Preliminary draft

Recent changes in work force participation among elderly in India
Evidence from National Sample Survey data

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Abstract

This paper examines recent changes in workforce participation rates (WFPR) among the aged population in India using unit-level data from National Sample Survey Organization survey on "Employment and Unemployment". Two rounds of data are used—55th round (1999-2000) and 66th round (2009-10). This enables us to explore the changes caused by the sweeping globalization of the Indian economy. Our analysis reveals that WFPR has decreased over the study period., particularly among those with low levels of education and household expenditure. We also find that informalization has decreased among elderly workers. Results also indicate that job squeeze within the formal sector has led to shift of younger workers to the informal sector. The ensuing intensification of competition for informal sector jobs has reduced work opportunities for the elderly. As a result, aged workers concentrate in low pay-occupations.

Keywords: Ageing, Labour, Occupational structure, Informal sector, India

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1. INTRODUCTION

Population ageing is a phenomenon that occurs when the proportion of aged in the total population increases to over seven percent owing to reduction of fertility and mortality (Prakash 1999). United Nations projection indicates that the population aged 60 years and above will grow from an estimated 737 million older persons in 2009 to 2 billion in 2050 (UN 2009). In particular, the oldest-old group (those aged above 80 years) will grow faster than other age groups, and will comprise about a fifth of total elderly population by 2050. Although ageing emerged as an important issue in European and American countries (OECD 1988, Anderson and Hussey 2000), in recent years it has become an important socio-demographic issue in Asia also (Chang 1996, Hugo 1996, UN 2002). India is no exception to this trend, with the total number of elderly persons being expected to increase from 70.6 million in 2001 (6.9 per cent of population) to 173 million by 2026 (12.4 per cent of population) (Subaiya and Bansod 2011). Estimates by the Planning Commission (2011) indicate that, by 2050, one out of every five persons in India will be aged above 60 years. The increasing 'graying' of population impose a greater burden on social security, health services, housing and urban planning, and require fundamental changes in consumption and saving patterns. Increasing feminization of ageing is another major cause of concern in India (James 1994, Alam 2009, Subaiya and Bansod 2011), as they often lack financial security and are dependent to a greater extent on other family members.

In India, the family has traditionally taken care of the elderly; the Maintenance and Welfare of Parents and Senior Citizens Act in 2007 also emphasized on familial care of the aged. The old-dependency ratio (number of aged as a ratio of total working population), however, is expected to rise in India (Subaiya and Bansod 2011). This will increase the pressure on the working population, particularly as more than half of the elderly people are fully dependent on others (Purohit 2008). Moreover, housing shortage, increasing trend towards nuclear families, shift from altruistic family-centric values to consumerism and individualism, greater mobility of workers, increasing work pressure and greater participation of women in economic activities is threatening inter-generational family bonds and reducing the support provided to aged relatives

(Visaria 2001; Rajan and Kumar 2003; Prakash 2005; Husain and Ghosh 2010; Raju 2011). While the Government has taken some measures to improve the socio-economic conditions of the economically vulnerable elderly in India—in the form of policies like *Annapoorna* and National Old Age Pension Scheme (Kumar 2003)—these policies fall far short of what is required (Kumar 2003; Purohit 2008). Given the focus on reducing fiscal deficit, it is doubtful to what extent, the Government can scale up expenditure on social security to meet the needs of a population with an increasing share of ageing persons. Inadequate social security leads to financial distress which increases economic dependence of the elderly and deteriorates the health status (World Bank 2001; Rajan et al. 2003; Alam and Karan 2011). Financial insecurity is found to be greater among the rural elderly, female elderly (particularly widows), aged residing in nuclear families or alone, and aged with health problems (Rajan et al. 2003).

Given the inability of both society and the state to ensure healthy ageing in India, the feasibility of market-based solutions has to be explored. In the long run, for instance, incentive to increase savings during the working period is a possible instrument. In the short run, however, participation of the elderly in the work force may enable them to be economically independent, particularly in view of its externalities. For instance, participation in economic activities has been observed to improve self-reported health status of the elderly (Husain and Ghosh 2010), and improve satisfaction of the elderly (Chang and Yen 2011). Simultaneously, complete retirement leads to increase in illness episodes and decline in mental health of the elderly (Dave et al. 2008), thereby reducing their well being (Stutzer, 2004).

Given the inadequacy of social security, therefore, the labour force participation of elderly should receive more importance in order to understand their economic dependence (Rajan et al. 2003). Increasing participation of aged in the labour market, however, has not received its due attention as governments uses retirement as an instrument to provide more employment opportunities to the young (Salem 2008), even at the cost of increasing the proportion of elderly who are financially dependent on the state (Walker 1981).

From 1950 to 2000 the world's labour force participation of population aged 65 years and above decreased by more than 40 per cent; the rate of decrease was faster among males than female

elderly (UN 2002). A similar trend was observed in most OECD countries, particularly in USA and European countries (Auer and Fortuny 2000). It has also been noticed that the full time employment among the elderly in USA has increased from 1995 to 2005 (Gendell 2006). Studies have also found that elderly work force participation rate depends upon factors like education (Focarelli and Zanghieri 2005; Johnson and Kaminski 2010), availability of pension (Gruber and Wise 1999, 2004; Blundell et al. 2002; Hurd and Rohwedder 2011), health status (Honig and Hanoch 1985; Lee et al. 2008; Adhikari et al. 2011; Muszynska and Rau 2012; Flores and Kalwij 2013), level of monthly per capita expenditure, wealth and sex (Haider 2001), health care cost (Gendell 2008), place of residence and marital status (Adhikari et al. 2011), and so on. However, elderly workers are paid lower wages than the non elderly (Auer and Fortuny 2000; Vodopivec and Arunatilake 2011); further, their earnings have been observed to decrease with age (Leslie et al. 2009). This has important implications for the financial security and welfare of the elderly.

Most of the research on elderly in India has tended to focus mostly on issues related to health, residential arrangement, social security and ill-treatment (Gupta et al. 2001; Husain and Ghosh 2011; Alam and Karan 2011; Bhat and Dhruvarajn 2001; Rajan and Mishra 2011; Soneja 2001). The few studies on work force participation of elderly in India have been essentially descriptive, describing trends in employment and wages (Rajan et al. 2003; Selvaraj et al. 2011). Analytical works are rare; so far we have been able to trace only works by Alam and Mitra (2012) Pandey (2009) and Singh and Das (2012).

This paper examines the changes in work-force participation rates and nature of employment (reflected in the extent of participation in the informal sector and occupational pattern) between 1999-2000 and 2009-2010. Data for these two years are available in the 55^{th} and 66^{th} rounds of National Sample Survey Organization survey on Employment and Unemployment. The choice of these two rounds enables us to examine changes that have occurred since the sweeping liberalization of the Indian economy between 1985 and 2000, culminating in the integration of the Indian economy with world markets. Using bivariate and econometric analysis we have tried to show that the aged workers have become increasingly vulnerable over the decade studied.

2. WORK FORCE PARTICIPATION AMONG ELDERLY IN INDIA

Rajan et al. (2003) on the basis of Census data have shown that work force participation (WFP) of elderly in India has decreased from 1961 to 1991. The participation rate declined by 10 percentage points between 1961 and 1981 and by 1 per cent between 1981 and 1991 (Rajan et al. 2003). Further, WFP rate was higher in rural areas compared to the urban areas. Rajan et al. also reports, based on analysis of National Sample Survey Organization (NSSO) 1986-87 data, that more rural elderly (34.02 per cent) were financially independent than the urban elderly (28.94 per cent). Disaggregating the analysis by gender, they have found that elderly male participated more in economic activities than the female elderly. Rajan et al. (2003) found that elderly workers were increasingly involved in the agricultural sector with almost 80 per cent of the aged workers worked in the agriculture sector in 1991. Among the male elderly, 62 per cent worked as cultivators; among the female, 70 per cent worked as agricultural labourers.

Selvaraj et al. (2011) have also analyzed the elderly WFP trend in India on the basis of usual activity status (usual principal status[1] and usual subsidiary status[2]) using NSSO data from 1983 to 2004-05. The total number of elderly workers in India was estimated to be 31 million in 2004-05; this is approximately 7 per cent of the total work force (Selvaraj et al. 2011). They have also shown that elderly WFP rate has decreased marginally from 42 per cent in 1983 to 39 per cent in 2004-05, mainly due to growing number of elderly in the higher age group who are less likely to participate in the work force. The WFP of elderly is higher in rural areas compared to urban areas. Further, the WFP declined sharply in urban areas from 31 per cent to 23 per cent in the same time period. In rural India, on the other hand, elderly employment shows a fluctuating trend. It has been observed that elderly employment was higher in the pre-reform era (1983 to 1994), compared to the post reform period (1994 to 2005). However, the work participation of male elderly declined from 64 per cent in 1983 to 57 per cent in 2004-05 while female employment trend remains stagnant over time. WFP rate declined significantly for urban male (from 50.2 per cent in 1983 to 36.6 per cent in 2004-05) while for rural male it declines slightly (66.8 per cent to 64.4 per cent). WFP for rural females increased marginally from 22.6 per cent to 25.3 per cent, while WFP of urban females declined from 13.8 per cent to 10 per cent. Most of

[1] If an individual is identified as a worker for the major part of the year, he/she is categorized as a worker on the basis of the usual principal status.

[2] If an individual is identified as a worker only for a minor part of the year he/she is categorized as a worker on the basis of subsidiary status.

the elderly workers belong to the 60 to 69 years age group; analysis also reveals that work force participation decreases with increase in age. With the increase in age the number of female elderly workers declines faster than the number of male elderly workers.

Selvaraj et al. (2011) also reports that educational attainments of elderly workers is low—more than 70 per cent of elderly are illiterate, or do not have any primary education. This implies that it is economic vulnerabilities that 'forces' the aged to work in India. Among the female workers illiteracy is almost 93 per cent. However, the illiterate elderly workers are higher in rural areas compared to urban areas. Selvaraj et al. (2011) have also argued that labour force participation is higher among the poor elderly than the richer elderly. However, this difference is more marked among the female elderly workers. Most of the elderly workers are self employed, with the proportion of self employed elderly workers increasing with age. Casual employment is higher among the female elderly. In urban area, significant proportions of female elderly workers are engaged in regular employment. Selvaraj et al. (2011) on the basis of current weekly status[3] data of NSSO have also shown that real wage of regular and casual workers have increased by 60 per cent from 1983 to 2005. Although the elderly are receiving lower income than non-aged workers, their (aged workers') contribution to total household income is substantial, amounting to about 4 to 5 per cent on average.

Singh and Das (2012) have analyzed the determinants of old age wage labour participation and supply in India from 1993-94 to 2009-10 on the basis of current weekly status data of NSSO. They have analyzed the work participation of elderly on the basis of wage received by them. If an elder gets wage on any of the seven days in the week preceding the date of survey, then he/she is considered as a part of the labour force. They have considered weekly days of work of an elderly as a measure for weekly labour supply. Accordingly, if an elder works for full day, it was taken as 1 day and if an elder works for half day, it was taken as 0.5 day. They have taken age, square of age, marital status, sex, education, caste and religion, number of children (below 18 years), number of adults (18 years and above) in the household, amount of land cultivated in acres and monthly per capita expenditure etc as the determinants of wage labour participation. They have disaggregated the analysis on the basis of place of residence. The descriptive analysis

[3] It is the activity status obtaining for a person during a reference period of seven days preceding the date of survey.

shows that wage labour participation of elderly from 1993-94 to 2009-10 has decreased in urban areas (from 7.45 per cent to 6.01 percent) but has increased in rural areas (9.66 per cent to 11.35 per cent). But average weekly days of work supplied by the working elders has decreased in rural area (from 6.22 per cent to 5.80 per cent) but has remained same in urban area (6.42 per cent) (Singh and Das 2012). In rural area, the wage labour participation of Hindu elderly has increased over time but that of Muslim has decreased. Singh and Das (2012) reports that in rural area among the elderly workers agricultural and other labour has increased (from 83.6 per cent to 86.8 per cent) and in urban area the proportion of casual labour has increased (from 37.88 per cent to 41.07 per cent). The tendency for families to be nuclear is increasing in India and elders from small families are participating more in the work force (Singh and Das 2012). Econometric analysis using the probit regression model reports that in urban area there is negative relation between probability of wage labour participation and age of the elderly. In rural area only for the year 1993-94, they are having same result but for the 2009-10 they are getting insignificant relation. In rural area, schedule caste and schedule tribes and in urban area schedule caste are participating more than the others in 2009-10. In both the round, female are participating less than the male in rural as well as in urban area. They have found that both in rural and urban area, elderly from poorer households are having higher probability of wage labour participation in both the round. They report that education does not play any systematic role in wage labour participation, only in urban areas the participation of secondary and a higher educated person is significantly different from the illiterate. Like descriptive analysis in econometric analysis they have found elders from smaller families are more likely to participate. Using Heckman sample selection regression they have found that in 2009-10, in rural and urban areas the weekly days of work supply by the working population of the elderly does not have significant relation with their age. Singh and Das (2012) argued that in urban area schedule caste elderly shows a lower weekly number of days of labour supply in 2009-10 compared to others. However, they have argued that in both the sectors, Muslim elderly are working more days than the Hindu elderly in 2009-10. In urban area, female elders work lower number of days compared to male elders in 2009-10. Education does not have any major significant effect on weekly days of work supplied in rural as well as in urban area in both the rounds. Elderly from smaller households are found to supply significantly lesser number of days of weekly work compared to larger families in both the rounds.

Rajan et al. (2003) have analyzed elderly WFP only in the pre globalization period. Although Selvaraj et al. (2011) have studied the WFP trend from 1983 to 2004-05, their study is limited to describing trends and has not undertaken any analytical work. Only the study of Singh and Das (2012) is analytical. But it suffers from some limitations.

1. For instance, they have used data on current weekly status which is not reliable as (say) principal status as the reference period is very small (week preceding the data of survey). Using current weekly status increases the probability of unemployment. A more reliable indicator regarding the presence in the labour market is principal status based on a reference period of 365 days preceding the survey.
2. Another limitation is that Singh and Das (2012) have considered only wage labour. But unpaid family labour is also important for aged workers. For instance, in the context of rural China, Pang et al. (2004) reports that the elderly tend to participate in the informal sector after withdrawing from the formal labour market. They report that about 62 per cent elderly and near elderly people in rural China are participating in informal sector, undertaking activities like household chores and taking care of grandchildren. To the best of our knowledge, there has been no similar study which has examined the extent of informalization among the elderly as a proxy of quality of employment in India

The present study aims to address these deficiencies. By using usual principal status data this study wants to analyze the elderly work force participation in India in recent years compared to the period just after globalization disaggregating the analysis by place of residence and gender and also wants to capture the extent of informalization of elderly in India.

3. DATABASE AND METHODOLOGY

3.1 Database

The two most important sources of data on work force participation rate in India are Economic Tables of the decadal Census and Employment and unemployment schedule of NSSO quinquennial survey. The last Census undertaken was in 2011. But data on employment is yet to be released. Therefore Census data on employment is available from 2001. If we were to use this data, then we do not have the prominent effect of globalization. Although Census data captures population, we are not able to analyze econometric model as from Census we are only having

data on religion, place of residence etc. Further, Census does not provide data on informal sector. However, NSSO provides unit level data and the availability of socio-economic information in the NSSO data allows for richer bivariate and multivariate analysis over socio-economic and demographic correlates. Moreover, NSSO provides information on informal sector. So, we use NSSO data even though it is based on a sample survey. This study uses data from the 55th round (1990-00) and 66th round (2009-10) surveys of NSSO on "Employment and Unemployment situation in India". We have taken these two rounds in order to identify recent changes in work force participation of elderly people compared to the period just after the globalization.

The sampling design adopted for the two surveys were essentially a stratified multi-stage one for both rural and urban areas. The surveys used the interview method of data collection from a sample of randomly selected households. The first stage units (FSUs) were villages (panchayat wards for Kerala) for rural areas and NSS Urban Frame Survey (UFS) blocks for urban areas. The ultimate stage units (USUs) were households.

In the 55th round, data was collected for 7,00,934 individuals. Within this sample, 48,223 persons were aged 60 years and above. In the 66th round, data was collected for 4,59,784 individuals, among which there were 36,774 individuals aged 60 years or above. The following table shows percentage distribution of elderly population by sex and place of residence in the 55th and 66th rounds.

Table 1: Percentage of elderly persons in population by place of residence and sex

Group	**1999-00**	**2009-10**
Rural male	4.49	4.80
Rural female	6.95	8.13
Rural	**7.10**	**8.00**
Urban male	6.01	7.51
Urban female	7.10	8.52
Urban	**6.50**	**8.00**

Source: Calculated from NSS 55th round and NSS 66th round

Table 1 reveals that the proportion of rural and urban elderly people increased marginally by 0.9 percentage point and 1.5 percentage points respectively over the study period. If we disaggregate the rural and urban population by gender, a similar marginal increase is observed.

3.2 Some methodological issues

We know that the two important macro measures of the decision to work are labour force participation rate (LFPR) and work force participation rate (WFPR). The LFPR of elderly people shows the percentage of elderly population that is in the labour force,[4] while the WFPR of elderly people indicates the percentage of elderly population that is in the work force.[5]

Now, a person may be willing to work, but may not be able to find work (unemployed). In that case, the person is deemed to be part of the labour force, but not part of the work force. This creates a gap between the two. In both the rounds we have found that the number of unemployed elderly workers is minimal—only 12 (comprising 0.06 percent of the labour force) and only 35 (comprising 0.30 percent of the labour force) in the 55th and 66th rounds, respectively. The marginal difference between LFPR and WFPR implies that it does not make much difference whether we look at the LFPR, or the WFPR. Given the trivial nature of the choice we focus on WFPR as this measure incorporates demand conditions also.

In the 55th and 66th rounds, the persons surveyed were classified into various activity categories on the basis of the activities pursued by them during certain specified reference periods. There were three reference periods for this survey. These are: (i) one year (ii) one week and (iii) each day of the reference week. Based on these three periods, three different measures of activity status are arrived at, termed respectively as usual status, current weekly status and current daily status.[6] Usual status is determined on the basis of the usual principal activity and usual subsidiary economic activity of a person taken together. Usual status data is a better indicator regarding the presence in the labour market as it looks at the status of the person over a longer reference period. In the 55th round and 66th round on the basis of usual subsidiary status data we have

[4] Labour force includes persons who are working and those who are willing to work but may be currently unemployed.
[5] Work force includes persons who are currently working.
[6] This activity status for a person is determined on the basis of his/her activity status on each day of the reference week.

found only 3.4 per cent and 5.6 per cent elderly people are employed. Such a small percentage is not helpful for meaningful analysis. So, we have taken only the usual principal status data for our analysis.

3.3 Econometric models

In this paper, in order to determine the influence of predictor variables on the WFPR of elderly by sex and place of residence, we have used the following model:

$$WFORCE = \alpha + \beta_1 AGE + \beta_2 AGE^2 + \beta_3 LPCME + \beta_4 LPCME^2 + \beta_5 ILLITERATE + \beta_6 BPRIMARY + \beta_7 MIDDLE + \beta_8 SECONDARY + \beta_9 HIGHER + \beta_{10} MUSLIM + \beta_{11} HSC + \beta_{12} HST + \beta_{13} OTHERS + \beta_{14} NORTH + \beta_{15} WEST + \beta_{16} EAST + \beta_{17} NEAST + \beta_{18} SOUTH + \beta_{19} UNEMP + \beta_{20} TIME \quad (1)$$

where

WFORCE = 1 if the respondent is a worker

= 0 otherwise

AGE = Age of the respondent

LPCME = Log of monthly per capita expenditure

ILLITERATE = 1 if the respondent is illiterate

= 0 otherwise

BPRIMARY = 1 if the respondent is below primary educated

= 0 otherwise

MIDDLE = 1 if the respondent is middle educated

= 0 otherwise

SECONDARY = 1 if the respondent is secondary educated

= 0 otherwise

HIGHER = 1 if the respondent is higher educated

= 0 otherwise

(PRIMARY, i.e. respondent has primary education, is taken as reference category)

MUSLIM = 1 if the respondent is a Muslim

= 0 otherwise

HSC = 1 if the respondent is a Hindu schedule caste

= 0 otherwise

HST = 1 if the respondent is a Hindu schedule tribes

= 0 otherwise

OTHERS = 1 if the respondent belongs to all others socio-religious identity

= 0 otherwise

(H-OTHERS, i.e. Hindu OBCs and forward castes, is the reference category)

NORTH = 1 if the respondent resides in North India

= 0 otherwise

WEST = 1 if the respondent resides in West India

= 0 otherwise

EAST = 1 if the respondent resides in East India

= 0 otherwise

NEAST = 1 if the respondent resides in North-east India

= 0 otherwise

(CENTRAL, i.e. respondent resides in Central India, is the reference category)

UNEMP = State level unemployment

TIME = 0 if data is for 66^{th} round (2009-10)

= 50^{th} round (1999-2000)

Here the dependent variable—whether the respondent is working or not—is binary. In case of a binary choice model we can use linear probability model (LPM), logit model or probit model. The fundamental weakness of LPM is its underlying assumption that the probability of something happening increases linearly with the level of regressor.[7] This restrictive assumption can be avoided if we use the logit and probit model.

Now, one possible problem with model (1) is endogeneity. We know that monthly per capita expenditure level influences the individual's decision to work. On the other hand, if a person participates in economic activities, his/her participation in the workforce increases household income, and hence expenditure. As this two-way relationship may lead to biased estimates if we use ordinary logit or probit model, we have estimated equation (1) accounting for endogeneity. To solve endogeneity problem, Arellano (2008) suggests a control function approach using two-step probit model.

[7] This may result in values of probability greater than unity or less than zero. In addition, the assumption of homoscedasticity is often violated in LPMs.

Let the initial model be as follows:

$$Y = 1\ (\alpha + \beta X + U \geq 0)$$

$$X = \pi Z + \sigma_v V$$

$$\text{Here } \begin{pmatrix} U \\ V \end{pmatrix} | Z \sim N\left[0, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right]$$

In this model X is an endogenous explanatory variable as long as $\rho \neq 0$ and X is exogenous if $\rho = 0$. U is an error term which is correlated with X but not with the instrument Z. Further, E(U) = 0 and E(ZU) = 0. The two step estimation of the model is given below:

Step1: We have to obtain the OLS estimates ($\hat{\pi}$, $\hat{\sigma}_v$) of the first stage equation and then form standardized residual $\hat{v}_i = (x_i - \hat{\pi} z_i)/ \hat{\sigma}_v$, i= 1,2,…….N.

Step 2: Run an ordinary probit of y on constant, x, and $\hat{v}_i$ to obtain consistent estimates of the parameter.[8]

In our study, we have found that LPCME and WFPR are the functions of the following variables:

LPCME = f (WFPR, other explanatory variables)

WFPR = g (LPCME, $LPCME^2$, other explanatory variables)

Following the Arellano's control function approach we have to identify an instrumental variable (IV) that affects LPCME but not WFPR of elderly. In our model the instrumental variable is number of non-aged working members of the family. We first regress LPCME on the instrument and other variables. Based on this model, we estimate predicted residual and we form standardize residual (SRES). As WFPR is the function of LPCME and $LPCME^2$, we have calculated SRES and square of SRES ($SRES^2$). We then estimate WFPR on SRES, $SRES^2$ (in place of LPCME

[8] The control function approach departs from the standard two stage model by regressing Y on standardized residuals, instead of regressing Y on predicted values of the instrument. Adopting the latter implies that our model will be:

$$Y = 1\ (\alpha + \beta(\hat{\pi} Z) + \varepsilon \geq 0)$$

where $\varepsilon \sim N(0, \sigma_\varepsilon^2)$ with $\sigma_\varepsilon^2 = 1 + \beta^2 \sigma_\varepsilon^2 + 2\beta\sigma_v\rho$

The problem is that, although it is possible to get consistent estimates of $\bar{\alpha} = \alpha/\sigma_\varepsilon$ and $\bar{\beta} = \beta/\sigma_\varepsilon$, we cannot obtain consistent estimates of α and β from the estimates $\bar{\alpha}$ and $\bar{\beta}$ as ρ in unknown (Arrelano, 2008: 5).

and $LPCME^2$) and other variables to obtain unbiased consistent estimates. This model is estimated for only the age sample.

In order to determine the influence of predictor variables on the informal sector participation of the people, we have used the model:

$$IFS = \alpha + \beta_1 AGEDUMMY1 + \beta_2 AGEDUMMY2 + \beta_3 AGEDUMMY4 + \beta_4 TIME + \beta_5 NORTH + \beta_6 WEST + \beta_7 EAST + \beta_8 NEAST + \beta_9 SOUTH + \beta_{10} MUSLIM + \beta_{11} HSC + \beta_{12} HST + \beta_{13} OTHERS + \beta_{14} LPCME + \beta_{15} LPCME^2 + \beta_{16} ILLITERATE + \beta_{17} BPRIMARY + \beta_{18} MIDDLE + \beta_{19} SECONDARY + \beta_{20} HIGHER + \beta_{21} UNEMP \quad (2)$$

where,

IFS = 1 if the respondent participating in the informal sector

= 0 otherwise

AGEDUMMY1 = age of the respondent is 15 to 24 years

AGEDUMMY2 = age of the respondent is 25 to 49 years

AGEDUMMY4 = age of the respondent is 60 years and above

(AGEDUMMY3, i.e., the age of the respondent is 50 to 59 years, is the reference category)

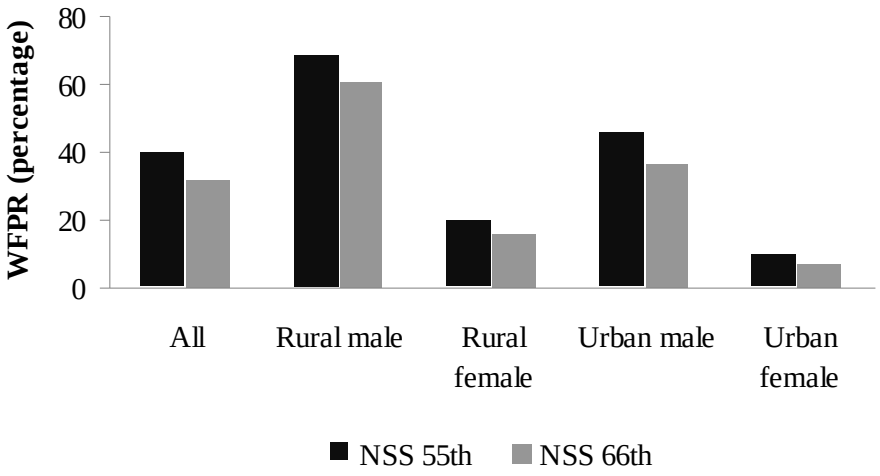
Other variables are same as (1). This model is estimated for the entire NSSO sample, comprising of both the aged and non-aged population.

4. RECENT CHANGES IN WFPR IN INDIA

In India the WFPR of elderly people in 1999-00 (55^{th} round) has decreased from 39 per cent (1999-00) to 32 per cent (2009-10)—a decline of 7 percentage points over the study period. Selvaraj et al. (2011) had argued that the declining trend in WFPR of elderly in India is due to decreasing WFPR among the urban elderly, who are less likely to participate in workforce. However, Figure 1 shows that WFPR has decreased for all the groups (rural male, rural female, urban male, urban female) over the study period. The greatest fall in WFPR is observed among the urban elderly male (a decline of 9 percentage points) followed by rural male elderly (a decline of 8 percentage point). The least decline is observed among the urban female (a decline

of two percentage points). Given the inadequate social security system prevailing in India, this decline is unlikely to be the result of deliberate withdrawal from the labour force. Rather, the declining work participation of elderly may be attributed to fewer job opportunities, poor health, lack of skills commensurate with modern production techniques, unfriendly public transport etc. (Pandey, 2009).

Figure 1: WFPR of elderly in the 55th and 66th round of NSS



Source: NSS 55th round and NSS 66th round

Obviously the socio-economic implications of a decreasing WFPR will depend upon which socio-economic stratum has experienced the greatest decline in WFPR over the two rounds. In the next section, we analyze changes in WFPR across expenditure groups and education levels.

4.1 Changes in WFPR across socio-economic strata

In order to analyze the work participation of elderly belonging to different expenditure groups we have taken quintile divisions of monthly per capita expenditure. The five groups are labeled: Poorest, Poor, Middle, Rich and Richest. Analysis of WFPR across these groups for rural male in 1999-00 (Table 2) reveals an upward rising trend—that is, as the level of expenditure increases work participation of the rural male elderly increases. In case of rural female, urban male and urban female as the level of expenditure increases WFPR decreases. In the 66th round in case of rural male and female elderly we observe an upward rising trend up to the Rich class; thereafter,

a sudden fall is observed. In case of urban male and female elderly, in the 66th round, an inverted U relationship between WFPR and expenditure classes is observed.

Table 2: WFPR of elderly by expenditure group, sex and location of residence in 55th and 66th rounds of NSS (percentage)

	Round	Expenditure group				
		Poorest	**Poor**	**Middle**	**Rich**	**Richest**
Rural male	NSS 55th	56.9	59.8	63.5	64.9	65.8
	NSS 66th	57.6	60.7	61.4	63.6	58.6
	Difference	**0.8**	**1.0**	**-2.0**	**-1.4**	**-7.2**
Rural female	NSS 55th	17.1	16.1	15.8	15.3	13.4
	NSS 66th	15.0	15.3	15.4	17.8	14.4
	Difference	**-2.1**	**-0.9**	**-0.4**	**2.5**	**1.1**
Urban male	NSS 55th	45.0	44.0	40.1	39.0	32.3
	NSS 66th	43.0	44.0	38.8	33.3	28.3
	Difference	**-2.0**	**-0.1**	**-1.2**	**-5.7**	**-4.1**
Urban female	NSS 55th	13.1	10.0	8.0	5.0	3.2
	NSS 66th	10.2	10.7	8.4	5.1	3.1
	Difference	**-2.9**	**0.7**	**0.4**	**0.1**	**-0.1**

Source: Calculated from NSS 55th round and NSS 66th round

Comparing between rounds we find that changes in WFPR are marginal for most of the quintile groups. Only among the Richest group for rural males and among Rich for urban males is the decline greater than five percentage points.

In this study education level of elderly is categorized as illiterate, below primary educated (including informal education), primary educated, middle educated, secondary educated and higher educated. Table 3 reveals that the decrease in WFPR has been substantial among the educated elderly in rural areas; in urban areas, the change in WFPR is relatively high (above four percentage points) only among elderly with primary education.

Table 3: WFPR of elderly by educational achievement, sex and location of residence in the 55th and 66th round of NSS (percentage)

	Round	Education level					
		Illiterate	Below primary	Primary	Middle	Secondary	Higher
Rural male	**NSS 55th**	61.1	63.8	68.6	68.2	60.6	61.3
	NSS 66th	57.3	63.5	68.6	68.9	56.6	52.9
	Difference	**-3.8**	**-0.3**	**0.0**	**0.7**	**-4.0**	**-8.4**
Rural female	**NSS 55th**	15.8	12.4	11.5	10.6	13.3	7.9
	NSS 66th	16.1	14.2	14.5	11.9	5.6	13.6
	Difference	**0.3**	**1.8**	**3.0**	**1.3**	**-7.7**	**5.7**
Urban male	**NSS 55th**	43.6	44.8	47.4	44.6	30.8	27.7
	NSS 66th	41.7	44.4	42.8	44.9	31.1	25.6
	Difference	**-2.0**	**-0.4**	**-4.7**	**0.2**	**0.3**	**-2.1**
Urban female	**NSS 55th**	9.3	5.9	5.1	4.9	2.1	6.5
	NSS 66th	8.8	7.4	6.6	4.5	2.3	4.6
	Difference	**-0.5**	**1.5**	**1.4**	**-0.5**	**0.2**	**-1.8**

Source: Calculated from NSS 55th round and NSS 66th round

This indicates that the elderly belonging to the poor and vulnerable sections of the society might not have been significantly affected by changes in the labour market. However, before arriving at a firm conclusion, we must also examine the quality of employment. This is indicated by changes in the extent of informalisation and the occupational pattern.

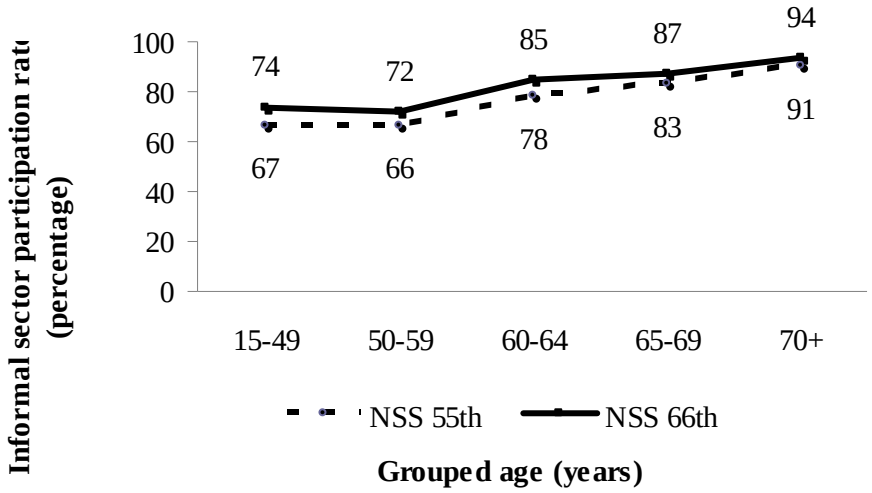
4.2 Trends in informalisation

Analysis of informal sector participation of the workforce[9] reveals a positive relation between age and informal sector participation in both rounds (Figure 2). This is not surprising, given that

[9] A worker is said to work in the informal sector if: (1) (S)he is an own account worker or employer or helper in household enterprises; or (2) (S)he works in enterprises which do not use electricity (or the electricity use is not known) and the number of workers in that enterprise is less than twenty; or (3) (S)he works in enterprises which use electricity but the size of workforce is less than ten.

full time employment in the public sector is possible only up to 60, or at most 65 years. More important is the fact that informalisation has increased over the study period for all age groups. This is possibly due to the shrinkage in job opportunities within the formal sector in recent years.

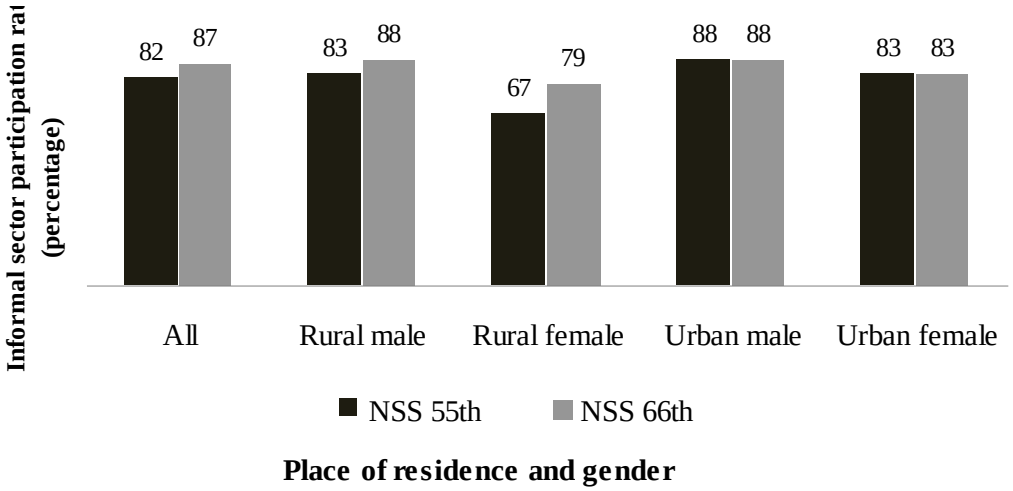
Figure 2: Informal sector participation of different age groups in India in the 55th and 66th round of NSS



Source: NSS 55th round and NSS 66th round

Disaggregating the elderly workforce by place of residence and gender it is found that the informalisation has increased sharply among rural male and rural female by 6 and 12 percentage points respectively. In contrast, the informal sector participation of both male and female elderly in urban area has remained same in both the rounds.

Figure 3: Informal sector participation of elderly in the 55th and 66th round of NSS



Source: NSS 55th round and NSS 66th round

Table 3 presents percentage of workers in the informal sector for different age groups by educational levels. It may be seen that, in rural areas, the increase in informalisation among illiterate and below primary educated is lower among the elderly, relative to other age groups. This may indicate that the decrease in formal sector jobs is leading to the younger workforce is squeezing out the elderly from the informal sector.

Table 3: Informal sector participation of different age groups by educational achievement in the 55th and 66th round of NSS (percentage)

	Education level	NSS 55th				NSS 66th			
		15-24	25-49	50-59	60+	15-24	25-49	50-59	60+
Rural male	Illiterate	52.38	53.06	62.47	75.66	65.43	69.45	73.51	83.60
	Below primary	61.37	63.71	73.85	88.54	66.76	72.37	77.39	88.46
	Primary	67.93	71.94	77.73	91.11	71.76	77.59	81.94	90.96
	Middle	73.69	77.12	80.94	93.82	77.97	81.82	82.78	93.76
	Secondary	79.25	78.44	81.42	98.04	81.87	82.42	78.20	95.77
	Higher	83.68	80.20	77.18	96.33	82.19	77.05	69.05	94.41
Rural female	Illiterate	51.34	52.47	61.78	65.43	68.81	65.01	71.62	77.23
	Below primary	58.40	65.21	76.99	87.58	61.40	66.55	80.28	84.43
	Primary	64.78	77.28	83.09	80.56	71.45	75.81	85.38	88.79
	Middle	67.62	81.11	87.50	92.59	75.08	81.83	88.44	92.11
	Secondary	81.69	81.67	85.57	100.00	81.56	84.75	84.91	100.00

	Higher	80.66	71.44	61.76	100.00	83.37	72.32	62.92	94.44
Urban male	**Illiterate**	78.74	74.23	71.52	83.32	77.11	76.26	75.40	83.13
	Below primary	79.16	73.37	70.07	89.45	79.54	77.11	80.74	89.97
	Primary	80.54	74.76	65.85	89.39	80.18	76.67	74.20	89.13
	Middle	80.37	74.41	64.13	92.10	79.53	77.82	70.27	89.39
	Secondary	80.98	66.07	57.06	91.68	78.48	73.84	63.04	93.24
	Higher	76.47	61.09	48.25	90.30	66.64	60.39	53.46	89.26
Urban female	**Illiterate**	61.35	67.69	68.93	79.06	76.72	72.21	73.78	79.77
	Below primary	74.57	76.61	82.91	97.14	75.41	75.05	87.02	91.67
	Primary	76.68	79.42	78.33	100.00	78.85	80.46	86.06	92.59
	Middle	78.44	77.02	85.47	94.44	83.33	82.90	75.81	96.43
	Secondary	68.71	65.24	50.43	88.89	81.18	76.83	60.53	75.00
	Higher	68.54	53.80	50.68	57.69	62.04	52.91	43.14	70.37

Source: Calculated from NSS 55th round and NSS 66th round

Examining the data for urban males, on the other hand, reveals that the increase in informalisation has been highest among the near-elderly. Among the elderly, in many educational groups, the extent of informalisation has actually reduced. A somewhat similar trend is observed for urban females. However, an important difference is the sharp increase in informalisation among urban females with at least Higher Secondary level of education or more.

Analysis of changes in level of informalisation among urban males by expenditure levels (Table 4) reveals a sharp increase in informalisation among the first four expenditure quintiles (bottom 80 percent of the sample). Among rural females, the increase in informalisation is substantial among all five quintile groups. In contrast the change in informalisation level among urban workers is marginal for almost all expenditure and age groups.

Another result is that informalisation is higher among the elderly workers vi-a-vis other age groups, particularly in 2009-10. This is expected, given that retirement age bars the elderly from formal sector job opportunities.

Table 4: Informal sector participation of different age groups by expenditure level in the 55th and 66th round of NSS

	Expenditure	**NSS 55th**	**NSS 66th**

	group	15-24	25-49	50-59	60+	15-24	25-49	50-59	60+
Rural male	**Poorest**	50.14	48.44	55.58	70.13	66.50	67.95	69.38	78.61
	Poor	59.88	61.34	62.93	75.17	72.77	77.43	77.71	84.81
	Middle	68.16	69.77	70.98	80.66	78.62	80.15	79.45	88.40
	Rich	74.31	76.94	77.36	86.47	80.77	81.59	79.05	90.90
	Richest	80.76	77.68	78.69	91.27	81.73	77.98	76.19	94.18
Rural female	**Poorest**	43.18	41.02	46.87	51.25	61.65	56.87	61.34	69.70
	Poor	51.62	50.60	56.59	61.60	70.58	66.04	70.76	75.82
	Middle	60.16	62.35	62.46	65.82	76.25	74.19	74.47	77.13
	Rich	71.74	72.11	73.55	71.83	82.46	78.85	81.50	82.26
	Richest	79.76	78.64	80.22	83.47	79.90	79.30	82.40	86.01
Urban male	**Poorest**	79.31	75.72	74.20	82.77	79.41	78.17	77.05	85.00
	Poor	82.22	75.57	69.41	90.08	81.72	78.76	77.34	85.82
	Middle	82.98	71.28	67.07	88.23	77.97	73.82	71.74	90.46
	Rich	76.87	66.51	59.25	89.25	73.85	67.82	61.58	90.48
	Richest	74.13	58.03	47.70	91.04	63.26	54.84	51.77	89.46
Urban female	**Poorest**	66.89	69.32	68.89	78.75	77.83	73.02	69.72	72.66
	Poor	72.16	73.84	71.76	82.83	80.26	76.70	79.70	88.28
	Middle	77.94	73.46	72.32	84.27	81.98	74.96	75.58	81.36
	Rich	71.71	68.03	74.04	91.07	70.63	69.05	73.00	87.01
	Richest	60.95	53.23	53.60	82.28	54.89	53.50	53.39	90.57

Source: Calculated from NSS 55th round and NSS 66th round

The relation between WFPR and informalisation is positive in rural areas. In urban areas, the relationship is not monotonic. In 1999-00 the WFPR curve is N-shaped for urban males; in 2009-10 it increases up to the third quintile, after which it remains more or less stable. Among urban female workers, WFPR exhibits an inverse U-shape in 1999-00 and an N-shape in 2009-10.

4.3 Econometric analysis

One limitation of the bivariate analysis undertaken in earlier sections is the failure to control for variables like socio-religious identity, geographical zone of residence, and other determinants of work force participation and informalization. To remedy this deficiency we have estimated two regression models, using methodology described in Section 3, to identify determinants of work force participation and informalization. Their results are discussed below.

Table 5 briefly explains the determinants of workforce participation of rural male, rural female, urban male and urban female elderly people. In all four models, the LR χ^2 statistic is significant at 1% level, indicating that the overall models are significant. The pseudo R^2 values show that all the independent variable explains 15 per cent, 12 per cent, 11 per cent and 34 per cent variations of the dependent variables for the rural male, rural female, urban male, and urban female elderly respectively. These are acceptable given that we are using cross-section data.

The dummy variable, TIME, is significant and negative for all the four groups. This indicates that the work participation of the elderly has decreased over the study period. This may be because of reduced job opportunities, poor health, etc. The variable AGE and AGE square are significant only for male elderly in both rural and urban areas. The negative sign with respect to age and positive sign with respect to square of age implies that work participation of the rural and urban male elderly has an U-shape relation with age. A possible reason for this may be that WFPR has a lower limit, beyond which it cannot fall. The variable LPCME is significant at 1% level for all the four groups and the positive signs imply that workforce participation increases with increase in expenditure levels for all the groups. This implies that WFPR is lower for economically vulnerable respondents. As expected, the relationship between the work participation and state level unemployment is negative.

Table 5: Effects of predictor variables on workforce participation of elderly

Variable	Rural male	Rural female	Urban male	Urban female
TIME	-0.07***	-0.04***	-0.07***	-0.48***
AGE	-0.07***	0.01	-0.06***	0.01
AGE2	0.0003***	-0.0002***	0.0002***	-0.0001
LPCME	0.06***	0.02***	0.05***	-0.01***
$LPCME^2$	-0.01***	-0.002	-0.003	-0.002
UNEMP	-0.004*	-0.003***	0.002	-0.004***
Education level (Ref. Cat. PRIMARY)				
ILLITERATE	-0.08***	0.04***	-0.02	0.03**

Variable	Rural male	Rural female	Urban male	Urban female
BPRIMARY	-0.04***	0.02	-0.01	0.005
MIDDLE	-0.05***	-0.03*	-0.03*	-0.02
SECONDARY	-0.20***	-0.06***	-0.19***	-0.06***
HIGHER	-0.26***	-0.05*	-0.27***	-0.01
Socio-religious identity (Ref. Cat. HINDU OTHERS)				
MUSLIM	-0.02*	-0.05***	-0.03**	-0.04***
HSC	-0.05***	0.05***	-0.04***	0.06***
HST	0.001	0.07***	-0.11***	0.03
OTHERS	-0.03***	-0.01	-0.02	0.02
Geographical zone (Ref. Cat. CENTRAL)				
NORTH	-0.05***	-0.01	-0.02	-0.03**
WEST	-0.10***	0.10***	-0.07***	0.01
EAST	-0.14***	-0.08***	-0.12***	-0.02
NEAST	0.03	0.17***	-0.02	0.15***
SOUTH	-0.10***	0.10***	-0.09***	-0.03***
N	27891	25618	15346	8636
LR χ^2	5343.18***	2766.53***	2388.78***	2555.84***
PSEUDO R^2	0.15	0.12	0.11	0.34

Source: Calculated from NSS 55th round and NSS 66th round

The sign (and statistical significance) of the coefficients of education dummies indicate that WFPR increases marginally for males and remains stable for females up to primary level, falling marginally thereafter. The drop in WFPR is substantial at the HIGHER level (corresponding to at least 12 years of schooling).

Muslims and Hindu Scheduled Castes have a significantly lower WFPR than Upper Caste Hindus. Rural females belonging to the Scheduled Tribe community have a lower WFPR than their Hindu Upper Caste counterparts; this relation is reversed for urban males. WFPR in Central

India tends to be higher than that in North, East, South and West; in contrast, WFPR in Central India is lower than in North-eastern India for females. This is possibly a result of the matriarchal nature of society in the latter region.

Table 6 presents results of the probt model of determinants of informal sector participation for the population aged above 15 years (that is, including both elderly and non elderly people). Although the coefficient of the dummy variable Time is significant for the rural male, rural female and urban male at 1% level, the sign of the coefficient varies between rural and urban areas. The negative coefficient for rural male and female implies that informal sector participation of the rural population has decreased over the period of study. In contrast, the coefficient of time for the urban male is positive, implying that informalisation has increased between the two rounds. Informalisation among urban female workers has remained at the same level, indicated by the statistical insignificance of the time dummy for this sub-sample. The coefficients of the variable LPCME and its square are significant for all the four groups. Signs of the coefficients of these variables indicate that informal sector participation of the people in rural and urban India increases at a decreasing rate with increase in monthly per capita expenditure of the people.

Table 6: Effects of predictor variables on informal sector participation of the people

Variable	Rural male	Rural female	Urban male	Urban female
TIME	-0.04***	-0.11***	0.05***	-0.03
LPCME	0.87***	0.94***	0.10*	0.34**
$LPCME^2$	-0.06***	-0.06***	-0.01***	-0.03***
UNEMP	-0.0***	0.0001	-0.01***	0.002
Age groups (Ref. Cat. 50-59 years)				
AGE 15-24	-0.07***	0.01	0.10***	0.09**
AGE 25-49	0.005	0.05***	0.08***	0.04
AGE 60+	0.13***	0.11***	0.23***	0.16***
Education level (Ref. Cat. PRIMARY)				
ILLITERATE	-0.11***	-0.18***	-0.01	-0.08**
BPRIMARY	-0.05***	-0.07*	-0.004	-0.10**
MIDDLE	0.03***	0.02	-0.01	-0.08**
SECONDARY	-0.01	-0.09**	-0.06***	-0.21***

Variable	Rural male	Rural female	Urban male	Urban female
HIGHER	-0.07***	-0.16***	-0.13***	-0.28***
Socio-religious identity (Ref. Cat. HINDU OTHERS)				
MUSLIM	0.02**	0.09***	0.08***	0.11***
HSC	-0.11***	-0.16***	-0.10***	-0.12***
HST	-0.07***	-0.10***	-0.11***	-0.15***
OTHERS	-0.02***	-0.003	-0.01	-0.05*
Geographical zone (Ref. Cat. CENTRAL)				
NORTH	-0.09***	0.02	-0.01	-0.02
WEST	-0.14***	-0.27***	-0.06***	-0.04
EAST	-0.04***	-0.15***	-0.03***	-0.04
NEAST	-0.08***	-0.11***	-0.07***	0.01
SOUTH	-0.10***	-0.26***	-0.03***	-0.03
N	42454	3988	39604	2992
LR χ^2	2135.2***	548.36***	3035.51***	251.57***
PSEUDO R^2	0.04	0.11	0.06	0.06

Source: Calculated from NSS 55th round and NSS 66th round

In rural areas, the coefficient of the 15-24 years male is negative, implying that informalisation has decreased among this age group, compared to the near elderly. On the other hand, in urban areas, informalisation has increased (compared to the near elderly) among the 15-24 years male and female. Among the 25-49 years rural female and urban male the informal sector participation also increases compared to near elderly. Informalisation has increased across the board among elderly workers, in both rural and urban areas and cutting across gender. In both cases, the reasons for this trend are possibly the same—absence of job opportunities for the elderly in the formal sector, leading them to accept employment in own account enterprises and engagements in the primary sector. In urban area, not only the elderly but also the 'just adult' sub-sample (15-24 year age group) are participating more in the informal sector, so the elderly in urban area faces fiercer competition with the 'just adults'.

Regression results reveal that informalisation among the lower and higher educated groups is significantly lower than that of primary educated people for all the four sub-samples. More educated respondents are, in general, better able to access jobs in the formal sector, reducing

their probability of participating in the informal sector. The lower participation of the illiterate may be due to their poor health conditions.

One important finding is that, the persons workers from disadvantaged castes are participating less in the informal sector than the Hindu upper class. This may be because of reservation. However, the probability of a Muslim worker participating in the informal sector is significantly higher than that of a Hindu upper caste worker for all four sub-samples. The sign and statistical significance of the dummies of geographical zone reveals that the informal sector participation of Central Indian is higher than the West, East and South Indian for all the groups. In North India only the rural male and in North-east India, the rural male, rural female and urban male are participating less in the informal sector than the Central Indian.

Finally, we consider the results of the probit model of determinants of participation in the informal sector among elderly workers (Table 7). This is the same model as above, with two differences. The model is estimated for only elderly workers; the age dummies are therefore dropped from the model.

The LR χ^2 statics are significant for all the four models, indicating that all the models are significant. The variable TIME is significant for the rural male, rural female and urban female at 1% level and the negative signs indicate that over the study period the informal sector participation of these groups have decreased. The coefficient value is particularly high for urban females, indicating that they have been the biggest losers. This may have happened because of the aged are in a disadvantageous position to compete with the young who are increasingly participating in the informal sector. However, the informalization of the urban male elderly has remained same in both the rounds (NSS 55th and NSS 66th).

Table 7: Effects of predictor variables on informal sector participation of the elderly

Variable	Rural male	Rural female	Urban male	Urban female
TIME	-0.05***	-0.14***	0.01	-0.27***
LPCME	0.40***	1.01	0.12	-0.70
$LPCME^2$	-0.02***	-0.06	-0.01	0.06

Variable	Rural male	Rural female	Urban male	Urban female
UNEMP	0.01	0.01*	0.01	0.03**
Education level (Ref. Cat. PRIMARY)				
ILLITERATE	-0.07***	-0.08	-0.03	-0.15*
BPRIMARY	-0.01	0.14	-0.004	0.01
MIDDLE	0.07***		-0.01	-0.06
SECONDARY	0.03		-0.002	-0.37
HIGHER	0.001		-0.01	-0.83***
Socio-religious identity (Ref. Cat. HINDU OTHERS)				
MUSLIM	0.01	0.06	0.06*	-0.03
HSC	-0.13***	-0.18***	-0.12***	-0.16**
HST	-0.04	-0.06	-0.12	-0.12
OTHERS	-0.06*	-0.16	-0.06	-0.15
Geographical zone (Ref. Cat. CENTRAL)				
NORTH	0.03	0.08	0.06*	-0.06
WEST	-0.05	-0.44***	0.04	-0.11
EAST	-0.04*	-0.05	-0.02	-0.02
NEAST	-0.002		0.04	-0.13
SOUTH	-0.07***	-0.33***	0.01	-0.11*
N	2663	568	1170	251
LR χ^2	213.39***	118.08***	32.28**	45.95***
PSEUDO R^2	0.10	0.16	0.03	0.19

Source: Calculated from NSS 55th round and NSS 66th round

Note: The variables MIDDLE, SECONDARY, HIGHER, NEAST for the rural female elderly predict success perfectly. These variables are dropped in the result.

4.4 Occupational shift

The combined findings that WFPR and extent of informalisation for elderly workers has both decreased are of some concern. We have suggested possible reason for this—contraction of formal sector employment opportunities leading to influx of younger workers into the informal sector. Another important dimension that needs to be explored is the occupational pattern of elderly workers and their corresponding wages. In this section we will identify sectors where aged workers concentrate and examine whether these are high paying.

In Table 8 we have listed occupations (following two digit NCO 2004 classification), sorted by proportion of aged workers in that occupation. Alongside we have given mean daily earnings of all workers in that sector.

Table 9a and 9b reveals changes in occupational structure of aged workers in rural areas. Both male and female rural workers are predictably concentrated in the primary sector (83 and 85 percent workers respectively in 1999-2000). This is important as engagement in occupations in the primary sector, where food is directly produced, ensures a minimum level of security and protection against hunger. While the concentration in primary sector persists in 2009-10, the proportion of aged workers in such occupations decline by 10 and 7 percentage points, respectively. This implies an increase in vulnerability of elderly workers.

In contrast, aged elderly workers in urban areas are found to concentrate in the service sector. Moreover, the change in occupational structure is about five percentage points for both male and female workers over the study period.[10]

Another important point to be noted about the occupational structure is that most of the occupations where aged workers are concentrated are low-earning occupations. In the tables, the top ten earning occupations in each round are shaded grey. It is easy to see that very few of the occupations with more than two percent of the aged workers belong to the high earning categories. This is another indication of the increasing vulnerability of elderly in the India, and the failure of the market to ensure their security.

5. Conclusion

As developments in the health sector prolong the life cycle, the issue of meeting consumption and health needs of the aged increasingly becomes an important issue. In European and North America countries the emergence of the concept of welfare state has resulted in the creation of a social security system in many of these countries that can ensure a minimum level of physical well-being to the elderly. Moreover, the realization that longevity is increasing has also led to

[10] The percentage of male workers I services has declined from 60 to 55 percentage over the study period. For female workers, corresponding figures are 51 and 45, respectively.

changes in work and savings patterns that complements the efforts of the state. In developing countries, on the other hand, policies targeting elderly from low income households have failed to attain their objectives. This calls for other substitutes to protect the aged population from destitution and poverty. One such instrument is the labour market.

Analysis of NSS data, however, reveals a decline in the work-force participation of elderly in India. Examination of the extent of informalisation of the work-force indicates that the decline in WFPR is likely to have been caused by a reduction in the share of aged workers in the informal sector. This may be attributed to greater competition from younger workers who are being driven out of the formal sector due to slow growth of employment opportunities in the formal sector. This, along with alienation of rural elderly workers from primary occupations, is a sign of increasing vulnerability.

One of the tenets of globalization was the increasing non-involvement of the state in the market and economy. This trend must not be confused with distancing the state from the social sector. The opening up of the economy to has led to structural changes that threatens the social fabric and increases vulnerability. The state must attempt to identify such threats and aim to protect affected sections of the population through carefully designed policies. This is also true for the increasing proportion of the aged population in India.

Table 9a: Occupation structure of aged workers—Rural male workers

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10	1999-00a	2009-10a
HIGH CONCENTRATION OF AGED WORKERS				
Market Oriented Skilled Agricultural and Fishery Workers	**67.1**	**59.8**	69	10
Agricultural, Fishery and Related Labourers	**15.8**	**9.1**	45	96
Models, Sales Persons and Demonstrators	**4.2**	**4.9**	70	16
Corporate Managers	**2.2**	**4.7**	274	28
Labourers in Mining, Construction, Manufacturing and Transport	**1.5**	**3.8**	63	109
Extraction and Building Trades Workers	**2.0**	**3.7**	77	102
Subsistence Agricultural and Fishery Workers	**0.0**	**3.2**		21
Other professionals	**0.6**	**2.1**	127	47
LOW CONCENTRATION OF AGED WORKERS				
Other Craft and Related Trade Workers	1.6	1.7	67	31
Sales and Services Elementary Occupations	1.2	1.6	95	104
Personal and Protective Service Workers	1.1	1.4	122	218

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10	1999-00a	2009-10a
Metal, Machinery and Related Trades Workers	0.4	0.8	131	144
Precision, Handicraft, Printing and Related Trade Workers	0.5	0.7	114	44
Other Associate Professionals	0.1	0.4	188	267
Machine Operators and Assemblers	0.7	0.4	99	116
Teaching Associate Professionals	0.1	0.3	201	413
Life Science and Health Professionals	0.3	0.3	346	232
Teaching Professionals	0.1	0.3	245	501
Drivers and Mobile-Plant Operators	0.1	0.3	112	130
Office Clerks	0.2	0.3	169	365
Stationary Plant and Related Operators	0.2	0.1	120	230
Life Science and Health Associate Professionals	0.1	0.1	190	298
Legislators and Senior Officials	0.0	0.1	292	430
Customer Services Clerks	0.0	0.1	188	373
Physical, Mathematical and Engineering Science Professionals	0.0	0.0	293	672
Physical and Engineering Science Associate Professionals	0.0	0.0	250	447

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10	1999-00a	2009-10a
General Managers	0.0	0.0		594

Table 9b: Occupation structure of aged workers—Rural female workers

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10		1999-00
HIGH CONCENTRATION OF AGED WORKERS				
Market Oriented Skilled Agricultural and Fishery Workers	**54.1**	**56.1**	34	5
Agricultural, Fishery and Related Labourers	**31.1**	**19.2**	29	70
Models, Sales Persons and Demonstrators	**3.4**	**4.0**	104	6
Sales and Services Elementary Occupations	**2.6**	**4.0**	48	60
Corporate Managers	**1.5**	**3.3**		7
Other Craft and Related Trade Workers	**2.9**	**3.1**	31	23
Subsistence Agricultural and Fishery Workers	**0.0**	**2.7**		5
Labourers in Mining, Construction, Manufacturing and Transport	**0.8**	**2.6**	39	87
LOW CONCENTRATION OF AGED WORKERS				

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10		1999-00
Personal and Protective Service Workers	0.9	1.3	68	109
Extraction and Building Trades Workers	0.1	0.9	44	89
Precision, Handicraft, Printing and Related Trade Workers	0.5	0.9	171	10
Other professionals	0.0	0.8	26	50
Machine Operators and Assemblers	1.6	0.7	51	48
Life Science and Health Associate Professionals	0.1	0.2	208	370
Other Associate Professionals	0.0	0.1	145	226
Metal, Machinery and Related Trades Workers	0.0	0.1	130	81
General Managers	0.0	0.1		274
Life Science and Health Professionals	0.0	0.1	193	428
Teaching Associate Professionals	0.2	0.1	150	272
Drivers and Mobile-Plant Operators	0.0	0.1		55
Physical, Mathematical and Engineering Science Professionals	0.0	0.0		573
Customer Services Clerks	0.0	0.0	179	109
Stationary Plant and Related Operators	0.1	0.0	77	42

Table 9c: Occupation structure of aged workers—Urban male workers

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10	1999-00	2009-10
HIGH CONCENTRATION OF AGED WORKERS				
Models, Sales Persons and Demonstrators	**23.1**	**15.4**	90	52
Market Oriented Skilled Agricultural and Fishery Workers	**15.7**	**17.8**	124	43
Corporate Managers	**13.7**	**18.0**	344	127
Other Craft and Related Trade Workers	**6.4**	**4.9**	85	79
Extraction and Building Trades Workers	**5.6**	**3.7**	119	137
Labourers in Mining, Construction, Manufacturing and Transport	**5.3**	**5.8**	82	124
Sales and Services Elementary Occupations	**4.9**	**5.3**	95	125
Personal and Protective Service Workers	**3.5**	**3.3**	122	283
Other professionals	**3.3**	**7.9**	233	131
Agricultural, Fishery and Related Labourers	**3.0**	**4.9**	58	112
Machine Operators and Assemblers	**2.3**	**1.0**	123	224
Precision, Handicraft, Printing and Related Trade Workers	**2.3**	**1.4**	149	113
Metal, Machinery and Related Trades Workers	**2.3**	**1.7**	145	251

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10	1999-00	2009-10
LOW CONCENTRATION OF AGED WORKERS				
Other Associate Professionals	1.7	1.5	219	351
Office Clerks	1.4	1.3	193	422
Drivers and Mobile-Plant Operators	1.4	1.2	129	199
Life Science and Health Professionals	1.1	1.3	403	406
Teaching Professionals	0.9	0.7	281	553
Stationary Plant and Related Operators	0.6	0.1	171	425
Teaching Associate Professionals	0.5	0.4	198	422
Physical and Engineering Science Associate Professionals	0.4	0.2	292	557
Customer Services Clerks	0.3	0.3	216	464
Physical, Mathematical and Engineering Science Professionals	0.2	0.4	357	744
Life Science and Health Associate Professionals	0.1	0.3	193	351
Legislators and Senior Officials	0.1	0.3	338	885
Subsistence Agricultural and Fishery Workers	0.0	0.7		108
General Managers	0.0	0.2		667

Table 9d: Occupation structure of aged workers—Urban female workers

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10	1999-00	2009-10
HIGH CONCENTRATION OF AGED WORKERS				
Sales and Services Elementary Occupations	**16.5**	**16.9**	53	102
Market Oriented Skilled Agricultural and Fishery Workers	**11.6**	**16.4**	77	16
Models, Sales Persons and Demonstrators	**17.1**	**12.6**	51	35
Agricultural, Fishery and Related Labourers	**9.4**	**10.9**	31	64
Corporate Managers	**8.9**	**10.0**	270	178
Other Craft and Related Trade Workers	**14.5**	**9.8**	48	32
Personal and Protective Service Workers	**7.0**	**5.6**	87	151
Other professionals	**0.1**	**4.9**	247	190
Labourers in Mining, Construction, Manufacturing and Transport	**4.0**	**3.6**	44	97
Machine Operators and Assemblers	**3.8**	**1.5**	60	135
LOW CONCENTRATION OF AGED WORKERS				
Life Science and Health Associate Professionals	1.1	1.1	181	377

Occupation	Percentage of aged workers		Mean daily wages for all workers	
	1999-00	2009-10	1999-00	2009-10
Extraction and Building Trades Workers	1.5	1.1	64	112
Life Science and Health Professionals	0.3	0.9	399	521
Teaching Professionals	1.0	0.9	279	510
Teaching Associate Professionals	0.3	0.9	181	319
Precision, Handicraft, Printing and Related Trade Workers	0.9	0.9	120	42
Subsistence Agricultural and Fishery Workers	0.0	0.8		48
Metal, Machinery and Related Trades Workers	0.3	0.4	90	354
General Managers	0.0	0.2		
Office Clerks	0.3	0.2	198	397
Stationary Plant and Related Operators	0.8	0.2	109	319
Physical and Engineering Science Associate Professionals	0.1	0.0	149	587
Other Associate Professionals	0.6	0.0	259	394