

# Time Use of Urban Poor and Rural Poor on Activity and Travel in Gujarat, India: Similarities and Differences

Makoto CHIKARAISHI <sup>a</sup>, Arnab JANA <sup>b</sup>, Ronita BARDHAN <sup>c</sup>, Akimasa FUJIWARA <sup>d</sup>

<sup>a,d</sup> *Graduate School for International Development and Cooperation, Hiroshima University, 1-5-1, Kagamiyama, Higashi-Hiroshima 739-8529, Japan*

<sup>b,c</sup> *Centre for Urban Science and Engineering, Indian Institute of Technology Bombay, Powai, Mumbai-400 076, India*

<sup>a</sup> *E-mail: chikaraishim@hiroshima-u.ac.jp*

<sup>b</sup> *E-mail: arnab.jana@iitb.ac.in*

<sup>c</sup> *E-mail: ronita.bardhan@iitb.ac.in*

<sup>d</sup> *E-mail: afujiw@hiroshima-u.ac.jp*

**Abstract:** This paper explores the impact of being poor on time use decisions and its similarities and differences between urban and rural areas in Gujarat, India. For this purpose, we develop a series of discrete-continuous time use models, including models on (1) mobile/immobile choice and the time allocated to travel, (2) time use of subsistence activities, and (3) time use of social and leisure activities. The empirical results show that (1) while a number of similar impacts of being poor are confirmed between urban and rural areas, the significant differences are also observed possibly due to the different labor needs in urban (tertiary) versus rural (primary) areas, infrastructure differences (such as road and water supply), and so on. Our results are evident that, although the meaning of “poor” from the income/expenditure perspective may not be different between urban and rural areas, it is unignorably different from the perspective of time use.

*Keywords:* Time use, Urban-rural comparison, Gujarat, Poverty

## 1. INTRODUCTION

Time is a limited resource (Becker, 1965; Juster and Stafford, 1991). An individual’s activity pattern depends upon their time use decision (Bhat, 1999). Socio-economic conditions, built environment, neighborhood characteristics, available transportation systems and intrinsic parameters such as education, age, gender and employment significantly affects time-use. This further varies with respect to the urban and rural divide. This study focusses on time –use in Gujarat India, with an attempt to analyze the similarities and differences among of being urban and rural poor.

One of the critical aspects of the rural-urban divide especially in Indian context is the associated disparity and social seclusion. It is undeniable that income poverty is high in rural areas than in urban. This disparity leads to the pull factor in urban areas which attracts people from rural areas to migrate to the apparently richer urban areas. As per census of India, an urban area is defined by 75% of population engaged in tertiary sector. By far Indian urbanization has been a migration phenomenon. People migrate to urban areas in expectation of increased income, better livelihood and high quality of life. But lack of adequate skill sets of tertiary sector jobs, unaffordable living standards forces these migrants to settle in slums and squatters, without access to the basic requirements of life. This in turn pushes them

towards higher inequality and increased income poverty. Hence, the urban-rural differences cannot be simply explained by comparing the average income differences. A poor in urban area may even earn more than the poor in rural area who generally is engaged in agricultural pursuit. The agriculture producer in rural area may earn less due to several reasons like misinformed and inappropriate price of his produce or share contribution to the middleman involved in selling the produce. However, it does not directly translate to lower living standards in rural area. Thus, apart from income, poverty needs to be assessed through other non-income parameters to explore the rural-urban disparity and social seclusion. One of the accepted indicators of depravity is time poverty (Bardasi and Wodon, 2006; Saboor et al., 2015). It means that if a person spends more time in non-economic activities than economic activities then he might be pushed into poverty. Often lack of support infrastructure induces such time poverty. Hence, policy discussions should be made through comprehensive understanding of the similarities and differences of time use induced disparity and social seclusion.

Under this pretext, the study aims to explore the non-income aspects of urban –rural differences and similarities in Gujarat, India through time use patterns. We particularly focus on explaining the similarities and differences of being poor in rural from urban India. We argue that the time use of an individual to a particular activity translates to poverty. Although time use in itself doesn't indicate the disparity and social exclusion we could have richer insights on these issues through a better understanding of time use, which could be the basis of policy debates. In the next section, we explain the meaning of poverty in India, time use induced poverty, the current situations in India, and why time use studies are needed to look at disparity and social exclusion issues. Section 3 introduces the current situations in Gujarat, the target state of this study. Section 4 briefly introduces data used, and gives some basic statistics. In Section 5, we introduce time use models of (1) mobile/immobile choice and travel time, (2) time use on subsistence activities, and (3) time use on social and leisure activities. Section 6 presents and discusses estimation results of these models. Section 7 summarizes the findings of this study and future tasks.

## **2. LITERATURE REVIEW**

### **2.1 Meaning of Poverty in India**

Poverty is both a relative and absolute term (Blackden and Wodon, 2006). In India several attempts had been made to determine the absolute value of poverty, primarily estimated based on minimum level of expenditure and nutrition intake (Bandyopadhyay, 2010). According to Planning Commission of India, 1977, poverty was defined on per capita consumption expenditure level, required to meet the average per capita daily calorie requirement of 2400 kcal in rural areas and 2100 kcal in urban areas along with quantum of expenditure on non-food items. The 1977 prices for the prescribed calorie intakes were determined as INR.49.09 and INR.56.64 per capita per month for rural areas and urban areas respectively. However, these values were highly criticized because of its rigid assumption of considering all the population as homogeneous and also the estimate was based on a data collected using a uniform recall period of 30-days. Sen (1974) underscored that it is unlikely for all age groups across all gender, in urban and rural will require the specified calorie intake. In 1999-2000, an updated method of separate recall periods for food and non-food items were used for capturing total consumption based expenditure. For food items a 7 day recall periods were used along with the 30 day recall for both food and non-food. It was also for the first time the

data was apportioned state wise to determine the state-specific poverty lines. Based on this INR 327.56 per capita per month for rural areas and 454.11 per capita per month for urban areas were fixed as the the estimated poverty line of India. In this study we have used these values apportioned for the state of Gujarat at INR 318.94 and INR 474.41 per capita per month for rural and urban respectively, to segregate the poor from non-poor (Planning Commission of India, 1979&1993).

## **2.2 Time Use Induced Poverty**

Time use pattern has a significant correlation to an individual's economic output which in-turn determines the poverty burden. Time poverty is the "burden of competing claims on individual's time" (Kes and Swaminathan ,2005). Effectively, it reduces the degrees of freedom to make unconstrained choice of allocating time for activities leading to trade-offs among activities (in Blackden and Wodon (2006), p16). These compromises are often observed as reduced time for subsistence activity leading to induced poverty. Such variation is stark when gender is considered. Women are more time pressed than men. Especially in India traditional customs make household maintenance activities mandatory for women hence leaving them less time to participate in economic activities. Moreover, lack of basic infrastructure and inability of the poor to invest in modern time saving HH appliances aggravates the time needed to be dedicated for maintenances like collection of water and fetching of firewood for cooking and so on (Antonopoulos and Memis, 2010). Thus in essence time poverty is a dimension that implicates on the welfare (Blackden & Wodon, 2006).

Although multiple studies have looked into time use behavior in developed countries (e.g., Kitamura, 1984; Yamamoto and Kitamura, 1999; Goulias, 2002; Bhat, 2005; Chikaraishi et al., 2010), but not many look into the implication of such time poverty in transportation field especially in developing countries. Although some researchers point out the importance of time use analysis to explore transportation-related social exclusion which may be crucial in developing countries (e.g., Lyons, 2003; Chikaraishi et al., 2008; Kantor, 2009), little empirical evidence exists.

## **2.3 Disparity and Social Exclusion Issues in India**

One of the biggest concerns in India is gender issues. The social norms persistent in the societal schema of India restrict the scope of adult urban poor women participation in out-of-home activity. Women generally have to perform compulsory in-home and out-of-home household maintenance activities before participating in out-of-home subsistence activity. This time poverty (Narayan and Petesch, 2009) diminishes their ability to make unrestrained choices of time provision which often leads to trade-off among tasks. Moreover if the outcome of subsistence activity is insufficient for hauling the family out of poverty, then her out-of-home activity does not stand justified (Kantor, 2009). Hence discontinuation of participation in income generation through out-of-home activity is often observed. 'Low marriage age' and 'boy-child aspiration' results in low education and multiple child births (Raj et al., 2009; Maertens, 2013). These factors affect adversely on the entitlement of women for high quality of employment. Further it is observed that child mortality is higher for employed mothers (Basu and Basu, 1991). The juxtaposition of social notion with impaired mobility (Tiwari, 2002; Srinivasan and Rogers, 2005) leads adult urban poor women to be dependent on near home or home-based work location for economic activity.

Socioeconomic differentials in female labor force participation shows lower women

employment with growing affluence and higher employability of unmarried girls in compared to adult women (Sundaram and Vanneman, 2008). Comparison of rural to urban workforce participation shows that while more women in rural areas are engaged in agricultural activities, urban employment consists of household maid servant, helping labor force in construction industry, or in-home manufacturing industry. The choice to work reflects number of concerns like life-cycle factors, high women's time demand for household responsibilities, socio-economic status, and employment conditions (Salway, 2003). Hence the chosen opportunities are dependent on residential location, time stress, and the availability of transportation.

It was argued that apart from economic affluence, education and health, time use pattern plays a pivotal role in determining the welfare (Hirway, 2005). On the other hand, time use statistics should be carefully understood. For example, unemployment often leads to forced leisure activity (hence discouraged workers) while voluntary leisure activity is often accounted as well-being (Hirway, 2007), indicating that time use should be understood with a careful examination of the underlying reasons. This would be especially true when we focus on time use in developing countries.

The multi-dimensional aspects of the urban-rural differences in India have different facets. Considerable differences in allocation of time can be attributed to the geographical and social context, such as (1) in rural areas households being mostly associated with agricultural activities; the children often start early to share responsibilities. Preference is given to activity in the field against the overlapped time window of education (Agrawal, 2014). (2) In terms of availability and quality there is a considerable amount of inequality of education, health and job opportunity (Asadullah and Yalonetzky, 2012), prompting out-of-home travel to engage in desired activity. (3) Opportunity for women to participate in subsistence activity reduces due to time poverty (such as fetching drinking water from sources away from their home), social stigma and lack of opportunity suiting the given skill sets.

The above mentioned situations in India indicate that there is a need to study on time use in India to design policies which targets basic services and public infrastructure for alleviating disparities and social exclusion.

## **2.4 Existing time use models**

In developing a framework on time use analysis, there would be at least three important aspects that need to be considered. First, time use consists of (1) whether individuals participate in a certain type of activity or not (activity participation), and (2) if participating, how much time individuals allocate to the activity (time allocation or activity duration). Although there are several time use models that do not consider the activity participation, recent studies clearly indicate the importance of looking at both activity participation and time allocation simultaneously, for example, by using discrete-continuous time use models (e.g., Kitamura, 1984; Bhat, 2005). This is especially important when we look at social exclusion issues. For example, those who have a difficulty to access to water may less participate in water collection activities, but may spend more time on each water collection. Such kind of phenomena can only be analyzed only when we focus on both aspects.

Second, time use models which can deal with both activity participation and time allocation simultaneously can be broadly classified into (1) structural type models derived from microeconomic theory and (2) statistical models which mainly focus on detailed behavior descriptions (Fukuda and Chikaraishi, 2013). The former structural type models are mostly derived from either Roy's identity (e.g., dubin and McFadden, 1984) or Karush-Kuhn-Tucker (KKT) condition (e.g., Bhat, 2005) with the assumption that individuals

maximize their utility with time constraints (i.e., 24 hours per day). Although this type of time use models is theoretically sound, the problem is in its flexibility: the same utility function should be applied to describe both activity participation and time allocation (i.e., activity participations are modeled as the results of corner solutions in optimizing time allocation). The latter statistical models, for example developed based on type II tobit model (e.g., Kitamura, 1984), are not strictly consistent with the microeconomic theory, but are more flexible in terms of behavioral description. In this sense, for a better understanding of time use behavior, statistical models could be superior to structural type models, though structural type models may be better when the first priority of the analysis is maintaining the consistency with the microeconomic theory. This study applies the type II tobit model, since the purpose here is not to develop the model that is consistent with economic theory, but rather to understand disparity and social exclusion issues in India from the perspective of time use.

Third, broadly speaking, there are two different types of activity classifications. First, activities are classified into in-home and out-of-home (e.g. Kitamura, 1984; Yamamoto and Kitamura, 1999). This is natural when our main interest is in travel behavior, since the role of travel is basically in connecting in-home activities with out-of-home activities. Second, activities are classified based on the type of activities, such as subsistence, maintenance, leisure, social and so on (e.g., Goulias, 2002). This type of activity classification may be useful to obtain a picture of their daily life, though the classification depends on the purpose of the analysis (Doherty, 2006). Some of the disparity and social exclusion issues can only be understood when we focus on both types of activity classifications. For example, in order to shed light on the issue of restriction on women participation in out-of-home subsistence activities, activities should be classified based on both in-home/out-of-home and activity types.

Hence, this study develops statistical discrete-continuous models to describe time use behavior, where activities are classified based not only on activity types, but also on in-home/out-of-home/travel.

### **3. STUDY AREA – GUJARAT, INDIA**

Gujarat is located at the westernmost portion of India. According to Census of India, Gujarat had a total population of 50,671,000 in 2001, which increased to 60,383,628 in 2011 with a decadal growth rate of 1.9% a year. However, the state has one of the lowest sex ratios of 918 girls per 1000 boys.

Gujarat is one of the prosperous states in the country. In 2000-01 the per capita income of the state was INR 12,975. The state has shown an increasing trend in growth from 3.32 percent in 1960s to 4.95 in the 70s to 5.67 in the 1980s and 90s (Hirway, 2000). The per capita net State Domestic Product was INR 17,227 in 2000-01, INR 32,021 in 2004-05 and INR 52,708 in 2010-11. In 1901 the total urban population of the state was 2.03 million which has increased to 25.7 million in 2011. According to Kundu (2000), the pace of urbanization varies across district but the disparity is not as high as compared to other states like Bihar and Orissa. Further it was reported that the spatial patterns of rural and urban poverty have no correlation, these are not linked through the dynamics of development in the region.

The urban rural poverty ratio in the state has been 0.7 in 1987-88, 0.8 in 1993-94 and remained 0.8 in 1999-2000. The rural poverty by headcount ratios shows that in 1987-88, in the drier region the figure was highest at 46.9 which decreased to 23.5 in 1993-94. It was lowest in Saurashtra (coastal region of Gujarat), the figures being 18.9 and 10.0 for 1987-88 and 1993-94 respectively. On the other hand, in case of urban poverty by head count

Saurashtra recorded the highest figure being 53.8 in 1987-88 and 34 in 1993-94. Gujarat has more poor in urban areas than the rural areas. This can be attributed to the increased migration to the urban centres from the rural areas. The drier areas and the tribal areas show higher incidence of poverty. “The Saurashtra region is particularly vulnerable to poverty and the northwestern dry regions are more affected in the years of drought” (Unni, 2013). Work participation rate for male was higher for Gujarat than for the country both in rural and urban areas, while female was lower particularly in urban area (11.4 in comparison to 15.4 of whole India in 2011).

## **4. TIME USE DATA AND DESCRIPTIVE STATISTICS**

### **4.1 Data**

In this study, we use time use data collected by the Ministry of Statistics and Programme Implementation (MOSPI) Government of India for Gujarat during the period July, 1998 to June, 1999.

The survey collected data pertaining to household characteristics, demographic and economic details, and activity pattern of the household members and time disposition on selected days of the week. Data were collected for three types of days namely, normal, weekly variant and abnormal to capture the variation in the activity pattern. Data for each type of these days were collected with a recall lapse of only one-day. For the current study, we only focus on time use on a normal day, since it would best describe their everyday life. Questionnaire based interviewing method of data collection was adopted on randomly selected household. In Gujarat, the valid sample was 3,161 households (11,789 individuals: 5,560 from urban residents and 6,229 from rural residents). Further, as per MOSPI a three-stage stratification sampling design was adopted ; the first stage stratification was at district level, second stage involved urban/rural blocks and the third stage was at household level. Stratification was further formulated based on population density and proportion of different section of society to reduce bias.

Based on the literature review, the following activity classification was adapted for the current study:

1. Subsistence: consisting of primary production activities, secondary activities, trade, business and services and learning
2. HH maintenance: consisting of household maintenance, management and shopping for own household, and care for children, the sick, elderly and disabled for own household.
3. Social and leisure: consisting of community services and help to other households and social and cultural activities, mass media, etc.
4. Personal maintenance: consisting of personal care and self-maintenance.

For each activity, we further subcategorize the activity as (1) in-home, (2) out-of-home, and (3) travel (for that particular activity type). The given dataset did not contain the detailed spatial information (such as residential location at the municipality level), transportation and other related information; hence, we could not include them in the analysis. This is the limitation of our study. However, analyses of just time use might give additional insights into the disparity.

## 4.2 Descriptive Statistics on the Time Use of Urban Poor and Rural Poor

Table 1 and Table 2 describe the time-use of urban and rural poor and non-poor in Gujarat, India respectively. A vast difference can be confirmed in social and leisure activities in both urban and rural areas. A major difference was observed in case of in-home social and leisure activity. 103.6 [37.9] minutes was found for urban non-poor against 68.8 [24.7] minutes for urban [rural] poor. On the other hand, urban poor outperforms in out-of-home social and leisure activity spending 39.9 minutes as compared 33.3 minutes of urban non-poor, while rural poor spent less time on out-of-home social and leisure activity but spent more time on traveling. This possibly can be attributed to longer distance to the leisure destinations in rural area. In general it was observed that urban non-poor were engaged for 320.2 minutes (68.8%) in subsistence activity, whereas urban poor involvement was for 316.2 minutes (73.0%). Ironically, urban non-poor traveled more compared to urban poor, presumably because urban poor may not be able to afford multiple mode choices and hence rely on walking only. Statistically, no significant difference in total subsistence activities was found among rural poor. In urban area, in-home HH maintenance activity took similar amount of time and participation ratio for both urban poor and non-poor, while rural poor engaged more in in-home HH maintenance. On the other hand, both urban and rural poor spent less time on out-of-home HH maintenance. The trend observed for time use in out-of-home personal maintenance shows that urban poor spent more time in comparison to non-poor, while rural poor spent less time than their non-poor counterpart. To examine the influential factors that induce these differences, we develop a series of time use models.

Table 1. Time use of urban non-poor and urban poor

	Total		In-home		Out-of-home		Travel
	Activity duration [min]	Activity participation [%]	Activity duration [min]	Activity participation [%]	Activity duration [min]	Activity participation [%]	Travel time [min]
Urban non-poor							
Subsistence	320.2	68.8	45.6	31.9	240.4	58.0	34.2
HH maintenance	180.9	57.4	158.7	53.0	15.6	25.6	6.6
Social and leisure	139.8	81.9	103.6	76.5	33.3	26.5	2.9
Personal maintenance	799.2	100.0	758.4	100.0	39.4	47.6	1.4
Urban poor							
Subsistence	316.2	73.0	48.6	33.6	237.7	58.9	29.9
HH maintenance	181.1	56.1	161.3	53.7	12.2	20.8	7.5
Social and leisure	111.0	63.2	68.8	53.4	39.9	23.9	2.3
Personal maintenance	831.7	100.0	785.1	100.0	45.2	51.4	1.5
Differences							
Subsistence	-4.0	4.2*	3.0	1.7	-2.7	1.0	-4.3*
HH maintenance	0.2	-1.3	2.7	0.6	-3.4**	-4.8**	0.9
Social and leisure	-28.8**	-18.7**	-34.8**	-23.0**	6.6+	-2.6	-0.6
Personal maintenance	32.5**	0.0	26.7**	0.0	5.7+	3.7+	0.1

Notes) \*\* significant at  $p < 0.01$ ; \* significant at  $p < 0.05$ ; + significant at  $p < 0.10$ . Welch's t-test is used for activity duration and travel time, and Pearson's  $\chi^2$  test is used for activity participation.

Table 2. Time use of rural non-poor and rural poor

	Total		In-home		Out-of-home		Travel
	Activity duration [min]	Activity participation [%]	Activity duration [min]	Activity participation [%]	Activity duration [min]	Activity participation [%]	Travel time [min]
Rural non-poor							
Subsistence	366.6	85.6	43.2	38.7	282.2	77.8	41.2
HH maintenance	169.7	58.9	137.9	53.8	20.2	29.7	11.6
Social and leisure	84.3	52.3	37.9	35.1	45.4	32.0	1.0
Personal maintenance	819.3	100.0	744.9	100.0	73.3	75.4	1.1
Rural poor							
Subsistence	363.7	87.5	44.8	43.0	275.7	78.3	43.2
HH maintenance	159.0	62.0	132.5	59.2	18.3	26.4	8.2
Social and leisure	65.0	36.6	24.7	21.4	38.4	24.6	1.9
Personal maintenance	852.3	100.0	795.7	100.0	54.8	64.9	1.8
Differences							
Subsistence	-3.0	1.9	1.6	4.3*	-6.5	0.5	2.0
HH maintenance	-10.7	3.2+	-5.4	5.4**	-1.9	-3.3+	-3.3**
Social and leisure	-19.3**	-15.6**	-13.2**	-13.6**	-7.0*	-7.4**	0.9+
Personal maintenance	33.0*	0.0	50.8**	0.0	-18.4**	-10.5**	0.6

Notes) \*\* significant at  $p < 0.01$ ; \* significant at  $p < 0.05$ ; + significant at  $p < 0.10$ . Welch's t-test is used for activity duration and travel time, and Pearson's  $\chi^2$  test is used for activity participation.

## 5. MODELING TIME USE BEHAVIOR

We use the following models to describe the differences:

1. A model of mobile/immobile choice and time allocation to travel
2. Time use model for total subsistence activities (in-home + out-of-home + travel)
3. Time use model for out-of-home subsistence activities (out-of-home + travel)
4. Time use model for total social and leisure activities (in-home + out-of-home + travel)
5. Time use model for out-of-home social and leisure activities (out-of-home + travel)

These models are developed for urban and rural areas separately (i.e., in total 10 models are developed) based on a Type II tobit model. Our approach here is relatively novel in two ways. First, we develop two time use models for each activity type (one consists of time use on in-home, out-of-home and travel, and the other consists of time use only on out-of-home and travel), since the inclusion/exclusion of in-home activity causes unignorable differences in describing a picture of time use behavior as discussed in Section 2. Second, we set a different parameter for each influential factor between poor and non-poor, giving a picture of poor/non-poor differences in greater details.

In the type II tobit model, whether participating in the corresponding activity or not is modeled as:

$$y_{li} = \begin{cases} 1 (= \text{Participate}) & \text{if } u_{li} > 0 \\ 0 (= \text{Not participate}) & \text{if } u_{li} \leq 0 \end{cases} \quad (3)$$



$$u_{1i} = x'_{1i}\alpha_1 + z'_{1i}(\beta_1 + \delta_i\gamma_1) + e_{1i} \quad (4)$$

And, if participate, the amount of time spent on the corresponding activity is modeled as:

$$y_{2i} = \begin{cases} u_{2i} & \text{if } u_{1i} > 0 \\ 0 & \text{if } u_{1i} \leq 0 \end{cases} \quad (5)$$

$$u_{2i} = x'_{2i}\alpha_2 + z'_{2i}(\beta_2 + \delta_i\gamma_2) + e_{2i} \quad (6)$$

where

$$\begin{pmatrix} e_{1i} \\ e_{2i} \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \sigma_{12} \\ \sigma_{12} & \sigma_2^2 \end{pmatrix}\right) \quad (7)$$

is assumed. Here,  $y_{1i}$  is a 0-1 variable indicating whether individual  $i$  participate in the corresponding activity or not,  $u_{1i}$  is the utility for activity participation,  $u_{2i}$  is the logarithm of time allocated to the corresponding activity,  $x_{1i}$ ,  $x_{2i}$ ,  $z_{1i}$ , and  $z_{2i}$  are the vectors of explanatory

Table 3. Variables used for model estimations

Variable	Definition
<i>Variable z</i>	
Female	Female (1=yes; 0=no)
Married	Married (1=yes; 0=no)
Age15	6~15 years of age (1=yes; 0=otherwise)
Age16_20	16~20 years of age (1=yes; 0=otherwise)
Age21_30	21~30 years of age (1=yes; 0=otherwise)
Age31_50	31~50 years of age (1=yes; 0=otherwise)
Age51_60	51~60years of age (1=yes; 0=otherwise)
Age61	61~ years of age (1=yes; 0=otherwise)
Weekend	Weekend (1=yes; 0=no)
Edu1	Education level: non literate (1=yes; 0=no)
Edu2	Education level: literate but below primary (1=yes; 0=no)
Student	Student (1=yes; 0=no)
Hwife	Housewife (1=yes; 0=no)
Non-work	Inoccupation (1=yes; 0=no)
S-employ1	Self employed non-professional (including agriculture) (1=yes; 0=otherwise)
S-employ2	Self employed professional (1=yes; 0=otherwise)
Labor	Agriculture, causal, or other labor (1=yes; 0=otherwise)
Landown	Logarithm of land owned (acres)
Scheduled	Scheduled tribe or caste (1=yes; 0=otherwise)
<i>Variable x</i>	
Exp.1	Monthly household expenditure (1=0~1000 [Rs]; 0=otherwise)
Exp.2	Monthly household expenditure (1=1001~2000 [Rs]; 0=otherwise)
Exp.3	Monthly household expenditure (1=2001~3000 [Rs]; 0=otherwise)
Exp.4	Monthly household expenditure (1=3001~4000 [Rs]; 0=otherwise)
Exp.5	Monthly household expenditure (1=4001~5000 [Rs]; 0=otherwise)
Exp.6	Monthly household expenditure (1=5001~7000 [Rs]; 0=otherwise)
Exp.7	Monthly household expenditure (1=7001~ [Rs]; 0=otherwise)

variables,  $\alpha_1$ ,  $\alpha_2$ ,  $\beta_1$ ,  $\beta_2$ ,  $\gamma_1$  and  $\gamma_2$  are the vectors of unknown parameters,  $\delta_i$  is a dummy variable indicating whether individual  $i$  is poor or not (1: poor; 0: non-poor),  $e_{i1}$  and  $e_{i2}$  are normally distributed error terms,  $\sigma_{12}$  is the covariance between  $e_{1i}$  and  $e_{2i}$ , and  $\sigma_2$  is the standard deviation of  $e_{2i}$ . Note that, if the error term correlation  $\rho (= \sigma_{12}/\sigma_2) = 1$ ,  $\alpha_1 = \alpha_2$ ,  $\beta_1 = \beta_2$ , and  $\gamma_1 = \gamma_2$ , then the model collapses to type I tobit model, indicating that the same utility function can be used for both activity participation and time allocation.

Our particular interest of the modeling exercises is in parameters  $\gamma_1$  and  $\gamma_2$  that represent the meaning of being poor in urban and rural contexts respectively. While  $\beta_1$  and  $\beta_2$  capture the impacts of influential factors on non-poor's time use,  $\gamma_1$  and  $\gamma_2$  capture the differences in the impacts between poor and non-poor and hence  $\gamma_1$  and  $\gamma_2$  can be understood as the impacts of being poor.

## 6. RESULTS AND DISCUSSIONS

All models are estimated by using explanatory variables shown in Table 3. Results of the models are as follows.

The estimation results of mobile/immobile choice and travel time expenditure are shown in Table 4. In order to explain the meaning of being poor in urban versus rural areas, we use parameter  $\gamma$  in the model. The main findings related  $\gamma$  can be summarized as follows:

### [Urban-rural similarities of being poor ( $\gamma$ ) on mobile/immobile choice and travel time]

- Agriculture, causal, and other poor labors allocate less time to travel in both urban and rural areas. This may be accredited to the inevitable proximity of house and work location such as farm land and small in-house economic enterprises and lack of affordability for travel.

### [Urban-rural differences of being poor ( $\gamma$ ) on mobile/immobile choice and travel time]

- The urban poor elderly (older than 60 years old) tend to travel less, while the rural elderly poor may not be different from the rural elderly non-poor due to strong traditional family ties and responsibility transfer to the son after father becomes the elderly.
- Less educated poor tend to be less mobile in rural area, while such tendency is not observed in urban area. In rural area, less education may restrict them to the agricultural labor pursuit where they trade-off economic expenses of traveling by working nearby farm land.
- Poor students, non-workers, and scheduled tribes/castes who live in rural area tend to spend more time on travel, while being poor in urban area may not cause such effects. For poor scheduled tribes/castes, spatial seclusion causing longer travel distance to work palaces could be the main reason.

The estimation results of time use for subsistence activities are shown in Tables 5 and 6. The main findings are summarized as follows:

### [Urban-rural similarities of being poor ( $\gamma$ ) on time use of subsistence activities]

- Poor young people under the age of 15 tend to participate less in total subsistence activities in both urban and rural areas.
- Poor housewives tend to participate more in total subsistence activities, while they spend less time on out-of-home subsistence activities. This may be because housewives have to append to the family income by doing in-house economic activities. Moreover, traditional customs restrict housewives to spend time out of house.
- Poor scheduled tribes/castes spend more time on total subsistence activities.

[Urban-rural differences of being poor ( $\gamma$ ) on time use of subsistence activities]

- Poor married people living in rural area tend to participate less, but those who participate spent a modest time, while participation ratio of poor urban married people does not vary from the non-poor, and they tend to less allocate time to total subsistence activities.
- Non literate urban poor people tend to spend less time to total subsistence activities, while non literate rural poor people tend to spend more time on out-of-home subsistence activities. This is because of differences in labor needs of primary versus tertiary sectors.

The estimation results of time use for social and leisure activities are shown in Tables 7 and 8. The main findings are summarized as follows:

[Urban-rural similarities of being poor ( $\gamma$ ) on time use social and leisure activities]

- Poor scheduled tribes/castes spend less time on social and leisure activities.

Table 4. Model estimation results of mobile/immobile choice and travel time expenditure

	Mobile/immobile and travel time expenditure							
	Urban				Rural			
	Mobile/Immobile		Travel time		Mobile/Immobile		Travel time	
	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$
Intercept	2.035**		3.303**		2.119**		3.256**	
Female	-0.677**	0.070	-0.042	-0.059	-0.654**	0.248	0.239**	-0.116
Married	0.283**	-0.259	0.177*	-0.112	0.159	0.014	0.164*	-0.217
Age15	-0.070	0.278	-0.287*	0.056	0.161	-0.243	-0.792**	-0.379
Age16_20	-0.192	0.409	0.039	0.622*	0.026	0.321	-0.086	0.030
Age21_30	-0.186*	0.219	0.082	0.136	-0.043	0.321	0.040	-0.151
Age31_50	0.0	-	0.0	-	0.0	-	0.0	-
Age51_60	-0.197+	-0.430	-0.209+	-0.014	-0.103	-0.104	-0.499**	-0.551*
Age61	-0.318**	-0.750**	-0.963**	-0.957**	-0.720**	-0.127	-1.474**	-0.184
Weekend	0.131+	0.094	0.132+	-0.073	-0.020	0.229	-0.022	0.205
Edu1	-0.049	0.096	-0.202*	0.060	0.058	-0.904**	-0.130*	-0.046
Edu2	-0.126	-0.127	-0.264**	0.351	0.140	-1.139**	-0.135+	0.265
Student	0.418**	-0.537	0.153	-0.334	0.537*	-0.132	-0.389**	0.873**
Hwife	-0.490**	0.272	-1.138**	0.047	-0.170+	-0.227	-0.759**	-0.189
Non-work	-0.906**	0.041	-1.111**	-0.914	-1.123**	0.107	-1.916**	1.008+
S-employ1	0.191	4.639	-0.431**	0.622	0.039	0.069	0.333**	-0.385+
S-employ2	-0.208**	-0.261	-0.177**	-0.517**	-0.287+	-0.288	-0.069	-0.044
Labor	0.491**	-0.581**	0.339**	-0.318+	0.216	0.020	0.290**	-0.404+
Landown	0.273*	41.54	0.164*	-0.127	-0.035	0.166	0.205**	0.192+
Scheduled	-0.332**	0.323	0.024	-0.035	0.469**	0.273	0.467**	0.543**
Exp1	-0.016		0.160		0.459**		0.053	
Exp2	0.0	-	0.0	-	0.0	-	0.0	-
Exp3	0.070		-0.010		-0.075		-0.197**	
Exp4	-0.075		-0.051		0.137		-0.289**	
Exp5	0.052		-0.157		0.002		-0.199*	
Exp6	-0.056		0.023		-0.027		-0.331**	
Exp7	0.015		-0.036		0.223		-0.323*	
Sigma	1.796**				1.615**			
Rho	0.048				-0.025			
Sample size	5560				6229			
Participation rate (%)	91.4%				96.1%			
LL(C)	-12150.2				-12961.8			
LL( $\beta$ )	-11531.9				-12208.7			

- Poor students participate less in social and leisure activities, presumably due to socio-economic barriers.

[Urban-rural differences of being poor ( $\gamma$ ) on time use of social and leisure activities]

- Poor married females and young people under the age of 20 participate less in total social and leisure activities in urban area probably due to social customs, while such tendencies are not observed for those who live in rural area.
- Less educated urban poor tend to participate more in social and leisure activities, while less educated rural poor tend to be participate less in those activities and allocate less time to out-of-home social and leisure activities. This would be because many of them are discouraged workers and stop working after earning a minimum wage.

Table 5. Model estimation results of time use on subsistence activities  
(In-home + Out-of-home + Travel)

	Time use on subsistence (In-home + Out-of-home + Travel)							
	Urban				Rural			
	Activity participation		Activity duration		Activity participation		Activity duration	
	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$
Intercept	1.757**		6.253**		0.856**		6.307**	
Female	-0.246**	0.094	-0.252**	-0.021	0.013	-0.277+	-0.247**	0.055
Married	0.227**	-0.265+	0.015	0.059	0.184**	0.182	-0.014	-0.142+
Age15	-0.669**	-0.286	0.094+	-0.339**	-0.199+	-0.293	-0.007	-0.309**
Age16_20	-0.068	0.097	0.100*	-0.036	0.105	-0.163	-0.054	-0.026
Age21_30	-0.032	-0.197	0.019	-0.044	-0.105	-0.078	-0.051*	-0.028
Age31_50	0.0	-	0.0	-	0.0	-	0.0	-
Age51_60	-0.521**	-0.229	-0.076+	-0.216+	-0.415**	-0.271	-0.058+	-0.048
Age61	-1.456**	-0.474*	-0.406**	-0.037	-1.417**	-0.090	-0.055	-0.007
Weekend	-0.055	0.259	-0.038	0.068	0.003	0.069	-0.039+	0.119*
Edu1	-0.072	0.064	0.020	-0.152*	0.24**	-0.029	-0.026	0.106
Edu2	-0.074	-0.048	-0.012	-0.084	0.023	0.195	-0.012	0.092
Student	0.184+	0.126	-0.214**	0.247*	-0.064	0.760**	-0.110**	0.183+
Hwife	-1.766**	0.607**	-1.690**	0.170+	-0.416**	0.457**	-0.698**	-0.075
Non-work	-1.954**	-0.170	-1.005**	0.341	-1.760**	0.609	-0.604**	0.063
S-employ1	-0.101	0.053	0.031	0.045	0.259**	0.024	0.023	-0.153+
S-employ2	0.125*	-0.061	0.056*	0.021	0.073	-0.398	0.047	-0.035
Labor	-0.205**	0.075	0.082*	-0.092	0.076	0.152	0.116**	-0.260**
Landown	0.051	0.067	-0.018	0.014	0.188**	0.019	-0.016	0.041
Scheduled	-0.268**	-0.015	-0.096**	0.166*	0.047	-0.137	0.037+	0.254**
Exp1	0.399**		-0.144*		0.261**		-0.042	
Exp2	0.0	-	0.0	-	0.0	-	0.0	-
Exp3	-0.079		-0.023		-0.078		0.013	
Exp4	-0.109		0.010		-0.047		-0.023	
Exp5	-0.330**		0.027		0.035		-0.095**	
Exp6	-0.309**		0.078*		-0.153		-0.037	
Exp7	-0.510**		0.076		-0.153		0.108+	
Sigma	0.563**				0.624**			
Rho	0.026				-0.887**			
Sample size	5560				6229			
Participation rate (%)	69.4%				85.8%			
LL(C)	-8450.53				-8463.03			
LL( $\beta$ )	-5513.48				-6366.89			

- Self-employed poor people spend more time on social and leisure activities in rural area, while such trend is not confirmed in urban area.

In summary, for both rural and urban areas, we found that the time use of vulnerable social in groups such as housewives, children, and elderly are restricted due to social custom ingrained Indian society. Poor students are force to participate in subsistence activities to augment family income. Another similar attribute which account for similar time use pattern is the socio-economic conditions, especially for subsistence activities. On the other hand, we found that a number of differences between urban and rural areas in social and leisure activities. Self-employed poor in rural area affirms higher time use in social and leisure activities, whereas in urban area such attributes are not significant. Unlike rural area, in urban area, the attribute of education, does not restrict poor from traveling. These results suggest differences in meaning of poor in urban versus rural areas.

Table 6. Model estimation results of time use on subsistence activities  
(Out-of-home + Travel)

	Time use on subsistence (Out-of-home + Travel)							
	Urban				Rural			
	Activity participation		Activity duration		Activity participation		Activity duration	
	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$
Intercept	1.434**		6.155**		0.671**		6.343**	
Female	-0.444**	0.047	-0.187**	-0.077	-0.118*	-0.152	-0.196**	0.042
Married	0.318**	-0.098	0.027	0.017	0.156*	0.210	-0.034	-0.196*
Age15	-0.372**	-0.013	0.047	-0.298**	-0.053	-0.177	-0.106*	-0.164
Age16_20	-0.189+	0.568*	0.075+	0.045	0.010	0.054	-0.027	-0.140
Age21_30	-0.071	-0.061	0.004	-0.018	-0.110+	0.032	-0.022	-0.042
Age31_50	0.0	-	0.0	-	0.0	-	0.0	-
Age51_60	-0.549**	-0.153	-0.082+	-0.243+	-0.333**	-0.283	-0.033	0.060
Age61	-1.428**	-0.960**	-0.290**	0.480	-1.255**	0.054	0.063	0.029
Weekend	-0.088	0.233	-0.032	0.038	-0.087+	0.158	0.014	0.007
Edu1	0.107	-0.077	-0.032	0.045	0.215**	-0.206	-0.065**	0.116+
Edu2	0.009	-0.008	-0.046	-0.030	0.059	-0.172	-0.036	0.135+
Student	0.196*	-0.042	-0.405**	0.322**	-0.018	0.592*	-0.239**	0.005
Hwife	-2.062**	0.479*	-1.776**	-0.291**	-0.517**	0.215	-0.608**	-0.167*
Non-work	-1.909**	0.201	-0.389*	-0.667	-2.304**	1.301*	-1.211**	0.544
S-employ1	-0.024	-0.21	-0.011	0.181	0.224**	0.007	-0.009	-0.101
S-employ2	0.014	-0.369*	0	0.010	-0.123	-0.488*	0.079	0.149
Labor	-0.014	-0.202	0.097**	-0.098	0.208**	-0.082	0.058	-0.065
Landown	0.048	-0.048	0.016	0.060	0.165**	-0.071	-0.04**	0.053
Scheduled	-0.318**	0.002	-0.011	0.030	0.088+	0.130	0.010	0.155**
Exp1	0.285+		-0.060		0.282**		-0.062	
Exp2	0.0	-	0.0	-	0.0	-	0.0	-
Exp3	-0.195**		0.082**		-0.082+		0.038+	
Exp4	-0.170*		0.092**		-0.064		0.014	
Exp5	-0.240**		0.088*		-0.003		-0.015	
Exp6	-0.224**		0.183**		-0.226**		0.010	
Exp7	-0.301**		0.099*		0.104		0.002	
Sigma	0.522**				0.647**			
Rho	0.040				-0.903**			
Sample size	5560				6229			
Participation rate (%)	59.4%				78.9%			
LL(C)	-8060.28				-8087.69			
LL( $\beta$ )	-4703.77				-6508.62			

Table 7. Model estimation results of time use on social and leisure activities  
(In-home + Out-of-home + Travel)

	Time use on social and leisure (In-home + Out-of-home + Travel)							
	Urban				Rural			
	Activity participation		Activity duration		Activity participation		Activity duration	
	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$
Intercept	0.904**		4.867**		0.536**		4.702**	
Female	-0.133+	-0.692**	-0.158**	0.206*	-0.437**	0.052	-0.215**	0.290**
Married	-0.016	-0.565**	-0.213**	0.064	-0.200**	-0.152	-0.133**	-0.203
Age15	0.739**	-0.447+	0.435**	0.272+	0.646**	0.912**	0.537**	0.087
Age16_20	-0.079	-0.384+	0.072	0.182	-0.098	-0.177	0.168**	-0.452*
Age21_30	-0.137*	-0.104	-0.062+	0.149	-0.039	0.255+	0.051	0.133
Age31_50	0.0	-	0.0	-	0.0	-	0.0	-
Age51_60	0.075	-0.225	0.125**	-0.038	0.044	0.340	0.142**	0.062
Age61	0.104	-0.379+	0.241**	0.153	0.108	0.244	0.253**	-0.201
Weekend	0.073	-0.216	0.048	-0.041	0.102*	-0.375**	-0.034	-0.078
Edu1	-0.806**	0.529**	0.089+	0.064	-0.553**	-0.008	-0.045	-0.292*
Edu2	-0.443**	0.457**	0.039	-0.171+	-0.261**	0.268	-0.052	-0.285**
Student	0.489**	1.164**	0.176**	-0.382**	1.404**	-0.458	0.343**	-0.509**
Hwife	0.217**	0.306	0.276**	-0.089	0.400**	-0.151	0.196**	-0.453**
Non-work	0.081	0.108	0.498**	-0.112	0.148	0.045	0.519**	0.176
S-employ1	0.081	1.098**	-0.042	-0.468*	-0.587**	-0.059	-0.192**	0.588**
S-employ2	-0.047	0.164	-0.071**	-0.116	-0.450**	0.136	-0.089	0.329+
Labor	-0.382**	0.369**	-0.002	-0.075	-0.614**	-0.149	-0.128*	0.562**
Landown	-0.12*	-0.202	0.094**	0.220	0.097**	-0.133	0.002	-0.137*
Scheduled	0.055	0.137	0.116**	-0.297**	-0.054	-0.031	0.006	-0.240*
Exp1	-0.147		-0.019		-0.200*		0.159*	
Exp2	0.0	-	0.0	-	0.0	-	0.0	-
Exp3	0.042		0.063		0.190**		0.036	
Exp4	0.197**		0.058		0.060		-0.045	
Exp5	0.292**		0.078+		0.482**		0.063	
Exp6	0.118		0.097*		0.614**		0.174**	
Exp7	0.568**		-0.005		-0.033		0.164+	
Sigma	0.754**				0.673**			
Rho	-0.667**				-0.106			
Sample size	5560				6229			
Participation rate (%)	79.3%				50.2%			
LL(C)	-7507.43				-8566.58			
LL( $\beta$ )	-6973.97				-6344.60			

## 7. CONCLUSIONS

This study presents a series of empirical analyses on time use behavior in Gujarat, India, aiming to explore the different impacts of being poor in urban versus rural areas. We found that, in both areas, the poor participate less in and allocate less time to social and leisure activities. Also, the results indicate that poor labors, who may live close to work location due to the lack of affordability for travel, use less time on travel. Although spatial information is not available from the current data, the results likely indicate that their daily activity space is largely restricted. Another important similarity of being poor in both urban and rural contexts is that poor housewives tend to do more in-home economic activities probably to supplement

Table 8. Model estimation results of time use on social and leisure activities  
(Out-of-home + Travel)

	Time use on social and leisure (Out-of-home + Travel)							
	Urban				Rural			
	Activity participation		Activity duration		Activity participation		Activity duration	
	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$	$\beta$	$\gamma$
Intercept	-0.749**		4.261**		-0.676**		4.181**	
Female	-0.486**	-0.081	-0.142*	-0.217	-0.560**	0.335*	-0.226**	-0.034
Married	-0.277**	-0.093	-0.218**	0.111	-0.201**	-0.163	-0.114	-0.213
Age15	1.032**	0.072	0.518**	0.314	0.972**	0.522*	0.724**	0.083
Age16_20	-0.045	-0.092	0.181+	-0.142	0.076	-0.331	0.326**	-0.378
Age21_30	-0.075	0.079	-0.073	0.014	0.084	0.113	0.145*	0.298
Age31_50	0.0	-	0.0	-	0.0	-	0.0	-
Age51_60	0.405**	-0.707*	0.158	-0.256	0.196**	0.357	0.241**	0.102
Age61	0.718**	-0.506*	0.260*	0.077	0.438**	0.157	0.320**	-0.244
Weekend	0.074	-0.051	0.056	-0.170	0.044	-0.238	0.035	-0.080
Edu1	-0.042	0.241	0.220**	-0.044	-0.062	-0.727**	0.170**	-0.214
Edu2	-0.091	-0.054	0.173**	-0.181	0.050	-0.475**	0.027	-0.137
Student	0.533**	-0.440*	-0.009	-0.066	1.059**	-0.862**	0.204*	-0.520**
Hwife	0.395**	0.011	0.316**	0.114	0.338**	-0.288	0.073	-0.157
Non-work	0.121	0.107	0.222+	0.601	0.262	0.166	0.418*	-0.001
S-employ1	0.147+	0.382	-0.038	-0.317	0.015	-0.054	-0.204**	0.537**
S-employ2	-0.048	0.070	0.013	-0.108	-0.012	0.023	-0.077	0.383
Labor	0.033	0.019	0.004	0.216	-0.017	0.151	0.005	0.348+
Landown	0.040	-0.288	0.059	0.484+	-0.027	0.166+	0.036	-0.099
Scheduled	-0.131+	-0.021	0.108	-0.041	-0.003	-0.044	0.004	-0.128
Exp1	-0.157		0.010		0.195*		0.127	
Exp2	0.0	-	0.0	-	0.0	-	0.0	-
Exp3	-0.026		-0.010		0.088+		0.018	
Exp4	-0.050		-0.057		-0.126+		-0.094	
Exp5	0.052		0.005		0.189*		0.011	
Exp6	0.122		-0.111		0.009		0.119	
Exp7	0.049		-0.032		-0.333*		0.142	
Sigma	0.745**				0.726**			
Rho	0.047				0.112			
Sample size	5560				6229			
Participation rate (%)	28.1%				31.5%			
LL(C)	-5196.20				-6253.48			
LL( $\beta$ )	-4430.12				-4977.60			

family income. Interestingly, such housewives' time use may not result in the reduction of travel in both areas. Instead, they reduce the time spent for social and leisure activities implying the existence of time poverty particularly in rural area. We also found a number of different impacts of being poor on time use between urban versus rural contexts. In particular, the results indicate that, from the viewpoint of labor participation, having higher education would be more important in urban area due to the differences in labor needs in urban and rural areas. On the other hand, since travel time tends to be longer in rural area (and hence the travel cost becomes higher), we also found that rural poor tend to allocate more time to travel when necessary (e.g., students and scheduled tribes/castes), while they would not when they can avoid traveling (e.g., the elderly and those who engage in small in-house economic enterprises).

An important message from these empirical findings is that being poor has different meaning in urban and rural contexts from time use perspective. This point would be quite important to design development policies. In particular, if we accept the assumption that time use of non-poor is “ideal” or at least better for the poor (while poor people simply couldn’t achieve it due to economic constraints), different time-related poverty indicators need to be set for urban and rural areas respectively. The meaning of “poor” from the viewpoint of income or expenditure ignores or aggregates the effects of critical indicators that define welfare in urban and rural areas. But, time use helps us to decompose welfare dimensions into multiple indicators and hence enabling us in understanding the significance of each indicator leading to unignorable differences.

The remaining issues that need to be addressed are as follows. First, although we try to give plausible explanations on time use differences between poor and non-poor or between urban and rural, there are certain difficulties to do it. This partially comes from the difficulties of distinguishing “choice” from “constraint”. In the current paper, we assume that time use decision of poor people involve more constraint, compared to that of non-poor, while it could not be always true. This makes difficult to give a concrete policy proposal through time use analysis. An analytical framework with a clear distinction between choice and constraint would be crucial to utilize the results of time use analysis in policy debates especially in developed countries. Second, in the current study, detailed spatial information is not available, but exploring land use and transportation related factors are certainly important to understand the different impacts of being poor in urban versus rural contexts. Third, household time use needs to be focused on, since household members are communicated with each other for a better household decision. For example, wife (husband) often spends her (his) time on household maintenance (paid work) not only for herself (himself) but also for all household members. Household level analysis may be especially important for the analysis on gender disparity issues. Finally, this study has focused only on Gujarat, but different states may show different time use patterns due to the differences in economic status, locational disadvantages, and so on. Comparison analysis between different states would provide additional insights on the impacts of being poor on time use, especially developing countries like India.

## REFERENCES

- Agrawal, T. Educational inequality in rural and urban India. *International Journal of Educational Development*, Vol. 34, No. 0, 2014, pp. 11-19.
- Antonopoulos, R., & Memis, E. (2010). Time and Poverty from a Developing Country Perspective. *Working Paper 600, Levy Economics Institute of Bard College*, New York.
- Asadullah, M. N., and G. Yalonetzky. Inequality of Educational Opportunity in India: Changes Over Time and Across States. *World Development*, Vol. 40, No. 6, 2012, pp. 1151-1163.
- Bandyopadhyay, K. R. (2010). *Poverty in India: A Chronological Review on Measurement and Identification*. In A. I. o. T. Development (Ed.).
- Bardasi, E., and Q. Wodon. Measuring Time Poverty and Analyzing its Determinants: Concepts and Application to Guinea. In *Gender, Time Use, and Poverty in Sub-Saharan Africa, World Bank Working Paper No.73*, The World Bank, 2006. pp. 75-95.
- Basu, A. M., and K. Basu. Women's economic roles and child survival: the case of India. *Health Transition Review*, Vol. 1, No. 1, 1991, pp. 83-103.
- Becker, G. S. A theory of the allocation of time. *The Economic Journal*, Vol. 75, 1965, pp. 493-517.
- Bhat, C. R., and F. S. Koppelman. A retrospective and prospective survey of time-use research. *Transportation*, 1999, pp. 119-139.
- Bhat, C. R. A multiple discrete-continuous extreme value model: formulation and application to discretionary time-use decisions. *Transportation Research Part B*, Vol.



- 39, 2005, pp. 679-707.
- Blackden, C. M., & Wodon, Q. (2006). *Gender, time use, and poverty in sub-Saharan Africa*: World Bank Publications.
- Chikaraishi, M., Fujiwara, A., and J. Zhang. Analysis of School Participation in Dhaka City of Bangladesh Based on a Time Allocation Model with Endogenous Activity Generation, *Paper presented at International Symposium on City Planning*, August 21-23, Jeonju, Korea, 2008, pp. 620-629.
- Chikaraishi, M., Zhang, J., Fujiwara, A., and K.W. Axhausen. Exploring variation properties of time use behavior based on a multilevel multiple discrete-continuous extreme value model, *Transportation Research Record*, No. 2156, 2010, pp. 101-110.
- Doherty, S. T. Should we abandon activity type analysis? Redefining activities by their salient attributes. *Transportation*, Vol. 33, No. 6, 2006, pp. 517-536.
- Dubin, J. A., and D. L. McFadden. An econometric analysis of residential electric appliance holdings and consumption. *Econometrica*, Vol. 52, No. 2, 1984, pp. 345-362.
- Fukuda, D., and M. Chikaraishi. A review on discrete-continuous models, *Journal of Japan Society of Civil Engineers D3*, Vol. 69, 2013, pp. 497-510 (in Japanese).
- Goulias, K. G. Multilevel analysis of daily time use and time allocation to activity types accounting for complex covariance structures using correlated random effects. *Transportation*, Vol. 29, 2002, pp. 31-48.
- Hirway, I. (2000). Dynamics of Development in Gujarat: Some Issues. *Economic and Political Weekly*, 35(35/36), 3106-3120.
- Hirway, I. Integrating Unpaid Work into Development Policy. *Presented at Unpaid Work and Economy: Gender, Poverty and Millennium Development Goals*, New York, 2005.
- Hirway, I. *Multiple Uses of Time Use Statistics in Developing Countries*. In *Towards Mainstreaming Time Use Surveys in National Statistical System in India*, Ministry of Home and Child Development, Government of India, India, 2007. pp. 31-44.
- Planning Commission of India. (1979). *Task Force on Projections of Minimum Needs and Effective Consumption Demand*. New Delhi.
- Planning Commission of India. (1993). *Report of the Expert Group on Estimation of Proportion and Number of Poor*. New Delhi.
- Juster, F. T., and F. P. Stafford. The Allocation of Time: Empirical Findings, Behavioral Models, and Problems of Measurement. *Journal of Economic Literature*, Vol. 29, No. 2, 1991, pp. 471-522.
- Kantor, P. Women's Exclusion and Unfavorable Inclusion in Informal Employment in Lucknow, India: Barriers to Voice and Livelihood Security. *World Development*, Vol. 37, No. 1, 2009, pp. 194-207.
- Kes, A., & Swaminathan, H. (2005). *Gender and Time Poverty in Sub-Saharan Africa*. In M. a. W. Blackden, Q. (Ed.), *Gender, Time Use, and Poverty in Sub-Saharan Africa* (Vol. 73, pp. 13-26): The World Bank.
- Kitamura, R. A model of daily time allocation to discretionary out-of-home activities and trips. *Transportation Research Part B*, Vol. 18, No. 3, 1984, pp. 255-266.
- Kundu, A. (2000). Globalising Gujarat: Urbanisation, Employment and Poverty. *Economic and Political Weekly*, 35(35/36), 3172- 3179+3181-3182.
- Lyons, G. The introduction of social exclusion into the field of travel behaviour. *Transport Policy*, Vol. 10, No. 4, 2003, pp. 339-342.
- Maertens, A. Social Norms and Aspirations: Age of Marriage and Education in Rural India. *World Development*, Vol. 47, No. 0, 2013, pp. 1-15.
- Narayan, D., and P. Petesch. *Moving Out of Poverty: Cross-Disciplinary Perspectives on Mobility*. World Bank and Palgrave Macmillan, Washington DC, 2009.
- Raj, A., N. Saggurti, D. Balaiah, and J. G. Silverman. Prevalence of child marriage and its effect on fertility and fertility-control outcomes of young women in India: a cross-sectional, observational study. *The Lancet*, Vol. 373, No. 9678, 2009, pp. 1883-1889.
- Saboore, A., Manzoore, M., & Khan, A. (2015). Time use poverty and gender inequality: empirical evidences from Punjab. *Quality & Quantity*, 1-18.
- Salway, S., S. Rahman, and S. Jesmin. A Profile of Women's Work Participation Among the Urban Poor of Dhaka. *World Development*, Vol. 31, No. 5, 2003, pp. 881-901.
- Srinivasan, S., and P. Rogers. Travel behavior of low-income residents: studying two

- contrasting locations in the city of Chennai, India. *Journal of Transport Geography*, Vol. 13, No. 3, 2005, pp. 265-274.
- Sundaram, A., and R. Vanneman. Gender Differentials in Literacy in India: The Intriguing Relationship with Women's Labor Force Participation. *World Development*, Vol. 36, No. 1, 2008, pp. 128-143
- Tiwari, G. Urban Transport Priorities: Meeting the Challenge of Socio-economic Diversity in Cities, a Case Study of Delhi, India. *Cities*, Vol. 19, No. 2, 2002, pp. 95-103.
- Yamamoto, T., and R. Kitamura. An analysis of time allocation to in-home and out-of-home discretionary activities across working days and non-working days. *Transportation*, Vol. 26, 1999, pp. 211-230.
- Sen, A. (1974) Poverty, Inequality and Unemployment, in Bardhan, P. K., and T N Srinivasan (eds.) *Poverty and Income Distribution in India*, Calcutta: Indian Statistical Publishing Society.