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ORIGINAL RESEARCH

Changes in Subjective Well-Being in India

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Abstract
Despite the growing literature on subjective well-being (SWB), few studies have focused on developing countries. Applying robust OLS and ordered probit models to the India Human Development Survey panel data in 2005 and 2012, we empirically assess SWB *changes* in 2005–2012, based on a self-reported measure of changes in economic well-being, as a function of household and state covariates in 2005. This is in sharp contrast with earlier studies' focus on the *levels* of SWB. Another point of departure of our study is to compare the covariates of SWB changes with those of objective well-being (OWB) changes, proxied by the relative growth in real per capita household consumption expenditure between 2005 and 2012, to identify specific micro-level correlates of SWB changes. Households with an older and educated head in a larger household, located in urban areas or affluent states in 2005 tend to experience improvement in both SWB and OWB between 2005 and 2012. In contrast, households with a female household head, with more male members in the labour market, with regular access to mass media, without members suffering from non-communicable diseases or disabilities are more likely to be better off subjectively without experiencing the corresponding improvement in OWB. The policy challenges raise serious concerns.

Keywords Subjective well-being · Objective well-being · Affluence · Age · Health · Caste · Religion · India

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1 Introduction

Subjective well-being (SWB) is hard to define, and harder to measure, which has made.

SWB measures, for instance, based on life evaluation or overall life satisfaction, controversial. Ravallion et al. (2016), for example, are sceptical but not dismissive of SWB measures. Their scepticism rests on scale heterogeneity—the standard deviation of utility over different choice situations.In another important contribution, Ravallion (2014) conjectures that different people are likely to have different ideas about what it means to be "rich" or "poor," or "satisfied" or not with one's life, leading them to interpret survey questions on subjective welfare differently. Deaton (2018), however, offers robust support to self-reported measures of well-being, as such measures capture aspects of welfare beyond real income, which is what economists typically use to proxy utility. He uses cross-country and country-specific comparisons to validate measures of SWB, and draws out their policy significance.

Much of empirical literature on SWB relies on the Cantril ladder (Cantril, 1965) or its variants wherein individuals are asked to place themselves on an 11 or multiple step ladder with the worst possible life representing the lowest rung and the best possible life representing the top rung. This has two limitations. First, perceptions about the best/worst possible life or scales can considerably differ among different people depending on their characteristics, preferences, the degree of optimism/pessimism, or other unobserved characteristics. The meaning of 'happiness', 'the best possible life', or any particular 'ladder' between the two, is considerably different among people depending on how developed or deprived the community, the society or the country is. This is because, for instance, the weight of economic well-being in aggregate well-being is likely to be larger in poorer countries or communities where a non-negligible share of the population is under the poverty line. Even the 'observationally identical' individuals in terms of socio-economic and other characteristics may perceive 'happiness' differently due to their differences in time-variant unobservable character. Second, the level of the SWB measure can change over time even for the same person (Levin & Currie, 2014). Despite a large body of literature on SWB, there have been few studies to verify the validity of SWB measures from different sources (ibid., 2014) or compare SWB measures and objective well-being (OWB) measures except a few. This is useful to identify specific micro-level correlates of SWB changes. A notable exception is Oswald and Wu (2010) who found a close correlation between SWB and OWB measures at the state level in the USA and Diener et al. (2013) who found a positive correlation across different countries. However, to our knowledge, none of the studies has compared SWB and OWB measures at micro levels, such as individuals or households.[1]

Our objective is to fill the gap in the literature on SWB by identifying the factors associated with *changes* in SWB and OWB in India between 2004–5 and 2011–12. We carry out econometric analyses using the large panel dataset constructed by India Human Development Surveys (IHDS) 1 and 2. Our measure of SWB focuses on the perceived economic well-being of the household. This is based on a survey question asking a respondent (or a household head) whether he or she perceived that the household is economically better-off (2), just the same (1) or worse-off (0) between 2004–5 and 2011–12. This is narrow, but useful to reduce the heterogeneity arising from the difference in perceptions by focusing

[1] As discussed later, validations of SWB measures have been made by examining the pattern of their correlations with other characteristics of individuals, including income in the literature (e.g., Kahneman and Krueger, 2006).

on a particular dimension of SWB (i.e., economic well-being) and its changes over time. To mitigate the endogeneity concern, we estimate this discrete dependent variable by a number of explanatory variables at household, community and state levels in 2004–5 (e.g., demographic and other variables such as age, health, caste, religion, and location) using robust Ordinary Least Squares (OLS) and ordered probit models.[2]

Another objective is to compare factors associated with SWB changes with those of objective well-being (OWB). The latter is proxied by the relative growth in real per capita household consumption between 2004–5 and 2011–2. We have classified the entire sample into three groups, better-off (2), just the same (1) and worse off (0) based on the ranking of the real per capita household consumption growth, making the frequency distribution across the three categories identical to that of SWB changes to make the coefficient estimates comparable in their sign and size. We aim to assess the factors associated with SWB changes, not with OWB changes, to identify the specific covariates of SWB changes. Using the nationally representative household data in India, the present study thus examines the hypotheses: (1) socio-economic characteristics of households, employment status, health and disability, media access, or initial economic conditions are associated with both SWB and OWB changes; and (2) the correlates of SWB changes and those of OWB changes are different. To our knowledge, this is the first study to compare SWB and OWB or their changes in terms of their covariates at micro-levels.While aiming to contribute to the aforementioned academic literature on SWB, we will pay particular attention to policy concerns arising from our results.

The rest of the study is organized as follows. After briefly discussing the theoretical backgrounds of SWB and OWB in the next section, Sect. 3 gives a selective review of important empirical contributions to the rapidly growing literature on SWB. Section 4 discusses salient features of the data. Section 5 offers brief expositions of multiple regression and ordered probit (OP) models for SWB and OWB changes. Section 6 is devoted to the interpretation of the results obtained by multiple regression and OP. Section 7 concludes with discussions of possible policy challenges.

2 Definitions and Theoretical Backgrounds of SWB and OWB

Despite a growing body of the literature on SWB and OWB, many empirical studies adopt their own definitions based on their disciplinary background (e.g., economics, psychology, philosophy, sociology)[3] and rarely attempt to define the concept of SWB or OWB rigorously or link the empirical studies to the theoretical backgrounds. This section thus defines SWB and OWB with a short review of underlying theoretical backgrounds.

We define SWB and OWB based on whether well-being is captured by subjective measurement (e.g., the Subjective Happiness Scale) based on self-evaluation or by objective measurement (e.g., income, consumption, health status). This distinction between SWB and OWB is founded on the 'subjective theory of well-being' and the 'objective theory of well-being' in philosophy (Bradley, 2014). The subjective theory of well-being focuses primarily on perceptions and attitudes of the individual by assuming that "all the things

[2] Although this does not completely overcome the endogeneity of some of the explanatory variables, it allows us to rule out reverse causality.

[3] Gasper (2005) notes systematic, large discrepancies exist across different disciplinary backgrounds in theorising SWB and OWB.

that are good for an individual are good for her *in virtue of her attitudes about them* (e.g., in virtue of the fact that she desires them)" (ibid., 2014, p. 231, emphasis added). On the other hand, the objective theory of well-being defines OWB independently of perceptions or attitudes on the assumption that "(s)ome of the things that are good for an individual are good for her *independently of her attitudes about them*." (ibid., 2014, p. 231, emphasis added). Hence, in essence, the subjective theory of well-being regards the individual's attitudes (or perceptions about her well-being influenced by emotions, characteristics, feelings) as a correlate of her well-being (i.e., an endogenous variable in the model). On the other hand, in the objective theory of well-being, the attitudes will not affect the well-being (i.e., exogenous variable). This distinction is consistent with Western and Tomaszewski (2016) who define SWB based on people's own evaluations of their lives and OWB in terms of material resources and social attributes.

An underlying assumption made in the traditional economic theory drawing upon the utility function is that the utility of an individual or a household – a representative agent of the society—increases as consumption increases. Here the individual or the household is assumed to be 'rational' in the sense that the individual or the household maximises the utility based on a possible set of choices over the goods given the budget constraints. Utility in this context refers to the amount of goods consumed. Here, given that there is no scope for psychological factors influencing the utility of the representative agent, this is akin to the objective theory of well-being. However, seminal works by Daniel Kahneman and Richard Thaler (e.g., Kahneman & Thaler, 1991) have brought psychological factors in the formulation of utility functions, namely, adaptation, contrast, interpersonal comparisons, loss aversion, and fairness. Here, the agent's attitudes about well-being are treated as endogenous in the model and it is closer to the objective theory of well-being. Empirically, there is no agreement as to whether SWB or OWB measures better capture the utility or well-being more broadly. However, as we discuss later, Deaton (2018) argues that if 'decision utility'—defined by Kahneman and Thaler (1991)—differs from welfare utility—used in the traditional economic theory -, the SWB measure could still be an accurate measure.

3 A Review of the Empirical Literature of SWB

One important empirical issue is whether the measures of SWB are reliable (e.g., Kahneman & Krueger, 2006; Kahneman and Deaton, 2011; Diener et al., 2013; Deaton, 2011, 2018). Kahneman and Krueger (2006) review the literature on SWB and argue that the income level is not necessarily associated with better SWB and that one way of partially assessing the validity of SWB measures is to examine their correlation with various individual traits (e.g. schooling, health, employment status, gender, age). Diener et al. (2013) scrutinize the life satisfaction scales in the global context based on their critical review of relevant studies. The authors verify the reliability of the scales and validity of judgments made in SWB measures based on the Gallup World Poll by showing the stability of measures over the years. They show that the reliability and the validity of life satisfaction scales reflect differences in the ways people evaluate their lives, and the scores move in expected ways to changes in people's circumstances.

Among those who have endorsed SWB measures is Deaton (2018). He argues that SWB measures do not need to be related to behaviour. 'If decision utility differs from welfare utility, and if people sometimes behave against their best interests, the direct measurement of well-being might still give an accurate measure, and might even enable

people to do better, either through paternalistic government policies, or incentives, but more simply by providing information on the circumstances and choices that promote well-being…' (ibid., 2018, p. 18). Deaton elaborates that direct measures may also capture aspects of welfare beyond real income, such as health.

In a comprehensive review of factors associated with SWB, Dolan et al. (2008) show positive but diminishing returns to income. Some of this positive association is likely to be due to reverse causation, as indicated by the studies which show higher well-being leading to higher future incomes (Clark et al., 2008). Studies that have included relative income in a reference group suggest that well-being is strongly, but not completely, affected by relativities (Dorn et al., 2007). Indeed, much evidence indicates that rank in the income distribution influences life satisfaction.

Some studies find a positive relationship between SWB and each additional level of schooling, while others find that the middle level of schooling is related to the highest life satisfaction (e.g., Blanchflower & Oswald, 2004). However, there is some evidence that schooling has more of a positive impact in low-income countries.

Evidence shows a large negative effect of individual unemployment on SWB. Models, which treat life satisfaction scales as a continuous variable, tend to find that the unemployed have around 5–15% lower scores than the employed. Men have been found to suffer most from unemployment and some studies also find that the middle-aged suffer more than the young or old (e.g., Clark, 2003; Di Tella et al., 2001). While the evidence is relatively clear that employment is better than unemployment, the relationship between the amount of work (e.g., number of hours worked) and well-being is less straightforward. An interesting result is an inverted U-shaped curve between life satisfaction and hours worked suggesting that well-being rises as hours worked rise but only up to a certain point and then starts to drop as hours become longer (Meier & Stutzer, 2008).

Studies consistently show a strong relationship between SWB and both physical and psychological health. Psychological health appears to be more highly correlated with SWB than physical health but this is not surprising given the close correspondence between psychological health and SWB. Some of the association may be caused by the impact that well-being has on health but the effect sizes of the health variables are substantial, suggesting that, even after accounting for the impact of SWB on health, the effect of health on SWB is still significant (Kohler et al., 2017).

The evidence is fairly consistent and suggests that regular engagement in religious activities is positively related to SWB. While some studies only examine whether or not the person actually attends church, others examine different amounts of time spent in these activities. Using World Values Survey (WVS) data, Helliwell (2003) finds higher life satisfaction to be associated with church attendance of once or more a week.

Generally, being alone appears to be worse for SWB than being part of a partnership. Although there is some variation across studies, it seems that being married is associated with the highest level of SWB and being separated is associated with the lowest level of SWB, lower even than being divorced or widowed (e.g., Helliwell, 2003).

The evidence on the impact of income inequality on well-being is mixed. Based on the WVS data, Fahey and Smyth (2004) find that inequality reduces life satisfaction, whereas Haller and Hadler (2006) find that inequality increases life satisfaction. One conjecture for these contrasting findings using international data is that the inclusion of particular countries influences the results. The evidence suggests that living in an unsafe or deprived area (Ferrer-i-Carbonell & Gowdy, 2007), or in large cities (Graham & Felton, 2006), is detrimental to life satisfaction.

In India's context, an important question is: Do *Dalits* and Other Backward Classes (OBC) report lower life satisfaction than higher caste people, and if so, is it merely because they are poorer? (Spears, 2016). Spears found that lower caste people in rural North India evaluate their lives to be worse than higher caste people, and this difference is not explained by income poverty. Fontaine and Yamada (2014) use the unique SWB panel survey data in urban India to assess the strength of within- and between-caste comparisons in India by utilizing the data on the median expenditure of each caste group calculated by the National Sample Survey Data in 2009–11. They found that caste does not impact SWB directly but indirectly through another channel where the indirect effects mainly come from comparisons of SWB of those in different castes, whereas only those in low castes are affected by the economic successes of their rivals. McIntyre et al. (2020) use the personal wellbeing index, capturing various domains, such as satisfaction with standard of living, personal health, achievement in life, satisfaction with spirituality or religion—which is important in the Indian context—to assess SWB using a non-random sample of 2004 Indian adults. The analysis of the mean scores suggests that Indians are relatively less satisfied with what they are achieving in life, compared to domains such as spirituality; personal safety; and being part of the community. The findings indicate that Indians have high levels of satisfaction with their spirituality or religion and that older people and those with a higher income had higher levels of SWB. However, there have not been any national-level studies on SWB in India. We aim to fill the gap by using nationally representative household survey data.

4 Data

Our analysis draws upon the two rounds of the nationally representative India Human Development Survey (IHDS) data for 2004–5 and 2011–12, conducted jointly by the University of Maryland and the National Council of Applied Economic Research, New Delhi.[4] The first round (IHDS-1) is a survey of 41,554 households in 2004–5. The second round (IHDS-II) involves re-interviews with 83% of the original households as well as split households residing within the same locality, along with an additional sample of 2,134 households in 2011–12. The total for IHDS-II is therefore 42,152 households. The sample is spread across 33 states and union territories, and covers rural as well as urban areas. Repeated interviewing of the same households at two points in time facilitates a richer understanding of which households are able to partake in the fruits of growth, what allows them to move forward, and the process through which they are incorporated into a growing economy. Topics covered by the IHDS relevant in the present context include the perceived changes in SWB, expenditure, income, employment, major morbidity (including NCDs), limitations in activities of daily living (ADLs), health insurance, castes, religion, assets, social networks (e.g., self-help groups), trust in institutions, conflicts, crimes, exposure to mass media, and demographic characteristics (e.g. gender, age, marital status, household size and composition).[5]

[4] https://ihds.umd.edu/data (accessed on 31 May 2021). It should be noted that more recent nationally representative household panel survey data are not available in India. Hence, the IHDS panel data allow us to carry out an in-depth analysis of the correlates of SWB changes in comparison with those of OWB changes.

[5] It is noted that the IHDS-1 in 2005 does not allow identification of the respondent, while the IHDS-2 in 2012 does. As the respondents reported SWB changes between 2005 and 2012 at the household level, we have matched SWB or OWB changes (dependent variables), to the household head's characteristics, and other explanatory variables, by restricting the sample to the cases where the respondent was the head of the

It should be noted that all explanatory variables are lagged to 2005.Some are exogenous such as age, gender, caste, and religion, while others could be designated as controls (such as log per capita income, log NSDP, affiliation to social networks, NCDs, disabilities and the measure of income inequality akin to the Piketty measure. We exploit this distinction in the Appendix to throw light on the robustness of our analysis.

An important feature of IHDS is that it collected data on SWB changes. The question asked is: "Compared to 7 years ago, would you say your household is economically doing the same, better or worse today?" So the focus of this SWB is narrow and it has only three scales corresponding to *the perceived change* in the SWB (denoted as ΔSWB hereafter), not its level. It should also be noted that the measure is at the household level, not at the individual level. While the focus of this variable is narrow, it has a few advantages. First, because the survey specifically asks about the change of economic well-being of the household, compared with the state 7 years ago, the question has the advantage of placing more weight on the respondent's own SWB rather than the relative SWB compared to others' SWB in the community or society. If a particular shock or a negative event hits only that household, relative to others, the measure can capture the relative components, but it captures the relative difference of the SWB of the respondent or his/her family. Second, by asking specifically about economic well-being, the respondents will perceive the same aspect in well-being. This will minimize the heterogeneity in the respondent's perceptions or focus on well-being compared with the variable based on more general questions about happiness or 'the best possible life'. Third, while most of the earlier studies asked about the individual SWB, our measure captures ΔSWB at the household level, which would make easier our comparison between ΔSWB and ΔOWB.

As noted earlier, we have constructed the variable on the actual changes in objective well-being (ΔOWB). ΔOWB is defined based on the relative change in real per capita household consumption expenditure between 2005 and 2012. The entire households are classified into the three groups: better-off (2), just the same (1) and worse off (0) based on the ranking of the changes in real per capita household consumption, making the frequency distribution across three categories identical to that of ΔSWB. While we lose continuous data on the change in per capita household consumption and the thresholds among the three cases are arbitrarily determined,[6] our approach has the advantages of (i) making the estimated coefficients for ΔSWB and ΔOWB comparable in their sign and size as well as statistical significance; (ii) being able to apply ordered probit model to ΔOWB; and (iii) capturing the relative improvement or worsening of the objective well-being.

A ranking of the changes in the growth rate of real household consumption per capita in 2005–12 is created by using the entire national sample for the purpose of making the frequency distributions for ΔSWB and ΔOWB identical. This captures the relative positions

Footnote 5 (continued)

households in 2005. The final sample size, after dropping the households with missing observations in one of the explanatory variables, is 27,958 households/household heads.

[6] In Appendix Table 4 we have estimated a robust OLS model by using the growth rate of real household consumption per capita between 2005 and 12 as the dependent variable. The results are very similar in terms of the sign and statistical significance to those where ΔOWB is used as the dependent variable in Table 2 and Table 3. It is noted that the coefficient of correlation between the growth rate of real household consumption per capita between 2005 and 12 and ΔOWB is 0.4173 and statistically significant at the 1% level. It should also be noted that the coefficient of correlation between ΔSWB and ΔOWB is 0.0401 and that between ΔSWB and the growth rate of real household consumption per capita between 2005 and 2012 is 0.0221, both significant at the 1% level given the large sample size.

in the improvement in OWB at different geographical aggregations, such as state, district, or village levels, though the share of each category varies reflecting the distribution of the original variable. Though it is simple, our measure (ΔOWB) can capture how per capita consumption has grown over the period compared with the consumption growth of other households in society. In our model, we have controlled for the initial level of per capita consumption and so ΔOWB is conceptually similar to ΔSWB, while the only difference is whether the measure is based on the household head's perception or the actual change in the economic status. The list of variables and their means and standard deviation are given in Table 1.

5 Models

We have employed multiple regression and ordered probit models. Their salient features are described below.

5.1 Multiple Linear Regression Model

We first estimate a multiple regression model where the dependent variable, ΔSWB (0, 1, 2), corresponding to 'worse-off', 'just the same' or 'better-off'- is associated with a set of explanatory variables using OLS.[7] We have followed closely the literature reviewed in Sect. 2 to select explanatory variables. They include the age of the household head and its squared term, log per capita expenditure in the initial year, and the ratio of per capita expenditure of the household to the maximum value in the primary sampling unit (PSU). The last variable captures the relative consumption level of the household compared to the richest household within a PSU (a cluster of villages/urban wards). The model also controls for demographic characteristics such as gender of the household head, caste, marital status, and religion. To reflect the structure of the economy and society between urban and rural areas, we include a dummy variable on whether a household is in a rural or urban area. Also, we include the variables on employment in terms of both participation and duration. Other important factors are health or disability conditions. We include dummy variables on (1) whether a household member suffered from NCD, and (2) whether there was a disabled member. Other covariates are whether there was a conflict in the village, exposure to mass media by gender, whether any household member experienced theft and whether received remittances. The model also controls for the net state-level domestic product per capita and its squared term, and the Piketty (2014) measure of income inequality (i.e., the ratio of the share of the top 1% to that of the bottom 50% in total income). Because ΔSWB is the perceived change of economic well-being during the last 7 years or between 2005 and 2012, all the explanatory variables are based on the survey questions in 2005 to partially address the issue of reverse causation from ΔSWB to, for instance, health or expenditure. In another specification, ΔSWB, a dependent variable, is replaced by ΔOWB (0, 1, 2), which indicates

[7] See Angrist and Pischke (2008) for the detailed argument in favour of the Linear Probability Model (LPM) over the probit model where OLS is used for a binary choice model, against the standard textbook recommendation of probit or logit models for the binary variable. The use of OLS for the discrete variable (0, 1, 2) can be justified on the same grounds. OLS with robust clustered standard errors is used to address possible correlations among individuals within a household as well as heteroscedasticity.

Table 1 List of variables and descriptive statistics. *Source*: Computed from IHDS

Variable	Mean	Std. Dev	Min	Max
SWB	1.292	0.634	0	2
Monthly Per capita expenditure ('00)	8.442	8.23	0.04	392.73
Household per capita expenditure as fraction of highest in PSU	0.456	0.268	0.004	1
Gender				
Female	0.078	0.268	0	1
Marital status				
Unmarried	0.008	0.091	0	1
Widowed/Divorced	0.099	0.299	0	1
Age	45.926	12.406	16	97
Household size				
1	0.007	0.082	0	1
>5	0.374	0.484	0	1
Sector				
Urban	0.311	0.463	0	1
Education				
1–4	0.117	0.322	0	1
5–8	0.236	0.425	0	1
9–10	0.170	0.376	0	1
>10	0.129	0.335	0	1
Religion				
Muslim	0.108	0.310	0	1
Others	0.061	0.239	0	1
Caste				
Brahmin	0.050	0.217	0	1
High caste	0.154	0.361	0	1
Dalit	0.221	0.415	0	1
Adivasi	0.081	0.273	0	1
Others	0.130	0.336	0	1
Household remittance				
Yes	0.067	0.250	0	1
Any work				
<240 h	0.111	0.314	0	1
Number of working adults (20–50) males in HH				
0	0.248	0.432	0	1
$>=2$	0.076	0.264	0	1
Number of working adults (20–50) females in HH				
1	0.465	0.499	0	1
$>=2$	0.027	0.161	0	1
NCD				
Yes	0.087	0.281	0	1
Disability				
Yes	0.031	0.173	0	1
Radio regular men				
Regularly	0.143	0.350	0	1

Table 1 (continued)

Variable	Mean	Std. Dev	Min	Max
Radio regular women				
Regularly	0.120	0.325	0	1
Newspaper regular men				
Regularly	0.201	0.401	0	1
Newspaper regular women				
Regularly	0.105	0.307	0	1
TV regular men				
Regularly	0.349	0.477	0	1
TV regular women				
Regularly	0.411	0.492	0	1
Social networks				
1	0.187	0.390	0	1
2	0.105	0.307	0	1
>2	0.071	0.257	0	1
Theft				
Yes	0.047	0.212	0	1
Conflict in village				
Yes	0.477	0.500	0	1
Ratio of share top 1% to bottom 50%	0.465	0.119	0.226	0.858
Net State domestic product (in '000)	23.631	9.391	7.914	63.877

(1) Number of OBS = 27,958

'worse-off', 'roughly the same' or 'better-off' based on the ranking of the growth of real per capita household expenditure and the frequency distribution identical to ΔSWB.

A standard OLS model is expressed as:

$$y_i = X_i\beta + \varepsilon_i \tag{1}$$

where y_i is a vector, ΔSWB or ΔOWB (0, 1, 2), the change in subjective or objective well-being from 2005 to 2012, and i stands for the household head (1, …, 27,958). X_i denotes a matrix containing the intercept and a number of explanatory variables described above and β is a vector of coefficients to be estimated. X_i includes household characteristics(such as age, log ofexpenditure per capita in 2005, religion, caste, gender, location, household size, whether suffering from an NCD, a disability, whether experiences theft, whether receives a remittance, and whether adult men and women are exposed to mass media in 2005. X_i also includes the Piketty measure of inequality at the state level (ratio of the share of the bottom 50% in total income to that of the top 1%) in 2005. ε_i is a vector of the error term assumed to be independent and identically distributed. We have applied the Huber-White robust standard errors to address the heteroscedasticity as y_i is a discrete measure. As noted earlier, our application of the standard robust OLS to a discrete dependent variable is justified

Table 2 Multiple regression analysis of subjective and objective well-being and its covariates

Variables	ΔSWB		ΔOWB	
	Coefficient	Robust Std. Err	Coefficient	Robust Std. Err
Individual and household characteristics and the location of households (2005)				
Gender				
Female	0.0486	(0.0328)	−0.0315	(0.0269)
Marital status				
Unmarried	−0.0315	(0.0446)	0.0371	(0.0501)
Widowed/Divorced	−0.0145	(0.0292)	0.0356	(0.0250)
Age[3]	0.00535**	(0.00251)	0.0184***	(0.00305)
Age*Age	−5.66e−05**	(2.60e−05)	−0.000186***	(3.29e−05)
Household size				
1[2]	−0.115*[1]	(0.0604)	−0.0793	(0.0613)
>5	0.0438***	(0.0121)	0.0410***	(0.0105)
Sector				
Urban	0.0464***	(0.0118)	0.0728***	(0.0106)
Education				
1–4	0.0480***	(0.0181)	−0.0415***	(0.0159)
5–8	0.0923***	(0.0145)	0.0552***	(0.0127)
9–10	0.146***	(0.0172)	0.0836***	(0.0145)
>10	0.145***	(0.0198)	0.202***	(0.0176)
Religion				
Muslim	0.0552	(0.0386)	−0.130***	(0.0353)
Others	0.118***	(0.0267)	0.00638	(0.0237)
Caste				
Brahmin	−0.0114	(0.0226)	0.0187	(0.0213)
High caste	−0.0153	(0.0155)	0.0266*	(0.0137)
Dalit	−0.0664***	(0.0154)	−0.0678***	(0.0130)
Adivasi	0.0391*	(0.0207)	−0.0359*	(0.0201)
Others	−0.0830**	(0.0368)	0.0847**	(0.0337)
Household remittance				
Yes	0.0673***	(0.0261)	−0.0345	(0.0219)
Employment (2005)				
Any work				
<240 h	0.0305*	(0.0185)	0.0290*	(0.0164)
Number of working adults (20–50) males in HH				
0	−0.0874***	(0.0150)	0.0481***	(0.0127)
>=2	0.0510***	(0.0187)	−0.142***	(0.0160)
Number of working adults (20–50) females in HH				
1	0.00927	(0.0119)	0.00308	(0.0103)
>=2	0.0367	(0.0298)	−0.102***	(0.0272)
Health & disability (2005)				
NCD				
Yes	−0.0371*	(0.0204)	0.0239	(0.0163)
Disability				
Yes	−0.0743***	(0.0284)	−0.0347	(0.0229)

Table 2 (continued)

Variables	ΔSWB		ΔOWB	
	Coefficient	Robust Std. Err	Coefficient	Robust Std. Err
Media access (2005)				
Radio regular men				
Regularly	0.0954***	(0.0252)	−0.0109	(0.0226)
Radio regular women				
Regularly	−0.0508*	(0.0278)	0.00732	(0.0239)
Newspaper regular men				
Regularly	0.0565***	(0.0186)	0.0211	(0.0151)
Newspaper regular women				
Regularly	0.0404**	(0.0201)	0.108***	(0.0177)
TV regular men				
Regularly	−0.00981	(0.0175)	−0.00216	(0.0159)
TV regular women				
Regularly	0.0563***	(0.0176)	0.0314**	(0.0157)
Other variables (2005)				
Social networks				
1	0.00994	(0.0149)	−0.0152	(0.0127)
2	−0.0469***	(0.0175)	−0.0120	(0.0148)
> 2	0.00267	(0.0182)	0.00385	(0.0173)
Theft				
Yes	−0.0269	(0.0255)	−0.0643***	(0.0212)
Conflict in village				
Yes	0.0163	(0.0105)	−0.0373***	(0.00929)
Initial economic conditions (2005)				
Monthly per capita expenditure ('00)	0.00449***	(0.00117)	−0.0463***	(0.00269)
Square of monthly per capita expenditure ('00)	−2.38e−05**	(1.02e−05)	0.000204***	(3.89e−05)
Household per capita expenditure as fraction of highest in PSU	0.0685***	(0.0258)	−0.249***	(0.0252)
Ratio of share top 1% to bottom 50%	0.261***	(0.0364)	−0.0670**	(0.0332)
Net state domestic product (in '000)	0.00738***	(0.00201)	0.0120***	(0.00176)
Net state domestic product (in '000) square	−7.77e−05**	(3.09e−05)	−0.000133***	(2.68e−05)
Constant	0.736	(0.0639)	1.124	(0.0776)
Observations	27,958		27,945	
R-squared	0.063		0.223	

1. Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.;

2. The results where the coefficient estimates are statistically significant for ΔSWB and ΔOWB with an opposite sign, or only significant for ΔSWB are highlighted in bold;

3. The results where the coefficient estimates are statistically significant for ΔSWB and ΔOWB with a same sign are highlighted in Italics

on the grounds of a well-known argument where robust OLS performs well for the binary dependent variable (Angrist & Pischke, 2008).[8]

5.2 Ordered Probit

We have applied the ordered probit as well, as the dependent variable is an ordered discrete variable (Greene, 2018). It has two merits: it yields separate estimates of the three cases of ΔSWB or ΔOWB—whether worse-off or just the same or better-off between 2005 and 2012. Also, the prediction of the OLS model can be outside the range between 0 and 2, though we are not using the predictions in our study. Once we convert the coefficients to marginal effects/associations evaluated at means, the estimates are fully comparable between OLS and ordered-probit, as we will show in the next section.

6 Results

Tables 2 and 3 report the coefficient estimates of the OLS model and the marginal effects/associations (evaluated at the means) of the ordered probit, respectively. It is noted that we have converted the coefficient estimates to the marginal effects/associations evaluated at the means in Table 3 so that the OP results in Table 3 are comparable with the OLS results in Table 2 after a simple conversion. For instance, the first row of Table 3 in the case of ΔSWB shows that 'being a female household head' leads to a change of the probability in the case of 'Worse Off (0)' by '−1.37%', that for 'Just the Same (1)' by '−2.21%' and that for 'Better Off (2)' by '3.57%' while other covariates are fixed at their means. That is, being a female head on average leads to a 4.93% (=−1.37%*0+(−2.21%)*1+3.57%*2) increase in the probability of shifting to the one above category. This is comparable with the OLS estimate of "0.0486" (4.86%) in the first row of Table 2. All the estimates in Tables 2 and 3 are highly similar after this conversion. The probabilities of moving up by one category are shown as 'Converted ME (Marginal Effect)' in the last columns of Table 3 for both ΔSWB and ΔOWB. We follow Angrist and Pischke's (2008) defence of the use of OLS for the binary dependent variable. As a robustness check, we have applied an alternative method of deriving the marginal effects for the ordered probit model by averaging marginal effects for all the observations (Appendix Table 5). The converted marginal effects are highly similar to those in Table 3 and the coefficient estimates in Table 2. These sets of results strongly corroborate the robustness of OLS in case it is applied to the discrete dependent variable.

Below we discuss the results of these tables together with a particular focus on distinct differences between the covariates of ΔSWB and ΔOWB. In Table 2, although the null of homoscedasticity is not rejected, we report robust OLS results in Table 2 given that the dependent variable is discrete for both ΔSWB and ΔOWB. The overall explanatory power of the specification is validated by the F test in both cases. In Table 3 the overall validation of the OP specification is confirmed by the Wald test. Further, as an additional measure of robustness we conduct OLS regression for ΔSWB and ΔOWB with only the exogenous

[8] As an extension, we have estimated ΔSBW and ΔOBW using a (robust) seemingly unrelated regression equations (SURE) model using the same set of covariates allowing for the correlations of residuals. As the correlation is relatively low (with a correlation coefficient of 0.0693) and the results are almost the same as those of robust OLS, we present the robust OLS results only.

Table 3 Marginal effects/associations of covariates with components of subjective well-being (evaluated at the means)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Individual and household characteristics (2005)and the location of households								
Gender								
Female[2]	−0.0137**[1]	−0.0221**	0.0357**	0.0493	0.00902	0.0212*[1]	−0.0302*	−0.0392
	(0.00630)	(0.01120)	(0.01750)		(0.00549)	(0.01170)	(0.01720)	
Marital status								
Unmarried	0.00988	0.0133	−0.0232	−0.0331	−0.00787	−0.0222	0.03	0.0378
	(0.01310)	(0.01620)	(0.02930)		(0.00752)	(0.02350)	(0.03100)	
Widowed/Divorced	0.00467	0.00657	−0.0112	−0.01583	−0.00860**	−0.0245**	0.0331**	0.0417
	(0.00638)	(0.00868)	(0.01510)		(0.00386)	(0.01200)	(0.01590)	
Age[3]	−0.00156***[1]	−0.00227***	0.00382***	0.00537	−0.00416***	−0.0108***	0.0150***	0.0192
	(0.00057)	(0.00083)	(0.00140)		(0.00040)	(0.00104)	(0.00142)	
Age*Age	.0000164***	.000024***	−.00004***	−0.00006	4.21e−05***	0.000109***	−0.000151***	−0.00019
	(0.00001)	(0.00001)	(0.00001)		(0.00000)	(0.00001)	(0.00001)	
Household size								
1	0.0381**	0.0370***	−0.0752**	−0.1134	0.0243*	0.0437**	−0.0681**	−0.0925
	(0.01800)	(0.01210)	(0.03010)		(0.01330)	(0.01770)	(0.03090)	
> 5	−0.0127***	−0.0190***	0.0317***	0.0444	−0.00843***	−0.0225***	0.0310***	0.0395
	(0.00242)	(0.00375)	(0.00616)		(0.00168)	(0.00463)	(0.00630)	
Sector								
Urban	−0.0135***	−0.0205***	0.0340***	0.0475	−0.0167***	−0.0471***	0.0638***	0.0805
	(0.00274)	(0.00437)	(0.00709)		(0.00183)	(0.00552)	(0.00729)	
Education								
1–4	−0.0149***	−0.0168***	0.0317***	0.0466	0.0123***	0.0201***	−0.0324***	−0.0447
	(0.00404)	(0.00481)	(0.00883)		(0.00337)	(0.00518)	(0.00852)	

Table 3 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
5–8	−0.0277***	−0.0351***	0.0628***	0.0905	−0.0140***	−0.0317***	0.0457***	0.0597
	(0.00323)	(0.00419)	(0.00733)		(0.00229)	(0.00524)	(0.00749)	
9–10	−0.0421***	−0.0615***	0.104***	0.1465	−0.0200***	−0.0494***	0.0694***	0.0894
	(0.00351)	(0.00558)	(0.00892)		(0.00253)	(0.00656)	(0.00902)	
> 10	−0.0420***	−0.0613***	0.103***	0.1447	−0.0401***	−0.139***	0.179***	0.219
	(0.00410)	(0.00692)	(0.01090)		(0.00240)	(0.00928)	(0.01130)	
Religion								
Muslim	−0.0153*	−0.0238	0.0390*	0.0542	0.0371***	0.0680***	−0.105***	−0.1420
	(0.00868)	(0.01490)	(0.02360)		(0.00921)	(0.01180)	(0.02090)	
Others	−0.0313***	−0.0571***	0.0884***	0.1197	−0.00221	−0.0064	0.00861	0.01082
	(0.00481)	(0.01050)	(0.01530)		(0.00381)	(0.01130)	(0.01510)	
Caste								
Brahmin	0.00339	0.00542	−0.00881	−0.0122	−0.00587*	−0.0165	0.0224*	0.0283
	(0.00521)	(0.00813)	(0.01330)		(0.00341)	(0.01020)	(0.01360)	
High caste	0.0044	0.00697	−0.0114	−0.01583	−0.00656***	−0.0187***	0.0252***	0.0317
	(0.00328)	(0.00512)	(0.00840)		(0.00218)	(0.00642)	(0.00860)	
Dalit	0.0194***	0.0270***	−0.0464***	−0.0658	0.0175***	0.0367***	−0.0542***	−0.0717
	(0.00310)	(0.00420)	(0.00725)		(0.00242)	(0.00487)	(0.00721)	
Adivasi	−0.0102***	−0.0184**	0.0285**	0.0386	0.0101***	0.0231***	−0.0332***	−0.0433
	(0.00388)	(0.00738)	(0.01120)		(0.00350)	(0.00745)	(0.01090)	
Others	0.0250**	0.0333***	−0.0584***	−0.0835	−0.0175***	−0.0587***	0.0762***	0.0937
	(0.01020)	(0.01160)	(0.02180)		(0.00475)	(0.01870)	(0.02340)	

Table 3 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Household remittance								
Yes	−0.0185***	−0.0312***	0.0497***	0.0682	0.00725**	0.0174**	−0.0246**	−0.0318
	(0.00386)	(0.00750)	(0.01130)		(0.00342)	(0.00753)	(0.01090)	
Employment (2005)								
Any work								
<240 h	−0.00823**	−0.0127**	0.0209**	0.0291	−0.00606**	−0.0168**	0.0228**	0.0288
	(0.00370)	(0.00602)	(0.00971)		(0.00253)	(0.00743)	(0.00995)	
Number of working adults (20–50) males in HH								
0	0.0273***	0.0344***	−0.0617***	−0.089	−0.0104***	−0.0309***	0.0414***	0.0519
	(0.00348)	(0.00393)	(0.00736)		(0.00191)	(0.00601)	(0.00790)	
> = 2	−0.0135***	−0.0244***	0.0379***	0.0514	0.0412***	0.0664***	−0.108***	−0.1496
	(0.00371)	(0.00734)	(0.01100)		(0.00459)	(0.00499)	(0.00937)	
Number of working adults (20–50) females in HH								
1	−0.00243	−0.00352	0.00595	0.00838	−0.000887	−0.00234	0.00323	0.00412
	(0.00246)	(0.00356)	(0.00602)		(0.00169)	(0.00446)	(0.00615)	
> = 2	−0.0101	−0.0157	0.0259	0.0361	0.0285***	0.0531***	−0.0816***	−0.1101
	(0.00658)	(0.01100)	(0.01760)		(0.00675)	(0.00921)	(0.01590)	
Health & Disability (2005)								
NCD								
Yes	0.0116***	0.0155***	−0.0271***	−0.0387	−0.00614**	−0.0171**	0.0232**	0.0293
	(0.00428)	(0.00525)	(0.00952)		(0.00253)	(0.00752)	(0.01000)	

Table 3 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Disability								
Yes	0.0239***	0.0287***	−0.0527***	−0.0767	0.00803	0.0189*	−0.0270*	−0.0351
	(0.00755)	(0.00739)	(0.01490)		(0.00496)	(0.01060)	(0.01560)	
Media Access								
Radio regular men								
Regularly	−0.0259***	−0.0445***	0.0704***	0.0963	0.00275	0.00695	−0.0097	−0.01245
	(0.00425)	(0.00861)	(0.01280)		(0.00359)	(0.00884)	(0.01240)	
Radio regular women								
Regularly	0.0162***	0.0211***	−0.0373***	−0.0535	−0.0018	−0.00475	0.00655	0.00835
	(0.00600)	(0.00702)	(0.01300)		(0.00364)	(0.00980)	(0.01340)	
Newspaper regular Men								
Regularly	−0.0167***	−0.0265***	0.0432***	0.0599	−0.00564**	−0.0153**	0.0209**	0.0265
	(0.00361)	(0.00625)	(0.00984)		(0.00257)	(0.00727)	(0.00983)	
NEWSPAPER REGULAR WOMEN								
Regularly	−0.0136***	−0.0218***	0.0354***	0.0490	−0.0229***	−0.0771***	0.1000***	0.1229
	(0.00440)	(0.00773)	(0.01210)		(0.00238)	(0.01010)	(0.01240)	
TV regular men								
Regularly	0.00286	0.00412	−0.00698	−0.00984	0.000896	0.00232	−0.00321	−0.0041
	(0.00418)	(0.00597)	(0.01020)		(0.00287)	(0.00740)	(0.01030)	
TV regular women								
Regularly	−0.0160***	−0.0238***	0.0398***	0.0558	−0.00760***	−0.0200***	0.0276***	0.0352
	(0.00401)	(0.00609)	(0.01010)		(0.00279)	(0.00745)	(0.01020)	

Table 3 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Other Variables (2005)								
Social networks								
1	−0.00294	−0.00446	0.0074	0.01034	0.00375*	0.00948*	−0.0132*	−0.01692
	(0.00281)	(0.00431)	(0.00712)		(0.00206)	(0.00507)	(0.00713)	
2	0.0146***	0.0190***	−0.0336***	−0.0482	0.00236	0.00608	−0.00844	−0.0108
	(0.00400)	(0.00475)	(0.00874)		(0.00257)	(0.00646)	(0.00903)	
>2	−0.000267	−0.000394	0.000661	0.000928	−0.000733	−0.00197	0.0027	0.00343
	(0.00436)	(0.00646)	(0.01080)		(0.00298)	(0.00806)	(0.01100)	
Theft								
Yes	0.00797	0.0109	−0.0188	−0.0267	0.0163***	0.0353***	−0.0516***	−0.0679
	(0.00544)	(0.00695)	(0.01240)		(0.00433)	(0.00774)	(0.01200)	
Conflict in village								
Yes	−0.00490**	−0.00713**	0.0120**	0.01687	0.00877***	0.0226***	−0.0314***	−0.0402
	(0.00221)	(0.00324)	(0.00545)		(0.00157)	(0.00397)	(0.00552)	
Initial economic conditions (2005)								
Monthly Per capita expenditure	−0.00126***	−0.00183***	0.00309***	0.00435	0.0103***	0.0267***	−0.0370***	−0.0473
	(0.00023)	(0.00034)	(0.00056)		(0.00027)	(0.00056)	(0.00064)	
Household per capita expenditure as fraction of highest in PSU	−0.0203***	−0.0294***	0.0497***	0.0700	0.0509***	0.132***	−0.183***	−0.2340
	(0.00481)	(0.00700)	(0.01180)		(0.00345)	(0.00881)	(0.01200)	
Ratio of share top 1% to bottom 50%	−0.0790***	−0.115***	0.194***	0.273	0.0146**	0.0379**	−0.0524**	−0.0669
	(0.00983)	(0.01400)	(0.02370)		(0.00661)	(0.01730)	(0.02390)	

Table 3 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Net State domestic Product (in '000)	−0.00107***	−0.00155***	0.00262***	0.00369	−0.00132***	−0.00343***	0.00475***	0.00607
	(0.00014)	(0.00021)	(0.00035)		(0.00010)	(0.00026)	(0.00036)	

1. Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 2.;

2. The results where the coefficient estimates are statistically significant for ΔSWB and ΔOWB with an opposite sign, or only significant for ΔSWB are highlighted in bold. Significance judged by a subset of three marginal effects/associations at the 10% level;

3. The results where the coefficient estimates are statistically significant for ΔSWB and ΔOWB with the same sign are highlighted in italics. Significance judged by a subset of three marginal effects/associations at the 10% level;

4. Average ME (marginal effects) show the additional probability that a household shifts to the category (0,1,2) one above and this is equivalent to the OLS estimate in Table 2. This is equal to '0*ME for "0" + 1*ME for "1" + 2*ME for "2"'

variables. The estimates are presented in Appendix Table 6. There is considerable similarity between results of multiple regression analysis with complete specification including both exogenous explanatory variables and other lagged explanatory variables/controls and those yielded by multiple regression analysis with only exogenous variables.To illustrate, gender is not significant in both cases; age and age^2 are significant in both cases; each education level is significantin bothΔSWB and ΔOWB in the complete specification, but only inΔSWB while only both primary and above matriculation in ΔOWB with only exogenous explanatory variables; while only Muslims are significant in ΔOWB and Others in ΔSWB with complete specification, only Others are significant in the exogenous variables case; whileHigh Castes, Dalits and Adivasis have significant coefficients in both ΔSWB and ΔOWB in the complete specification, only High Castes and Dalits have significant coefficients in ΔSWB and Brahmins and Dalits ΔOWB inthe specification with only exogenous variables. Some of the differences in the caste and religion coefficients are not surprising as these are partly due to the omitted variable bias. Omission of income which is correlated with castes and religions (lower castes and Muslims belong to low income households) is a case in point. It is thus a fair inference that, taking both similarities into account, and the omitted variable bias, the doubts about the robustness of our analysis are minor.

We will first focus on the coefficient estimates which show similar patterns in the results, that is, the common covariates of ΔSWB and ΔOWB (for which the results are given in italics in Tables 2 and 3). We will then discuss the explanatory variables which are statistically significant and show opposite signs for ΔSWB and ΔOWB, or significant only for ΔSWB in Tables 2 and 3 to identify the correlates specific to ΔSWB (indicated in bold in Tables). Finally, we will selectively mention a few other coefficient estimates, that is, those which are statistically significant (or not significant) for either ΔSWB or ΔOWB.

6.1 Common Covariates of ΔSWB and ΔOWB

6.1.1 Age

The coefficient of age is positive and significant while that of the square of age is negative and significant for both ΔSWB and ΔOWB in OLS (Table 2). This is consistent with the ordered probit results where age is negatively associated with being worse-off and just the same and positively with being better-off for ΔSWB and ΔOWB (Table 3). Households with an old head tend to feel their economic well-being has improved both subjectively and objectively, with the association attenuating as the head gets older. If a head gets 1 year older, the household is more likely to move to one above category of ΔSWB (or ΔOWB) by 0.54% (or 1.84%) on average, other things being equal (Table 2). This is consistent with marginal effect/association estimates in Table 3 (0.537% (or 1.92%)). The association of age with the improvement in well-being is thus much larger for OWB than for SWB.

6.1.2 Household Size

Living arrangements can be associated with a perceived change in well-being. These are captured through the household size. Relative to the omitted group (2–5 members),[9] those living alone are associated with lower ΔSWB and ΔOWB and those belonging to households with

[9] For all the categorical explanatory variables, the group with the largest number of observations is omitted and serves as a reference group.

more than 5 members express a higher ΔSWB and ΔOWB in OLS (Table 2). Given the weak social security system, and weakening family ties, it is not surprising that living alone is closely associated with lower well-being and belonging to large households (>5 members) with higher ΔSWB or ΔOWB. In addition to economies of scale in household consumption expenditure, the joy of living with children, and perhaps better family support during contingencies (e.g., accident and serious illness) influence the results on ΔSWB and ΔOWB. So 'insurance' against misfortunes and other contingencies underlie this result. For instance, compared with the default household size (2–5), a larger household (>5) tends to see the probability of perceiving better economic well-being (by one category) increase by 4.38% for ΔSWB and 4.10% for ΔOWB. Consistent results are found in Table 3 in terms of the sign and magnitude of marginal effects/associations (4.44% for ΔSWB and 3.96% for ΔOWB). In Table 3, for both ΔSWB and ΔOWB, relative to the omitted group of households with 2–5 members, those living alone are more likely to be worse-off and just the same and less likely to be better-off, while those living in households with >5 members are less likely to be worse-off and just the same and more likely to be better off. Not only the signs but also the magnitude of the associations are similar for both ΔSWB and ΔOWB.

6.1.3 Living in Urban Areas

It is interesting to observe that living in urban areas is associated with a higher ΔSWB and ΔOWB after controlling for schooling, employment and health factors as well as state-level income (Tables 2 and 3). That could reflect better quality of schooling, not captured by years of schooling, higher labour productivity, better health care, or more developed transportation and telecommunication infrastructure in urban areas. Those living in urban areas tend to be 4.64% (7.28%) more likely to move up by one category in ΔSWB (ΔOWB) in OLS (Table 2). Similar estimates (4.75% for ΔSWB and 8.05% for ΔOWB) are obtained from the ordered probit (Table 3).

6.1.4 Schooling

Schooling of adults endows them with skills and expertise to engage in remunerative employment, and adds to their awareness of entitlements and obligations, as well as of prospects for their self-advancement. Relative to the omitted category (illiterates), those with primary schooling (1–4 years of schooling) have significantly higher ΔSWB (4.8% more likely to move up to the above category), but the estimate for this category is negative and significant for ΔOWB. Those with successively higher levels of schooling have a still higher likelihood of improvement in SWB (OWB), by 9.23% (5.52%) for 5–8 years/middle level, by 14.6% (8.36%) for 8–9 years/pre-matriculation, and by 14.5% (20.2%) for 10 years or more/matriculation and above (Table 2). It is sometimes questioned whether the effect of schooling is exaggerated because it compounds both direct and indirect effects through better health (Dolan et al., 2008). This is not ruled out but since we control for the effects of health indicators, our estimate of the association between well-being and schooling is net of this indirect effect. The marginal correlates of education shown in Table 3 are similar to the coefficient estimates in Table 2. Overall, schooling, particularly at the secondary or higher level, is associated with significant improvements in both subjective and objective well-being. While higher levels of schooling open avenues for more remunerative and secure employment, no less important are the non-economic reasons: better awareness

of rights, entitlements and obligations, though we did not include these variables. Schooling is, for instance, the key to women's empowerment. As Kabeer (2005) observes, better-schooled women in Tamil Nadu scored higher on a composite index measuring their access to, and control over resources, as well as their role in economic decision-making.

6.1.5 Macroeconomic Environment—Higher Net State Domestic Product

To capture specific aspects of the macro-economic environment, we have examined the associations between change in well-being and state affluence measured in terms of net state domestic product per capita and its square, and between change in well-being and extreme income inequality using a measure akin to Piketty's (2014). We have computed the ratio of the share of the income of the top 1% in total income to that of the bottom 50%.

As expected, ΔSWB, as well as ΔOWB, are positively and significantly associated with state affluence (NSDP), while negatively and significantly with the squared term of NSDP (Table 2). It follows therefore that ΔSWB (ΔOWB) rises (decreases) in association with state affluence but at a diminishing rate. One conjecture is that state affluence is linked to better infrastructure (e.g. transport, health, telecommunications) leading to improvement in SWB. In such a context, well-being is likely to be higher in more affluent states. However, the diminution of this association at higher levels of affluence suggests that the provision of public goods does not grow apace with state affluence because of special interest groups pursuing their own agenda and diverting public resources to their own interests. Tables 2 and 3 have similar results.

6.2 Specific Covariates of ΔSWB

While the correlates of ΔSWB and those of ΔOWB are generally similar and consistent, there are some factors associated with only ΔSWB as delineated below.

6.3 Being a Female Head of Household

We find using the ordered probit model that women (i.e. female heads of household) are less likely to be worse-off and just the same but more likely to be better-off (ΔSWB) with significant marginal effects/associations and a higher probability (4.93% on average) of moving up by one category (Table 3). This is surprising, especially in light of robust evidence of discrimination against women in the allocation of food and medical resources (e.g., Kynch & Sen, 1983). However, the signs are reversed and the corresponding probability is − 3.92 (Table 3). While the signs are the same, the coefficient estimates are not significant when OLS is applied to ΔSWB or ΔOWB (Table 2).

6.3.1 Religion

Another important variable is religion. Relative to Hindus, the reference group, 'Muslims' and 'Others' (including those belonging to Jainism and Buddhism) tend to have higher ΔSWB, while Muslims tend to have lower ΔOWB (Table 3). Three observations are

pertinent: Hinduism is different from many religions because it has no specific beliefs that everyone must agree with to be considered a Hindu. Instead, it is inclusive of many different, sometimes contradictory, beliefs. For example, hidden within Hinduism are both theistic and semi-theistic schools or philosophies. Moreover, the caste system is integral to Hinduism. As the former is divisive and exclusionary, Hindus as a religious group are likely to have lower ΔSWB. The third observation is a pervasive view that belief in God helps imbibe values of forbearance, integrity and compassion (Deaton, 2011; Dolan et al., 2008). These values are reinforced by, say, regular church attendance or performance of rituals or, more broadly, religiosity (Helliwell, 2003). It is noted that Muslims or 'Others' tend to perceive improved subjective well-being without experiencing the corresponding improvement in objective well-being. In particular, the lower ΔOWB among Muslims reflects that they are on average more deprived than Hindus.

6.3.2 Caste

The caste hierarchy reveals a somewhat intriguing pattern. Relative to the omitted group (OBC), the highest-ranking *Brahmins* do not display significantly higher well-being (either ΔSWB or ΔOWB), while those belonging to High Castes have a significantly higher level of well-being (only ΔOWB, Table 2). *Dalits*/SCs, who are on the lower rung, are, however, associated with significantly lower ΔSWB and ΔOWB in Table 2 (based on robust regression). However, Table 3 shows that their probability of 'moving up' rises in both ΔSWB and ΔOWB by 6.58% (7.17%). *Adivasis*/STs, who are on the lowest rung, display significantly higher well-being for ΔSWB (by 3.91%), but the sign is reversed for ΔOWB (−3.56%) as shown in Table 2, with similar estimates (3.86%; −4.33%) of marginal correlates as given in Table 3. The residual category of 'Others' shows significantly lower well-being for ΔSWB with the opposite sign for ΔOWB. The fact that there is little consonance between caste hierarchy and well-being—particularly SWB—suggests that the latter has little to do with poverty. To illustrate, while *Dalit*s and *Adivasis* are most likely to be poor, their SWB differs. In contrast, while Brahmins are least likely to be poor, their SWB is not significantly higher than OBCs'.

6.3.3 Employment

We also include the variables on whether employed as well as the duration of employment. The first variable shows the number of adult male and female workers in the household, respectively. The number of workers in the age-group 20–50 years is classified into three categories, '0', '1', '2 or more'. Relative to the omitted group (with 1 adult male), households without any male workers are associated with lower ΔSWB and those with '2 or more' adult male workers with higher ΔSWB, but the signs are reversed for ΔOWB (Tables 2 and 3). Since households without any adult female worker are the largest group, this is the omitted group. Relative to these households, those with '2 or more' adult female workers are associated with lower ΔOWB, but not significant in the case of ΔSWB (Tables 2 and 3). The coefficient/marginal effect of households with a single worker is positive but not significant (Tables 2 and 3). Duration of employment is not sufficiently disaggregated for meaningful inferences. There are just two categories: 'annual hours worked ≤ 240 h' and '> 240 h'. The first category lumps together those who hardly do any work with those who work 20 h or less in a month. The difficulty is that the threshold

for the leisure-work choice cannot be identified. Relative to the reference category, that is, households with workers exceeding 240 h, those working ≤ 240 h display higher ΔSWB and ΔOWB.

6.3.4 NCDs

Change in SWB and ill-health and/or disabilities are likely to be negatively associated. We use two relevant indicators: one is NCDs and the second is disabilities/limitations of ADL. Their separate roles suggest that NCDs or disabilities are significantly associated with lower well-being, relative to those not suffering from either, respectively. The reverse causality where high SWB lowers prospects of ill-health is minimized as ill-health (in 2005) is prior to well-being (in 2012). Though our SWB measure is the perceived change of economic well-being in 2005–2012, it is ruled out that the perception in 2012 influenced ill health in 2005. In any case, as observed by Kohler et al. (2017), the causality from health to well-being is more likely.

If an individual in a household suffers from any NCD, the household is more likely to be worse-off and just the same and less likely to be better-off, relative to those not suffering from any NCD only for ΔSWB, not ΔOWB (Tables 2 and 3). Similar results are obtained for individuals suffering from any disability only for ΔSWB, not for ΔOWB (Table 2). More specifically, households with disabled members are more likely to be worse-off and just the same and less likely to be better off in terms of SWB (Table 3).

6.3.5 Mass Media

The association between SWB and exposure to mass media has not received much attention. IHDS allows us to examine this relationship in detail. The mass media include radio, newspapers and TV. Exposure of men and women is classified into 'never', 'sometimes' and 'regularly'. By combining 'never' and 'sometimes', we are able to focus on regular exposure of men and women separately and their associations with ΔSWB and ΔOWB. For men, ΔSWB and regular exposure to radio and newspapers but not TV are positively related, implying that they perceive a positive change in SWB. These factors are not significantly associated with ΔOWB (Tables 2 and 3). In sharp contrast, women reading newspapers and watching TV experience greater improvement in both subjective and objective well-being (Tables 2 and 3). However, regular listening to the radio by women is not associated with ΔSWB or ΔOWB. Overall, the results corroborate the importance of exposure to mass media—particularly for women in improving SWB.

6.3.6 Initial Consumption

The relationship between change in subjective well-being and income remains controversial with some studies reporting a positive relationship and others a varying relationship, depending on the region (Kahneman & Deaton, 2010). Following Deaton (2011), we use the log of per capita expenditure as a proxy for the log of per capita income. Our results show a positive and significant relation between ΔSWB and initial expenditure, implying the higher the initial expenditure, the higher is the change in SWB, with the probability of moving up by one category as 0.45% (Table 2). The corresponding estimate is 0.44% in

Table 3. However, the sign is reversed as higher initial expenditure reduces the growth rate of per capita consumption.[10]

6.4 Other Covariates of ΔSWB and ΔOWB

6.4.1 Remittances

As remittances include international transfers mostly from non-resident relatives and acquaintances, they are in a large number of cases an important supplement to household income/expenditure. As expected, these are associated with higher ΔSWB, but not ΔOWB (Table 2). Households receiving remittances are less likely to be worse-off and just the same and more likely to be better off, relative to those who do not in the case of ΔSWB, but not in the case of ΔOWB (Table 3).

6.5 Other Covariates

Marital status is found to be closely linked to SWB-in particular, the married are found to enjoy higher SWB (Helliwell, 2003). IHDS allows us to disaggregate marital status into: married, unmarried, separated and divorced. As 'the married' is the largest category, this is omitted. Neither unmarried nor 'widowed and divorced' show significant differences in terms of ΔSWB or ΔOWB (Tables 2 and 3). It is important to bear in mind that married women do not enjoy the improvement in their subjective or objective well-being. This may seem counter-intuitive, but it could be because many married women are subject to intimate partner violence including marital 'rape'.

There are frequent conflicts in the local neighbourhood, some minor and others not minor and on a larger scale. Inter-caste conflicts (e.g., rape of a *Dalit* woman), disputes over ownership of land or property, and communal riots vary in scale and intensity. Relative to no conflict, conflicts are associated with significantly lower well-being for ΔOWB (Tables 2 and 3). For ΔSWB conflict is statistically non-significant in Table 2 but positive and significant in Table 3. The latter seems counter-intuitive, as even minor conflicts involve loss of property, loss of income and violence. Another variable of interest is crimes. IHDS is confined to thefts. Thefts are not significantly associated with ΔSWB but are significantly and negatively associated with ΔOWB (Tables 2 and 3). A definitive result would have been obtained if the value of stolen items were given.

Participation in social networks such as self-help groups, women's associations, and producers' associations is potentially beneficial during illness, loss of livelihood, and other contingencies such as accidents and the death of the primary breadwinner (Deaton, 2018; Dolan et al., 2008). However, in the absence of information on the density of these networks and people's frequency of participation, their importance in enhancing SWB may be inconclusive. There are four categories of participation in networks: 0, 1, 2 and > 2. Relative to households not affiliated to any social network, the only significant positive association is between change in ΔSWB and ΔOWB and households belonging to 2 networks (Table 2). However, in Table 3 the signs are reversed which is counter-intuitive.

[10] Admittedly, the variables on the initial per capita household expenditure are likely to be endogenous, but we include them in estimating ΔOBW to facilitate the comparison of the results for ΔSWB and ΔOWB. Omitting the initial expenditure, its square and its share in PSU from the equation estimating ΔOBW does not significantly affect the estimates of other coefficients except that estimates for schooling in the top two categories become statistically non-significant.

Piketty (2014) drew attention to growth in developed countries over a long period leading to a rise in income inequality. In another study, Chancel and Piketty (2019) point to a rise in income inequality in India since 1922. The important contribution of these studies is to shift the attention away from conventional measures of income inequality (say, the Gini coefficient) to the income disparity between the top 1% and the bottom 50%. We find that the association between well-being and the Piketty measure of extreme income inequality is positive and significant. This suggests that the higher the ratio of the share of the bottom 50% in total income to that of the top 1%, the higher is ΔSWB. This is counter-intuitive as the income accumulation of multi-millionaires is driven by speculative gains in the stock market and real estate.

7 Conclusions and Policy Challenges

Although there is abundant literature on SWB, there is virtually none for India at the national level. Growing recognition of the validity and accuracy of measures of SWB vis-à-vis objective measures of well-being (based on real income) underlies the rapid growth of literature on SWB in recent decades. As prominent studies in the SWB literature have endorsed the case for SWB both conceptually and empirically, we were motivated to examine the relationship between SWB and its covariates using the nationally representative household survey data in Indian. Furthermore, we identified the household-level covariates of the perceived changes in SWB in comparison with the changes in OWB, objective well-being, in the same period.

Consistent results have been found by robust OLS and ordered probit models. Households with an older and educated head in a larger household, located in urban areas or affluent states in 2005 tend to experience improvement in both SWB and OWB between 2005 and 2012. On the contrary, households with a female household head, with more male members in the labour market, with regular access to mass media, without members suffering from non-communicable diseases or disabilities are more likely to be better off subjectively without experiencing the corresponding improvement in OWB.

Thanks to the important contributions of Sen (1985) and Deaton (2018) emphasizing in different ways a broadening of the focus for assessing well-being-specifically, looking beyond per capita income as a measure-there is a growing consensus that perceptions of well-being matter a great deal. Although our analysis of change in SWB is narrowly focused on perceived change in economic well-being, its comparison with changes in OBW yields important insights into the commonalities and divergences between them. For example, the lack of consonance between the socio-economic hierarchy and change in SWB is revealing. While Brahmins are at the top of this hierarchy, they fare worse than the lower rungs comprising SCs and STs in this measure of well-being. Despite their greater vulnerability to poverty and other deprivations, they are more likely to move up the ranks of ΔSWB. To borrow Sen's powerful terminology, this is compatible with these deprived groups' better functioning (e.g., local knowledge and better bonding). As Deaton emphasized, in a similar vein, measures such as SWB may enable individuals to live better lives while policymakers design and implement appropriate policies.[11]

[11] There are a few limitations in our study. First, our analysis focuses on the changes in SWB and OWB in economic aspects in India. An analysis is required on SWB and OWB in non-economic aspects (e.g. health) in the Indian context. Second, given the methodologies we have adopted, our results only show the correlation between the covariates and changes in SWB or OWB. Future studies should examine the causal relationship between socioeconomic factors and SWB or OWB in India or developing countries. This may be feasible when the third wave of IHDS panel becomes available.

A broader perspective in the current Indian policy context is delineated below in line with our main econometric results. As income and its growth are closely related to improvement in SWB, a fiscal stimulus that generates income through the strengthening of infrastructure—roads, transportation, power generation, irrigation, schools, and hospitals—is a priority.

To illustrate challenges for public policies within specific areas, a few examples suffice. Positive externalities of building roads in rural areas—especially those that do not get washed away during the monsoon—are likely to be greater than building highways and strengthening inter-city connectivity. Limited allocations to solar energy development and continued heavy reliance on thermal energy are lop-sided given high levels of pollution and rising incidence of respiratory ailments and certain types of cancer such as breast, liver, and pancreatic, and high risk of mortality. A substantial increase in public investment in schooling is imperative but greater attention must be given to upgrading its quality. Rampant absenteeism of teachers, their lack of training, shortage of textbooks, and absence of toilets for female students, to which pointed attention was drawn by Sen and Dreze (1995), are still as relevant and cry out for reform.

Behavioural changes are no less important and also no less challenging. For example, inadequate physical activity and unbalanced high-calorie diets promote weight gain. Obesity is a risk factor for cardiovascular and diabetes and can aggravate symptoms of CVD such as emphysema and bronchitis (Academy of Medical Sciences, 2018).

Information through mass media adds to awareness of healthy living, entitlements, social safety nets, and discriminatory behaviour. While the links between improvement in well-being and mass media vary between men and women, it is plausible that some information content is more offensive to women. That self-censorship by the media has been shrouded in corruption is common knowledge while government regulation is oversensitive to any criticism and frequently authoritarian. It is thus a challenge that defies any resolution.

The socio-economic hierarchy inherent in the caste system is not reflected in the change in SWB. Indeed, relative to OBCs, upper castes do not display significantly higher changes in SWB while among SCs on the lower rung change in well-being is significantly higher. Despite affirmative action, caste inequities and discrimination against lower castes have persisted. While a case could be made for lower castes catching up with upper castes through more equitable opportunities of schooling, employment and personal advancement, it is arguable that upper castes might resent it unless their attitudes towards lower castes change drastically. The fact that Muslims and Others, relative to Hindus, are associated with higher levels of improvement in SWB is not surprising as Hinduism is 'more a way of life than religion'. It lacks a code of beliefs and religious practices are flexible. Moreover, the caste system—an integral part of Hinduism–is iniquitous and exclusionary. Religious harmony is vital for improvements in SWB.

Our analysis suggests that the high disparity between personal incomes within a village or a small town is linked to the gap between aspiration and achievement and thus breeds resentment and frustration, and a negative association with subjective well-being. Expansion of more remunerative employment opportunities may narrow this gap and enhance well-being. Reduction of disparity in affluence between states through larger allocations of revenues through the Finance Commission without compromising their incentive to raise more revenue is an option.

In brief, there are many policy challenges that are daunting and some that seem unresolvable.

Appendix

See Tables 4, 5 and 6.

Table 4 Robust OLS—the growth rate of real household consumption per capita in 2005–12

Variables	Coefficient	Robust Std. Err
Individual and household characteristics (2005)and the location of households		
Gender		
Female	−0.0280	(0.0646)
Marital status		
Unmarried	0.161	(0.108)
Widowed/Divorced	−0.0137	(0.0640)
Age	0.0494***	(0.00739)
Age*Age	−0.000490***	(7.82e−05)
Household size		
1	−0.170	(0.104)
> 5	0.155***	(0.0383)
Sector		
Urban	0.102***	(0.0298)
Education		
1–4	−0.0862**	(0.0418)
5–8	0.0878**	(0.0406)
9–10	0.156***	(0.0544)
> 10	0.334***	(0.0454)
Religion		
Muslim	−0.426***	(0.0941)
Others	0.0280	(0.0504)
Caste		
Brahmin	0.0409	(0.0510)
High caste	0.0638	(0.0563)
Dalit	−0.177***	(0.0493)
Adivasi	−0.138***	(0.0468)
Others	0.230**	(0.0921)
Household remittance		
Yes	0.134	(0.127)
Employment (2005)		
Any work		
< 240 h	−0.0114	(0.0536)
Number of working adults (20–50) males in HH		
0	0.139***	(0.0393)
> = 2	−0.335***	(0.0388)
Number of working adults (20–50) females in HH		
1	0.00944	(0.0331)
> = 2	−0.248***	(0.0678)
Health and disability (2005)		
NCD		
Yes	0.0100	(0.0399)
Disability		
Yes	−0.0414	(0.0623)

Table 4 (continued)

Variables	Coefficient	Robust Std. Err
Media access (2005)		
Radio regular Men		
Regularly	−0.0360	(0.0827)
Radio regular women		
Regularly	0.0174	(0.0878)
Newspaper regular men		
Regularly	0.0904	(0.0748)
Newspaper regular women		
Regularly	0.0819	(0.0761)
TV regular men		
Regularly	−0.0401	(0.0389)
TV regular women		
Regularly	0.0403	(0.0402)
Other variables (2005)		
Social networks		
1	−0.0320	(0.0497)
2	−0.0441	(0.0357)
> 2	0.0655	(0.0502)
Theft		
Yes	−0.174***	(0.0382)
Conflict in village		
Yes	−0.132***	(0.0320)
Initial economic conditions (2005)		
Monthly per capita expenditure (’00)	−0.0711***	(0.00586)
Square of monthly per capita expenditure (’00)	0.000344***	(7.62e−05)
Household per capita expenditure as fraction of highest in PSU	−0.522***	(0.0668)
Ratio of share top 1% to bottom 50%	−0.0881	(0.127)
Net state domestic product (in ‘000)	0.0246***	(0.00484)
Net state domestic product (in ‘000) square	−0.000247***	(7.34e−05)
Constant	−0.126	(0.169)
Observations	27,945	
R-squared	0.053	

Robust Standard errors in parentheses

Table 5 Marginal effects/associations of covariates with components of subjective and objective well-being (an alternative estimate of marginal effects based on the average marginal effects for all the observations)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Individual and household characteristics and the location of households (2005)								
Gender								
Female[2]	−0.0146*[1]	−0.0195[1]	0.0341*[1]	0.0487	0.00953	0.0182	−0.0278	−0.0374
	(0.00705)	(0.01020)	(0.01670)		(0.00578)	(0.01040)	(0.01590)	
Marital status								
Unmarried	0.0104	0.0117	−0.0221	−0.0325	−0.00854	−0.0188	0.0273	0.0358
	(0.01400)	(0.01410)	(0.02790)		(0.00822)	(0.02000)	(0.02810)	
Widowed/Divorced	0.00494	0.00581	−0.0107	−0.01559	−0.00935**	−0.0207**	0.0300**	0.0393
	(0.00678)	(0.00766)	(0.01440)		(0.00435)	(0.01030)	(0.01440)	
Age[3]	−0.00165**[1]	−0.00200**	0.00365**	0.0053	−0.00446**	−0.00921**	0.0137**	0.01819
	(0.00061)	(0.00073)	(0.00134)		(0.00043)	(0.00088)	(0.00130)	
Age*Age	1.74e−05**	2.11e−05**	−3.84e−05**	−0.000056	4.51e−05**	9.31e−05**	−0.000138**	−0.0001829
	(0.00001)	(0.00001)	(0.00001)		(0.00000)	(0.00001)	(0.00001)	
Household size								
1	0.0397*	0.0321**	−0.0719*	−0.1117	0.0248	0.0387*	−0.0635*	−0.0883
	(0.01900)	(0.01230)	(0.02890)		(0.01350)	(0.01680)	(0.02940)	
>5	−0.0134**	−0.0168**	0.0302**	0.0436	−0.00905**	−0.0193**	0.0283**	0.0373
	(0.00298)	(0.00410)	(0.00594)		(0.00209)	(0.00431)	(0.00579)	
Sector								
Urban	−0.0142**	−0.0183**	0.0326**	0.0469	−0.0181**	−0.0400**	0.0581**	0.0762
	(0.00333)	(0.00471)	(0.00689)		(0.00479)	(0.00650)	(0.00644)	
Education								
1–4	−0.0155**	−0.0152**	0.0307**	0.0462	0.0123**	0.0181**	−0.0304**	−0.0427
	(0.00447)	(0.00528)	(0.00867)		(0.00366)	(0.00513)	(0.00804)	

Table 5 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
5–8	−0.0288**	−0.0320**	0.0608**	0.0896	−0.0146**	−0.0275**	0.0420**	0.0565
	(0.00448)	(0.00677)	(0.00755)		(0.00276)	(0.00546)	(0.00704)	
9–10	−0.0440**	−0.0564**	0.100**	0.1436	−0.0211**	−0.0425**	0.0636**	0.0847
	(0.00614)	(0.00977)	(0.00929)		(0.00347)	(0.00696)	(0.00841)	
> 10	−0.0439**	−0.0563**	0.100**	0.1437	−0.0447**	−0.116**	0.160**	0.204
	(0.00649)	(0.01060)	(0.01110)		(0.00584)	(0.01050)	(0.01020)	
Religion								
Muslim	−0.0162	−0.0211	0.0373	0.0535	0.0380**	0.0596**	−0.0976**	−0.1356
	(0.00940)	(0.01370)	(0.02260)		(0.01020)	(0.01260)	(0.01980)	
Others	−0.0335**	−0.0510**	0.0845**	0.118	−0.00241	−0.00539	0.0078	0.01021
	(0.00669)	(0.01090)	(0.01460)		(0.00419)	(0.00951)	(0.01370)	
Caste								
Brahmin	0.0036	0.00482	−0.00842	−0.01202	−0.00638	−0.0139	0.0203	0.0267
	(0.00556)	(0.00722)	(0.01270)		(0.00378)	(0.00867)	(0.01230)	
High caste	0.00467	0.0062	−0.0109	−0.0156	−0.00714**	−0.0157**	0.0229**	0.0301
	(0.00354)	(0.00460)	(0.00803)		(0.00253)	(0.00555)	(0.00779)	
Dalit	0.0205**	0.0239**	−0.0443**	−0.0647	0.0182**	0.0318**	−0.0500**	−0.0682
	(0.00425)	(0.00485)	(0.00690)		(0.00343)	(0.00507)	(0.00663)	
Adivasi	−0.0108*	−0.0164*	0.0273*	0.0382	0.0106**	0.0199**	−0.0305**	
	(0.00431)	(0.00693)	(0.01080)		(0.00390)	(0.00664)	(0.01010)	
Others	0.0264*	0.0294**	−0.0558**	−0.0822	−0.0196**	−0.0489**	0.0684**	−0.0411
	(0.01110)	(0.01120)	(0.02090)		(0.00601)	(0.01560)	(0.02080)	

Table 5 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Household remittance								
Yes	−0.0198**	−0.0277**	0.0475**	0.0673	0.00768*	0.0149*	−0.0226*	−0.0303
	(0.00474)	(0.00758)	(0.01090)		(0.00372)	(0.00663)	(0.01010)	
Employment (2005)								
Any work								
< 240 h	-0.00873*	-0.0112*	0.0199*	0.0286	-0.00656*	-0.0142*	0.0208*	0.0274
	(0.00399)	(0.00567)	(0.00933)		(0.00281)	(0.00648)	(0.00907)	
Number of working adults (20–50) males in HH								
0	0.0286**	0.0305**	−0.0591**	−0.0877	−0.0114**	−0.0262**	0.0376**	0.049
	(0.00467)	(0.00634)	(0.00742)		(0.00262)	(0.00527)	(0.00712)	
> =2	−0.0144**	−0.0219**	0.0363**	0.0507	0.0415**	0.0595**	−0.101**	−0.1425
	(0.00453)	(0.00683)	(0.01050)		(0.00610)	(0.00955)	(0.00985)	
Number of working adults (20–50) females in HH								
1	−0.00257	−0.00311	0.00568	0.00825	−0.000952	−0.002	0.00295	0.0039
	(0.00261)	(0.00319)	(0.00576)		(0.00181)	(0.00381)	(0.00562)	
> =2	−0.0108	−0.0139	0.0247	0.0355	0.0292**	0.0467**	−0.0759**	−0.1051
	(0.00717)	(0.00994)	(0.01680)		(0.00740)	(0.01010)	(0.01520)	
Health & Disability (2005)								
NCD								
Yes	0.0122**	0.0136**	−0.0259**	−0.0382	−0.00665*	−0.0145*	0.0211*	0.0277
	(0.00467)	(0.00513)	(0.00915)		(0.00291)	(0.00641)	(0.00911)	

Table 5 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Disability								
Yes	0.0251**	0.0252**	−0.0503**	−0.0754	0.00849	0.0163	−0.0248	−0.0333
	(0.00835)	(0.00777)	(0.01440)		(0.00527)	(0.00933)	(0.01440)	
Media access								
Radio regular men								
Regularly	−0.0276**	−0.0398**	0.0674**	0.095	0.00294	0.00594	−0.00888	−0.01182
	(0.00558)	(0.00921)	(0.01240)		−0.00385	−0.00757	−0.0114	
Radio regular women								
Regularly	0.0171**	0.0185**	−0.0356**	−0.0527	−0.00193	−0.00405	0.00598	0.00791
	(0.00656)	(0.00680)	(0.01240)		(0.00394)	(0.00833)	(0.01230)	
Newspaper regular men								
Regularly	−0.0176**	−0.0239**	0.0416**	0.0593	−0.00607*	−0.0130*	0.0191*	0.0252
	(0.00444)	(0.00640)	(0.00953)		(0.00290)	(0.00622)	(0.00894)	
Newspaper regular women								
Regularly	−0.0144**	−0.0195**	0.0339**	0.0483	−0.0255**	−0.0646**	0.0901**	0.1156
	(0.00506)	(0.00731)	(0.01160)		(0.00428)	(0.00910)	(0.01100)	
TV regular men								
Regularly	0.00303	0.00363	−0.00666	−0.00969	0.00096	0.00198	−0.00294	−0.0039
	(0.00444)	(0.00527)	(0.00967)		(0.00308)	(0.00631)	(0.00938)	
TV regular women								
Regularly	−0.0169**	−0.0214**	0.0383**	0.0552	−0.00815*	−0.0171**	0.0252**	0.0333
	(0.00471)	(0.00622)	(0.00977)		(0.00317)	(0.00647)	(0.00933)	

Table 5 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Other variables (2005)								
Social networks								
1	−0.00312	−0.00395	0.00707	0.01019	0.00400	0.00811	−0.0121	−0.01609
	(0.00300)	(0.00386)	(0.00680)		(0.00225)	(0.00439)	(0.00653)	
2	0.0154**	0.0167**	−0.0321**	−0.0475	0.00253	0.00519	−0.00772	−0.01025
	(0.00453)	(0.00497)	(0.00841)		(0.00275)	(0.00555)	(0.00827)	
> 2	−0.000282	−0.000349	0.000631	0.000913	−0.00079	−0.00167	0.00246	0.00325
	(0.00462)	(0.00572)	(0.01030)		(0.00322)	(0.00685)	(0.01010)	
Theft								
Yes	0.00841	0.00959	−0.018	−0.02641	0.0171**	0.0306**	−0.0477**	−0.0648
	(0.00583)	(0.00625)	(0.01180)		(0.00489)	(0.00746)	(0.01130)	
Conflict in village								
Yes	−0.00519*	−0.00631*	0.0115*	0.01669	0.00939**	0.0193**	−0.0287**	−0.0381
	(0.00237)	(0.00307)	(0.00524)		(0.00209)	(0.00365)	(0.00503)	
Initial economic conditions (2005)								
Monthly Per capita expenditure	−0.00136**	−0.00159**	0.00295**	0.00431	0.0108**	0.0235**	−0.0343**	−0.0451
	(0.00025)	(0.00029)	(0.00054)		(0.00022)	(0.00047)	(0.00057)	
Household per capita expenditure as fraction of highest in PSU	−0.0214**	−0.0260**	0.0474**	0.0688	0.0545**	0.113**	−0.167**	−0.221
	(0.00509)	(0.00617)	(0.01130)		(0.00369)	(0.00727)	(0.01080)	
Ratio of share top 1% to bottom 50%	−0.0836	−0.101	0.185	0.269	0.0156	0.0323	−0.0479	−0.0635
	(0.01030)	(0.01240)	(0.02260)		(0.00711)	(0.01470)	(0.02180)	

Table 5 (continued)

Variables	ΔSWB				ΔOWB			
	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted	dy/dx (Std. Error) Worse-off	dy/dx (Std. Error) Just the Same	dy/dx (Std. Error) Better-off	ME [4] Converted
Net state domestic Product (in '000)	−0.00119	−0.00128	0.00247	0.00366	−0.00145	−0.00290	0.00435	0.0058
	(0.00016)	(0.00017)	(0.00032)		(0.00011)	(0.00021)	(0.00032)	

1. Standard errors in parentheses. ** $p < 0.01$, * $p < 0.05$

2. The results where the coefficient estimates are statistically significant for ΔSWB and ΔOWB with an opposite sign, or only significant for ΔSWB are highlighted in bold. Significance judged by a subset of three marginal effects at 10% level;

3. The results where the coefficient estimates are statistically significant for ΔSWB and ΔOWB with a same sign are highlighted in Italics. Significance judged by a subset of three marginal effects at 10% level;

4. Average ME (marginal effects) show the additional probability that a household shifts to the category (0,1,2) one above and this is equivalent to the OLS estimate in Table 2. This is equal to '0*ME for "0" + 1*ME for "1" + 2*ME for "2"'

Table 6 Multiple regression analysis of subjective and objective well-being with main exogenous variables

Variables	ΔSWB		ΔOWB	
	Coefficient	Robust Std. Err	Coefficient	Robust Std. Err
Gender				
Female	−0.00596	(0.0175)	−0.0269	(0.0170)
Age	0.00826***	(0.00240)	0.0109***	(0.00284)
Age*Age	−8.90e−05***	(2.46e−05)	−0.000127***	(3.00e−05)
Education				
1–4	0.0770***	(0.0181)	−0.0432**	(0.0169)
5–8	0.131***	(0.0139)	0.00722	(0.0135)
9–10	0.228***	(0.0159)	−0.0173	(0.0148)
>10	0.274***	(0.0168)	−0.0547***	(0.0164)
Religion				
Muslim	0.0401	(0.0373)	−0.0376	(0.0363)
Others	0.145***	(0.0253)	−0.00236	(0.0250)
Caste				
Brahmin	0.00719	(0.0223)	−0.0532**	(0.0241)
High Caste	0.0266*	(0.0149)	−0.0234	(0.0149)
Dalit	−0.0779***	(0.0151)	−0.0289**	(0.0140)
Adivasi	0.00445	(0.0204)	0.0303	(0.0204)
Others	−0.0549	(0.0359)	0.00941	(0.0354)
Constant	1.004	(0.0569)	1.127	(0.0665)
Observations	29.543		29.543	
R-squared	0.036		0.005	

Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.;

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Data Availability The authors confirm that the data which are necessary to reproduce the statistical and econometric results will be available.

Code Availability The authors confirm that the State codes necessary for replicating the results will be made available.

Declarations

Conflict of interest The authors do not have any conflict of interests or competing interests, including appropriate disclosures, associated with this submission.

Consent to Participate This is not relevant as the study is based on a large anonymised secondary household dataset (IHDS data). Use of the data for publications has been agreed when the authors obtained the data.

Consent for Publication This is not relevant as the study is based on a large anonymised secondary household dataset (IHDS data). Use of the data for publications has been agreed when the authors obtained the data.

Ethical Approval As this paper is based on the fully-anonymised secondary household dataset (India Human Development Survey (IHDS) Data), no ethical issues will arise or no ethical approval is necessary as the ethical issues were carefully addressed by the IHDS team (https://ihds.umd.edu/).

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