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Too Poor to Afford Time: Measuring Time and Consumption Poverty in India

Hritic Gautam

(University of Leeds)

hriticgautam@gmail.com

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Hritic Gautam

Department of Economics, University of Leeds

Email: hriticgautam@gmail.com

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Abstract

This paper argues that money and time poverty are complementary concepts. While the literature on extended income and time-deficit-adjusted income poverty highlights the importance of accounting for time spent on household production in assessing individual and household well-being, time poverty is often treated as a standalone concept. I challenge this independent conceptualization and refine existing methods of measuring time poverty to capture its complementarity with income poverty. I then apply this method to estimate time poverty and time-deficit-adjusted consumption poverty in India using the 2019 and 2024 Indian Time Use Surveys. My findings show that the distribution of time surplus in 2019 second order stochastically dominated that of 2024, indicating an unambiguous increase in time poverty between the two survey years. Moreover, the distribution of time surplus for employed men first order stochastically dominated that of employed women, and similarly, the distribution for 'upper' castes dominated that of 'lower' castes, implying systematic gender and caste-based inequalities in time poverty in India.

1. Introduction

‘Time poverty’ is not a valid standalone concept as it is inextricably linked with ‘material poverty’. Defining someone as time poor simply because they have less ‘free time’, the residual time after finishing paid and unpaid work obligations, as done in (Hirway, 2010; Qi and Dong, 2018; Adeyeye et al., 2019; Orkoh et al., 2020), does not necessarily imply lower welfare. This is because the welfare implications of limited free time depend on material resources: individuals may outsource unpaid work to the market or reduce paid work hours without falling into income poverty. In such cases, the amount of free time reflects lifestyle choices rather than deprivation.

For instance, Elon Musk has claimed to work 100 hours a week (Spencer, 2022). Any measure of time poverty that defines it solely as a “shortage of time” would classify him as time-poor. But why can’t Musk reduce his working hours and thereby have more free time? If he has the autonomy to choose otherwise, is he truly time-poor? In contrast, consider a low-income single mother working a full-time job, doing household chores, and caring for children. If her combined paid and unpaid workload amounts to fewer than 100 hours per week, does that make her less time-poor than Musk?

The motivation behind measuring any kind of poverty lies in an evaluative concern for well-being. As Sen (1995) notes, “while the term poverty is used in rather different ways, there are clear associations that constrain the nature of the concept, and we are not entirely free to characterize poverty in any way we like.” A fundamental feature of poverty, therefore, is a lack of choice. One does not choose to be poor. Poverty is a condition forced upon individuals by their circumstances. If one *can* choose not to be poor, they *are* not poor. Just as a billionaire who squanders their wealth and becomes miserable cannot be considered poor (Sen, 1995), an individual who *chooses* to spend excessive time on activities—whether sleeping, eating, cooking, or even working (because they prefer a luxurious life)—is not time poor.

Hamermesh and Lee (2007) emphasize the distinction between ‘time stress’, which is the tension generated by feelings that the available time is insufficient to accomplish the desired activities, and ‘time poverty’. Individuals who command higher wages in the market are likely to feel more time stressed as they attach higher shadow value to their time. However, this doesn’t mean they are actually ‘time-poor’.

If ‘time poverty’ is evaluated in isolation from monetary poverty, we risk a strange conclusion that individuals/households with higher income are more time-poor than individuals/households with lower income. For example, Vithanage and Dunusinghe (2023) finds “time poverty in Sri Lanka is more of an issue among income non-poor or high-income people” (p.79). However, such a conclusion overlooks the fact that the time stress or time poverty, defined as such, does not necessarily imply deprivation, but can also be “Yuppie Kvetch!” (Hamermesh and Lee, 2007).

This problem becomes clear if we look at the free time available to employed individuals¹ in India across percentiles of monthly per capita expenditure (MPCE) in 2019.² We observe a downward sloping pattern, implying the free time declines with increasing MPCE for employed individuals. In other words, the richest percentiles of individuals have the least amount of free time. Is it enough to say that the richest individuals in India experience a higher rate of time poverty than the poor?

Sen (1995) defines poverty as the “failure of basic capabilities to reach a certain minimally acceptable level.”³ Similarly, time poverty can be conceptualized as a condition where individuals are *unable to afford* a certain minimally acceptable amount of time. While Musk may choose to do excess paid work, he retains the capability to rest, perform care work, or socialize. By contrast, the single mother lacks that freedom: her time constraints are a form of unfreedom and poverty.

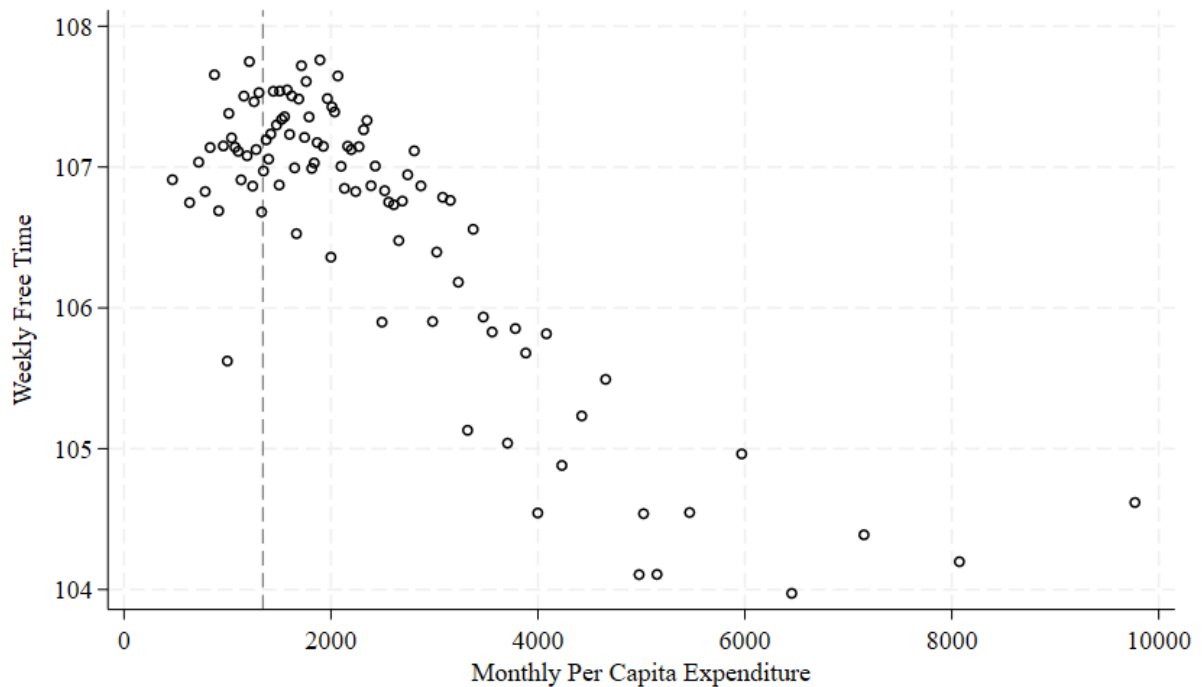
This basically translates into the definition given by Bardasi and Wodon (2010) who defines time poverty as “working long hours without choice because an individual’s household is poor or would be at risk of falling into poverty if the individual reduced her working hours below a certain time-poverty line” (p.45).

¹ We focus on employed individual since time poverty is often framed in relation to conflict between employment time, household production and free time.

² MPCE is calculated as household expenditure divided by number of members in the household, The pattern holds under both square-root and OECD equivalence scales of household expenditure.

³ This conceptualization under capability approach is different than the outcome-based approach which evaluates achieved outcomes, such as income, instead of capabilities.

FIGURE 1: MPCE and Weekly Free Time in India Among Employed Individuals - 2019



Source: ITUS 2019. The vertical line represents the poverty line for 2019 in INR. Weekly free time is the residual after subtracting the allocated time in household production, and employment work from the total available weekly time, i.e. 168 hours. The sample is restricted to employed individuals.

Based on these considerations, this paper argues that time poverty is not a valid standalone concept⁴ and can only be conceptualized in relation to material poverty. Thus, methods to measure time poverty should recognize this interdependence such that the concept of time poverty reflects deprivation—not a choice of lifestyle.

The first major contribution of this study is to improve over existing methods of measuring time poverty to reflect this view. Particularly, I build on the methods inspired by Vickery (1977), especially the Levy Institute Measure of Time and Income/ Consumption Poverty (LIMTIP/LIMTCP) (Zacharias 2011), combining it with the Goodin et al. (2005) critique to address the interconnected nature of time and money poverty.

⁴ It is now accepted that poverty is a multidimensional concept, so to think of income-poverty or time-poverty in isolation is an incomplete picture of poverty. However, people almost never have an *incentive* to fall below an income poverty line as that would unambiguously reflect deprivation. Conversely, individuals may well have an incentive to reduce their free time, for example by working longer hours to increase earnings to support a luxurious lifestyle. Hence, the concept of free time, fundamentally, reflects a choice of lifestyle and not necessarily any kind of deprivation.

The second contribution of this study is the application of this new method using the 2019 and 2024 Indian Time Use Surveys (ITUS) to show that time poverty in India, after accounting for the interconnectedness with the consumption poverty, has increased between this period. Additionally, I highlight the impact of caste, class and gender on time and consumption poverty in India. To my knowledge, this is the first study that combines the ITUS 2019 and 2024 in its analysis to present the evolving picture of time poverty in India.

My third contribution lies in inferring long-term time use patterns from the single-day time diaries recorded in the ITUS. The ITUS captures time use data only for the day preceding the interview. However, to make meaningful claims about long-term time poverty (on a weekly, seasonal, or annual basis) we require information that reflects individuals' typical time use over extended periods. Although existing studies on time poverty ignore this limitation, I address it by generating OLS predictions of long-term time use.

Following this introduction, the paper is structured as follows: Section 2 reviews the literature to which this study contributes. Section 3 outlines the method used to estimate time poverty and discusses the construction of 'thresholds' for identifying time poverty. Section 4 describes the data used in the analysis. Section 5 presents the approach for estimating long-term time use from the single-day diaries in the ITUS. Section 6 presents the results of the analysis, and Section 7 provides the tentative next steps for this research.

2. Literature Review

Vickery (1977) is often credited for being the first to formalize the measurement of 'time poverty'. Her motivation behind measuring time poverty, as well as in studies inspired by her approach, was to find the adjustment factor for the official money poverty line to accommodate for the deficit in household production⁵ time. She argued that if the non-poor level of consumption requires both money and time spent on household production, then the official poverty measure will underestimate the money poverty as it ignores household production. This method is examined in Appendix A.

⁵ Household production refers to the production of services within the household. This includes activities such as cooking, cleaning, and caring for children, the elderly, and the sick. Although these activities are conventionally considered outside the production boundary, they contribute to the material welfare of the household, as they would otherwise need to be outsourced if not performed by household members.

Estimating time poverty is an essential part of her measure, as well as in measures inspired by her, such as (Harvey and Mukhopadhyay, 2007; Burchardt, 2008; Zacharias, 2011). More precisely, ‘time deficits’ are time deficits are defined as the difference between the minimum amount of time individuals require for unpaid work or rest, and the actual amount of time they have available to them after engaging in paid work. Subsequently, anyone having time deficits is classified as a time poor. Once these time deficits are estimated for everyone, their monetary value is calculated using a generalist replacement wage. A replacement wage is the hourly cost of hiring someone to perform a task. In this case, the hourly wage of a generalist housekeeper is used to estimate the money one needs to compensate for their time deficits. This monetized value of time deficits is then added to the poverty line for that individual to arrive at a new threshold to evaluate their money poverty status (see Appendix A for detailed explanation of this approach).

A significant advancement in the measurement of time and income poverty was made by Zacharias (2011) through the development of the Levy Institute Measure of Time and Income/Consumption Poverty (LIMTIP/LIMTCP).⁶ This approach introduced two major departures from earlier Vickery-style methods: first, the incorporation of intra-household disparities by shifting the unit of analysis from households to individuals; and second, a revised method for calculating thresholds (determination of thresholds under the LIMTIP is discussed in Section 3.2 and Appendix B).

Zacharias (2011) challenges the use of the household as the unit of analysis for time poverty, arguing that “unlike income or consumption, the individuals in the household cannot pool or share their time” (p.12). As a result, the LIMTIP departs from Vickery-style approaches by adopting the individual, rather than the household, as the unit of analysis. Under LIMTIP, a household is considered time-poor if any of its members experiences a time deficit. Formally:

$$X_i = 168 - \bar{M} - \alpha_i \bar{R} - L$$

Equation (1)

⁶ Zacharias (2011) also offers a useful review of various time and income poverty measurement methods. This paper adopts some of the notations introduced therein. Another useful summary of time poverty methods is provided in Aloè (2023).

$$X_j = \sum_{i=1}^n \min(0, X_i)$$

Equation (2)

where X_i is individual time deficit, X_j is household time deficit, n is the household size, \bar{M} is the socially necessary personal maintenance time, α_i is the actual share of that individual in the actual household production (rather than socially necessary), \bar{R} is the socially necessary time for household production for a given household structure, and L is the actual paid work time. Subsequently, individuals are time poor if $X_i < 0$ and households are time poor if $X_j < 0$.

In other words, households are classified as time-poor not based on an aggregate household time deficit but if any member of the household has a time deficit. This individual focus of LIMTIP allows us to examine individual characteristics that make people vulnerable to time poverty such as sex, marital status, and type of job. An essential assumption in such individual focussed calculation is regarding the intra-household sharing of socially necessary household production (R)—the parameter α in equation 1. It is assumed that the share in \bar{R} will be equal to the actual share in household production (R). Hence, the gendered burden of household production is preserved at the socially necessary level of household production.

However, if time is understood as “task-oriented” rather than “clock-oriented,” the sharing of time appears feasible for most activities, except for personal care tasks. While one household member cannot sleep on behalf of another, they can certainly perform other tasks, such as cleaning dishes, cooking food, sweeping, etc., if they have time available and others do not.

Nevertheless, intra-household disparities in time allocation remain undeniable. Household production activities are heavily gendered in most countries, with women contributing significantly more than men. For instance, in India, the average female share in household production was 87.6% in 2019 and 86.3% in 2024. Measuring time poverty without acknowledging these disparities risks masking the gendered burden of unpaid work and systematically underestimating time poverty among women. In Section 3, I account for both these phenomena by defining individual and household time poverty separately.

Time spent on education is not considered necessary within the Vickery/LIMTIP framework, as education is not treated as a constraint on people's time. Any time spent on education is classified as part of an individual's discretionary time and an exercise of temporal autonomy.

This approach overlooks the fact that, similar to employment activities, time spent in formal education is also contracted to an external entity (in fact, Ås (1978) categorizes both under the same type of activities: 'contracted time'). There is often little to no autonomy in educational time; if an individual is enrolled in school, attendance is mandatory. Moreover, educational time is 'necessary' in a sense comparable to personal care—it is essential for personal and social sustenance.

The exclusion of education in time poverty measurement is sometimes justified by the fact that time poverty analyses are typically limited to the working-age population, and therefore, excluding education is assumed to make little difference. However, this does not hold true for all countries. For instance, in ITUS 2024, 11.05% of individuals of working age (15–64 years) reported their usual principal status as students, and education continues to be a significant activity until approximately 25 years of age.

Notably the only variable components, at an individual level, in Equation (1) are α and L . In other words, the only way one can change their time poverty status is by either changing their actual share in household production or by reducing their labour time. The LIMTIP uses actual time spent on labour (L) in calculating the time deficits. In fact, under LIMTIP, the identification function for 'time poverty' can be described as:

$$L_i > 168 - \bar{M} - \alpha_i \bar{R}$$

Equation (3)

This implies that the LIMTIP treats all time spent on paid work as necessary. On the other hand, only a portion of time spent on household production is treated as necessary and any excess time spent on household production is assumed to be an exercise of choice. Since household production is a gendered activity with most of it done by women, this results in systematic underestimation of women's time poverty.

Goodin et al. (2008) include the strictly necessary time for labour, along with household production and personal care, in their measure of 'discretionary time'. They argue that "insofar

as people work longer hours than strictly necessary for that, purely by their own choice (because they prefer a higher income than the minimum necessary), that should be seen as an exercise of their temporal autonomy, not a constraint upon it” (p.6) However, not all individuals have the freedom to determine their working hours. Therefore, instead of relying on the notion of ‘strictly necessary’ labour time, I adopt a weaker assumption: individuals living at a certain distance from the poverty line can reduce their working hours to the extent necessary to eliminate their deficits without falling below the poverty line. Hence, conceptually, my method can be seen as an integration of Goodin and Vickery approaches.

To summarize, time poverty cannot be meaningfully conceptualized without considering monetary circumstances. Individuals are only genuinely constrained in their ‘free time’ if they cannot reduce time spent on other activities without falling below a poverty threshold of well-being. This constraint may involve reducing time devoted to household production and personal care (as recognized by the LIMTIP approach), but also employment time. Any measure that overlooks this relationship risks misrepresents the true nature of time poverty. The next section describes the changes I introduce in the existing methods of measuring time poverty to address these issues.

3. Methodology

3.1 Method

I start with a similar accounting equation of time as in other Vickery inspired measures (equation 4), but make two changes at this stage, which have implications over the method of measuring time poverty. Firstly, I divide the component of household production into two: housework (R_{HW}) and carework (R_{CW}). This is done to account for the differing behaviour of these two components of household production.

The second change is with respect to the inclusion of educational time. Note that I do not consider education as a constraint for the entire population, but only for individuals whose usual principal status is student. I treat all the time spent by students in formal educational activities (E) as necessary time not only because a change in contract would be required to change the time spent in these activities, but also because all education is treated like an essential commitment, even at the poverty level.

$$168 \equiv M + R_{HW} + R_{CW} + E + L$$

Equation (4)

Subsequently, the individual time deficits are defined like the LIMTIP:

$$X_{ij} = 168 - \bar{M} - \alpha_1 R_{HW} - \alpha_2 R_{CW} - \delta E - L$$

Equation (5)

where α_1 is the share of individual in housework, α_2 is the share of individual in care work, δ is a dummy variable which takes the value of 1 if the individual is student, and 0 otherwise.

Subsequently, since I allow for compensation of time deficits between household members:

$$X_j = \sum_{i=1}^n X_{ij}$$

Equation (6)

Following Vickery (1977) and Zacharias (2011), I adjust the official poverty line by adding the monetized value of time deficit to the official poverty line⁷:

$$\hat{Y} = \bar{Y} - \min(0, X_j)p$$

Equation (7)

The identification function for time deprivation is twofold and defined by a ‘weak’ intersection of time deficit (which does not necessarily signal deprivation) and money deprivation (identified by income or consumption). In other words, individuals are classified as time-poor if they have time deficit ($X_{ij} < 0$) and live in a household whose $Y_j < 2\hat{Y}$. The second criterion ensures that, at the time poverty level, only labour time necessary to maintain a poverty-level standard of living influences time poverty status. If individuals were free to reduce their labour

⁷In doing so, we risk assigning monetary value to deficits in personal maintenance time, which is conceptually problematic, as such activities—like sleep or self-care—are inherently non-substitutable and cannot be outsourced (e.g., one cannot pay someone else to sleep on their behalf). However, in our framework, deficits in personal maintenance are only monetized if $|X_{ij}| > \bar{M}$. This threshold is rarely, if ever, breached in actual time-use data. For instance, the largest observed time deficit in the ITUS is –81.2 hours, while \bar{M} is set at 93.5 hours.

time at will, having $Y_j < \hat{Y}$ would have been sufficient to satisfy this condition. However, given that employment hours are often contractually fixed, and individuals have limited ability to reduce them voluntarily, we specify that individuals whose household income is significantly above the adjusted threshold are not eligible to be classified as time poor. This assumes that individuals living substantially above the poverty line would not fall into poverty even if they reduce their employment hours. This condition also addresses the asymmetry between paid and unpaid work by not allowing luxurious life at the time poverty level

3.2 Discussion on Thresholds

All time poverty measures evaluate welfare against a threshold of normative or relative ‘residual’ or ‘leisure’ time, identifying individuals with less leisure than this threshold as time poor. The difference then arises mainly in how leisure is defined and calculated. Basic approaches equate leisure with ‘free time’ or non-work time, assuming all time spent in obligatory activities is necessary. For instance, Aguiar and Hurst (2007) used four definitions of leisure, all of them some variation of non-work time with leisure being treated as entire time spent in certain group of activities.

As discussed in Section 2, this approach is misleading, as people may voluntarily spend extra time on such tasks. Since time poverty concerns necessary activities and constraints they impose, using time spent in the entire category as the unit of analysis is problematic.

More nuanced frameworks (e.g., Vickery (1977), Goodin et al. (2008)) instead assess whether individuals have the capability to meet the strictly necessary time for physical and social reproduction, giving rise to the notion of thresholds that defines the minimum necessary time for each obligatory activity such as work, sleep, hygiene, and so on. Even if the rationale for using thresholds is strong, more research is needed to explore the methods using which they can be specified. For instance, Dorn and Folbre (2022) have pointed out that the weaknesses of these thresholds within Vickery (1977) and Zacharias (2011).

Thresholds can either be absolute or relative. An absolute threshold is a fixed standard that is independent of the overall distribution. In contrast, a relative threshold is defined with reference to the overall distribution and therefore shifts as the distribution changes.

It is not clear whether LIMTIP is an absolute or relative poverty method as most of its thresholds are relative (for household production, sleep, eating and drinking and hygiene) but

the thresholds for minimum necessary leisure and non-substitutable household production are absolute (although minimum necessary leisure also vary across countries, see Table 1).

TABLE 1: LIMTIP PERSONAL MAINTENANCE THRESHOLD ACROSS COUNTRIES

	Personal maintenance (M)	Minimum necessary leisure	Non-substitutable household activities	Sleep	Eating and drinking	Hygiene	Rest
Ethiopia 2013	95	10	7	61	13	4	
Ghana 2009	93	10	7	61	11	4	
S. Africa 2010	98	10	7	64	10	4	
Tanzania 2006	98	10	7	62	10	4	
Italy 2008	98	14	7	57	14	6	
Italy 2014	99	14	7	57	12	6	
Korea 2008	97	14	6	54	14	6	
Turkey - Rural 2006	94	10	7			4	1
Turkey - Urban 2006	96	14	7	57	14	3	1
Argentina 2005	94	14	7	62	12	6	2
Chile 2007	100	14	7	67	10	6	2
Mexico - Rural 2009	99	14	7	62	12	6	2
Mexico - Urban 2009	93	10	7	56	13	6	1
India 2019	101	10	7	67	12	9	3
India 2024	99	10	7	62	13	8	2

Source: Various LIMTIP Reports. Estimates for India are calculated by the author using ITUS.

M represents the minimum time required for personal maintenance—such as sleeping, eating and drinking, personal hygiene—which is determined by physiological needs. Defining M based on empirical averages, as in LIMTIP for most components of M , is problematic in the sense that if people are compelled to work longer hours to sustain themselves, they may do so by cutting back on rest, thereby reducing the observed average maintenance time. Using this lowered average to redefine what counts as “necessary” creates a feedback loop where

structurally induced deprivation is mistaken for a new norm. This obscures the systemic pressures that force individuals to sacrifice essential rest and instead normalizes overwork. By anchoring M in empirical averages, we risk underestimating the real extent of time poverty and legitimizing unsustainable conditions.

To avoid the challenges associated with empirically determining the thresholds for each component of M , I rely instead on normative guidelines established in the literature.

Activity	Weekly Threshold
Personal Maintenance	93.5
<i>Leisure</i>	14
<i>Non-Substitutable Household Production</i>	7
<i>Sleeping</i>	56
<i>Eating and drinking</i>	7
<i>Hygiene</i>	7
<i>Health & Physical Activity</i>	2.5

TABLE 2: ABSOLUTE NORMATIVE THRESHOLD OF PERSONAL MAINTENANCE

Research on leisure indicates that less than two hours of daily leisure is associated with significantly lower well-being and is generally perceived as inadequate (Sharif et al. 2021). Accordingly, I adopt two hours per day as the threshold for leisure time. Finally, following the LIMTIP approach, I assume that the strictly necessary, non-substitutable time devoted to household production amounts to one hour per day.

Minimum sleeping hours are relatively uncontroversial. Experts in American Academy of Sleep Medicine, Sleep Research Society, and the American Academy of Pediatrics have recommended different necessary sleeping time according to age but recommends that adults should have at least 7 or more hours of sleep in a day. While those engaged in physically demanding labour (often from economically underprivileged groups) may require more rest, I adopt the eight-hour benchmark to estimate poverty conservatively.

In the case of nutrition, the dietary literature recommends three meals per day (Paoli et al., 2019), with each meal ideally taking around 20–30 minutes to consume. Based on this, I set the strictly necessary time for eating at one hour per day. For personal hygiene, various sources suggest that maintaining a healthy routine also require one hour per day.

In addition to these categories, I also set aside 2.5 hours per week for necessary time for physical activities. The U.S. Department of Health and Human Service (2018) advises adults to spend 150 to 300 minutes a week in moderate-intensity physical activity (also see Piercy et al. (2018)). To estimate time poverty conservatively, I choose the threshold for physical activity as 150 minutes (2.5 hours) a week.

Hence, the overall threshold for personal maintenance in this analysis is defined as the sum of socially necessary time for leisure, sleep, eating and drinking, hygiene, and physical activity: amounting to 93.5 hours per week.⁸ We acknowledge that certain groups may require more time to meet these basic needs than others; for example, women often face stricter hygiene standards (Clough, 2011) and may therefore require more time for such activities. However, to ensure a conservative estimate of time poverty, we adopt a universal minimum threshold across all individuals.

4. Data

The first Indian Time Use Survey (ITUS) was conducted during January 2019 to December 2019 to measure the “participation of men and women in paid and unpaid activities” (NSO 2020). The survey collected information from all individuals aged six and above across a nationally representative sample of 138,799 households, covering 447,250 individuals. The second edition of the ITUS took place during January 2024 to December 2024, covering a total of 1,39,487 households and 4,54,192 individuals aged 6 years and above. Using the personal interview method of surveying, respondents in both editions were asked to recall their activities over a 24-hour reference period, beginning at 4:00 AM the day before the interview and ending at 4:00 AM on the interview day.

ITUS employs a “time-diary” method with fixed 30-minute time slots. While the survey records multiple activities if a respondent engaged in them for 10 minutes or more within a single 30-minute slot, their specific durations were not recorded. Instead, respondents were asked to select a “major” activity. The official survey report proposed two methods for calculating time spent on different activities. The first method considers only major activities, assigning the

⁸ According to LIMTIP framework, which uses sample mean as thresholds for sleeping, eating and hygiene, this threshold would be 101 hours in 2019 and 99 hours in 2024. If we had followed a threshold defined similarly to Goodin et al. (2005) as one standard deviation below the mean for sleeping, eating, and personal hygiene—and added absolute thresholds of 14 hours of leisure, 7 hours of non-substitutable household production, and 2.5 hours of physical exercise—the threshold for personal maintenance would have been 95.4 hours per week in 2019.

entire time slot to the designated major activity. The second method distributes the total duration equally among all recorded activities. To maintain comparability with the literature, this analysis is based solely on major activities of working age (i.e. 15-64 years) individuals.

Furthermore, ITUS classified survey days as ‘normal’ or ‘other’. A normal day was defined as one in which the respondent followed their routine activities, whereas an ‘other’ day included disruptions due to social obligations, unforeseen events (such as illness or hospitalization), weekly off-days, holidays, or leave. The classification was determined by the interviewer “in consultation with the informant and considering the routine activities of the household members” (NSO 2020, p. 7). As shown in Appendix Figure 1, time allocation on these days is significantly different.

Apart from time use data, ITUS also contains information about background characteristics of individuals/households such as religion (i.e. Hinduism, Islam, Christianity, Sikhism, Jainism, Buddhism, Zoroastrianism and others), caste (Scheduled Tribes (ST), Scheduled Castes (SC), Other Backward Classes (OBC), and others), district, sex (Male/Female/Transgenders)⁹, level of education, marriage status (never married, currently married, widowed, divorced/separated), usual principal status, MPCE, age and number of household members. I use these background characteristics as a dependent variable while estimating the average long run time use in Section 5, and for presenting the results in Section 6.

5. Estimating Long-Run Time Use from Single-Day Time Diaries

Time-use diaries typically capture information for a single day preceding the interview. However, our study is concerned with long-term patterns of time use, as it is not particularly meaningful to assess whether an individual is time-poor based solely on their activities from the previous day. Most studies tend to overlook this limitation of time-use data—for instance, Kalenkoski et al. (2011) and Goodin et al. (2005). Yet, this constraint significantly reduces the analytical value and depth of such assessments.

There is a small literature that engages with this issue of long-term time use estimation from short term time use diaries (Frazis and Stewart, 2012; Gershuny, 2012; Stewart, 2013; Han et al., 2020). These approaches typically involve extracting the ‘permanent’ component of time

⁹ Since the number of transgender individuals is minuscule (129 in 2019 and 49 in 2024), no reliable estimates can be made about them using this data. Therefore, I'll restrict the sample to males and females

use by conditioning on observable characteristics and averaging over multiple expected states, such as workdays and non-workdays.

In this analysis, we theorize the time recorded in the ITUS for any activity i (T_i) as comprising two parts: the individual's long run or permanent time use for that activity (T_i^P), and a transitory deviation from that average (T_i^T) because of the influence of the day the time diary was conducted. Formally:

$$T_i = T_i^P + T_i^T$$

Equation (8)

We model the observed time spent on activity i as a linear function of observable characteristics:

$$T_i = X_i\beta + \gamma D_i + \varepsilon_i$$

Equation (9)

Here X_i denotes a vector of controls (i.e., sector, district, sex, caste, dwelling type, religion, education, marriage status, usual principal status, weekday, MPCE, age, age squared, number of children aged 0-6 years, number of children aged 7-17 years, number of adults aged 18-59 years, and number of elders aged 60 and above), D_i is a dummy variable capturing whether the diary day is a 'normal' (i.e., regular day of the week) or 'other' (i.e., weekend/holiday/illness), and ε_i is an idiosyncratic error term. The parameter γ captures the marginal effect of diary day type on time use for each activity.

Using the fitted values from these regressions, we construct predicted values for both types of diary days: normal (\widehat{T}_i^N) and other (\widehat{T}_i^O). We then compute a convex combination of the two, weighted by the proportion of each day type in a week, to estimate an individual's weekly long-run average for activity i :

$$\widehat{T}_i^P = w \cdot \widehat{T}_i^N + (1 - w) \cdot \widehat{T}_i^O$$

Equation (10)

Where w denotes the share of normal days in our sample (e.g., 0.91 for 2019 and 0.88 for 2024).

Finally, in keeping with standard conventions in time-use analysis, we convert any negative predicted values to zero and rescale the total predicted time to a 168-hour week.¹⁰ This ensures that our model remains internally consistent with the rules of time and permits meaningful interpretation of time allocation shares across competing uses.

Table 3 shows the average time spent in each ITUS category in both years according to both single-day recorded time use and predicted long-run time use. Since the ITUS samples are representative of days in each week (roughly 14.3% for each weekday), the weekly averages derived from the recorded and predicted values are expected to be similar. The change in the overall distribution of time use in activities is examined in Appendix C.

TABLE 3: AVERAGE RECORDED AND PREDICTED WEEKLY TIME SPENT IN EACH ITUS CATEGORIES (IN HOURS)

ITUS Category	Year	Recorded (mean)	Predicted (mean)
1. Employment and related activities	2019	24.5	24.5
	2024	27.6	27.6
2. Production of goods for own final use	2019	3.6	3.7
	2024	2.5	2.5
3. Unpaid Domestic Services for Household Members	2019	19.4	19.2
	2024	18.8	18.2
4. Unpaid Caregiving Services for Household Members	2019	3.2	3.4
	2024	3.2	3.7
5. Unpaid volunteer, trainee and other unpaid work	2019	0.3	0.3
	2024	0.2	0.2
6. Learning	2019	5.9	7.1
	2024	5.8	7.0
7. Socializing and communication, community participation and religious practice	2019	11.3	11.0
	2024	11.5	11.4
8. Culture, leisure, mass-media and sports practices	2019	14.9	15.0
	2024	16.2	16.4
9. Self-care and maintenance	2019	84.8	83.6
	2024	82.3	80.9

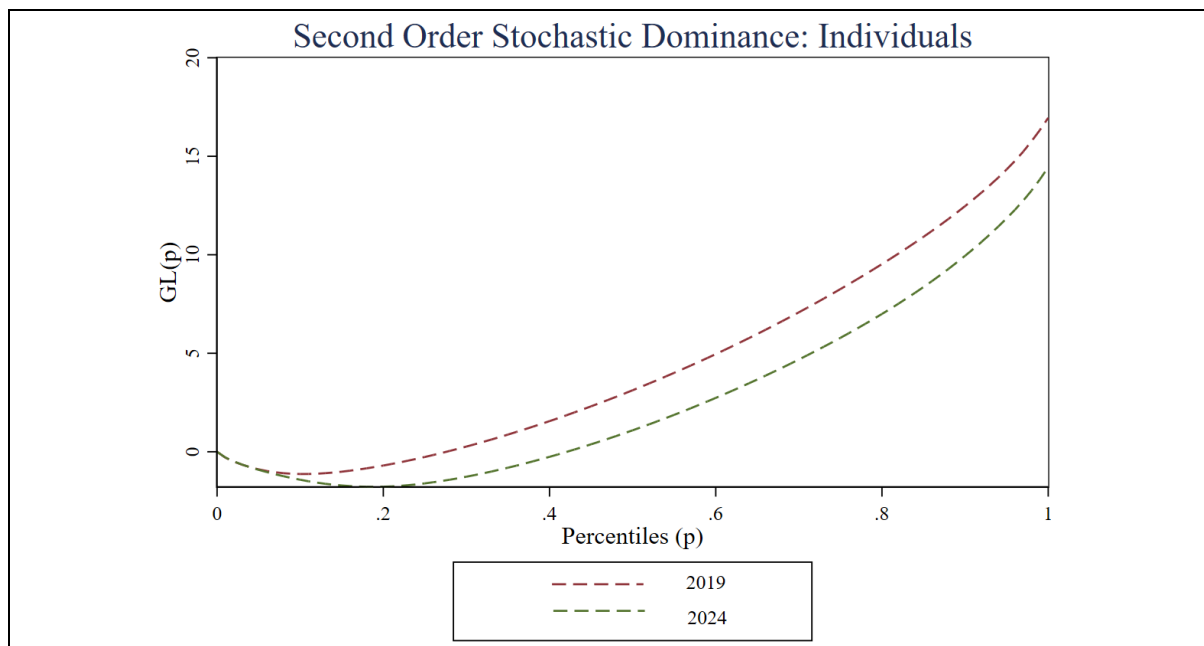
¹⁰ We can also add the supervisory care work before rescaling to 168 to account for supervisory care work in time poverty analysis.

6. Results from Indian time use surveys

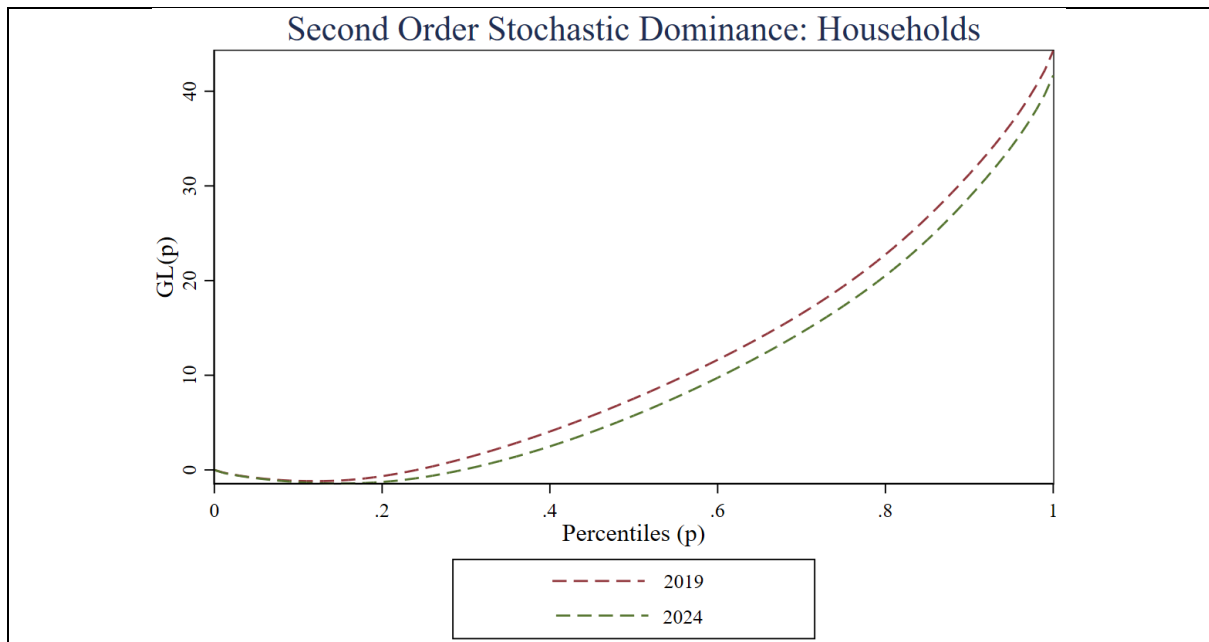
Time Poverty

We find that time poverty in India has worsened between 2019 and 2024 at both the individual and household levels. The distribution of time deficit in 2024 exhibits second-order stochastic dominance (SOSD)¹¹ over that of 2019, indicating a deterioration in time welfare. This implies that the observed increase in time poverty is robust to the choice of the time poverty threshold and to the method of aggregation, such as those used in computing the headcount ratio, poverty gap, or other distribution-sensitive measures (Foster and Shorrocks, 1988). In other words, even if one adopts different normative assumptions about inequality aversion or selects alternative poverty lines, the conclusion that time poverty has increased over this period remains robust.

FIGURE 4: SECOND ORDER STOCHASTIC DOMINANCE of 2019 OVER 2024



¹¹ X SOSD X' if and only if $\int_{-\infty}^z F(X; s) ds \leq \int_{-\infty}^z F(X'; s) ds$ for all $z \in Z$ and $\int_{-\infty}^z F(X; s) ds < \int_{-\infty}^z F(X'; s) ds$ for some $z \in Z$



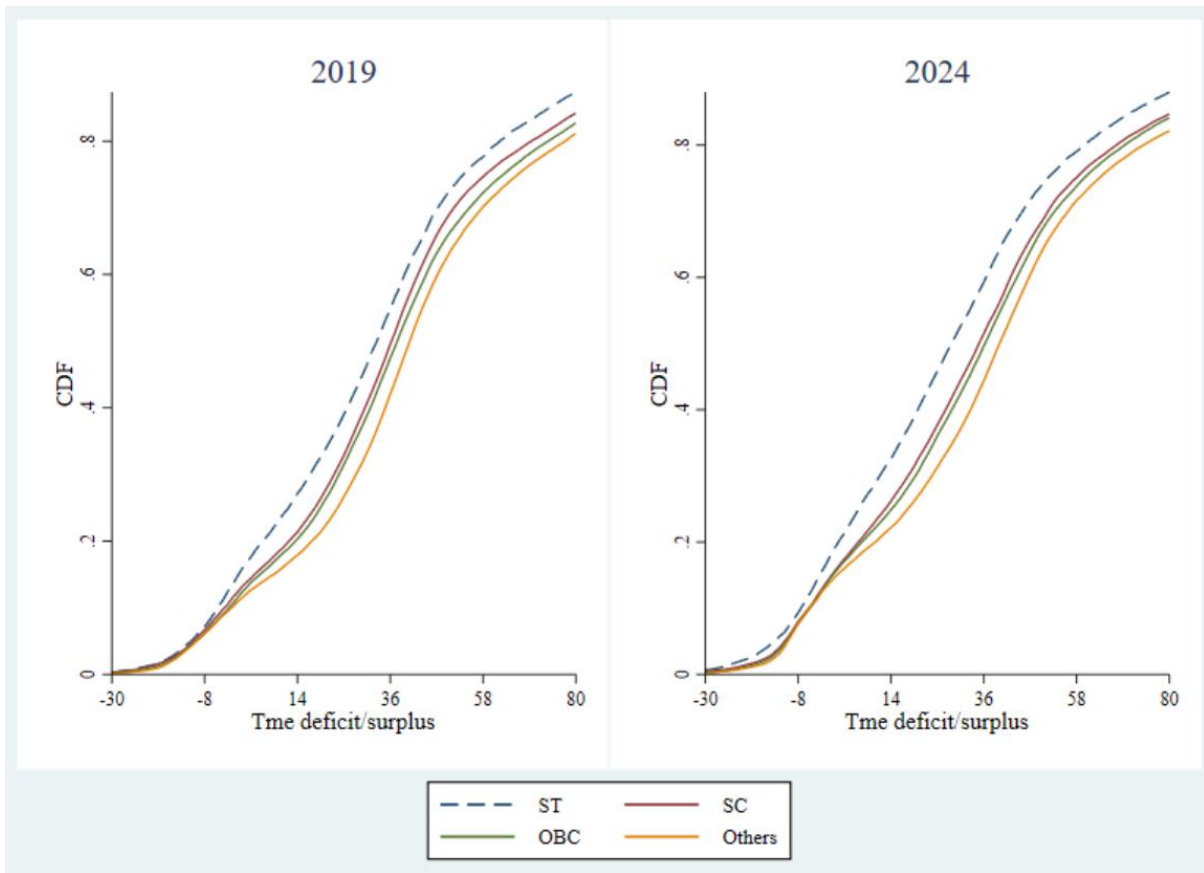
The distribution of X_j among historically privileged ‘upper’ caste households exhibits first-order stochastic dominance¹² over that observed in marginalized ‘lower’ caste households.¹³ This implies that at every threshold z , a greater proportion of upper caste households have more time surplus than lower caste households. In other words, the result that the marginalized caste households are more time poor is not sensitive to where the time poverty threshold is set. Additionally, all standard measures of time poverty such as the headcount ratio, poverty gap, and squared poverty gap are higher among lower caste households (Foster and Shorrocks, 1988).

We observe that individual time poverty in India has risen from 7.6% in 2019 to 12.5% in 2024. The rise is sharper in urban sector where it has more than doubled (7.8% to 16.5%) as compared to rural sector (7.6% to 10.1%), signalling towards the increasing time constraints imposed by the urban life.

¹² x FOSD x' if and only if $P(x; z) \leq P(x'; z)$ for all $z \in Z$; and $P(x; z) < P(x'; z)$ for some $z \in Z$

¹³ We highlight the household level results as caste is a household characteristic in ITUS. Everyone recorded as a part of the household is treated as same caste. However, this is not always true. For instance, the resident house help can, in theory, be of different castes

FIGURE 5: FIRST ORDER STOCHASTIC DOMINANCE – CASTE



Curiously, the household time poverty is higher than individual time poverty (rising from 9.7% in 2019 to 11.5% in 2024). This is curious given that our method allows individuals with surplus time to compensate for the deficits of other household members. The higher rate of household time poverty suggests that, in some cases, the time deficits of certain individuals (often females) exceed the combined surplus available within the household, resulting in an overall time deficit at the household level. This needs to be investigated further.

Unsurprisingly, employment influences time poverty and there is no time poverty among the unemployed. Unpaid helpers, regular wage and casual wage workers are the most time poor. The time poverty HCR among the regular wage workers rose from 15.6% in 2019 to 26.2% in 2024, whereas HCR for casual wage workers rose from 16.4% to 24.4%, and unpaid helpers 19.1% to 22.5% between the same period. At the same time, the time poverty amongst unpaid domestic workers decreased from 2.2% to 1.6%.

TABLE 4: Individual Time Poverty (2019 and 2024)

	Time Poor 2019	Share 2019	Time Poor 2024	Share 2024
All	0.076	1.000	0.125	1.000
<i>By Sector</i>				
Sector: Rural	0.076	0.689	0.101	0.636
Sector: Urban	0.078	0.311	0.165	0.364
<i>By Sex</i>				
Sex: Male	0.035	0.501	0.117	0.510
Sex: Female	0.118	0.499	0.133	0.490
<i>By MPCE quartile</i>				
MPCE Q1	0.085	0.272	0.115	0.202
MPCE Q2	0.091	0.261	0.122	0.221
MPCE Q3	0.069	0.245	0.109	0.244
MPCE Q4	0.057	0.221	0.143	0.333
<i>By Caste</i>				
Caste: ST	0.117	0.099	0.169	0.091
Caste: SC	0.088	0.193	0.137	0.189
Caste: OBC	0.077	0.425	0.124	0.450
Caste: General	0.055	0.282	0.102	0.270
<i>By Religion</i>				
Religion: Hindu	0.081	0.816	0.130	0.835
Religion: Muslim	0.055	0.127	0.097	0.114
Religion: Christian	0.079	0.026	0.110	0.027
Religion: Sikh	0.032	0.018	0.046	0.014
Religion: Other	0.090	0.012	0.135	0.010
<i>By Employment Status</i>				
Employment: Own account	0.072	0.178	0.110	0.189
Employment: Employer	0.059	0.009	0.073	0.011
Employment: Unpaid helper	0.191	0.046	0.225	0.039
Employment: Regular wage	0.156	0.125	0.262	0.164
Employment: Casual wage	0.164	0.153	0.241	0.154
Employment: Unemployed	0.000	0.018	0.000	0.019
Employment: Student	0.022	0.123	0.087	0.111
Employment: Unpaid domestic	0.022	0.317	0.016	0.275
Employment: Other	0.001	0.031	0.001	0.038
<i>By Education</i>				
Education: No school	0.130	0.227	0.172	0.178
Education: Some school	0.093	0.067	0.149	0.060
Education: Primary	0.088	0.116	0.137	0.121
Education: Middle	0.064	0.177	0.119	0.164
Education: Secondary	0.049	0.169	0.109	0.163
Education: Higher secondary	0.050	0.123	0.116	0.156
Education: College graduate	0.043	0.094	0.089	0.129
Education: Postgraduate	0.036	0.027	0.060	0.030
<i>By Household Size</i>				
HH Size: 1	0.488	0.029	0.488	0.123
HH Size: 2	0.092	0.107	0.100	0.166
HH Size: 3	0.063	0.182	0.065	0.201
HH Size: 4 or more	0.060	0.683	0.068	0.510

By Number of Children

Children: 0	0.082	0.651	0.140	0.727
Children: 1	0.055	0.190	0.065	0.160
Children: 2	0.069	0.118	0.089	0.088
Children: 3 or more	0.111	0.041	0.183	0.025

By Marital Status

Marital Status: Never Married	0.038	0.241	0.135	0.255
Marital Status: Currently Married	0.081	0.706	0.108	0.664
Marital Status: Widowed	0.183	0.048	0.219	0.072
Marital Status: Divorced	0.267	0.005	0.314	0.008

Source: Author's calculations using Indian Time Use Survey 2019 and 2024

TABLE 5: HOUSEHOLD TIME POVERTY (2019 AND 2024)

	Time Poor 2019	Share 2019	Time Poor 2024	Share 2024
All Households	0.097	1.000	0.115	1.000
<i>By Sector</i>				
Sector: Rural	0.083	0.682	0.093	0.658
Sector: Urban	0.125	0.318	0.156	0.342
<i>By MPCE quartile</i>				
MPCE Q1	0.081	0.256	0.103	0.266
MPCE Q2	0.086	0.280	0.099	0.252
MPCE Q3	0.102	0.240	0.114	0.242
MPCE Q4	0.123	0.224	0.144	0.240
<i>By Caste</i>				
Caste: ST	0.132	0.100	0.164	0.094
Caste: SC	0.110	0.194	0.126	0.191
Caste: OBC	0.097	0.424	0.113	0.453
Caste: General	0.076	0.282	0.091	0.262
<i>By Religion</i>				
Religion: Hindu	0.101	0.819	0.120	0.828
Religion: Muslim	0.074	0.126	0.087	0.122
Religion: Christian	0.097	0.028	0.110	0.027
Religion: Sikh	0.046	0.016	0.048	0.014
Religion: Other	0.106	0.012	0.132	0.009
<i>By Household Size</i>				
HH Size: 1	0.488	0.075	0.488	0.090
HH Size: 2	0.104	0.157	0.111	0.138
HH Size: 3	0.064	0.203	0.073	0.189
HH Size: 4 or more	0.055	0.565	0.071	0.584
<i>By Number of Children</i>				
Children: 0	0.105	0.647	0.122	0.629
Children: 1	0.070	0.192	0.080	0.195
Children: 2	0.083	0.121	0.106	0.131
Children: 3 or more	0.126	0.039	0.190	0.044

Source: Author's calculations using Indian Time Use Survey 2019 and 2024

Even though unpaid domestic work in itself is not a major driver of time poverty, it has significant implications for time poverty among the employed women. In fact, distribution of

men’s time surplus FOSD women’s time surplus (Figure 6), implying that employed women are more time poor than employed men, regardless of the choice of poverty line or aggregation index.

FIGURE 6: FIRST ORDER STOCHASTIC DOMINANCE – EMPLOYED MALES AND FEMALES

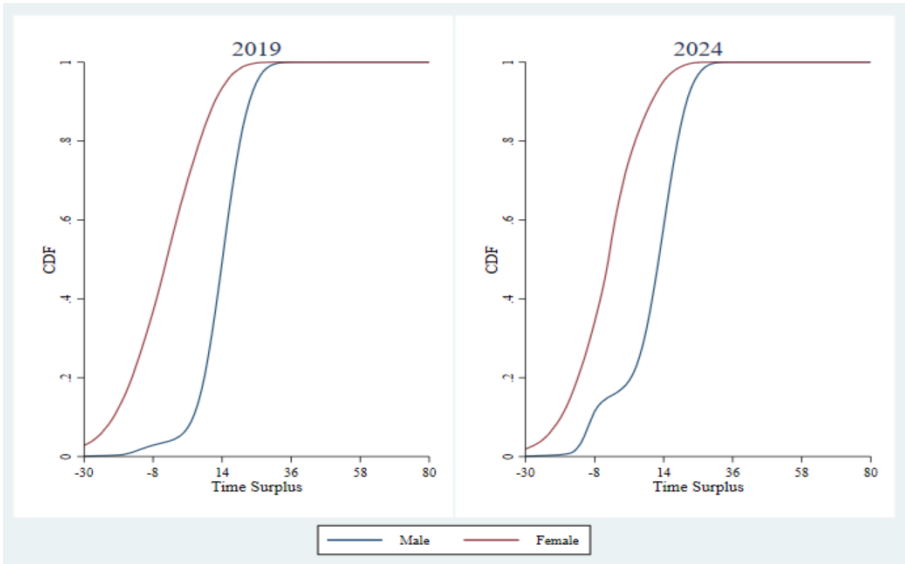


FIGURE 7: HCR OF TIME POVERTY, LIMTCP TIME POVERTY, OFFICIAL POVERTY AND CONSUMPTION POVERTY

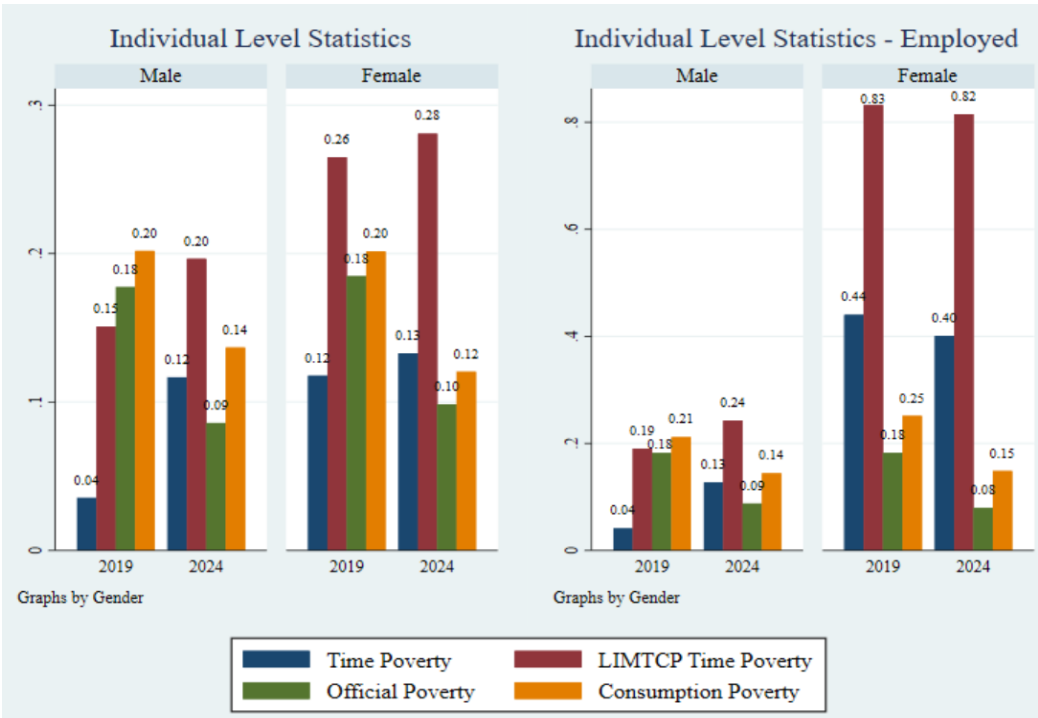
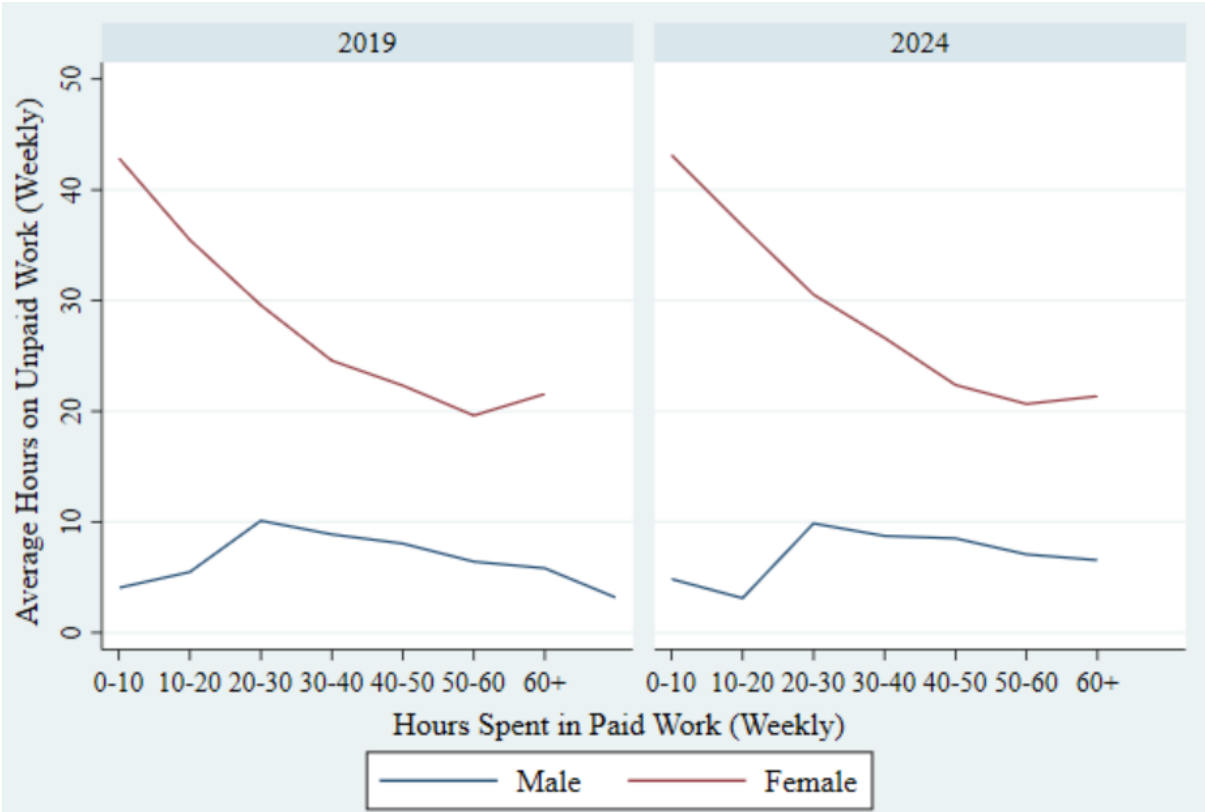


Figure 7 compares the time poverty rates of men and women, along with LIMTCP time poverty, official poverty and consumption poverty rates for 2019 and 2024. It shows that while being employed does not change the proportion of time poor males, it almost quadruples the HCR for females (12% to 44% in 2019 and 13% to 40% in 2024). However, it is also noteworthy that the time poverty among employed females has decreased by 4% between 2019 and 2024.

The higher incidence of time poverty among employed women is largely driven by the ‘double burden’ of paid and unpaid work. Figure 8 shows that although the hours spent on unpaid work decline as women allocate more time to paid employment, the reduction is not proportional, and unpaid work hours remain significantly high. Consequently, working women often face total work weeks of 60–80 hours, contributing to their high levels of time poverty.

FIGURE 8: HOURS OF PAID AND UNPAID WORK AMONG ALL INDIVIDUALS



Another notable insight from Table 4 is the sharp rise in time poverty among students, which increased from 2.2% in 2019 to 8.7% in 2024. This form of deprivation was captured by treating time spent on formal education as an obligation rather than a discretionary activity. The data also reveal an inverse relationship between education level and time poverty: in 2024,

individuals with no formal schooling had a time poverty rate of 17.2%, while those with postgraduate education experienced a significantly lower rate of just 3%.

Time poverty, at both the household and individual levels, declines as household size increases, possibly due to the intra-household sharing of responsibilities, even if unequally distributed. Notably, 48% of individuals living in single-person households are time poor, with the incidence of time poverty falling steadily as household size grows. Interestingly, having one child is associated with a lower likelihood of time poverty; however, the presence of more than one child leads to a progressively higher time poverty HCR for both individuals and households.

Time poverty also varies by marital status. As shown in Table 5, individuals who are never married or currently married tend to experience lower levels of time poverty compared to those who are widowed or divorced. Notably, time poverty among the never married increased sharply between 2019 and 2024, rising by 9.7 percentage points (from 3.8% to 13.5%). Given that marriage is a gendered institution, Table 6 further disaggregates these patterns by sex to highlight gender-specific differences in time poverty across marital categories.

TABLE 6: TIME POVERTY BY MARITAL STATUS AND SEX (2019 VS 2024)

	Time Poor 2019	Share 2019	Time Poor 2024	Share 2024
<i>Male</i>				
Never Married	0.046	0.308	0.177	0.336
Currently Married	0.024	0.669	0.072	0.627
Widowed	0.205	0.019	0.315	0.029
Divorced	0.276	0.005	0.379	0.008
<i>Female</i>				
Never Married	0.023	0.173	0.050	0.171
Currently Married	0.132	0.743	0.141	0.703
Widowed	0.177	0.078	0.195	0.118
Divorced	0.259	0.006	0.249	0.009

Source: Author's calculations using Indian Time Use Survey 2019 and 2024

Among males, never married individuals saw the highest increase in time poverty, from 4.6% in 2019 to 17.7% in 2024 (a 13.1 percentage point increase). Although the time poverty of currently married men also rose (from 2.4% to 7.2%), they remained the least time-poor group. Although widowed and divorced men have smaller in share in population, they consistently experienced higher levels of time poverty.

In contrast, time poverty among women remained relatively stable over time. Currently married women constituted the largest group and consistently exhibited high time poverty rates, 13.2% in 2019 and 14.1% in 2024. Notably, this is the only marital category in which women are more time poor than men. While marriage appears to reduce men's likelihood of being time poor (the currently married category has the lowest HCR), the opposite holds true for women. Never married women have the lowest HCR of time poverty, suggesting that marriage increases women's time burdens while alleviating them for men.

6.1. Consumption Poverty

Following the approach of Vickery (1977) and Zacharias (2011), we adjust the official poverty line using the method outlined in Equation 7. In the Indian context, this involves modifying the consumption poverty line established by the Tendulkar Committee, which remains the officially accepted benchmark since 2009.¹⁴ After accounting for inflation, we assume the rural and urban national poverty lines to be INR 1,218 and INR 1,467 (in MPCE) for the year 2019, and INR 1,632 and INR 1,944 for 2024, respectively. Since the poverty lines are stated in MPCE, the household poverty lines were arrived at simply by simply multiplying the appropriate poverty line by household size.

We use the national minimum wage for “sweeping and cleaning” as the replacement wage. The country is divided into three types of areas: A, B, and C, with Area A comprising the highest cost-of-living cities, followed by Areas B and C. For rural areas, we take an average of minimum wages of areas B and C (to account for lower cost-of-living in rural area), and for urban areas we take an average of minimum wages of areas A and B (to account for higher cost-of-living in urban areas). Hence, the replacement wage is INR 56.625 per hour and 69.125 per hour in 2019; INR 73.3125 and INR 89.3125 for 2024.

Using Equation 7, I adjusted the poverty line and classified all households with consumption below the adjusted threshold as consumption-poor. Table 7 compares consumption poverty with official poverty for 2019 and 2024.

¹⁴ The Tendulkar Committee poverty line has often been criticized for being set too low. In response to such criticisms, the Government of India constituted a new expert group under the chairmanship of Dr. C. Rangarajan to re-examine the methodology for measuring poverty. This committee submitted its report in 2014. However, we continue to use the Tendulkar Committee poverty line, as the recommendations of the Rangarajan Committee have not been formally adopted by the government.

TABLE 7: Consumption and Official Poverty: 2019 and 2024

	Consumption Poor 2019	Official Poverty 2019	Consumption Poor 2024	Official Poverty 2024
All Households	0.204	0.166	0.153	0.114
<i>By Sector</i>				
Sector: Rural	0.231	0.199	0.167	0.136
Sector: Urban	0.145	0.095	0.125	0.072
<i>By MPCE quartile</i>				
MPCE Q1	0.669	0.649	0.471	0.430
MPCE Q2	0.053	0.000	0.050	0.000
MPCE Q3	0.041	0.000	0.038	0.000
MPCE Q4	0.033	0.000	0.023	0.000
<i>By Caste</i>				
Caste: ST	0.321	0.274	0.271	0.210
Caste: SC	0.254	0.212	0.196	0.152
Caste: OBC	0.209	0.171	0.146	0.109
Caste: General	0.118	0.089	0.090	0.061
<i>By Religion</i>				
Religion: Hindu	0.207	0.167	0.154	0.114
Religion: Muslim	0.220	0.189	0.163	0.134
Religion: Christian	0.137	0.108	0.109	0.076
Religion: Sikh	0.048	0.034	0.061	0.044
Religion: Other	0.173	0.145	0.163	0.133
<i>By Household Size</i>				
HH Size: 1	0.271	0.052	0.185	0.024
HH Size: 2	0.094	0.052	0.071	0.033
HH Size: 3	0.115	0.090	0.080	0.055
HH Size: 4 or more	0.257	0.240	0.191	0.167
<i>By Number of Children</i>				
Children: 0	0.151	0.108	0.106	0.067
Children: 1	0.226	0.202	0.162	0.134
Children: 2	0.343	0.310	0.263	0.218
Children: 3 or more	0.527	0.498	0.452	0.392

Source: Prepared using ITUS 2019 and 2024

We observe a general decline in poverty over this period using both measures. Consumption poverty fell from 20.4% to 15.3%, while official poverty declined from 16.6% to 11.4% between 2019 and 2024. Other notable patterns include higher poverty rates in rural areas compared to urban areas, and the highest incidence of poverty among Scheduled Tribes, followed by Scheduled Castes, OBCs, and others.

Consumption poverty is consistently higher than official poverty by design: no officially poor household was allowed to fall outside consumption poverty, while officially non-poor households could be classified as consumption-poor if they faced uncompensated time deficits.

The difference between official and adjusted consumption poverty is particularly evident in the case of single-person households. According to the official measure, only 2.4% of such households are classified as poor, whereas under the consumption poverty measure, the figure rises to 18.5%. This reflects that single-person households face significant time deficits without sufficient consumption expenditure to compensate through expenditure.

An important feature of these results is that, across most categories, the change in HCR between 2019 and 2024 is broadly similar when measured using either the official or the adjusted consumption-based poverty line. This indicates that the adjusted poverty line is most valuable for uncovering hidden poverty among households, but it does not change the *direction* of poverty trends.

7. Conclusion

This study has made theoretical, methodological and empirical contributions to the literature on time poverty. Theoretically, it has argued that time poverty and money (income/consumption) poverty are complementary in understanding material deprivation. Methodologically, it has improved over existing methods of measuring time poverty to reflect this theoretical view. Empirically, it has shown that time poverty has unambiguously worsened between 2019 and 2024 in India, with sharp disparities persistent across gender, caste, urbanization, employment type, education, and household structure.

Appendix A: The Vickery (1977) Method

The approach begins by categorizing the total available time in a week (168 hours) into four mutually exclusive components: paid work (L), household production (R), personal care and maintenance necessary for survival and reproduction (M), and residual time (V), which includes all other activities. Formally,

$$168 \equiv M + L + R + V$$

Equation A1

Because M represents the minimum time necessary for biological and social reproduction, no individual or household can sustainably function without allocating sufficient time to these activities. This means the time that can be freely allocated across market work (L) household production (R), and other uses is limited to $T_M = 168 - M$.

Within this allocatable time T_M , a minimum threshold of time, which is denoted by T_0 in Figure A1 must still be devoted to essential, non-substitutable household production. These are core tasks related to maintaining the household that cannot be outsourced or replaced by market-based services. Crucially, this time requirement is independent of an individual's level of market income or consumption.

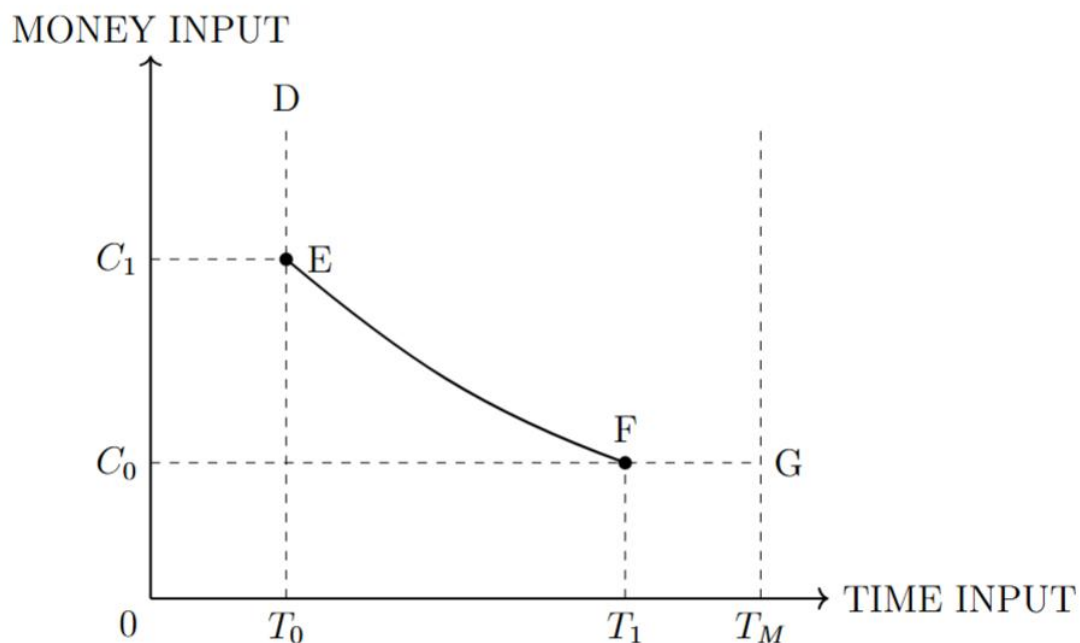


FIGURE A1: Vickery Bivariate Measure of Time and Income Poverty

Similarly in the money dimension, the framework assumes that a certain minimum level of monetary income or consumption is necessary for basic living, regardless of how much time an individual can devote to household production. This threshold is represented by the official poverty line, C_0 .

Thus, an individual is considered money-poor if their market income or consumption falls below C_0 , irrespective of the time they allocate to household tasks. They are classified as time-poor if they are unable to dedicate at least T_0 to household production, regardless of the money resources at their disposal.

Beyond these minimum thresholds, it can substitute the money input from the time input at the rate of a ‘replacement wage’ which is represented by a convex curve EF, implying that each additional hour of household production can substitute less and less money input required to stay above poverty. Hence, the curve DEFG becomes the new poverty line and all households below this curve are classified as poor in this framework.

This framework can be operationalized using following set of equations:

$$X_j = n \cdot (168 - \bar{M}) - \bar{R} - \sum_{i=1}^n L^f$$

Equation A2

$$\hat{Y} = \bar{Y} - \min(0, X_j)p$$

Equation A3

Equation A2 calculates the time deficit for households. As earlier, M represents time on personal care and maintenance, R represents time on household production and L represents time on labor related activities, and n represents the household size. The bar on these letters signify that they represent the time required for these activities as opposed to time actually spent. Vickery chose to evaluate time deficit in full time employment scenario (L^f).

Equation A3 estimates the adjusted threshold for poverty (\hat{Y}) by adding the monetized value of time deficits (only if $X_j < 0$) to the official poverty line (\bar{Y}), p represents the average replacement wage, which is assumed to be equal to hourly wages of a generalist household

worker.¹⁵ The assumption that the hourly value of the time deficit is equal to the average hourly wage of domestic workers is consistent with the literature on the valuation of unpaid care work (Zacharias et al., 2018).¹⁶

Subsequently, households with $X_j < 0$ are classified as time poor and households with $Y < \hat{Y}$ are classified as money poor. Vickery chooses an intersection approach to classify a household poor if it is deprived in either dimension.

As evident from these equations, calculating necessary time for each activity is a crucial component of these methods, and the way in which these thresholds are estimated significantly influences poverty estimates. Unfortunately, as also noted by Dorn and Folbre (2022), the thresholds for necessary time in these activities lack strong empirical grounding. For example, Vickery (1977) used the “average number of hours that husbands and wives with the same number of children spent on various tasks” to calculate the value of T_1 . To estimate the required amount of childcare, she used the average time spent by employed homemakers, as it was lower than that of unemployed homemakers. She justified using the lower figure by arguing that preferences might outweigh needs in this activity. Similarly, T_0 was estimated based on the assumption that all adult members of the household must spend at least two hours a day “managing the household and interacting with its members if the household is to function as a unit.” However, no justification for selecting the two-hour threshold was provided.

The value of T_M was estimated by subtracting from the total available hours in a week (i.e., 168 hours) the average time adults spend on sleeping, resting, eating, personal care, and an assumed 10 hours of free time per week. Again, no justification is provided for using the 10-hour figure, other than the assumption that everyone requires one hour of free time each day and three additional hours on the weekend. This estimate is noted to be significantly lower than the average amount of free time reported by adults in the sample.

¹⁵ Using average replacement wage instead of actual replacement wage implies that the curve $\$EF\$$ will be a straight line instead of convex curve.

¹⁶ This assumption, however, is not uncontroversial. (Dorn, F. and Folbre, N. 2022. Income and time poverty: Definitions, thresholds and trade offs. In: *37th IARIW General Conference, August.*) have pointed out that this linear substitution ignores the possible declining marginal productivity of unpaid work.

Appendix B: Thresholds under LIMTIP

The second major contribution of the LIMTIP was to provide a formal method to estimate the threshold of M and R. M or weekly time on personal maintenance, is explained as the sum of non-substitutable household production (assumed to be 7 hours per week) and personal care. The thresholds for personal care are calculated as the sum of the weekly average of the actual time adults spend sleeping, eating, drinking, personal hygiene, and a normative necessary time for minimum leisure (assumed to be 10 hours a week - 1 hour a day on weekdays and 2.5 hours a day on weekends). See Section 3.2 for more details for thresholds of personal maintenance.

The weekly threshold for minimum necessary household production, R, is defined at the household level, i.e., they indicate the necessary household production time that is required by all household members taken together. Estimation of this threshold involves the construction of a reference group of households around the official poverty line ($\pm 25\%$) with at least one non-employed adult. In principle, this method of calculating \bar{R} is used to estimate “the amount of household production implicit in poverty lin” (Zacharias et al., 2018). The rationale behind the second filter is that poor households in which all individuals are employed may not be able to spend the necessary amount on household production, thus including them would result in underestimation of thresholds. Generally, separate reference groups are created for rural and urban areas.

After constructing these reference groups, a non-linear regression model is used to predict the time spent on household production in a given household (R_j) of each reference group based on the number of adults, children, adolescents, and elderly people in the household. This model can be specified as:

$$R_j = a_0(A_{(18-59)} + a_1C_{0-6} + a_2C_{7-17} + a_3E_{60+}) + e$$

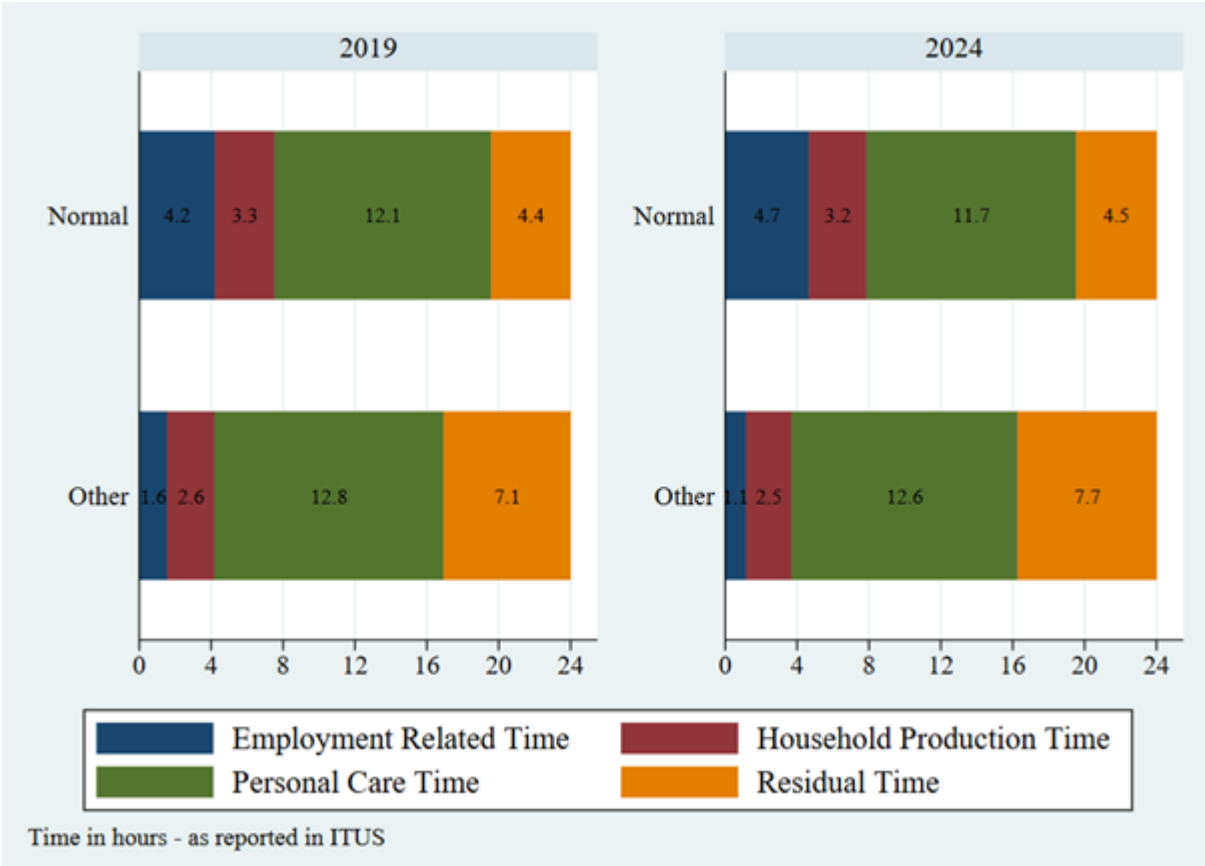
Equation B1

Where R_j is the substitutable household production for a given household; $A_{(18-59)}$ represents the number of adults aged 18 to 59 years, C_{0-6} represents the number of children aged 0 to 6 years, C_{7-17} represents the number of children aged 7 to 17 years and E_{60+} is the number of elders aged 60 years or older.

Within this model, a_0 serves as the baseline indicator, denoting the socially necessary hours of household production in a single-adult household. The coefficients a_1 to a_3 capture the incremental hours required with each additional member of the household, and b represents the parameter that accounts for the economies of scale in household production. The estimated equation takes on the function of a simple cell average, with its parameters helping to determine the threshold for each household within the population.

This is similar to the thresholds for personal care (M) which is also calculated using the average, but for all adults rather than just around the poverty line. Although using the average for personal care is less contentious due to the minimal variation in empirical data, applying the average to household production is less justified (Dorn and Folbre, 2022). Research needs to explore whether more justified threshold can be estimated using some other method such as a proportion of median (as done in case of univariate money poverty), median, mode, or even via qualitative methods.

Appendix Figure 1: Time use profile on ‘normal’ and ‘other’ days

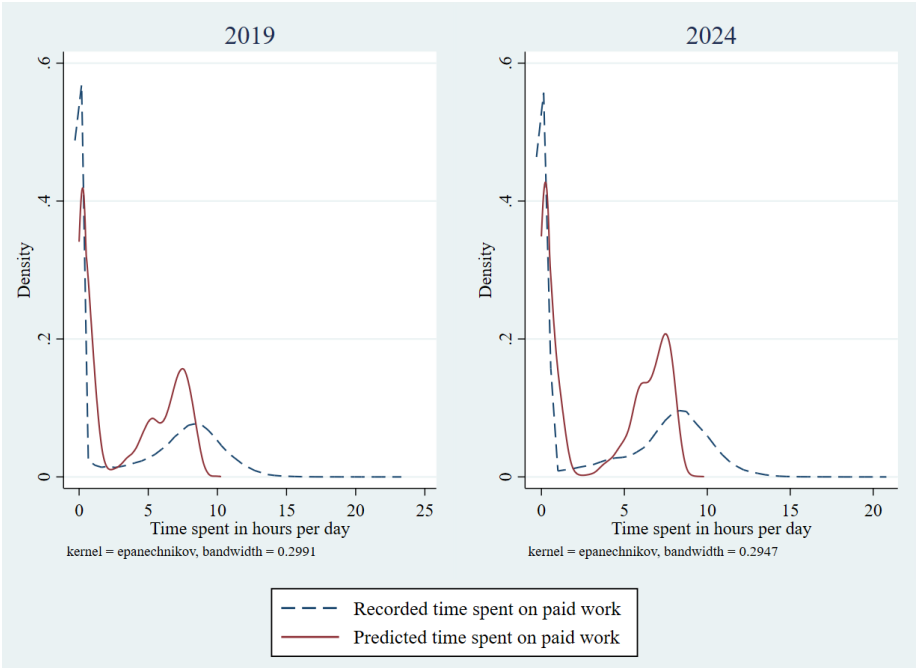


Appendix Figure 1 illustrates the distribution of time across normal and other days. Compared to normal days, an average individual spends less time on both employment and household production and more time on personal care and residual activities. This highlights that individuals have different time-use patterns on different type of days. This variation needs to be taken into account when making any claims about the long-term time-use patterns of individuals. The next section addresses this issue in greater detail.

Appendix C: Distribution of recorded and predicted time use in paid work

The logic of the prediction exercise is further reinforced by examining changes in the distribution of time use across activities. Appendix Figure 2 depicts the distribution of time spent on paid work in 2019 and 2024, comparing recorded (dashed blue line) and predicted (solid maroon line) values. As expected, the recorded data displays a sharp spike at zero, reflecting the substantial proportion of individuals who reported no time spent on paid work on the diary day. In contrast, the predicted distribution is smoother and exhibits a lower concentration at zero, indicating that non-participation in paid work is less prevalent when viewed over the long run. Furthermore, the recorded data for 2024 includes individuals reporting as much as 20.5 hours of paid work in a single day, which is an implausible figure when considering long term time use. In comparison, the prediction model appropriately moderates such extreme values.

Appendix Figure 2: Distribution of Recorded and Predicted Time Spent on Paid Work



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