

# WILLINGNESS TO CONTRIBUTE TO SANITATION PROJECTS – EVIDENCE FROM INDIA

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## Abstract

*Using a nationally representative data set from India, this paper estimates a multinomial logit model to analyze the intended form of contribution (money, labor, no contribution) by households to a public project aimed at improving sanitation. After controlling for existing access to water and sanitation, we find that primary occupation of the household, ownership of assets explain the form of contribution. Worsening of the state of environment, participation in existing programs increases likelihood of contribution. Minority groups' access to CPR affects their decision to contribute.*

**Keywords:** Public Projects, Willingness to Pay, Contribution

**JEL Classification:** H4

## 1. Introduction

In the recent past, governments and multilateral organizations have adopted a more decentralized model of development. In the context of provision of water and sanitation services, World Bank and national governments including India have adopted a demand driven approach. In 1998, the Indian Government decided that centrally monitored non-participatory schemes would give way to community-based, demand driven programs with cost sharing by the communities. Under the Rajiv Gandhi Drinking Water Mission, the Indian government introduced a demand driven \$550 million pilot program across the Indian states in selected districts. Under this program, 2.9 million households contributed \$16.8 million for drinking water schemes of their choice (World Bank 2003b). The "Jalswarajya" Project in state of Maharashtra seeks to decentralize rural water supply and sanitation service delivery to local governments. The key feature is that the government bears 90 percent of the cost of a new water supply or sanitation scheme. Users have to make upfront cash payment of 5 percent and the remaining 5 percent in the form of cash or labor. They also have to bear the entire cost associated with operations and maintenance.

Given the mammoth investment<sup>2</sup> needs of this sector, contribution by users would partially ease the burden on government finances. As is evident, the central issue is members'

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ability and willingness to contribute to community initiatives. We address the following specific research question in this paper. What are the determinants of willingness to contribute on part of households for impure public goods like water - sanitation quality improvement projects? How can we differentiate between the willingness to make financial contributions from contributions of labor or time? This is important since poorer households might be willing to contribute labor while richer households could prefer contributing money. We address the above questions after controlling for availability and current access rights to water and sanitation facilities.

Given that the focus of our empirical exercise is the type of contribution -- viz., money, labor or a mix of both -- the theoretical models relevant in our context would be those, which take into account the form of contribution by the agent. The theoretical motivation for our paper can be derived from Baland and Platteau (1997), who consider a game of voluntary provision of a common good. They consider two separate cases: one where only labor is contributed and another where only money is contributed. They show that richer agents contribute less labor to the common good when the opportunity cost of their time is very sensitive to their own wealth. In the game with monetary contributions, they find that contributions increase more than proportionately with income. An extension of their model would be one where households contribute a mix of labor and money to a public project. The result that would intuitively follow is that households with higher labor endowment (lower opportunity cost of contributing labor) would be willing to contribute more labor. The relationship between the wealth of the household and the extent of contribution of labor and money would depend on, among other things, the magnitude of the opportunity cost of labor and marginal utility of the public good at different levels of wealth.

On the empirical side the literature closest to this paper is the one using the contingent valuation method<sup>3</sup> and many studies pertain to water supply and sanitation sector. Whittington et al. (1993) base their study on a survey of over 1200 households in Kumasi, Ghana about their current sanitation practices, perceptions of existing sanitation conditions, expenditures and their knowledge of improved sanitation options. They find that households were open to the idea of simple low-cost on-site solutions to their sanitation problems. The primary determinants of households' willingness to pay are income, whether the premise is owned or rented, the household's current expenditures on sanitation, and the state of the current existing sanitation system. Altaf and Hughes (1994), based on a contingent valuation study in Ouagadougou, Burkina Faso, find that households are willing to contribute for improved urban sanitation services. Gaspart et al. (1998) undertake a study of factors accounting for variations in individual participation in the construction of a central drainage channel in Ghinchi watershed, Ethiopia. They show that the personal interests which local farmers have in the drain influence individual contributions. Lall et al. (2002) use household - level survey data for Bangalore, India and show that a key determinant of willingness to contribute to urban services provisions is tenure security.

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<sup>2</sup> Large investments are needed in order to meet the Millennium Development goals of halving the population without access to water supply and sanitation in India by the year 2015, and providing 100 percent coverage by 2025 (Planning Commission 2002).

<sup>3</sup> Critics of the contingent valuation method point out that a bias creeps in on account of the potential difference between the stated behavior to a hypothetical question and the actual behavior (Hausman, 1993).

They find that residents owning the house or residents who have rented it for over 20 years are more willing to participate.

In our empirical exercise we will be able to address many of the above issues: the role of access rights and more importantly the form of contribution, an issue that has not been adequately addressed in the literature. Our analysis based on a large sample collected by the National Sample Survey Organization (NSSO), India, relates to willingness to contribute to sanitation improvement projects (at neighborhood and village levels). In addition to household responses on willingness to contribute towards improved sanitation, this data set has detailed information on household characteristics, enabling us to address a variety of questions related to the issues outlined above.

Our analysis reveals that occupation profile, asset ownership, and rights of minorities are key determinants of the form of contribution to public projects. After controlling for existing access to water and sanitation, the results of the multinomial logit model suggest that richer households are more likely to contribute money. For both urban and rural households, primary occupation and asset ownership impact the form of contribution. A worsening of the state of the environment also increases the likelihood of contribution.

The rest of the paper is structured as follows. In the next section we provide a description of the data. In the section 3, we discuss the results based on the multinomial logit model. This is followed by some concluding remarks.

## **2. Data**

### **2.1 Description of Data Set**

We use the NSSO: Round 54, Schedule 31: common property resources sanitation and hygiene services, survey data covering over 76,000 rural and 30,000 urban households from India. The survey was conducted during January – June 1998. For details on the survey see National Sample Survey Organisation (1999).

### **2.2 Description of Variables**

The variables that we use to model the determinants of willingness to contribute and the form of contribution can be grouped under the following categories.

Willingness to Contribute: Two questions are posed to the households. Is the household willing to contribute towards improved sanitation<sup>4</sup> in the neighborhood? Is the household willing to contribute towards improved sanitation in the village? In response the households chose from these four options: willing to contribute money, labor, both labor and money, unwilling to contribute. The response is coded as willing as long as the household is willing to contribute towards improving any aspect of sanitation.

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<sup>4</sup> Though water supply and sanitation is not a single sector, in India, a larger multi-sectoral approach was rejected and a decision was taken to integrate the implementation of water supply with sanitation and hygiene promotion.

Since the focus of this paper is on the form of contribution, we combine the response of the households to the two questions and generate a new variable as follows: do not contribute to either project, contribute money only to either or both projects, contribute labor only to either or both projects, mix of money and labor to either or both projects.

Since there is lack of data on actual participation, one might argue that it is difficult to interpret the response to questions on willingness to contribute. However in the context of this paper a few issues need to be taken into account before casting doubt on the utility of such an analysis. First, this paper is unusual in the sense that a very large micro-dataset rich in household characteristics is used to address the issue of contribution to a public good. Second, as mentioned earlier, under the Rajiv Gandhi Drinking Water Mission households indeed did contribute. They are informed about the exact nature and quantum of contributions expected of them. It is also true that there are many instances of collective action in India that have failed on account of lack of contribution. In order to tackle this problem the state governments are undertaking an extensive capacity building exercise to ensure that collective action is sustainable and not derailed by non-contributors. Some states have also set up pilot operation and maintenance funds in order to salvage and revitalize existing water supply sanitation projects that have fallen into disuse on account of failure of collective action. While inclusion of regional expenditures on such programs in our estimation exercise or inclusion of a measure of extent of collective action would mitigate the criticism of contingent valuation survey, such data is not necessarily available for whole of India.

Household Characteristics: In order to control for household demographics we include the following variables: social group<sup>5</sup> (scheduled caste, scheduled tribe, other backward caste, other social groups) to which the household belongs and sex of the household head. In the rural areas, the primary occupation of the household is one of the following: self-employed in non-agriculture, agricultural labor, other labor (fisheries), self-employed in agriculture, others. In the urban areas, the primary occupation of the household is one of the following: self-employed, regular wage/salaried, casual labor, others. To control for household size we create a dummy variable: households with up to four members and those with more than four members.<sup>6</sup>

Access Rights for Minorities and Participation in Government Programs: Households have responded to question on whether scheduled castes are prevented from accessing common property resources and whether the household enjoys timber rights.<sup>7</sup> We include these as explanatory variables. This information is not available for the urban areas.

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<sup>5</sup> The scheduled castes (SC) and scheduled tribes (ST) are the minority groups and have also been disadvantaged with regard to education and occupation. The state governments have also identified another group called other backward castes (OBC), an assortment of socially backward groups.

<sup>6</sup> Many Indian state governments have enacted policies to encourage families to have a maximum of two children. Hence instead of using the number of members of the households as the explanatory variable, we split the households according to whether they have more than 4 members or not.

<sup>7</sup> People living in areas adjoining forests, particularly protected and unclassified forests, usually have user rights, more often restricted, to collection of fuel wood.

Ownership of Assets: Firstly, it should also be noted that this data set does not have any information on the monthly per capita expenditure of the household. What we have however is information on land holdings for households in the rural areas but this information is missing for close to 18 percent of the households. We use land holding to control for the wealth status of the household. Since we do have information on households who report that they have no land holdings, there is no reason to believe that households without information on land holding have zero acres of land. We drop the households for whom information on land holdings is not available and there is no reason a priori to believe that the elimination of households is non random. We also include whether the household owns a television (color or a black and white), radio, animal, either diesel or electric pump, and has a bank account. Information on land holding, pump and animal ownership is not available for the urban areas.

Water Availability, Quality and Access Rights: In addition to whether the household reports water sufficiency, we control for water quality according to whether it is satisfactory or unsatisfactory and whether the household has exclusive access to the drinking water source, shares the access with a common set of households or whether the source is open to the whole community. Since a tubewell is an important water source in rural areas, we include the presence of a tubewell as an explanatory variable. Information on tubewells is not available for urban areas.

State of the Environment & Sanitation: We collate the responses of the households on whether they experience problems relating to flies, odor and mosquitoes. Thus a household would get a value of 3 if it reports all three problems, 2 if it reports any two of the problems, 1 if it reports any one problem and 0 if it does not report any problem. Instead of using this as a continuous variable we generate three dummies.

Three aspects of sanitation on which we have information are the type of the drainage system available to the household, whether the household has a latrine and garbage location. Households can have no drainage, open drainage or covered drainage for wastewater. Households either have no latrine, a non-sanitary latrine or a sanitary latrine. Garbage<sup>8</sup> could be taken to the bio gas plant, community pit, household's site including indiscriminate littering or other locations.

State Level Variables: We include as an explanatory variable the rural and urban human poverty index<sup>9</sup> for the year 1991 for each state as an explanatory variable. In addition, we also include three region dummies - a dummy for the southern states (Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, Pondicherry), a dummy for the four most populous and least developed states (Bihar, Madhya Pradesh, Rajasthan, Uttar Pradesh – BIMARU states) and a dummy for

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<sup>8</sup> Per capita municipal solid waste generated daily has increased over time and varies from 100 g in small towns to 500 g in large towns. However, cash - strapped municipalities are unable to undertake investments for proper disposal. Rampant dumping of garbage has led to an accentuation of problems relating to flies, odor and mosquitoes.

<sup>9</sup> The Human Poverty Index is a composite of variables capturing deprivation in three dimensions of human development, viz., economic, educational and health. (National Human Development Report 2001).

the north eastern states (Arunachal Pradesh, Mizoram, Nagaland, Sikkim, Tripura). There is a further discussion regarding geographical dummies in the section on the empirical model.

### 2.3 Summary Statistics

In the urban areas, for the project in the neighborhood (town) 19 (16) percent of the households are willing to contribute money, 32 (25) percent are willing to contribute labor, 19 (16) percent are willing to contribute money and labor. The proportion of households not willing to contribute increases from 30 percent to 43 percent if the project is at the town level in contrast to the one in the neighborhood.

In the rural areas, for the project in the neighborhood (village) 7 (6) percent of the households are willing to contribute money, 52 (45) percent are willing to contribute labor, 17 (17) percent are willing to contribute money and labor and 24 (32) percent are not willing to contribute.

Households tend to make similar decisions on choice of projects and form of contribution, i.e. over 80 (85) percent of urban (rural) households choose one of the four options: contribute money to both projects, labor to both projects, a mix of money and labor for both projects, make no contribution to either project.

In urban areas, we find that 29 percent of the households are not willing to contribute to either project, 18 percent are willing to contribute money only to either or both projects, 31 percent are willing to contribute labor only to either or both projects and 22 percent are willing to contribute a mix of money and/or labor to either or both projects. Less than 14 percent of households are willing to contribute to the neighborhood project but not to the town project. On the other hand, less than one percent of the households are not willing to contribute to the neighborhood project but willing to contribute to the village project.

In rural areas, we find that 22 percent of the households are not willing to contribute to either project, 6 percent willing to contribute money only to either or both projects, 52 percent are willing to contribute labor only to either or both projects and 20 percent are willing to contribute a mix of money and/or labor to either or both projects. Less than 10 percent of households are willing to contribute to the neighborhood project but not to the village project. There are very few households willing to contribute to a village project but not to the neighborhood project.

The descriptive statistics for the urban and rural areas are presented in Tables 1 and 2. Here we discuss some basic conjectures. The size of the household and the assets owned by the household shed light on the form of contribution by it. Larger households are more likely to contribute labor. Households which own a color television or a black and white television, have a bank account are more likely to contribute money and less likely to contribute labor (summary statistics not reported here). There is a link between the social group to which the household belongs and the primary occupation of households. This will get reflected in the decision on whether to contribute and the form of contribution. Households whose primary occupation is laborer are least likely to contribute money and were most likely to contribute labor. This reflects the fact that households whose primary occupation is casual labor are also probably the poorer households as opposed to households whose primary occupation is self employed or salaried (regular wage).

Next we discuss demand shifters, namely state of the environment and access to water and sanitation. We collated the responses of the households on their perception of whether there is a problem of flies, mosquitoes and odor. Among the rural (urban) households not reporting any problem over 34 (40) percent are not willing to contribute. In contrast, of the households reporting all three problems 17 (27) percent are not willing to contribute.

Aspects of sanitation including bathroom, latrine, drainage facility and garbage dump location act both as demand shifters and determinants of form of contribution. The summary statistics also revealed differences in the willingness to contribute across the different states of India.

**Table 1. Descriptive Statistics (Urban)**

	<i>Mean</i>		<i>Mean</i>
<b>Household Characteristics</b>		<b>Environment</b>	
Household Head Male	0.89	Reports No Problem (Fly, Odour, Mosquito)	0.10
# Household Members > 4	0.49	Reports any 1 Problems (Fly, Odour, Mosquito)	0.19
<b>Occupation</b>		Reports all 2 Problems (Fly, Odour, Mosquito)	0.27
Self Employed	0.32	Reports all 3 Problems (Fly, Odour, Mosquito)	0.44
Salaried	0.38	<b>Drainage</b>	
Other Employment	0.12	Household has No Drainage	0.24
Casual Labor	0.18	Household has Open Drainage	0.49
<b>Social Group</b>		Household has Closed Drainage	0.27
Scheduled Tribe	0.06	<b>Latrine</b>	
Scheduled Caste	0.15	Household has No Latrine	0.27
Other Backward Caste	0.22	Household has Non Sanitary Latrine	0.06
Other Social Groups	0.57	Household has Sanitary Latrine	0.67
<b>Economic Status of Household</b>		<b>Bath</b>	
Own Color TV	0.20	Household has Attached Bath	0.34
Own Black & White TV	0.39	Household has Detached Bath	0.29
Do not Own TV	0.41	Household has No Bath	0.37
Have Bank Account	0.53	<b>Household's Garbage Location</b>	
<b>Water</b>		Bio-gas plant, manure pit, community spot	0.46
Water Availability Sufficient	0.84	Individual Dumping Spot or Indiscriminate	0.30
Water Quality Satisfactory	0.91	Other	0.24
Share Access Right to Water Source	0.29	<b>State Urban Human Poverty Index</b>	
Access Right to Water Source Open to All	0.29	URBANHPI	22.11
Exclusive Access Right to Water Source	0.42		

**Table 2. Descriptive Statistics (Rural)**

	<i>Mean</i>		<i>Mean</i>
<b>Household Characteristics</b>		<b>Water</b>	
Household Head Male	0.91	Water Availability Sufficient	0.86
# Household Members > 4	0.56	Water Quality Satisfactory	0.89
<b>Occupation</b>		Share Access Right to Water Source	0.21
Self Employed Agriculture	0.36	Access Right to Water Source Open to All	0.56
Self Employed Non Agriculture	0.10	Exclusive Access Right to Water Source	0.23
Agricultural Labor	0.30	<b>Environment</b>	
Other Labour (Fisheries)	0.09	Reports No Problem (Fly, Odour, Mosquito)	0.16
Others	0.14	Reports any 1 Problems (Fly, Odour, Mosquito)	0.16
<b>Social Group</b>		Reports all 2 Problems (Fly, Odour, Mosquito)	0.32
Scheduled Tribe	0.14	Reports all 3 Problems (Fly, Odour, Mosquito)	0.36
Scheduled Caste	0.20	<b>Drainage</b>	
Other Backward Caste	0.27	Household has No Drainage	0.58
Other Social Groups	0.39	Household has Open Drainage	0.28
<b>Existing Arrangements</b>		Household has Closed Drainage	0.14
Households Have Timber Rights	0.06	<b>Latrine</b>	
Scheduled Castes not Barred from CPR	0.74	Household has No Latrine	0.77
<b>Economic Status of Household</b>		Household has Non Sanitary Latrine	0.03
Own Color TV	0.03	Household has Sanitary Latrine	0.20
Own Black & White TV	0.18	<b>Bath</b>	
Do not Own TV	0.79	Household has Attached Bath	0.08
Have Bank Account	0.30	Household has Detached Bath	0.14
Tube	0.17	Household has No Bath	0.78
Animal	0.57	<b>Garbage Location</b>	
Pump Own	0.13	Biogas Plant \ Manure Pit	0.67
Total Land	1.07	Community Spot	0.06
		Households Spot	0.03
		Other	0.24
		<b>State Rural Human Poverty Index</b>	
		Rural HPI	41.37

It has long been recognized that in the rural areas, the effective and equitable participation of traditionally marginalized groups will be key for the sustainability of local organizations in the future. The data suggest that willingness on the part of scheduled caste households to contribute to either project declines if scheduled caste households are barred from



accessing common property resources. The percentage of scheduled caste households not willing to contribute to either project increases from over 20 percent to 28 percent if scheduled caste households are barred from accessing common property resources. Households that participate in community activities or in other government programs (timber rights) are more willing to contribute to public projects than households that do not participate in such activities. The data also reveal that there are marked differences in the willingness to contribute across the different states of India.

### 3. The Empirical Model

As mentioned earlier, a majority of households make similar decisions on whether to contribute to the projects. In addition, given that the village and neighborhood project are similar, we focus on the form of contribution.<sup>10</sup> So the outcome or dependent variable of interest is: household does not contribute to either project, contributes money only to either or both projects, contributes labor only to either or both projects, mix of money and labor to either or both projects. We estimate a multinomial logit model<sup>11</sup> where the  $i^{\text{th}}$  household chooses from one of the four options with the base category being not contribute to either project. The probability of each option can be written as follows.

$$\text{Prob}(Y=j) = \frac{e^{\beta_j' x_i}}{1 + \sum_{k=0}^3 e^{\beta_k' x_i}} \quad \text{for } j = 1, 2, 3 \quad \dots (1)$$

$$\text{and } \text{Prob}(Y=0) = \frac{1}{1 + \sum_{k=0}^3 e^{\beta_k' x_i}} \quad \dots (2)$$

We can estimate the 3 log odds ratios.

$$\ln \left[ \frac{P_{ij}}{P_{i0}} \right] = \beta_j' x_i \quad \dots (3)$$

Notice that the odds ratio does not depend on other choices and this follows from the assumption of independence of disturbances.

<sup>10</sup> We also estimated the determinants of contributing to the neighbourhood project and village project separately. The results did not throw up any surprises and so we do not report them here for sake of brevity.

<sup>11</sup> We tested for the independence of irrelevant alternatives (IIA) and find that the IIA assumption holds. Since we do not have the project specific characteristics, we are not able to estimate a conditional logit model. We also estimated a nested model: contribute to neither project, contribute to one or both projects. If a household opts to contribute then it chooses from one of the following: contribute money only, contribute labor only or contribute a mix of money and labor. The likelihood ratio test rejects the hypothesis that the nesting structure is the appropriate model. Hence we estimate the multinomial model only.

### 3.1 The Multinomial Logit Model – Results (Urban)

We first discuss the results of the multinomial model for the urban areas. The model tends to marginally over-predict contribution of labor and under-predict the rest (Table 3).

**Table 3. Actual and Predicted Frequencies (Urban)**

	<i>Actual</i>	<i>Predicted</i>
No Contribution	8618	8112
Money	5289	5050
Labor	9474	10956
Mix	6455	5718
Total	29836	29836

Instead of reporting coefficients of the multinomial logit model, we provide estimates of the relative risk ratios (RRR) or odds ratios (Table 4).

The RRRs show the effects of the regressors on the probability of contributing money, labor or mix of money and labor, relative to the likelihood of no contribution. If a parameter estimate is greater (less) than one it indicates that the regressor is associated with a probability of the outcome that is greater (smaller) than the probability of the base case.

In the discussion that follows, we focus on the most important of these results.

**Sex of Household Head and Household Size:** If the household is headed by a male then this household is more likely to contribute in any one of the following forms - money, labor, mix of money and labor - rather than not contribute. This is true because all the relevant RRRs are greater than one. A larger household has a higher labor endowment and the opportunity cost of contributing labor is lower. We find that a household with more than four members is more likely to contribute labor or mix of money and labor rather than not contribute.

**Primary Occupation:** The RRRs, pertaining to contribution of labor, for households whose primary occupation is not casual labor are all less than one. This, we argue, reflects the opportunity cost of time – households whose primary occupation is not casual labor have a higher opportunity cost of time and hence unwilling to contribute labor. Also, households whose primary occupation is not casual labor are more likely to contribute money rather than not contribute. This is true because, if a household's primary occupation is self-employed, salaried or other occupations, we find that the RRR is greater than one.

**Social Group:** For SC and ST households the probability of their contributing money is lower than the probability of these households not contributing (RRR less than one). Households belonging to the scheduled caste are more likely to contribute labor or mix of money and labor instead of opting not to contribute.

**Economic Status of Household:** We find that the economic status of a household does determine the form of contribution. Households owning a color television or black and white television or having a bank account are more likely to contribute money or mix of money and labor rather than not contribute. The impact is the largest for households owning a color

television. The probability of households, owning a color television, contributing labor is lower than the probability of such households making no contribution (since the RRR is less than one).

**Table 4. Willingness to Contribute to Project in the Urban Areas (RRR)**

	Money		Labor		Mix	
	RRR	S.E	RRR	S.E.	RRR	S.E
<b>Sex of Household Head (Female), Household Size (Less than 4 members)</b>						
Household Head Male	1.32***	0.13	1.35***	0.11	1.71***	0.16
# Household Members > 4	0.93	0.05	1.43***	0.07	1.21***	0.07
<b>Primary Occupation of Household (Casual Labor)</b>						
Self Employed	1.68***	0.20	0.80***	0.06	0.97	0.09
Salaried	1.56***	0.19	0.72***	0.05	1.03	0.10
Other Employment	1.42***	0.20	0.57***	0.06	0.93	0.11
<b>Social Group (Other Social Groups)</b>						
Scheduled Tribe	0.63***	0.13	1.19	0.17	0.78	0.13
Scheduled Caste	0.85*	0.09	1.68***	0.13	1.49***	0.13
Other Backward Caste	1.24***	0.10	1.35***	0.09	1.12	0.08
<b>Economic Status of Household (No TV, No Bank Account)</b>						
Own Color TV	2.69***	0.24	0.65***	0.06	1.58***	0.14
Own Black & White TV	1.61***	0.13	1.06	0.06	1.52***	0.10
Have Bank Account	2.12***	0.14	1.10*	0.06	1.89***	0.12
<b>Water Availability (Insufficient), Quality (Unsatisfactory), Rights to Source (Exclusive)</b>						
Water Availability Sufficient	0.95	0.77	0.62***	0.04	0.75***	0.06
Water Quality Satisfactory	0.90	0.08	0.68***	0.06	0.95	0.09
Share Access Right to Water Source	0.77***	0.05	0.96	0.06	0.78***	0.05
Access Right to Water Source Open to All	0.98	0.08	1.24***	0.09	0.75***	0.06
<b>State of Environment (Household does not Report any Problem w.r.t. Flies Odor or Mosquitoes)</b>						
Reports any 1 Problem	1.65***	0.16	1.91***	0.18	2.06***	0.20
Reports any 2 Problems	1.12	0.11	1.48***	0.14	1.83***	0.17
Reports all 3 Problems	1.40***	0.13	1.50***	0.13	2.19***	0.20
<b>Bath (No Bath)</b>						
Household has Detached Bath	1.06	0.09	0.89*	0.06	0.78***	0.06
Household has Attached Bath	1.28***	0.11	0.73***	0.05	0.93	0.07
<b>Latrine (Sanitary Latrine)</b>						
Household has No Latrine	0.58***	0.06	1.31***	0.09	0.99	0.08
Household has Non Sanitary Latrine	1.96***	0.30	1.69***	0.20	1.65***	0.22
<b>Garbage (Bio-gas Plant, Manure Pit , Community Spot )</b>						
Individual Dumping Spot or Indiscriminate	1.55***	0.11	1.75***	0.11	1.36***	0.09
Other	0.88*	0.07	1.13*	0.07	0.87**	0.06
<b>Drainage (Closed Drainage)</b>						
Household has No Drainage	1.10	0.11	1.05	0.08	0.98	0.09
Household has Open Drainage	1.14**	0.07	1.01	0.06	0.99	0.06

Base Category – No Contribution, RRR – Relative Risk Ratio

N=29,836, Geographical (Region) dummies not reported. \*\*\*, \*\*, \* significant 1%, 5%, 10%

Water Sufficiency, Water Quality, Access Rights: Households reporting water sufficiency or satisfactory water quality are less likely to contribute labor and more likely not to contribute (corresponding RRRs are less than one). We also find that a household's access rights to water source, which in a way reflects the economic condition of the household, also influences the form of contribution. Of particular interest is the result that a household whose access rights to water source is open to the whole community is more likely to contribute labor instead of not contributing.

State of the Environment: We find that a worsening of the state of the environment (as reflected by whether the household reports problems relating to flies, odor and mosquitoes) increases the probability of the household contributing in some form rather than not contribute.

Sanitation: Access to a bathroom reflects not only improved sanitation facilities but also reflects the wealth of the household. The probability of a household with access to an attached or detached bath contributing labor is lower than the probability of such a household not contributing. This is probably capturing the fact that richer households have attached or detached bathrooms. We also find that households with an attached bath are more likely to contribute money rather than not contribute.

Availability of a latrine and the kind of drainage system available to the household reflects access to sanitary options for the household and we find that these do influence the probability of contribution by a household.

We find that the likelihood of a household with access to a non sanitary latrine making any form of contribution is higher than the probability of such households not contributing. Also, households with no access to a latrine are more (less) likely to contribute labor (money) instead of not contributing. These results reflect the unmet demand for sanitation. The difference in the results between households with a non sanitary latrine and no latrine can be attributed to the fact the households without a latrine are poorer and hence less likely to contribute money.

We find that a household, which dumps garbage indiscriminately, is more likely to contribute rather than not contribute.

While we find that the state of the environment, access to latrines and garbage location do explain the form of contribution, the coefficients associated with the type of drainage system available to the household come out insignificant in most cases. The fact that some indicators of sanitation (and in particular drainage) are poor predictors of willingness to contribute to projects is consistent with project implementation experience. There is evidence to suggest that demand for sanitation lags that for water. "Historical evidence suggests that demand for water and sanitation follows sequencing — water first, followed by sanitation and then demand for waste water treatment" (World Bank, 2004, p. 175).

### 3.2 The Multinomial Logit Model – Results (Rural)

We now discuss the results of the multinomial model for rural areas. When we estimate the model using data for all of rural India and including only the three region dummies (BIMARU, SOUTH, NORTHEAST) and the rural human poverty index the model does poorly in terms of prediction.<sup>12</sup> Consequently, we opted to classify the states into the following groups: the NORTHEAST states, the 11 states (excluding the north east states) that rank high on the human development index (HDI), the BIMARU states, and remaining states.<sup>13</sup> We estimate the model for each of these groups of states. In certain specifications, in order to partially address the issue relating to over prediction of labor we use the geographical dummies (as per the NSSO classification) within each state.

Given the large extent of heterogeneity in access to water and sanitation across the Indian states, there is a lot of variation in how the multinomial logit model performs across the different Indian states. Table 5 reveals how the model fares in terms of actual and predicted frequencies. For the states that rank high<sup>14</sup> on the HDI and the north eastern states<sup>15</sup> the model does well in terms of predicting the non contributors. In contrast, for the states ranking in the middle of the HDI and the BIMARU states, the model tends to under-predict no contributions. For the BIMARU states the model tends to over predict contribution of labor and under predicts all other forms of contribution and in particular contribution of money.

**Table 5. Actual (A) and Predicted (P) Frequencies**

	<i>Top HDI</i>		<i>North East</i>		<i>Mid HDI</i>		<i>BIMARU</i>	
	<i>A</i>	<i>P</i>	<i>A</i>	<i>P</i>	<i>A</i>	<i>P</i>	<i>A</i>	<i>P</i>
No	1632	1592	1446	1319	3824	1536	4167	1797
Money	1075	699	209	73	1045	344	873	94
Labor	2574	3501	2895	3584	10717	16014	11140	16909
Mix	2147	1636	1539	1113	2761	453	4766	2146
Total	7428	7428	6089	6089	18347	18347	20946	20946

We now discuss the results of the multinomial model for rural areas. Tables 6-9 provide estimates of RRR for each of the four groups of states.

<sup>12</sup> The model under predicts no contribution and contribution in the form of mix of money and labor by a wide margin and over-predicts contribution of labor.

<sup>13</sup> Since the north eastern states have had special programs we opt to treat them as a separate group. The BIMARU states constitute the poorest regions of India. The BIMARU states also rank low on the human development index. The remaining states are classified according to the states ranking high on the human development index and the ones in the middle of the rankings. The states and union territories that rank high on the human development index are Andaman and Nicobar Islands, Chandigarh, Daman and Diu, Delhi, Goa, Himachal Pradesh, Kerala, Lakshwadeep, Pondicherry, Punjab, Tamil Nadu henceforth referred to as top states. The north eastern states are Arunachal Pradesh, Assam, Manipur Meghalaya, Mizoram, Nagaland, Sikkim, Tripura - henceforth referred to as north east. The four relatively poorest states of India are Bihar, Madhya Pradesh Rajasthan, Uttar Pradesh - henceforth referred to as BIMARU and the remaining nine states are Andhra Pradesh, Dadra and Nagar Haveli Gujarat, Haryana, Jammu and Kashmir, Karnataka, Maharashtra, Orissa, West Bengal.

<sup>14</sup> For these states we do not use any geographical dummies.

<sup>15</sup> For the north eastern states we use the geographical dummies within each state.

**Table 6. Willingness to Contribute to Project in the Rural Areas (RRR) (Rural – Top)**

	<i>Money</i>		<i>Labor</i>		<i>Mix</i>	
	<i>RRR</i>	<i>S.E.</i>	<i>RRR</i>	<i>S.E.</i>	<i>RRR</i>	<i>S.E.</i>
<b>Sex of Household Head (Female), Household Size (Less than 4 members)</b>						
Household Head Male	0.81 **	0.09	1.45 ***	0.12	1.26 ***	0.11
# Household Members > 4	0.99	0.13	1.13	0.12	1.27 **	0.15
<b>Primary Occupation of Household (Self Employed Non Agriculture)</b>						
Agricultural Labor	0.42 ***	0.08	0.97	0.15	0.87	0.14
Other Labor (Fisheries)	0.55 ***	0.11	0.81	0.13	0.77	0.13
Self Employed Agriculture	0.81	0.14	0.66 ***	0.1	1.03	0.16
All Other Labor	0.83	0.14	0.54 ***	0.09	0.79	0.13
<b>Social Group (Other Social Groups)</b>						
Scheduled Tribe	0.44 ***	0.09	0.87	0.11	1.17	0.16
Scheduled Caste	1.58	0.92	1.36	0.41	0.85	0.3
Other Backward Caste	1.78 ***	0.2	1.06	0.11	1.23 **	0.13
<b>Existing Arrangements (No Timber Rights, Scheduled Castes Barred from Accessing CPR)</b>						
Households have Timber Rights	0.95	0.28	0.86	0.17	0.76	0.16
Scheduled Castes not Barred from CPR	2.6 ***	0.3	2.62 ***	0.27	2.16 ***	0.22
<b>Economic Status of Household (No TV, No Bank Account)</b>						
Own Color TV	1.16	0.18	0.52 ***	0.09	0.92	0.14
Own Black & White TV	0.99	0.13	0.81 **	0.09	1.11	0.13
Have Bank Account	1.74 ***	0.2	1.04	0.1	1.42 ***	0.14
Tubewell	0.89	0.12	0.85	0.1	0.77 **	0.1
Animal	0.98	0.11	1.32 ***	0.12	1.43 ***	0.14
Own Pump	1.16	0.19	1.42 **	0.21	1.46 ***	0.21
Total Land (Acres)	1.1 *	0.06	0.92	0.05	1.15 ***	0.05
<b>Water Availability (Insufficient), Quality (Unsatisfactory), Rights to Source (Exclusive)</b>						
Water Availability Sufficient	0.51 ***	0.06	0.71 ***	0.07	0.54 ***	0.06
Water Quality Satisfactory	0.6 ***	0.11	1.04	0.13	0.79 *	0.11
Access Right to Water Source Open to All	0.77 *	0.12	0.72 ***	0.09	0.68 ***	0.09
Share Access Right to Water Source	0.52 ***	0.08	0.69 ***	0.08	0.79 *	0.1
<b>State of Environment - Household does not Report any Problem w.r.t. Flies Odor or Mosquitoes</b>						
Reports any 1 Problem	1.91 ***	0.26	2.74 ***	0.33	1.82 ***	0.22
Reports any 2 Problems	1.76 ***	0.24	3.68 ***	0.41	2.09 ***	0.24
Reports all 3 Problems	4.76 ***	0.78	6.07 ***	0.84	4.76 ***	0.65
<b>Bath – (No Bath)</b>						
Household has Detached Bath	1.44 ***	0.2	0.95	0.11	0.95	0.12
Household has Attached Bath	0.96	0.17	0.52 ***	0.08	0.66 ***	0.1
<b>Latrine –(Sanitary Latrine)</b>						
Household has No Latrine	0.66 ***	0.09	1.1	0.13	0.76 **	0.09
Household has Non Sanitary Latrine	0.22 ***	0.09	0.8	0.24	0.39 ***	0.13
<b>Garbage Location– (Households Spot )</b>						
Biogas Plant \ Manure Pit	1.1	0.39	1.49	0.44	4.16 ***	1.05
Community Spot	1.93 **	0.54	0.73	0.18	1.25	0.32
Other	1.21	0.15	0.99	0.09	1.17	0.12
<b>Drainage - (Closed Drainage )</b>						
Household has No Drainage	0.74 *	0.12	1.41 **	0.2	1.05	0.15
Household has Open Drainage	0.6 ***	0.11	1.31 *	0.21	1.42 **	0.22

Base Category – No Contribution, RRR – Relative Risk Ratio

N=7,428 No Geographical Dummies Used. \*\*\* , \*\* , \* significant 1%, 5%, 10%

**Table 7. Willingness to Contribute to Project in the Rural Areas (RRR) (Rural – North East)**

	<i>Money</i>		<i>Labor</i>		<i>Mix</i>	
	<i>RRR</i>	<i>S.E</i>	<i>RRR</i>	<i>S.E</i>	<i>RRR</i>	<i>S.E</i>
<b>Sex of Household Head (Female), Household Size (Less than 4 members)</b>						
Household Head Male	1	0.24	1.01	0.11	0.78 **	0.1
# Household Members > 4	1.69	0.78	1.29	0.25	2.03 ***	0.5
<b>Primary Occupation of Household (Self Employed Non Agriculture)</b>						
Agricultural Labor	0.38	0.23	1.73 ***	0.37	0.42 ***	0.11
Other Labor (Fisheries)	0.3 *	0.2	2.59 ***	0.53	0.55 **	0.15
Self Employed Agriculture	1.93	0.86	2.6 ***	0.52	1.25	0.27
All Other Labor	2.55 **	0.97	1.2	0.27	0.7	0.16
<b>Social Group (Other Social Groups)</b>						
Scheduled Tribe	2.18 **	0.78	0.91	0.17	1.53 **	0.33
Scheduled Caste	0.62	0.27	0.95	0.17	1.11	0.25
Other Backward Caste	0.7	0.26	0.92	0.15	1.32	0.25
<b>Existing Arrangements (No Timber Rights, Scheduled Castes Barred from Accessing CPR)</b>						
Households have Timber Rights	0.28 ***	0.1	1.69 ***	0.33	0.77	0.15
Scheduled Castes not Barred from CPR	1.74 **	0.44	2.1 ***	0.29	1.49 ***	0.24
<b>Economic Status of Household (No TV, No Bank Account)</b>						
Own Color TV	0.39	0.24	0.36 **	0.17	1.12	0.47
Own Black & White TV	1.75 *	0.51	0.85	0.16	1.24	0.25
Have Bank Account	4.41 ***	1.47	2.28 ***	0.43	3.57 ***	0.71
Tubewell	1.3	0.47	0.51 ***	0.1	1.43 *	0.29
Animal	1.86 **	0.49	1.29 **	0.16	1.71 ***	0.25
Own Pump	0.16 *	0.15	2.57 **	1.04	1.84	0.94
Total Land (Acres)	0.73 **	0.11	0.9	0.04	0.88 **	0.05
<b>Water Availability (Insufficient), Quality (Unsatisfactory), Rights to Source (Exclusive)</b>						
Water Availability Sufficient	1.84	1.03	1.4 *	0.26	2.53 ***	0.58
Water Quality Satisfactory	0.3 ***	0.08	0.88	0.1	1.02	0.15
Access Right to Water Source Open to All	2.38 ***	0.71	1.16	0.17	1.47 **	0.26
Share Access Right to Water Source	0.39 **	0.17	0.62 ***	0.1	0.58 ***	0.11
<b>State of Environment - Household does not Report any Problem w.r.t. Flies Odor or Mosquitoes</b>						
Reports any 1 Problem	4.43 ***	2.07	3.29 ***	0.67	4.11 ***	1.01
Reports any 2 Problems	2.62 **	1.11	1.74 ***	0.28	2.09 ***	0.41
Reports all 3 Problems	39.7 ***	14.53	5.7 ***	0.91	9.96 ***	1.93
<b>Bath – (No Bath)</b>						
Household has Detached Bath	1.95 **	0.63	0.84	0.12	2.06 ***	0.36
Household has Attached Bath	4.35 ***	2.17	0.68	0.21	1.23	0.37
<b>Latrine –(Sanitary Latrine)</b>						
Household has No Latrine	2.05 *	0.89	0.94	0.14	1.07	0.19
Household has Non Sanitary Latrine	0.53 **	0.16	0.53 ***	0.09	0.43 ***	0.09
<b>Garbage Location– (Households Spot)</b>						
Biogas Plant \ Manure Pit \ Community Spot	0 ***	0	19.05 *	29.78	16.23 *	24.38
Other	0.93	0.24	0.68 ***	0.09	1.55 ***	0.23
<b>Drainage - (Closed Drainage )</b>						
Household has No Drainage	0.77	0.38	0.24 ***	0.06	0.2 ***	0.05
Household has Open Drainage	4.68 ***	2.32	1.32	0.32	1.08	0.29

Base Category – No Contribution, RRR – Relative Risk Ratio

N=6,089 Geographical (state region) dummies not reported. \*\*\*, \*\*, \* significant 1%, 5%, 10%

**Table 8: Willingness to Contribute to Project in the Rural Areas (RRR) (Rural – States Middle Rank HDI)**

	<i>Money</i>		<i>Labor</i>		<i>Mix</i>	
	<i>RRR</i>	<i>S.E.</i>	<i>RRR</i>	<i>S.E.</i>	<i>RRR</i>	<i>S.E.</i>
<b>Sex of Household Head (Female), Household Size (Less than 4 members)</b>						
Household Head Male	0.94	0.09	1.11**	0.05	1.11*	0.07
# Household Members > 4	1.73***	0.26	2.13***	0.15	2.29***	0.25
<b>Primary Occupation of Household (Self Employed Non Agriculture)</b>						
Agricultural Labor	0.43***	0.07	1.12	0.1	0.58***	0.07
Other Labor (Fisheries)	0.28***	0.07	0.94	0.11	0.48***	0.08
Self Employed Agriculture	0.79	0.12	0.86	0.08	0.88	0.1
All Other Labor	1.16	0.18	0.65***	0.07	0.83	0.11
<b>Social Group (Other Social Groups)</b>						
Scheduled Tribe	0.58***	0.08	1.12*	0.07	1.15*	0.1
Scheduled Caste	0.59***	0.11	0.94	0.06	0.64***	0.07
Other Backward Caste	0.75***	0.09	1.36***	0.08	1.19**	0.09
<b>Existing Arrangements (No Timber Rights, Scheduled Castes Barred from Accessing CPR)</b>						
Households have Timber Rights	1.62	0.71	1.49*	0.33	1.9**	0.52
Scheduled Castes not Barred from CPR	1.46***	0.16	1.99***	0.1	1.85***	0.14
<b>Economic Status of Household (No TV, No Bank Account)</b>						
Own Color TV	1.16	0.24	0.86	0.14	1.23	0.22
Own Black & White TV	1.68***	0.19	1.2***	0.08	1.47***	0.12
Have Bank Account	1.9***	0.19	1.14**	0.06	1.61***	0.11
Tubewell	1.16	0.17	1.18*	0.11	1.43***	0.16
Animal	0.67***	0.07	1.2***	0.06	1.35***	0.1
Own Pump	1.39**	0.22	1	0.09	1.13	0.13
Total Land (Acres)	1.08***	0.02	0.98	0.02	1.02	0.02
<b>Water Availability (Insufficient), Quality (Unsatisfactory), Rights to Source (Exclusive)</b>						
Water Availability Sufficient	0.59***	0.06	1.03	0.06	0.85**	0.07
Water Quality Satisfactory	3.12***	0.45	3.42***	0.34	2.23***	0.27
Access Right to Water Source Open to All	1.26**	0.15	1.17**	0.08	1.08	0.09
Share Access Right to Water Source	0.66***	0.1	1.24***	0.1	0.97	0.1
<b>State of Environment - Household does not Report any Problem w.r.t. Flies Odor or Mosquitoes</b>						
Reports any 1 Problem	1.28	0.21	2.16***	0.16	1.98***	0.22
Reports any 2 Problems	1.92***	0.27	2.23***	0.15	1.9***	0.19
Reports all 3 Problems	2.59***	0.36	2.38***	0.15	3.03***	0.28
<b>Bath – (No Bath)</b>						
Household has Detached Bath	1.05	0.14	0.57***	0.04	0.71***	0.07
Household has Attached Bath	1.42***	0.18	0.29***	0.02	0.51***	0.05
<b>Latrine –(Sanitary Latrine)</b>						
Household has No Latrine	0.53***	0.07	0.96	0.08	0.59***	0.06
Household has Non Sanitary Latrine	2.31*	0.59	2.68***	0.54	2.05***	0.46
Garbage Location– (Households Spot )						
Biogas Plant \ Manure Pit	0.41***	0.1	0.97	0.08	0.65***	0.08
Community Spot	1.18	0.24	0.76**	0.09	0.54***	0.1
Other	0.42***	0.06	0.6***	0.04	0.65***	0.06
<b>Drainage - (Closed Drainage )</b>						
Household has No Drainage	0.62***	0.08	0.75***	0.06	0.54***	0.05
Household has Open Drainage	1.42**	0.2	1.13	0.11	0.88	0.1

Base Category – No Contribution, RRR – Relative Risk Ratio

N=18,347 No Geographical Dummies Used. \*\*\*, \*\*, \* significant 1%, 5%, 10%



**Table 9. Willingness to Contribute to Project in the Rural Areas (RRR) (Rural – BIMARU)**

	Money		Labor		Mix	
	RRR	Std. Err.	RRR	Std. Err.	RRR	Std. Err.
<b>Sex of Household Head (Female), Household Size (Less than 4 members)</b>						
Household Head Male	0.87	0.08	1.19***	0.06	1.11*	0.06
# Household Members > 4	0.96	0.14	1.87***	0.15	2.75***	0.31
<b>Primary Occupation of Household (Self Employed Non Agriculture)</b>						
Agricultural Labor	0.31***	0.06	1.11	0.1	0.84*	0.09
Other Labor (Fisheries)	0.7	0.17	1.29**	0.16	1.02	0.16
Self Employed Agriculture	0.75**	0.11	1.08	0.09	1.35***	0.13
All Other Labor	0.83	0.15	0.74***	0.08	1.15	0.15
<b>Social Group (Other Social Groups)</b>						
Scheduled Tribe	0.51***	0.08	1.51***	0.09	1.02	0.08
Scheduled Caste	0.76*	0.12	1.13	0.09	0.8**	0.08
Other Backward Caste	0.75***	0.08	1.41***	0.08	1.24***	0.08
<b>Existing Arrangements (No Timber Rights, Scheduled Castes Barred from Accessing CPR)</b>						
Households have Timber Rights	3.76***	1.43	6.68***	1.61	4.66***	1.14
Scheduled Castes not Barred from CPR	0.92	0.1	0.93	0.05	0.86**	0.06
<b>Economic Status of Household (No TV, No Bank Account)</b>						
Own Color TV	4.64***	1.71	1.37	0.45	2.5***	0.78
Own Black & White TV	1.21	0.15	0.92	0.07	1.39***	0.12
Have Bank Account	2.28***	0.24	1.2***	0.07	1.75***	0.12
Tubewell	1.16	0.15	1.23***	0.09	1.07	0.09
Animal	0.9	0.1	1.22***	0.06	1.16**	0.07
Own Pump	0.88	0.13	0.7***	0.06	0.82**	0.07
Total Land (Acres)	1.07***	0.02	0.98	0.01	1.03***	0.01
<b>Water Availability (Insufficient), Quality (Unsatisfactory), Rights to Source (Exclusive)</b>						
Water Availability Sufficient	0.83	0.16	0.84**	0.07	0.9	0.09
Water Quality Satisfactory	1.03	0.17	1.26***	0.1	2.06***	0.18
Access Right to Water Source Open to All	0.65***	0.08	1.22***	0.08	0.96	0.07
Share Access Right to Water Source	0.72***	0.09	0.99	0.07	0.9	0.07
<b>State of Environment - Household does not Report any Problem w.r.t. Flies Odor or Mosquitoes</b>						
Reports any 1 Problem	1.14	0.17	1.17**	0.09	1.36***	0.13
Reports any 2 Problems	1.26*	0.16	1.58***	0.11	1.45***	0.12
Reports all 3 Problems	1.43***	0.18	1.86***	0.13	1.8***	0.16
<b>Bath – (No Bath)</b>						
Household has Detached Bath	1.25	0.23	0.83	0.1	1.14	0.15
Household has Attached Bath	1.7**	0.39	1.3	0.22	2.65***	0.49
<b>Latrine –(Sanitary Latrine)</b>						
Household has No Latrine	0.58***	0.1	0.89	0.11	0.89	0.12
Household has Non Sanitary Latrine	0.54**	0.16	0.62***	0.12	0.91	0.19
<b>Garbage Location– (Households Spot )</b>						
Biogas Plant \ Manure Pit	0.97	0.15	0.98	0.08	1.65***	0.14
Community Spot	0.63	0.22	0.68**	0.12	1.15	0.21
Other	0.3***	0.04	0.45***	0.02	0.31***	0.02
<b>Drainage - (Closed Drainage )</b>						
Household has No Drainage	0.61***	0.09	1.18**	0.1	0.81**	0.07
Household has Open Drainage	0.62***	0.08	1.19***	0.09	0.9	0.08

Base Category – No Contribution, RRR – Relative Risk Ratio

N=20,946. Geographical (state region) dummies not reported. \*\*\*, \*\*, \* significant 1%, 5%, 10%

As in the case of urban areas, we find that household size, household occupation and ownership of assets explain the form of contribution. Water availability and access rights affect the form of contribution. Across all regions, we find that a worsening of the state of the environment makes the households more likely to contribute in some form rather than not contribute. As in the case of urban areas, we find that access to sanitation selectively explains the form of contribution.

Before elaborating on the above results, we focus on the three key variables, viz. ownership of land, access rights of minorities to common property resources and whether households enjoy timber rights, for which information is available only for rural areas. Except in the case of the north east states (Table 7), for all other regions we find that households owning land are more likely to contribute money rather than not contribute (Tables 6,8,9). Thus richer households are more likely to contribute money rather than not contribute. In particular, for the rural areas, we find that except in the BIMARU states (Table 9), in all other regions (Tables 6-8), allowing minorities (scheduled castes) access to common property resources increases the likelihood of contribution.

Poorer households benefit from timber rights and we see that such households are more likely to contribute labor rather than not contribute. For the states ranking high on the HDI, timber rights do not explain the form of contribution (Table 6). In the north eastern states nearly 29 percent of households have timber rights and we find that a household having timber rights is more likely to contribute labor rather than not contribute (Table 7). We find a similar result for the states ranked in the middle of the HDI and the BIMARU states (Table 8-9).

We now briefly discuss the results for the states that rank high on the human development index (Table 6). Given that scheduled castes and scheduled tribes do not have substantial presence in these states,<sup>16</sup> we do not find many of the social group variables to be significant. If the household is headed by a male then this household is more likely to contribute mix of money and labor rather than not contribute. We find that a household with more than four members is more likely to contribute mix of money and labor rather than not contribute. The probability of a household contributing labor is higher than the probability of not contributing if the household's primary occupation is agricultural labor or works as a laborer in the fisheries sector. The results back up the results we found with the urban data. Households whose primary occupation is not wage labor have a higher opportunity cost of time and hence are unwilling to contribute labor.

<sup>16</sup> Over 80 percent of SC households live in the following nine states: Uttar Pradesh, West Bengal, Bihar, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Maharashtra, Rajasthan, Karnataka. Nearly 90 percent of the ST households live in the following states: Madhya Pradesh, Maharashtra, Orissa, Bihar, Gujarat, Rajasthan, Andhra Pradesh, West Bengal, Assam, Karnataka. Except for Tamil Nadu, these states are ranked in the middle of the HDI or at the bottom of the HDI rankings. Hence the caste variable should come out significant for the states ranked in the middle of the HDI and the BIMARU states. This is exactly what we find to be the case. If a household belongs to any minority group - SC, ST or OBC - then the probability of such a household contributing money is lower than the probability of these households not contributing (Tables 8, 9). Also, the ST have a presence in the north eastern states. We find the coefficient associated with this variable significant for the north eastern states (Table 7).

Once again the economic status of the households does explain the form of contribution. Households owning a color television or black and white television are more likely not to contribute rather than contribute labor. We also find that RRRs for a household with a bank account contributing money or mix of money and labor (instead of not contributing) are greater than one.

Households' reporting water sufficiency are less likely to contribute in any form and are more likely not to contribute. If a household reports water quality as satisfactory then the probability of it contributing money or mix of money and labor is lower than the probability of this household not contributing. In contrast to households having exclusive access to their water source, we find that households whose access rights to water source is open to the whole community or selectively share the rights to water source with others are less likely to contribute in any form.

Similar to the results in the case of the urban areas, we find that a worsening of the state of the environment increases the probability of household contributing in some form rather than not contributing. As in the case of the urban areas, we find that the probability of a household with an attached bath contributing labor is lower than the probability of it not contributing. This reflects the fact that richer households have attached bathrooms.

We find that the probability of a household without access to a latrine or with access to a non sanitary latrine contributing money or mix of money and labor is lower than the probability of such a household not contributing. This is probably due to the fact that households with a non sanitary latrine or no latrine are poorer and hence less likely to contribute money. We find a similar result with regard to households' existing drainage system. The probability of a household without access to a drainage system or with access to open drainage contributing money is lower than the probability of such a household not contributing. These households are more likely to contribute labor rather than not contribute. As discussed in the context of the urban areas, some indicators of sanitation are poor predictors of willingness to contribute to projects.

The results of the empirical exercise suggest that there is potential and scope for the success of demand driven projects in India. Firstly, we find evidence in favor of households' willingness to contribute to public projects. Data available as part of Census 2001 provides information on the percentage of households having access to water and sanitation facilities nationwide. From this data, one can identify the regions where there is an underlying demand for improved water and sanitation facilities. These regions would be ideal candidates for piloting decentralization programs. Secondly, we shed light on the issue of form of contribution to public projects. After controlling for the demand shifters, we found that poorer households are more likely to contribute labor rather than not contribute. Our analysis showed that occupation of the households and asset ownership help explain the form of contribution. Information on occupational profile and ownership of assets which is available as part of the Census 2001 data could be used for identifying the relatively rich and poorer regions within each state.

The above analysis suggests that a one-policy-fits-all approach cannot be adopted by the state governments while fixing contribution levels in the context of public projects. The state governments could allow the contribution shares to vary across the state and the shares could be determined on the basis of the occupational profile and ownership of assets in each geographical

region within each state. As mentioned earlier, in the state of Maharashtra the government bears 90 percent of the cost of a new water supply or sanitation scheme, users make upfront cash payment of 5 percent and the remaining 5 percent in the form of cash or labor. It is possible that in the poorest regions of Maharashtra, households might not be able to contribute their share in the form of money. Faced with the prospect of contributing money, the poorer households might opt not to contribute at all, thereby undermining the effectiveness of demand driven initiatives. To expect poorer households to contribute money towards operations and maintenance expenses might also prove to be unrealistic. It is entirely possible a newly implemented water system might fall into disuse on account of lack of funds for maintenance.

#### 4. Discussion and Conclusions

In the recent past there has been growing interest in issues relating to community-based and community-driven development. Governments and multilateral institutions have also veered towards the view that community action is necessary in the provision of public goods like water supply and sanitation services. The World Bank is estimated to have funded \$7 billion worth of community-based and community-driven projects (Mansuri and Rao 2004).

In this paper we use a large nationwide data from India and empirically address the issue relating to form of contribution to public projects. We find that after controlling for existing access to and adequacy of water and sanitation facilities, the economic status of the household as reflected by its primary occupation and asset ownership explains the form of contribution. The odds of monetary contribution are higher for households owning assets and whose primary occupation is not casual labor. Richer households are more likely to contribute money while poorer households are more likely to contribute labor, rather than not contributing. We also find differences in willingness to contribute across the minority groups. More importantly, we find that if households participate in existing programs then this has a positive influence on willingness to contribute. Also, in certain states we find that allowing minorities access to common property resources increases odds of contribution.

We find that harsh living conditions leads to an increase in willingness to contribute. We also find that a worsening of the state of the environment or water insufficiency increases the odds of contribution. This is consistent with findings in the project implementation literature (World Bank, 2003a, p. 11).

For the analysis relating to the urban areas we did not have to control for state specific differences, while for the rural data set we had to classify the states according to the human development index and also include district dummies. One way to satisfactorily address the issue of having too many geographical dummies is to have some village level controls on programmes already implemented. But we did not have any information on programmes implementation in the data set.

The model does well for states that rank high on the human development index, the northeast. The model does poorly however, for the remaining states and the BIMARU states. The model over predicts labor contribution in these states and this could be because of the

relatively economic backwardness of these regions. Also its well knows that there are issues related to (poor) governance in these states, an issue we do not address here.

Eventually, in addition to governance it is important to change the mindset of the consumers from passive users to critical users, a change that is integral to the decentralization process. A beginning has been made with the users being made to recognize that water is not a free commodity. Closely related to willingness to contribute is sustainability of projects. The analysis suggests that occupation profile and asset ownership would provide clues on sustainability of projects across the geographical regions of India. There is a need for recognizing differences across the states of India and differences across minority groups while decentralizing projects.

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