

**WORK FORCE PARTICIPATION AMONG ELDERLY IN INDIA
STRUGGLING FOR ECONOMIC SECURITY**

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Abstract

In India, ageing is rapidly becoming a major socio-economic concern. The rapidly increasing dependency ratios impose an economic burden on the family. Simultaneously, the state has failed to create an adequate social security network for the vulnerable elderly. In this situation the labour market remains as the only possible means to ensure security to the elderly. How well the labour market in India has succeeded in this front is analysed in this study. The main source of data is National Sample Survey Office unit level data for the 55th (1999-2000) and 66th (2009-10) rounds. In addition, data from the 60th round (2004) survey on "Morbidity and Health Care" is also used.

The study reveals a decline in workforce participation rate among elderly over the study period, particularly among the urban and rural male. This is accompanied by a high level of informalisation of the aged workforce. The decline in work force participation rate appears more as a deliberate withdrawal from the labour force, caused by rural prosperity and expansion of employment opportunities in the manufacturing sector between 2004-2009, rather than forced unemployment. Examination of the occupational profile shows that in rural areas elderly workers concentrate in the primary sector; in urban areas, on the other hand, they are mainly engaged in services. Analysis of occupational structure and earnings, however, reveals that the aged who continue to work are generally employed in low-wage sectors. Further, their own wages are lower than the (low) average earnings in these occupational categories. This remains an area of concern that needs to be addressed by policy makers.

Keywords: Ageing, employment, informal sector, occupational pattern, India.

JEL category: J14, J21.

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 (Anderson and Hussey 2000), in recent years it has become an important socio-demographic issue in Asia also (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 'greying' 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 (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 (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—these policies fall far short of what is required (Purohit 2008). Given the need to control 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 (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 (Vodopivec and Arunatilake 2011), besides generating non-economic 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).

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 (Husain and Ghosh 2011, Alam and Karan 2011, Rajan and Mishra 2011). 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 55th and 66th rounds of National Sample Survey Office (NSSO) survey on Employment and Unemployment. The choice of these two rounds enables us to examine the impact of changes since the sweeping liberalization of the Indian economy between 1985 and 2000, culminating in the integration of the Indian economy with world markets. This is also the period when India was ‘shining’ and was resilient enough to weather even the petro shocks and sub-prime crisis. Using bivariate and econometric analysis we have tried to examine whether growth was inclusive and resulted in a decline of economic vulnerability of aged workers 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(Rajan et al. 2003), with rural WFP rate being higher than WFP in urban areas. Disaggregating by gender, they have found that elderly male participated more in economic activities than the female elderly. Further, elderly workers were increasingly involved in the agricultural sector with almost 80 per cent of the aged workers engaged in this sector in 1991.

Selvaraj et al. (2011) have also analysed the WFP trend in India on the basis of usual activity status (usual principal status¹ and usual subsidiary status²) using NSSO data from 1983 to 2004-05. The total number of elderly workers in India was approximately seven 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

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 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.

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.

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. 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 status³ 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 analysed 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. The descriptive analysis 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). 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

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

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.

Rajan et al. (2003) have analysed 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.
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.

The present study aims to address these deficiencies. Using data on principal status this study have focused on the changing levels and patterns of WFP of elderly in India in recent years compared to the period just after globalization. The analysis is undertaken after disaggregating by place of residence and gender. In addition we also seek to examine the nature of employment of the elderly work force, captured by the extent of informalisation and occupational pattern. The analysis enables us to assess the extent to which the elderly have succeeded in their struggle to secure economic independence through participation in the labour market.

3. DATABASE AND METHODOLOGY

3.1 Database

The two most important sources of data on work force participation rate (WFPR) 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 as data on employment is yet to be released, latest Census data on employment is available for 2001. Further, Census does not provide data on informal sector. In contrast, 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”. The selection of these two rounds enables us to analyse changes in WFP of elderly people following the second round of liberalization in the 1990s.

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 NSSO 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 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.

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

Group	1999-00	2009-10
Rural male	7.24	7.87
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

3.2 Some methodological issues

Two important macro measures of the decision to work are labour force participation rate (LFPR) and 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 measures. 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 low rates of unemployment among the elderly is in keeping with studies reporting that if the aged do not secure work, they tend to withdraw from the workforce (Vodopivec and Arunatilake 2011)—referred to as hidden unemployment (OECD 2006). 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.

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

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.

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—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 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:

$$\begin{aligned} \text{WFORCE} = & \alpha + \beta_1 \text{AGE} + \beta_2 \text{LPCME} + \beta_3 \text{LPCME}^2 + \beta_4 \text{ILLITERATE} + \beta_5 \text{BPRIMARY} + \\ & \beta_6 \text{MIDDLE} + \beta_7 \text{SECONDARY} + \beta_8 \text{HIGHER} + \beta_9 \text{MUSLIM} + \beta_{10} \text{HSC} + \beta_{11} \text{HST} + \beta_{12} \\ & \text{OTHERS} + \beta_{13} \text{UNEMP} \end{aligned} \quad (1)$$

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

⁶ This activity status for a person is determined on the basis of his/her activity status on each day of the reference week.

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)

UNEMP = State level unemployment

Region specific fixed effect are also included, taking CENTRAL as the reference category.

Here the dependent variable—whether the respondent is working or not—is binary. In case of a binary choice model we use either the logit or probit model.⁷ Now, one possible problem with model (1) is reverse causality. 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. In order to check the endogeneity between the above mentioned variables we have used two test of endogeneity, namely Hayashi test⁸ and Wu-Hausman⁹ test (results are reported in Appendix). Both the statistics are significant at 1% level of significance (Table A1), so that we can reject the null hypothesis of exogeneity. Given that there is two-way relation between monthly per capita expenditure level and work participation of the elderly, estimating logit or probit models may lead to biased estimates (endogeneity). To solve this endogeneity problem caused by reverse causality, Arellano (2008) suggests a control function approach using a two step probit model.

Let the initial model be as follows:

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

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

⁷ In recent years, Linear Probability Models (LPM) have re-emerged as the latest fashion. The fundamental weakness of LPM is its underlying assumption that the probability of the event occurring increases linearly with the level of regressor. 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.

⁸ Hayashi (2000) suggests the use of a C statistics (also known as a “GMM distance” or “difference in Sargan” statistic). This is defined as the difference of the Sargan-Hansen statistic of the equation with the smaller set of instrument (valid under both the null and alternative hypothesis) and the equation with a full set of instruments (i.e including the instrument whose validity is suspect). Under the null hypothesis that both the smaller set of instruments and the additional, suspect instruments are valid, the C statistic is distributed as χ^2 in the number of instrument tested.

⁹ The Wu- Hausman test checks for endogeneity of a variable by comparing instrumental variable estimates (β_{iv}) to ordinary least square estimates (β_{ols}). The null hypothesis is that both the estimator are consistent but β_{iv} is efficient : the alternative is that β_{ols} is consistent while β_{iv} is not. If we reject the null hypothesis this mean that β_{iv} is inconsistent.

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

In this model X is an endogenous explanatory variable if $\rho \neq 0$ and 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 Ordinary Least Square (OLS) estimates $(\hat{\pi}, \hat{\sigma}_v)$ of the first stage equation and then form standardized residual $\hat{v}_i = (x_i - \hat{\pi}z_i) / \hat{\sigma}_v$, $i = 1, 2, \dots, N$.

Step 2: Run an ordinary probit of y on constant, x, and \hat{v}_i to obtain consistent estimates of the parameter.¹⁰

In our study, the functional forms of LPCME and WFPR are hypothesised as follows:

$$\text{LPCME} = f(\text{WFPR}, \text{other explanatory variables})$$

$$\text{WFPR} = g(\text{LPCME}, \text{LPCME}^2, \text{other explanatory variables})$$

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 variables are number of non-aged working members of the family and percentage of elderly members co-residing with their children in the state. We first regress LPCME on the instrument and other variables. Based on this model, we estimate predicted residual and form standardized 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 and LPCME^2) and other variables to obtain unbiased consistent estimates. This model is estimated for only the aged sample.

¹⁰ 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 is unknown (Arrelano, 2008: 5).

One problem with the above model is that it does not incorporate information on the physical ability of the aged respondent and residential arrangements—even though such factors affect the ability of the aged to participate in the labour market and the economic pressure to work, respectively. As such information is available only in the NSSO Morbidity and Health Care round (60th round data), undertaken in 2005, we have also estimated a revised model of WFP using this data.

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

$$\begin{aligned} \text{IFS} = & \alpha + \beta_1 \text{LPCME} + \beta_2 \text{LPCME2} + \beta_3 \text{UNEMP} + \beta_4 \text{ILLITERATE} + \beta_5 \text{BPRIMARY} + \\ & \beta_6 \text{MIDDLE} + \beta_7 \text{SECONDARY} + \beta_8 \text{HIGHER} + \beta_9 \text{MUSLIM} + \beta_{10} \text{HSC} + \beta_{11} \text{HST} + \\ & \beta_{12} \text{OTHERS} \end{aligned} \quad (2)$$

where,

IFS = 1 if the respondent participating in the informal sector, = 0 otherwise

Other variables are same as (1).

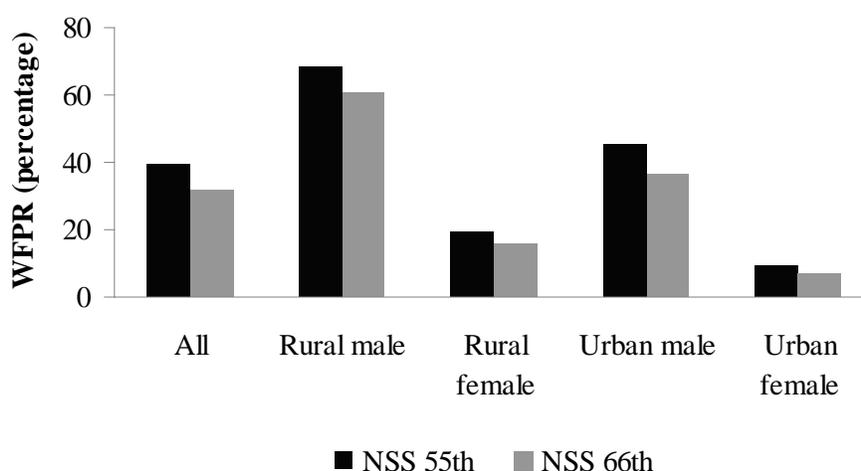
4. RECENT CHANGES IN WFPR IN INDIA

In India the WFPR of elderly people has decreased from 39 per cent (1999-00) to 32 per cent (2009-10)—a decline of seven 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 nine percentage points) followed by rural male elderly (a decline of eight percentage point). The least decline is observed among the urban female (a decline of two percentage points). The pooled regression results (taking NSS 55th and 66th round together, and incorporating a TIME

dummy to capture between-round changes in the work participation) also confirms that WFP has decreased in the 66th round, compared to the 55th round, for all groups (Appendix Table A2).¹¹

Now is this decline the result of a deliberate withdrawal from the labour force, or can it be attributed to factors like declining job opportunities, poor health, lack of skills commensurate with modern production techniques, unfriendly public transport etc. (Pandey 2009). In times of distress, both work participation of female, children and elderly people and unemployment increases as the demand for jobs increases at a higher rate than creation of job opportunities (Himangshu 2011). Given that unemployment rate of elderly population is marginal in both rounds the declining WFPR is likely to be a result of a withdrawal of aged from workforce.

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



Source: NSS 55th round and NSS 66th round

Now, the reduction in supply of labour from elderly may be a response to change in real earnings or due to general prosperity, particularly in rural areas. Abraham (2009) found that WFPR of the rural elderly people increased between 1999-00 and 2004-05 due to declining earning capacity of normal income earners. Over a longer time period (1999-00 and 2009-10), however, daily

¹¹ $WFORCE = \alpha + \beta_1 AGE + \beta_2 LPCME + \beta_3 LPCME^2 + \beta_4 ILLITERATE + \beta_5 BPRIMARY + \beta_6 MIDDLE + \beta_7 SECONDARY + \beta_8 HIGHER + \beta_9 MUSLIM + \beta_{10} HSC + \beta_{11} HST + \beta_{12} OTHERS + \beta_{13} UNEMP + \beta_{20} TIME$. Reported in Appendix Table, Table A2.

average real earnings of non-elderly people (both in rural and urban India) has increased.¹² This may be one of the reasons for the declining participation of elderly in rural and urban India. In particular, populist Government policies before the 2009 General Elections (like waiver schemes) and the success of Mid Day Meal scheme, MNREGA and Public Distribution System buffered the Indian economy from the adverse effects of global economic crisis on Indian economy and the 2009 drought (Himangshu 2011; Khera 2006, 2011).

4.1 Changes in WFPR across socio-economic strata

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 this section, we analyse changes in WFPR across expenditure groups. In order to analyse 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. Table 2 shows that WFPR of rural males increases over quintile groups, while WFPR of remaining gender-residence groups (rural female, urban male and urban female) decreases. Results also reveal marginal changes in WFPR over the two rounds for most of the quintile groups. Only among rural males (top 20 percent) and urban males (top 40 percent) is the decline in WFPR greater than four percentage points.

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

Gender and place of residence	Round	Expenditure group				
		Poorest	Poor	Middle	Rich	Richest
Rural male	NSS 55 th	56.9	59.8	63.5	64.9	65.8
	NSS 66 th	57.6	60.7	61.4	63.6	58.6
	Difference	0.8	1.0	-2.0	-1.4	-7.2
Rural female	NSS 55 th	17.1	16.1	15.8	15.3	13.4
	NSS 66 th	15.0	15.3	15.4	17.8	14.4

¹² Daily average real earnings of non elderly people increases from Rs. 87.73 in 1999-00 to Rs. 137.98 in 2009-10.

Gender and place of residence	Round	Expenditure group				
		Poorest	Poor	Middle	Rich	Richest
	Difference	-2.1	-0.9	-0.4	2.5	1.1
Urban male	NSS 55 th	45.0	44.0	40.1	39.0	32.3
	NSS 66 th	43.0	44.0	38.8	33.3	28.3
	Difference	-2.0	-0.1	-1.2	-5.7	-4.1
Urban female	NSS 55 th	13.1	10.0	8.0	5.0	3.2
	NSS 66 th	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

4.2 Econometric analysis

One limitation of the bivariate analysis is the failure to control for variables like socio-religious identity, geographical zone of residence, and other determinants of WFP. To remedy this deficiency we have estimated the multivariate regression model, using the methodology described in section 3, to identify determinants of WFP. Table 3 presents results of the regression model for determinants of WFP of rural male, rural female, urban male and urban female elderly. In all eight models, the LR χ^2 statistic is significant, indicating that the overall models are significant.¹³ The pseudo R² values show that all the independent variable explains 13 to 16 percent of the variations in the dependent variables. These are acceptable given that we are using cross-section data.

Results reveal, predictably, that WFP declines with age. In rural areas, WFP increases with household expenditure levels, but at a decreasing rate. In contrast, in urban areas, elderly persons from affluent families are less willing to re-enter the labour market, possibly because they enjoy economic security. Larger families have more potential working members, in general; this reduces pressure on elderly persons to work. The impact of education varies, depending upon the gender of respondent. Among aged male workers, WFP initially rises, but subsequently declines

¹³ We do not report the sample size and LR χ^2 statistic as both of them are very large due to use of NSSO survey weights as multipliers.

with education—an inverse U-shaped curve is observed; in case of female aged workers, we observe a negative relationship between WFP and education. In urban areas, however, aged women with more than 12 years of education are more likely to work in both rounds. In general, Hindu Upper castes tend to have a higher WFP than aged members from other socio-religious groups. There are, however, several exceptions—urban female Muslims (55th round), female SCs (in both rural and urban areas and in both rounds), rural male STs (55th round), female STs (in both rural and urban areas and in both rounds) and other minorities (rural males in 66th round, urban females in both rounds).

Table 3: Determinants of WFP of elderly in 55th and 66th rounds— All-India, by place of residence and gender

Variable	Rural male		Rural female		Urban male		Urban female	
	NSS 55 th	NSS 66 th						
AGE	-0.03*	-0.03*	-0.01*	-0.02*	-0.02*	-0.03*	-0.005*	-0.004*
LPCME	0.03*	0.03*	-0.02*	0.004*	-0.004*	-0.01*	-0.03*	-0.01*
LPCME2	-0.01*	-0.02*	-0.001*	-0.01*	-0.001*	0.01*	-0.001*	-0.001*
HHSIZE	-0.01*	-0.01*	-0.02*	-0.02*	-0.005*	0.001*	-0.01*	-0.01*
UNEMP	0.10*	-0.01*	-0.39*	-0.003*	1.04*	0.01*	0.02*	-0.0002*
Education level (Ref.Cat. Primary)								
ILLITERATE	-0.07*	-0.12*	0.03*	0.02*	-0.02*	-0.01*	0.02*	0.01*
BPRIMARY	-0.03*	-0.08*	0.03*	-0.01*	-0.01*	-0.04*	-0.004*	0.01*
MIDDLE	-0.05*	-0.05*	0.02*	-0.03*	-0.04*	-0.03*	-0.004*	-0.01*
SECONDARY	-0.22*	-0.18*	-0.04*	-0.08*	-0.16*	-0.16*	-0.02*	-0.03*
HIGHER	-0.16*	-0.31*	-0.07*	-0.10*	-0.22*	-0.24*	0.08*	0.01*
Socio-religious identity (Ref. Cat. HINDU OTHERS)								
MUSLIM	-0.03*	-0.01*	-0.03*	-0.06*	-0.0003*	-0.02*	0.01*	-0.005*
HSC	-0.06*	-0.04*	0.02*	0.01*	0.03*	-0.34*	0.06*	0.03*
HST	0.04*	-0.02*	0.09*	0.06*	-0.003*	-0.12*	0.06*	0.05*
OTHERS	-0.01*	0.003*	-0.01*	-0.03*	-0.02*	-0.01*	0.0001*	0.001*
Region specific fixed effect (Ref. Cat. CENTRAL): Included in all models, but not reported								
PSEUDO R²	0.14	0.16	0.15	0.15	0.10	0.13	0.16	0.16

Source: Calculated from NSS 55th and 66th round

* denotes significance at 1%.

In the next step we extend the above model by incorporating:

- a) Physical health of the aged respondent, determining their ability to participate in the labour market. This is captured by mobility of the respondent and freedom from chronic ailments; and,
- b) Economic pressure on the aged to rejoin the workforce after retirement captured through economic independence and residential arrangements.

We have therefore run a revised model of WFP using the NSSO Morbidity and Health Care 60th round (2004)—which has these information. The only instrument taken is number of non-elderly workers, while additional variables in the form of residential arrangements, mobility of respondent, whether respondent suffers from chronic ailments and economic independence of respondent are incorporated in the second stage model. Results are reported in Table 4.

Table 4: Determinants of WFP of elderly in 60th round—All-India, by place of residence and gender

Variable	Rural male	Rural female	Urban male	Urban female
Mobility of respondent: Ref. Cat. Immobile				
Mobile	0.29*	0.06*	0.21*	0.02*
Freedom from chronic ailment: Ref. Cat. No ailment				
Chronic	-0.05*	-0.02*	-0.05*	-0.01*
Economic independence of response: Ref. Cat. Economcally dependent				
Economic independence	0.38*	0.16*	0.34*	0.12*
Living arrangement (Ref. Cat. Living with spouse or with spouse & others)				
Living with child but not spouse	-0.07*	-0.04*	-0.05*	-0.02*
Living with others including grandsons	-0.22*	-0.02*	0.05*	-0.01*
Living with others but not grandsons	-0.09*	-0.02*	0.04*	-0.01*
Other control variables	YES	YES	YES	YES
Pseudo R²	0.23	0.10	0.20	0.20

Source: Calculated from NSS 60th round

* denotes significance at 1%.

Results (Table 4) indicate that physical health of the respondent—captured through mobility and chronic ailments—are important determinants of decision to work. In both cases, the expected signs (positive and negative, respectively) are obtained. It is also observed that economically independent aged persons generally withdraw themselves from the labour force. This may be attributed to the economic security enjoyed by such persons, reducing the economic pressure on them to work. Analysis of the impact of residential arrangements reveals that elderly persons residing with their spouses (with or without other relatives) are more likely to work in general.

Analysis in this section indicates that the elderly belonging to low income households might not have been adversely affected by changes in economic conditions or in the labour market. However, before arriving at a firm conclusion, we must also examine the *quality of employment*. In this study, quality of employment is captured by the extent of informalisation and the occupational pattern.

5. INFORMAL SECTOR AND THE ELDERLY

Quality of employment may be captured through different indicators. One of these indicators is the extent of informalisation of the workforce. The concept of the informal sector was first propounded by the social anthropologist Keith Hart (1970), and popularized in the ILO report on employment in Kenya (ILO 1972). The informal sector comprises primarily of the urban self-employed labour force and those engaged in household production enterprises. It is unrecognized by the Government, so that its economic activities are not included within national income statistics; nor is this sector subject to regulations or provided Government support (De Soto 1989), despite its substantial coverage. This makes entry or exit easy and imparts flexibility in the operation of informal sector units. Consequently, the informal sector was viewed as a refuge of reserve labour in urban areas. Further, early studies argued that, given its unregulated nature, employers in the informal sector were able to retain informal labour at low wages, without providing social security and good working conditions.

While initial researchers equated the informal sector with traditional and low end technology, it has now been recognized that certain segments of the informal sector are capable of considerable adaptation. In particular, globalization has resulted in economic integration of the formal and informal sector, resulting in emergence of a dynamic, high growing and profitable segment within the informal sector (Arye 1981). Thus, mere employment in the informal sector need not imply that the worker is in distress— as the experience of East Asian countries show (Fields 1990, Lubell 1991, Charmes 1998), educated workers may deliberately join the dynamic segment of the informal sector to earn decent wages. Therefore the occupational distribution—which we will consider in section 6— is also important.

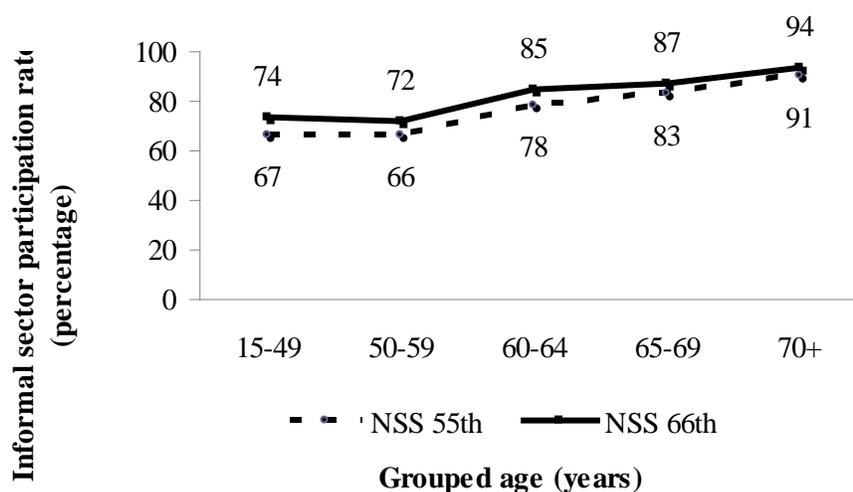
5.1 Trends in informalisation in India

In India the informal sector is the largest employment providing sector (Shakthivel and Joddar 2006). Given that the population and workforce now contain a greater share of aged persons, we would expect that the extent of informalisation will increase over time. As expected, we find that the proportion of workers aged 15 years and above engaged in the informal sector has grown from 67.59 per cent in 1999-00 to 74.57 per cent in 2009-10. Analysis of informal sector participation of the workforce¹⁴ reveals a positive relation between age and informal sector participation in both rounds (Figure 2). This is not surprising, given that 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. The increasing informalisation of the elderly workforce may simply be due to the increase in the number of workers aged above 65, or even 70, years. As avenues for employment in the formal sector is limited for such workers, increasing proportion of ‘middle-old’ (persons aged 70-80 years) in the population and workforce should result in an increase proportion of informal sector workers among the elderly. While data does show an increase in proportion of workers aged 65 years and above, it also reveals increasing informalisation of workers in the 60-65 year bracket by about six percent. While this result may be attributed to jobless growth in the Indian economy squeezing out the elderly from the formal sector, such an explanation overlooks recent trends in employment in India. Studies report that,

¹⁴ 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.

while the growth rate of organised sector employment declined from 0.4 per cent per annum during 1994-2000 to -1.1 per cent in 2004-05, it subsequently increased to 0.7 per cent in 2005-08 (Papola 2013). Goldar (2011) found organised manufacturing sector to have increased at the rate of 7.5 per cent per annum between 2003-04 and 2008-09; similar findings have also been reported by Himangshu (2011). What is more likely, therefore, is that the increasing integration of the formal and informal sectors has led to creation of job opportunities and an increase in real earnings in the latter.¹⁵ Given the easy nature of entry in to the informal sector labour force, this has led to aged workers from low income households flowing to this sector to augment household income.

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



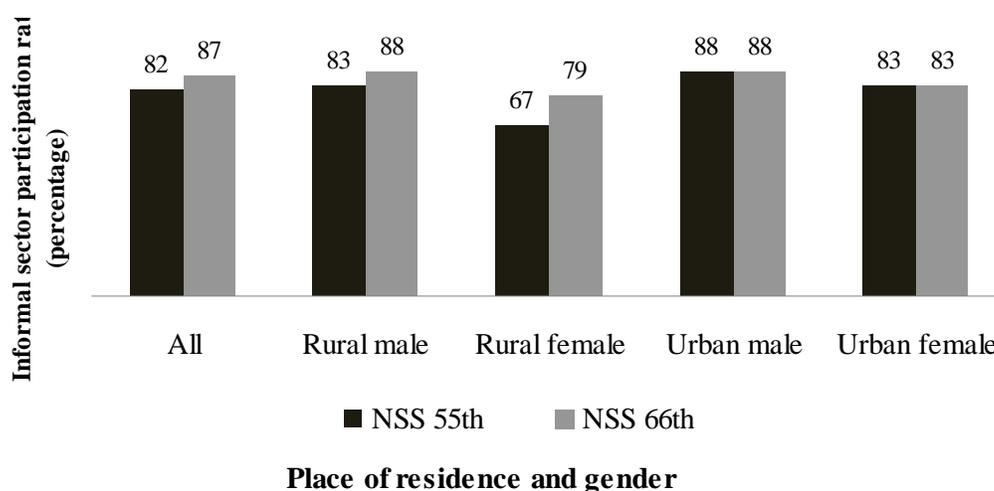
Source: NSS 55th round and NSS 66th round

Figure 3 presents the results of informalisation among the elderly workforce disaggregating by place of residence and gender. Given the disadvantaged position of women in the labour market in most parts of the developing world—the result of long-standing societal norms which

¹⁵ Real earnings of aged in the informal sector have increased by 21 percent.

discourage the social and economic integration and advancement of women—the majority of female workers are in the informal sector (UN 2000, Sethuraman 1998). This is also observed in India (Figure 3). We also find that informalisation has increased among rural male and rural female workers by 6 and 12 percentage points respectively. In contrast, the informal sector participation of elderly workers of either gender has remained about the same in urban area 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

Econometric analysis¹⁶ indicates that the variable TIME is significant and negative for rural male and urban female at 1% level; it is statistically insignificant for rural female and urban male workers (Appendix Table A3). This is in contrast to the results of the bivariate analysis reported in Figure 3. In Figure 3 we had seen that informalisation had increased among rural elderly and remained same in urban areas. Econometric results are consistent with only the bivariate results for urban male workers. For the remaining three groups changes in the demographic and social

¹⁶ Regression model: $IFS = \alpha + \beta_1 TIME + \beta_2 MUSLIM + \beta_3 HSC + \beta_4 HST + \beta_5 OTHERS + \beta_6 LPCME + \beta_7 LPCME^2 + \beta_8 ILLITERATE + \beta_9 BPRIMARY + \beta_{10} MIDDLE + \beta_{11} SECONDARY + \beta_{12} HIGHER + \beta_{13} UNEMP$. Reported in Appendix, Table A3.

structure may have masked the true change in informalisation. The coefficient is particularly high for urban females, indicating that they have been the biggest losers. This may have happened because of the aged female are in a disadvantageous position to compete with other workers—both younger females and male elderly—who are more capable of adjusting themselves to the demands of the technology and organisational forms emerging in the informal sector (Jhabvala and Sinha 2002).

Analysis of changes in level of informalisation among urban males by expenditure levels (Table 5) reveals a sharp increase in informalisation among the first three expenditure quintiles (bottom 60 percent of the sample) in rural areas. The trend is less clear in urban areas. Among male workers, informalisation has changed only marginally. The percentage of female workers engaged in the informal sector has increased by 10 percent in the top quintile. This may indicate a shift to household based part-time jobs by women from affluent households. On the other hand, there has been a decline in share of women workers in the informal sector from the bottom quintile group. Given the vulnerability and poor health status of elderly women (Eapen 2001), this may reflect their inability to continue working. Another possibility is that these women may shift to household activities like looking after their grandchildren, cooking and similar chores, thereby facilitating the entry of younger and more productive women into the labour market.

Table 5: Informal sector participation of elderly by expenditure quintiles in 55th and 66th rounds

Expenditure group	NSS 55 th	NSS 66 th	%age change	NSS 55 th	NSS 66 th	%age change
	Rural males			Urban males		
Poorest	70.13	78.61	12.1	82.77	85.00	2.7
Poor	75.17	84.81	12.8	90.08	85.82	-4.7
Middle	80.66	88.40	9.6	88.23	90.46	2.5
Rich	86.47	90.90	5.1	89.25	90.48	1.4
Richest	91.27	94.18	3.2	91.04	89.46	-1.7
	Rural female			Urban female		
Poorest	51.25	69.70	36.0	78.75	72.66	-7.7
Poor	61.60	75.82	23.1	82.83	88.28	6.6
Middle	65.82	77.13	17.2	84.27	81.36	-3.5
Rich	71.83	82.26	14.5	91.07	87.01	-4.5
Richest	83.47	86.01	3.0	82.28	90.57	10.1

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

5.2 Determinants of informalisation

Table 6 presents results of the probit model of determinants of informal sector participation only for the aged workers.

Regression results reveal that an inverse U-shaped relationship between education and informalisation among male workers. While Lubell (1991) had noted that informal sector workers in South Asia had very low levels of education, it appears that a new trend is emerging with the informal economy in India converging towards that of the South-east Asian economies.¹⁷ Aged male workers with middle and secondary level education may be able to secure jobs in the dynamic, productive and lucrative “upper-tier informal sector” (Fields 1990, Charmes 1998), while respondents with even higher education levels are able to access jobs in the formal sector. On the other hand, urban females with five to eight years of schooling seem to be more suited to find jobs in the urban informal sector.

Male workers from affluent households seem to find it easier to enter the informal sector. This is another indication of the dynamic nature of the informal sector. Expectedly, of course the supply of labour to the informal sector tapers off at high levels of household expenditure. This possibly reflects a withdrawal of labour from affluent households as savings made during their working period may provide them with the necessary economic security; their children, also, may be in a position to provide for their economic needs.

¹⁷ Lubell (1991) reported that informal workforce in South-east Asia generally had secondary, or even tertiary, level of education.

Table 6: Determinants of informal sector participation of elderly people in the 55th and 66th rounds of NSS

Variable	60 Years and above population							
	Rural male		Rural female		Urban male		Urban female	
	NSS 55th	NSS 66th	NSS 55th	NSS 66th	NSS 55th	NSS 66 th	NSS 55th	NSS 66th
LPCME	0.59*	0.52*	-1.00*	1.33*	0.38*	0.45*	-0.24*	1.12*
LPCME2	-0.03*	-0.02*	0.11*	-0.07*	-0.02*	-0.03*	0.02*	-0.07*
HHSIZE	0.03*	0.03*	0.05*	0.06*	0.01*	0.02*	0.01*	0.01*
UNEMP	-1.07*	0.02*	0.50*	0.005*	0.06*	0.003*	0.47*	0.01*
Education level (Ref. Cat. PRIMARY)								
ILLITERATE	-0.12*	-0.08*	-0.06*	-0.08*	-0.04*	-0.07*	-0.45*	-0.10*
BPRIMARY	-0.04*	-0.02*	0.13*	-0.12*	-0.003*	-0.02*	-0.93*	-0.08*
MIDDLE	-0.004*	0.02*	0.22*	0.05*	0.03*	-0.06*	-0.93*	0.18*
SECONDARY	0.08*	0.10*	-	-	0.03*	0.02*	-0.92*	-0.30*
HIGHER	-0.01*	-0.03*	-	0.17*	-0.001*	-0.05*	-0.95*	-0.20*
Socio-religious identity (Ref. Cat. HINDU OTHERS)								
MUSLIM	-0.05*	-0.08*	-0.18*	-0.005*	0.04*	0.05*	0.06*	-0.16*
HSC	-0.22*	-0.15*	-0.25*	-0.26*	-0.08*	-0.08*	-0.06*	0.49*
HST	-0.04*	-0.09*	-0.07*	-0.04*	-0.03*	0.43*	-0.06*	-0.02*
OTHERS	-0.12*	-0.16*	-0.12*	-0.18*	0.01*	-0.03*	-0.08*	-0.07*
Region specific fixed effect Included (Ref. Cat. CENTRAL)								
PSEUDO R²	0.18	0.16	0.18	0.19	0.08	0.07	0.14	0.13

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

* denotes significance at 1% level.

Note: The variable SECONDARY and HIGHER in the 55th round and SECONDARY in the 66th round for the rural female elderly predicts success perfectly. These variables are dropped in the result.

One important finding is that, the 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 male participating in the informal sector is significantly higher than that of a Hindu upper caste worker in urban areas. This is in keeping with studies of the Muslim community (GoI 2006). Over time, participation of Muslim female workers in the informal sector has gone down (coefficients fall from 0.06 to -0.16). This may be attributed to a fall in demand for items produced by household based women workers, with such items being produced in factories. It may also reflect an incapability of adjusting themselves to the demands of the technology and organisational forms emerging in the informal sector (Jhabvala and Sinha 2002) due to lower levels of education and social restrictions on movement and interaction. The participation of female SC workers in the urban informal sector has also gone up sharply.

Among other findings are: aged workers from larger households are more likely to join the informal sector, and high levels of unemployment prevailing in the state is more likely to push aged workers to the informal sector.

6. OCCUPATIONAL STRUCTURE

Our analysis indicates so far that WFPR of the aged has decreased as a result of rural prosperity. The extent of informalisation, on the other hand, has either increased (in rural areas) or remained same (urban areas). Given that real earnings have increased in the informal sector this need not necessarily be an alarming development. But, before arriving at a conclusion on this issue, it is necessary to examine the occupational pattern of elderly workers. Two questions become important in this context: is there any substantial level of segregation in occupational choice between elderly and near elderly workers? The absence of segregation would indicate that workers are probably remaining in the same occupation after crossing 60 years. In the second step, we will identify the sectors where aged workers are concentrating and examine whether these are high earnings or low earnings sector.

6.1 Occupational segregation

Occupational segregation refers to the inequality in concentration of two groups (here elderly and near elderly) of workers in different occupational categories. Analysis of occupational segregation helps us to analyse objective and subjective status of aged workers and trace reasons for wage differences between aged and near aged workers. A commonly used measure of occupational segregation, suggested by Duncan and Duncan (1955), is:

$$D = \frac{1}{2} \sum_{i=1}^n \left| \frac{p_i}{P} - \frac{r_i}{R} \right|$$

When p_i is number of workers from the first group in i^{th} occupation, r_i is number of workers from the second group in i^{th} occupation, and P and R are the respective group sizes. D ranges from zero to one, with a higher value for the index shows a higher degree of segregation.

Given that D is not sensitive to occupational distributions, Hutchens (2004) computes an alternative measure of segregation, called the 'square root' segregation index. This measure allows for additive decomposition of segregation, allowing us to define segregation as the summation of between group segregation and within group segregation. Let P_j be the number from social group A (elderly) in unit j and R_j be the number from social group B (near elderly) in unit j . P and R be the total number of observation in group A and B. The square root segregation index S is defined as

$$S = 1 - \sum_j \sqrt{\left\{ \frac{P_j}{P} \right\} * \left\{ \frac{R_j}{R} \right\}} \quad j = 1, 2, \dots, J$$

Or equivalently

$$S = \sum_j C_j \quad \text{Where } C_j = \frac{R_j}{R} - \sqrt{\left\{ \frac{P_j}{P} \right\} * \left\{ \frac{R_j}{R} \right\}}$$

' S ' represents the summation of each unit's shortfall from distributional equality. For each value of occupation, this shortfall is the difference between the geometric mean of the shares of individuals with different backgrounds characterized by group of age when there is no segregation, and the geometric mean of the actual shares.

Table 7 reports occupational segregation between the above two groups of workers, elderly and near elderly, in each round—disaggregating the sample by place of residence and gender. We

present results for both the two digit and three-digit classification systems. Changes are marginal—with an increase being observed in rural areas, and decrease in urban areas. The low value of the segregation index suggests that aged workers continue to use their skills and experience by remaining in the same occupation after ‘retirement’—as the econometric results suggest, they only shift from the formal to the informal sector. Given that the latter is typically an unregulated sector, this would allow employers to exploit the skill and experience of elderly workers by offering them wages below the market rate.

Table 7: Occupational segregation between elderly and near elderly

Classification digit	Group	Duncan index		Hutchens index	
		NSS 55 th	NSS 66 th	NSS 55 th	NSS 66 th
2 digit classification	Rural male	0.18	0.23	0.03	0.05
	Rural female	0.04	0.07	0.01	0.02
	Urban male	0.27	0.27	0.06	0.06
	Urban female	0.25	0.23	0.08	0.07
3 digit classification	Rural male	0.21	0.24	0.06	0.06
	Rural female	0.08	0.09	0.03	0.03
	Urban male	0.39	0.31	0.15	0.10
	Urban female	0.34	0.30	0.16	0.11

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

6.2 Occupational structure and earnings

In the last step of our analysis, we have examined the occupational pattern of elderly sectors to identify sectors where they concentrate. We then estimate average earnings of *all* workers in each occupational category to find out whether the occupations where elderly workers concentrate are high earning or not. The tables are reported in Appendix (Table A4-A7). In the top panels of the tables we have listed occupations (two digit NCO 2004 classification followed) where at least two percentage of the elderly workers are concentrated; this is followed by another panel, giving information for remaining occupations. Corresponding to each occupation we have given the proportion of *aged* workers and mean daily earnings of *all* workers.

Table A4 and A5 presents 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. In recent years, the percentage of workers in services has declined for both male and female workers.¹⁸ 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 a concerning sign. Interestingly, within the low-paying sector, earnings of elderly workers (given in parantheses) are not necessarily below that of average earnings in each occupational category. In several occupational categories, elderly workers are earning more than the average payments in these occupational categories, while in some occupations the gap between average earnings and earnings of elderly workers is marginal. Variations in earnings of aged workers and the wage gap between elderly and near elderly workers across occupational categories requires more indepth analysis.

7. 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 ensures a minimum level of physical well-being to the elderly. Moreover, the realisation that longevity is increasing has also led to changes in work and savings patterns that complements the efforts of the state. In developing countries,

¹⁸ The percentage of male workers in services has declined from 51 to 45 percentage over the study period. For female workers, corresponding figures are 60 and 55, respectively.

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.

Our analysis finds *a decline in WFPR* among elderly. This is accompanied by a *high level of informalisation* of the aged workforce. This may be interpreted as a concerning sign, particularly if we take the Lewisian view of the informal sector as a traditional, low productive and stagnant sector. However, *when we take into account the effects of rural growth and expansion of employment opportunities in the manufacturing sector, the decline in WFPR appears more as a deliberate withdrawal from the labour force, rather than forced unemployment*. Moreover, recent studies have pointed out that the informal sector is not homogeneous, but may contain a highly vibrant and productive segment with close links to the formal sector. If, using their skill and experience, aged workers are able to secure work in these sectors the growing informalisation need not necessarily be alarming.

A study of occupational structure and earnings can shed some light in this regard. Such analysis reveals that *aged workers are employed in sectors that are typically low earning*. However, contrary to expectations, *their wages are not always lower than the average earnings in these occupational categories*. Although this is a positive feature of the informal sector in India, further analysis, particularly based on micro-studies, are necessary to substantiate such findings and allow us to conclude that the condition of aged workers has improved.

We should also note that our study period is only up to 2009-10. The study focuses on a period in which populist measures like the loan waiver schemes and programmes to ensure inclusive growth like PDS, MNREGA and Mid Day Meal schemes was in full swing. But it was also at this time that the economy was approaching the doldrums. Inflation was entering into double digits, while industrial and overall economic growth would soon start its slump. This would be followed by troubles in the external sector—persistent Current Account deficit followed by a decline in Foreign Institutional Investment and devaluation of the rupee. All these had an adverse effect on the economy, that will be reflected in the labour market. Extending the study period to

the next major NSS round may, therefore, find the bell tolling for the elderly workers. In such circumstances, the market will become an unreliable substitute of Government provided social security network unless compensatory policies are adopted.

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. In the context of the growing proportion of elderly persons in India's population, *public policy must be targeted to reduce structural rigidities obstructing entry of elderly workers into the labour market*. Simultaneously, employers should be encouraged to discard the notion that elderly workers have outdated skills and low capability for adaptation and *appreciate that the experience, skill and loyalty of such workers can make them a valuable asset*. This realisation would motivate employers to modify job specifications and operations, and redesign work to facilitate employment of aged workers. In this context it should be kept in mind that aged workers are easily stressed, particularly as their working conditions are poor (OECD 2006). While regulations to improve working conditions should be introduced, a potential solution to reduce work-related stress is to offer elderly workers flexible working hours in the form of part-time employment. Though this may lead to co-ordination problems within the workforce, the lower wages paid to elderly workers can compensate such co-ordination costs. Another challenge before the state is to increase the substitutability between elder and younger workers. Although Goldin and Katz (2007) has shown that older workers are rapidly becoming closer skill substitutes for their younger counterparts, a similar trend is yet to be observed in India. This makes training an important issue. Although older workers are reluctant to enter training programmes, increasing duration of the working career may overcome such reluctance—especially if it increases their flexibility with respect to occupational choice. Finally, investment in health of the elderly workers is an important challenge before policy makers. Poor health is a major reason for withdrawal of elderly from the labour market (Currie and Madrian 1999). On the other hand, aged from low income households may be forced to work aggravating their poor health. An important challenge before the state is to ensure healthy ageing through a public health policy catering to the needs of the elderly. This will increase the motivation of the aged to work, reducing the dependence on the state social support system.

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APPENDIX

Table A1: Endogeneity Test Statistics

Gender & place of residence	Hayashi test		Wu-Hausman test	
	NSS 55th	NSS 66th	NSS 55th	NSS 66th
Rural Male	1165.2 *	778.41 *	815.85 *	1296.29 *
Rural Female	783.79 *	882.37 *	827.54 *	956.48 *
Urban Male	1177.946 *	1222.96 *	1427.49 *	1415.08 *
Urban Female	3113.53 *	25.63 *	25.74 *	326.62 *

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

* denotes significance at 1% levels.

Table A2: Change in workforce participation of elderly over rounds

Variable	Rural male	Rural female	Urban male	Urban female
TIME	-0.07*	-0.04*	-0.07*	-0.48*
Control Variables	Yes	Yes	Yes	Yes
N	27891	25618	15346	8636
LR χ^2	5343.18*	2766.53*	2388.78*	2555.84*
PSEUDO R²	0.15	0.12	0.11	0.34

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

* denotes significance at 1% level.

Table A3: Change in informal sector participation of elderly workers over rounds

Variable	60 years and above population			
	Rural male	Rural female	Urban male	Urban female
TIME	-0.03*	-0.03	-0.01	-0.08*
Control variables	Yes	Yes	Yes	Yes
N	18249	4537	6368	1339
LR χ^2	2189.99*	985.93*	173.32*	139.24*
PSEUDO R²	0.1406	0.1825	0.0379	0.1136

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

* denotes significance at 1% level.

Table A4: Occupational pattern of elderly workers and mean daily earnings in occupation—Rural Males

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers(Rs.)	
		NSS 55th	NSS 66th	NSS 55th	NSS 66th
High concentration (≥ 2%)	Market oriented skilled agricultural and fishery workers	67.1	59.8	51(46)	82(69)
	Agricultural, Fishery and Related Labourers	15.8	9.1	41(40)	60(58)
	Models, Sales Persons and Demonstrators	4.2	4.9	52(49)	73(68)
	Corporate Managers	2.2	4.7	161(141)	264(81)
	Labourers in Mining, Construction, Manufacturing and Transport	1.5	3.8	60(58)	77(72)
	Extraction and Building Trades Workers	2.0	3.7	73(76)	92(79)
	Subsistence Agricultural and Fishery Workers	0.0	3.2		61(90)
	Other professionals	0.6	2.1	105(43)	186(77)
Low Concentration (< 2%)	Other Craft and Related Trade Workers	1.6	1.7	51(55)	70(80)
	Sales and Services Elementary Occupations	1.2	1.6	71(51)	114(56)
	Personal and Protective Service Workers	1.1	1.4	94(51)	172(76)
	Metal, Machinery and Related Trades Workers	0.4	0.8	84(68)	136(90)
	Precision, Handicraft, Printing and Related Trade Workers	0.5	0.7	69(39)	76(50)
	Other Associate Professionals	0.1	0.4	165(109)	254(78)
	Machine Operators and Assemblers	0.7	0.4	63(51)	109(61)
	Teaching Associate Professionals	0.1	0.3	173(175)	250(306)
	Life Science and Health Professionals	0.3	0.3	297	362(465)
	Teaching Professionals	0.1	0.3	199(228)	311(252)
	Drivers and Mobile-Plant Operators	0.1	0.3	93(114)	108(107)
	Office Clerks	0.2	0.3	127(68)	219(152)

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers(Rs.)	
		NSS 55th	NSS 66th	NSS 55th	NSS 66th
Low Concentration (< 2%)	Stationary Plant and Related Operators	0.2	0.1	92(40)	143(106)
	Life Science and Health Associate Professionals	0.1	0.1	153	242(309)
	Legislators and Senior Officials	0.0	0.1	241(30)	360(231)
	Customer Services Clerks	0.0	0.1	156	225
	Physical, Mathematical and Engineering Science Professionals	0.0	0.0	200(229)	393(222)
	Physical and Engineering Science Associate Professionals	0.0	0.0	168(100)	269(234)
	General Managers	0.0	0.0		273

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

*Note: Figures for daily average real earnings given. Figures in last two columns are daily average real earnings of of all workers (including elderly), while figures in parantheses are daily average real earnings for elderly workers.

Table A5: Occupational pattern of elderly workers and mean daily earnings in occupation—Rural Females

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers (Rs.)	
		NSS 55 th	NSS 66 th	NSS 55 th	NSS 66 th
High concentration (≥ 2%)	Market oriented skilled agricultural and fishery workers	54.1	56.1	33(29)	50(48)
	Agricultural, Fishery and Related Labourers	31.1	19.2	29(27)	43(41)
	Models, Sales Persons and Demonstrators	3.4	4.0	34(25)	47(26)
	Sales and Services Elementary Occupations	2.6	4.0	35(25)	52(31)
	Corporate Managers	1.5	3.3	53(30)	226
	Other Craft and Related Trade Workers	2.9	3.1	27(23)	49(51)
	Subsistence Agricultural and Fishery Workers	0.0	2.7		41(42)
	Labourers in Mining, Construction, Manufacturing and Transport	0.8	2.6	40(28)	56(52)
Low Concentration (< 2%)	Personal and Protective Service Workers	0.9	1.3	219(23)	67(35)
	Precision, Handicraft, Printing and Related Trade Workers	0.5	0.9	51(25)	41(30)
	Extraction and Building Trades Workers	0.1	0.9	40(30)	57(51)
	Other professionals	0.0	0.8	82(33)	134(60)

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers (Rs.)	
		NSS 55 th	NSS 66 th	NSS 55 th	NSS 66 th
	Machine Operators and Assemblers	1.6	0.7	38(18)	54(18)
	Life Science and Health Associate Professionals	0.1	0.2	135	175(18)
Low Concentration (< 2%)	Other Associate Professionals	0.0	0.1	126	207(255)
	Metal, Machinery and Related Trades Workers	0.0	0.1	57	94
	Teaching Associate Professionals	0.2	0.1	130(98)	149(44)
	General Managers	0.0	0.1		274
	Life Science and Health Professionals	0.0	0.1	224	212(192)
	Drivers and Mobile-Plant Operators	0.0	0.1	57	97(39)
	Stationary Plant and Related Operators	0.1	0.0	38	56
	Physical, Mathematical and Engineering Science Professionals	0.0	0.0	88	349
	Customer Services Clerks	0.0	0.0	150	131

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

*Note: Figures for daily average real earnings given. Figures in last two columns are daily average real earnings of all workers (including elderly), while figures in parantheses are daily average real earnings for elderly workers.

Table A6: Occupational pattern of elderly workers and mean daily earnings in occupation—Urban Males

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers (Rs.)	
		NSS 55 th	NSS 66 th	NSS 55 th	NSS 66 th
High concentration (≥2%)	Models, sales persons and demonstrators	23.1	15.4	62(66)	89(85)
	Market Oriented Skilled Agricultural and Fishery Workers	15.7	17.8	82(61)	137(74)
	Corporate Managers	13.7	18.0	259(209)	447(292)
	Other Craft and Related Trade Workers	6.4	4.9	66(66)	84(70)
	Extraction and Building Trades Workers	5.6	3.7	89(84)	106(104)
	Labourers in Mining, Construction, Manufacturing and Transport	5.3	5.8	69(63)	87(78)
	Sales and Services Elementary Occupations	4.9	5.3	76(52)	110(65)
	Personal and Protective Service Workers	3.5	3.3	95(83)	178(78)
	Other professionals	3.3	7.9	186(122)	290(118)
	Agricultural, Fishery and Related Labourers	3.0	4.9	68(47)	67(64)
	Machine Operators and Assemblers	2.3	1.0	79(63)	133(107)
	Metal, Machinery and Related Trades Workers	2.3	1.7	91(82)	160(141)
	Precision, Handicraft, Printing and Related Trade Workers	2.3	1.4	92(71)	101(78)
	Other Associate Professionals	1.7	1.5	187(111)	301(248)
	Office Clerks	1.4	1.3	146(98)	250(134)
	Drivers and Mobile-Plant Operators	1.4	1.2	106(97)	149(100)
	Life Science and Health Professionals	1.1	1.3	337(256)	535(575)
	Teaching Professionals	0.9	0.7	223(248)	346(315)

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers (Rs.)	
		NSS 55 th	NSS 66 th	NSS 55 th	NSS 66 th
Low Concentration (< 2%)	Stationary Plant and Related Operators	0.6	0.1	116(54)	244(51)
	Teaching Associate Professionals	0.5	0.4	158(179)	262(715)
	Physical and Engineering Science Associate Professionals	0.4	0.2	213(186)	346(302)
	Customer Services Clerks	0.3	0.3	161(83)	255(66)
	Physical, Mathematical and Engineering Science Professionals	0.2	0.4	263(181)	463(692)
	Life Science and Health Associate Professionals	0.1	0.3	144(170)	237(142)
	Legislators and Senior Officials	0.1	0.3	301(173)	546(576)
	General Managers	0.0	0.7		485(430)
	Subsistence Agricultural and Fishery Workers	0.0	0.2		166(36)

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

*Note: Figures for daily average real earnings given. Figures in last two columns are daily average real earnings of of all workers (including elderly), while figures in parantheses are daily average real earnings for elderly workers.

Table A7: Occupational pattern of elderly workers and mean daily earnings in occupation—Urban Females

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers (Rs.)	
		NSS 55 th	NSS 66 th	NSS 55 th	NSS 66 th
High concentration (≥2%)	Sales and services elementary occupations	16.5	16.9	45(28)	53(35)
	Market Oriented Skilled Agricultural and Fishery Workers	11.6	16.4	49(16)	61(77)
	Models, Sales Persons and Demonstrators	17.1	12.6	44(43)	99(26)
	Agricultural, Fishery and Related Labourers	9.4	10.9	31(30)	43(37)
	Corporate Managers	8.9	10.0	261(28)	503(894)
	Other Craft and Related Trade Workers	14.5	9.8	31(27)	49(24)
	Personal and Protective Service Workers	7.0	5.6	61(60)	85(69)
	Other professionals	0.1	4.9	155	214(59)
	Labourers in Mining, Construction, Manufacturing and Transport	4.0	3.6	44(35)	56(41)
Low Concentration	Machine Operators and Assemblers	3.8	1.5	38(38)	61(29)
	Extraction and Building Trades Workers	1.5	1.1	57(56)	69(51)
	Life Science and Health Associate Professionals	1.1	1.1	143(45)	219(140)

Concentration	Occupational category	Distribution of aged workers across occupation (%)		Mean earnings for all workers & elderly workers (Rs.)	
		NSS 55 th	NSS 66 th	NSS 55 th	NSS 66 th
(< 2%)	Teaching Professionals	1.0	0.9	189(138)	299(588)
	Precision, Handicraft, Printing and Related Trade Workers	0.9	0.9	62(20)	69(34)
Low Concentration (< 2%)	Life Science and Health Professionals	0.3	0.9	311	357(638)
	Teaching Associate Professionals	0.3	0.9	121(34)	197(467)
	Subsistence Agricultural and Fishery Workers	0.0	0.8		39(36)
	Metal, Machinery and Related Trades Workers	0.3	0.4	81	133(53)
	Stationary Plant and Related Operators	0.8	0.2	65(23)	92
	Office Clerks	0.3	0.2	137(100)	232(213)
	General Managers	0.0	0.2		410
	Other Associate Professionals	0.6	0.0	190(400)	286
	Physical and Engineering Science Associate Professionals	0.1	0.0	160	308

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

*Note: Figures for daily average real earnings given. Figures in last two columns are daily average real earnings of of all workers (including elderly), while figures in parantheses are daily average real earnings for elderly workers.