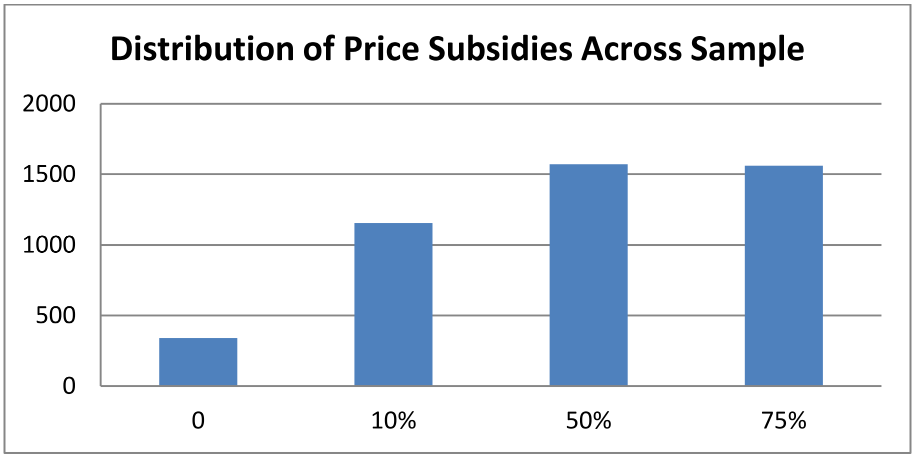


Figure 4

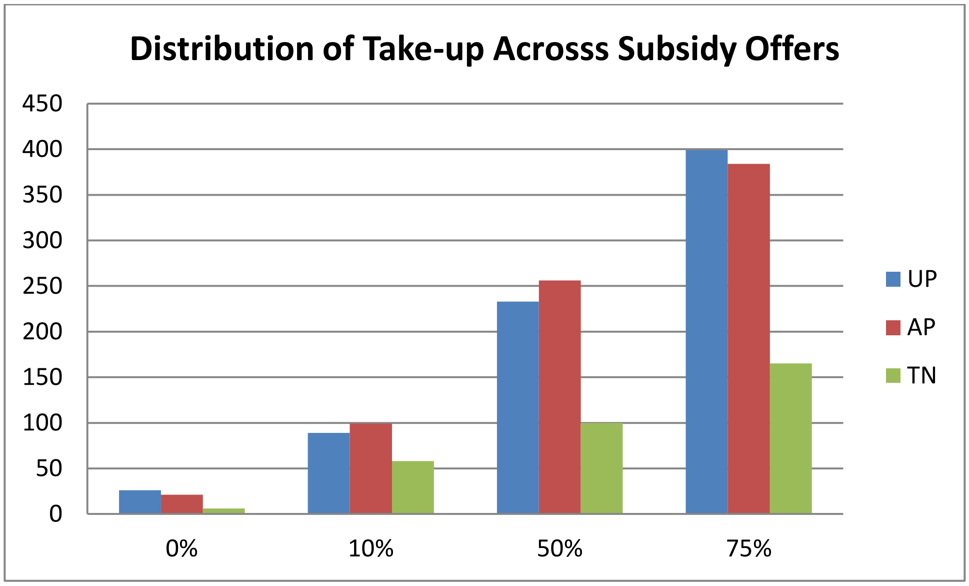

Table 1

| Occupational Segmentation | Total Sample | Purchased Insurance | % Purchased |
| --- | --- | --- | --- |
| Cultivation HH | 1369 | 556 | 40.6% |
| Ag Labour HH | 1261 | 542 | 43.0% |
| Cultivation & Ag. Lab HH | 583 | 271 | 46.5% |
| Non-Agricultural HH | 516 | 136 | 26.4% |

Table 2

| Occupational Segmentation | Mean Units Purchased | Mean Purchase Amount (Rs.) |
| --- | --- | --- |
| Cultivation HH | 3.65 | 181 |
| Ag Labour HH | 1.5 | 85 |
| Cultivation & Ag. Lab HH | 1.9 | 97.5 |
| Neither | 1.6 | 88 |

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