

Antonopoulos, Rania; Memis, Emel

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Working Paper No. 600

Time and Poverty from a Developing Country Perspective

by

Rania Antonopoulos*

Emel Memis**

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* Levy Economics Institute, rania@levy.org

** Levy Economics Institute and Department of Economics, Ankara University, emel.memis@politics.ankara.edu.tr

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Levy Economics Institute
P.O. Box 5000
Annandale-on-Hudson, NY 12504-5000
<http://www.levyinstitute.org>

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ABSTRACT

This study is concerned with the measurement of poverty in the context of developing countries. We argue that poverty rankings must take into account time use dimensions of paid and unpaid work jointly. Reviewing the current state of the literature on this topic, our methodology introduces a critical but missing analytical distinction between time poverty and time deprivation. On this basis, we proceed to provide empirical evidence by using South African time use survey data compiled in 2000. Our findings show that existing methods that work well for advanced countries require modification when adopted in the case of a developing country. The results identify a group of adults who previously were inadvertently missing, as they were considered “time wealthy.”

Keywords: Time Poverty Measurement; Time Use; Poverty; Policy

JEL Classification: J22; J16; I32

1. INTRODUCTION

The devastating human, economic, and social consequences of poverty have been long recognized and, as a result, national and international commitments for remediation have been a part of the development discourse for over three decades. All along, it has been crucial to identify poverty thresholds and socioeconomic characteristics of those who fall below that datum. This has been considered particularly important because data collected over time sheds light on how effective poverty reduction strategies are and on how to improve the design of interventions in accordance to the demographic characteristics of the population they are meant to serve.

In this regard, the very definition of what constitutes poverty and the means through which poverty thresholds are calculated matters, as they determine the ranking of households and/or individuals vis-à-vis the poverty scale; misjudgments in this regard can result in miscalculations of quantity, depth, and trends in poverty—making some population groups in need disappear all together. Even though the most widely used measure remains the World Bank’s global \$1/day (now revised to \$1.25)¹ or \$2/day threshold, over the years researchers have proposed a movement away from the singular emphasis on (earned) income poverty (Townsend 1962; Sen 1976; Ravallion 1996).

Concepts such as “minimum caloric intake,” “consumption expenditures,” and “extended income” have drawn attention to the fact that necessities of life can be secured through government contributions (public provisioning to education and health services) and other income sources (i.e., remittances, short-term loans), all of which expand the space of commodities enjoyed; also, to better identify subpopulations at risk of being or falling into poverty, much work has insisted on cross-listing income/consumption data with other multidimensional deprivations poverty engenders. Examples here include frameworks based on the notions of “capabilities, functionings, and achievements” (Sen

¹ The World Bank provides basic poverty estimates according to \$1 per person per day for 22 countries using purchasing power parity (PPP) exchange rates in 1985 (detailed information is available at: siteresources.worldbank.org/DATASTATISTICS/Resources/WDI08supplement1216.pdf). Estimates are revised using 1993 PPP exchange rates with a poverty line of \$1.08 and 2005 PPPs with a poverty line raised to \$1.25. Since 1985 the number of countries that provide household income and expenditure surveys has considerably expanded. The World Bank’s poverty monitoring database now includes more than 600 surveys representing 115 developing countries. (Chen and Ravallion 2008; UN 2009)

1985 and 1992), “dignity and self-respect” (Cagatay 1998; Fukuda-Parr 1999), “citizenship, participation, and voice,” and “marginality” and “social exclusion” (Townsend 2002; Burchardt 2000)

Yet, despite many advances made, a critical dimension that has received little attention—with a few notable exceptions that we will discuss shortly—is the availability and distribution of *time* across and within households. Simply put, for the vast majority of the world population, in addition to gaining access to goods and services from the government and the market, standards of living also depend on unpaid household work. For that, time must be spent on household (unpaid) production activities, such as cooking, to transform market purchases to final consumable goods; cleaning, to maintain a sanitary and healthy home environment; and caring, to attend to the needs of young children, the elderly, etc. For developing countries—especially among poor households—time must also be spent to collect water, fuelwood, and free goods for household use; the absence of basic infrastructure and lack of durable household appliances also increases the time needed to perform routine daily household functions and for transporting goods and people to their destinations.² The time requirements and ability of households to meet them is bound to result in variations and inequalities affecting the standard of living individuals and households enjoy. Poverty thresholds and deprivation measures do not incorporate this fundamental—but unaccounted for—inequality. How important of an omission might “time” then be? Vickery (1977) for the case of the United States, and more recently, Harvey and Mukhopadhyay (2007) for Canada and Burchardt for England (2000), have shown through their research findings that it matters a great deal.

To our knowledge, this analytical framework has not been used in the context of a developing countries³ and this is what we propose to do in this paper. For that, a modified analytical framework must be developed. This modification is imperative, as existing measures of time-adjusted poverty thresholds are built on assumptions germane to advanced countries, but quite unrealistic for developing ones. For example, in the face of

² Also referred to as unpaid reproduction work, the conceptualization of unpaid activities as “production” that expands the pool of available goods and services, and hence of well-being, can be traced back to M. Reid in the 1930s, G. Becker (1970s), Mincer (1962), and many contemporary feminist economists.

³ Except for Bardasi and Wodon (2006 and 2009), which analyzes time poverty issues in the case of Ghana. However, they use a different framework than we discuss here. We elaborate on these studies in the next section.

very high seasonal unemployment in agricultural-based economies, the allocation of time to market work is neither readily available, nor year-round and or full-time; or, time spent on unpaid work cannot be represented by the use of a single value across the board, as physical location and other household characteristics result in exorbitant variations around the mean/median. In this paper, following this pioneering work, we modify previously developed analytical frameworks to make them suitable for developing countries and apply it to the case of South Africa.

The paper is organized as follows. In section 2, we provide a summary of the literature, focusing mostly on two time-adjusted poverty measures that have been important in developing our own methodological framework. In section 3, we develop the scope of this study and build our arguments analytically. Section 4 summarizes the data, income poverty characteristics, and description of time use patterns in South Africa and presents our empirical results. The final part, section 5, concludes with some observations and policy recommendations derived from the obtained empirical results.⁴

2. TIME-ADJUSTED POVERTY THRESHOLDS: LITERATURE REVIEW

Decision on allocation of time between work and non-work is in general taken as determined jointly by the level of income earned per paid work hour and the demographic composition of the households individuals live in. Given that there are 24 hours in a day, a person is assumed to be able to decide freely how much to spend on work vis-à-vis leisure after the necessary personal time (i.e., time spent on eating, sleeping, bathing, and other personal needs) is subtracted from 24 hours. The total amount of time people have available for free allocation (T_m), as noted by Vickery (1977: 28) and Harvey and Mukhopadhyay (2007: 60), is, however, constrained by the time required to maintain their household. Time necessary (T_1) for cleaning, preparing food, maintaining the household and taking care of children and/or other household members varies widely

⁴ Note that this is the first in a series of exploratory papers on the topic with the aim to advance knowledge on how various proposed methodologies can be modified for use in the context of developing countries.

among households depending on their composition.⁵ Work time thus includes both paid work time and time spent on unpaid work activities to sustain the household.

It is well accepted by now that not all goods and services are provided in the market. Any well-being measure indicating the living standard attainable by any household includes the goods and services produced by non-market unpaid work in addition to paid market work. However, the standard poverty thresholds, i.e., minimum necessary levels of income/consumption, take into account only the needs of the households with respect to money income. Nevertheless, standard poverty measures assume that every household has a sufficient amount time for unpaid work as these measures do not take into account variations in unpaid work needs. In particular, households with an income level just above the cut-off level of minimum standards may not be able to devote the required unpaid work time to their households. Based fundamentally on this issue, time-adjusted poverty thresholds were built by Vickery in 1977.

If minimal nonpoor consumption requires both money income and unpaid work products then, argues Vickery (1977: 27), the official poverty standards do not correctly measure household needs. Only if the household has T_1 hours of time available for homemaking are standard income poverty thresholds sufficient. But in case when paid work hours are more than T_m minus T_1 hours, then the household has a time deficit and adult members need to substitute forgone necessary unpaid work products with goods and services purchased in the market to attain the same standard of living as those who have sufficient time. Note that here Vickery assumes that unpaid work time is perfectly *substitutable* with paid work time/money income except for a nonbinding minimum level of unpaid work time (T_0) and vice versa.

Vickery (1977) identifies time-poor households indirectly by examining the wage distribution. She calculates the level of wage, i.e., critical wage per adult living in different household types, depending on the amount of time available for paid work after T_1 is subtracted from T_m . Comparing the wage distribution of full-time workers (i.e.,

⁵ The amount of time necessary for personal needs is determined as the societal averages for activities included. Similarly T_1 is determined as the societal average of this time considering different compositions of households, i.e., number of children or number of adults. Benchmark personal necessary time and T_1 level is assigned to every adult and every household with the same compositional characteristics.

Vickery assumes people can choose how much time they spend doing paid work and also that when they work they are employed full time) living in urban areas with the critical wage cut-offs constructed for different types of households Vickery identifies the potential poor. If the wage level is below the critical wage level then the household is considered as involuntarily time poor, but if above then not time poor. Her findings show that single-adult households, particularly single-female-headed household with children, are highly associated with being time poor.

Three decades after Vickery's pioneering work that presents the time poverty situation in the United States, Harvey and Mukhopadhyay developed time-adjusted poverty thresholds for Canada, introducing a remarkable modification to Vickery's measure. Identification of involuntarily time-poor households based upon the critical wage-level analysis can only be possible if we assume people can choose the amount of their paid work time. The contemporary structure of paid work time across the globe (including advanced countries) shows that this is not the case. This is an assured fact given the irregular, precarious, and/or part-time jobs of today's world. Thus, Harvey and Mukhopadhyay (2007) aimed at relaxing the assumption that people have the choice to decide how much time to spend on paid work.

Similar to Vickery's calculations, after subtracting T_1 from T_m , Harvey and Mukhopadhyay obtain the amount of available time (T_A) for different types of households to be allocated between paid work and leisure. If this available time for paid work is less than the actual time spent doing paid work that means the household has a time deficit, which in turn means not only that the household has no leisure time, but also does not have enough time for the required unpaid work activities. The difference between the available and actual amounts of time for paid work is what determines time deficit/wealth both in both Vickery (1977) and Harvey and Mukhopadhyay's (2007) measures.

When it comes to the method used to identify the time-poor households, Harvey and Mukhopadhyay's measure differs significantly from Vickery's method. Instead of the indirect method that provides the potential poor with critical wage analysis, Harvey and Mukhopadhyay (2007) calculate the money value of the time deficit. They impute a monetary equivalent of the time deficit amount by the working poor and adjust the usual

poverty threshold by the amount obtained, implementing a replacement cost set at the minimum wage rate in the market. Here Harvey and Mukhopadhyay assume that paid work time cannot be changed or substituted by unpaid work time due to the contracted nature of paid work time, but unpaid work time, except for the minimum nonbinding amount (T_0), is again perfectly substitutable with paid work time/money income.

Similar to Vickery's results, Harvey and Mukhopadhyay (2007: 75) have found a high incidence of time deficit among employed single parents with children. Unlike Vickery, they have not addressed the gender issue, arguing that in Canada (as supported by the data) there are very few single fathers and that single fathers face similar challenges to single mothers.

Both studies summarized above consider the time poverty issue within the context of advanced countries. The only exception in this respect is provided by Bardasi and Wodon (2006), who raise some issues peculiar to developing-country cases by providing evidence from Ghana. They, however, use a framework that is not adequate for capturing the issue at hand, i.e., minimal standard of not being poor can only be jointly determined by time needs and income needs at hand. The time dimension of poverty in Bardasi and Wodon focuses on time dimension of poverty in its single dimension. Both conceptually and analytically this strand of research carries some differences from what we discuss here. Bardasi and Wodon apply the methodology used by the World Bank in calculating poverty thresholds and proceed to a headcount of the time poor. No need to mention that all of the criticisms valid for the head-count ratio measurement of poverty are valid also for the time-poverty line introduced by Bardasi and Wodon (2006).

Time in their study is the only attribute considered to identify poor. The time-poverty line is calculated considering the total individual working hours (paid and unpaid) and a lower threshold is assigned equal to 1.5 times the median of the total individual working hours distribution; a higher threshold is assigned equal to 2 times the median. If a person spends more time than the social median on paid and unpaid work activities together then that person is identified as time poor. First, the ways these two thresholds are chosen is arbitrary. Second, for a person to be time poor, spending long hours on paid and/or unpaid work is a sufficient condition independent from income level of the household they live in. Third, employed people in the market who spend long

hours doing unpaid work are highly likely to be time poor, but this might lead to bias against the unemployed who are living under extreme income poverty conditions.

In a more recent study, Bardasi and Wodon (2009) aimed to correct their omission regarding the impact of income poverty on time poverty. Categorizing people as poor and nonpoor according to money income poverty, they identify time-poor people among the income-poor group as the ones who work longer than time poverty line. In addition, they add to this group people who would fall into income poverty if they were to reduce working hours below a given time-poverty line. However, the issue of the determination of time poverty jointly by time needs and money income needs cannot be captured by the latter analysis, unlike the time-adjusted poverty thresholds explained above. Given high rates of unemployment, paid work time may be more restrictive than Bardasi and Wodon consider. Assuming that people are free to reduce their paid work hours and solve their time-poverty problem by changing their choices may not be considered very appropriate in a developing country context.

3. SCOPE OF THE STUDY AND THE PROPOSED APPROACH

Time-poverty measures, as summarized above (despite some methodological differences), share the common critical view on traditional poverty measures for being blind towards the time dimension of poverty and inequalities among people with respect to the allocation of time as a limited resource. Each measure provides a way to overcome the limitations of the traditional measurement of poverty, yet their focus has been more on the issues and problems particular to poverty situations in advanced countries. For instance, while Vickery (1977) put forth the idea that time needs of households have to be considered for minimum sufficient living standard, what she had in mind was the fact that a working single parent has to either do a second-shift to accomplish the required unpaid work or buy their market substitutes and thus needs more time or a higher income level in order to reach a sufficient living standard. Then, recognizing that Vickery's full-time employment assumption does not fit with the recent situation of employment patterns in advanced countries, Harvey and Mukhopadhyay (2007) introduced a modified method for the identification of time-poor households. Evidence shows that not only in advanced

countries, but across the globe, people are not able to choose their employment hours and full-time employment is no longer a social norm; current evidence weakens the assumption of full-time employment. With the rise in the share of part-time, irregular, and informal forms of employment, particularly in 1980s and 1990s (ILO 2002), it is highly likely for the employed to spend greater or fewer hours working than regular full-time employment hours. However, all these issues were discussed more within the context of advanced countries. Possible limitations of the existing measures from a developing-country perspective, other than a full-employment assumption, have not been discussed yet.

Unlike advanced country cases, in some developing countries there are several unpaid work activities where market substitutes and/or state provisioning options do not exist for citizens. This is the central point we want to raise in the current study. To put it simply, we question the assumption of perfectly substitutable unpaid work activities in earlier work, except for a minimum nonbinding, nonsubstitutable amount (T_0).⁶ In fact, the nonsubstitutable amount of unpaid work that is similar to paid work time varies in high degrees depending on the development level of the country. The nonsubstitutable amount of unpaid work time in a developing country context can be as binding as contracted paid work time, where unpaid work includes activities such as collecting fuel and fetching water. As it is highly unlikely to hire someone to collect water for your household, time spent on these activities cannot be assumed as perfectly substitutable in the market, because such markets usually do not exist. What if the nonsubstitutable portion of unpaid work is as restrictive as paid work? Then given the possibility of lower or zero degree of substitutability of unpaid work time in several developing countries, estimates for the required unpaid work time (T_1) explained above become problematic.

Similar to the determination of T_1 , both Vickery (1977) and Harvey and Mukhopadhyay (2007) assign the societal average as the benchmark required level for personal necessary time⁷ (the difference between 24 hours and T_m). For this assigned

⁶ T_0 is set as two hours a day in Vickery for managing the household and interacting with its members if the household is to function as a unit.

⁷ Vickery uses the observed average derived from the Michigan (United States) 1966 time use survey and adds to that ten more hours as the necessary free time per week for each adult. Then each adult is assumed to need 81 hours of maintenance each week. Harvey and Mukhopadhyay use the comparable figure from the 1998 Canadian study and they add two more hours per day to this necessary personal activities time,

personal necessary time, no time substitutions/adjustments are allowed in both studies. Thus, it must be assumed that variations among people with respect to amount of time they spend on necessary activities are negligible. However, evidence shows that in some instances people do substitute their time for personal necessary; for example they sometimes compromise their sleep in order to meet the time required for work. In particular, consider the case where they cannot substitute both paid and unpaid work time they need to spend. They find themselves with persistent time burdens that last for extended periods of time.

To drive the point home, consider a fresh graduate out of law school who is required to put in very long hours of paid work, often bordering 12–13 hour days. There may not be enough hours in the week for unpaid work, participation in family events, and/or sufficient time for sleep. In order to distinguish such cases where people engage in time substitution from the time they need to spend for their self-reproduction; we'll call these situations *time deprivation*. Time deprivation enables us to describe and categorize people according to the way they adjust their time, lacking time. Hence, the young lawyer in our example may be referred to as time-deprived.

Very long hours of paid work not only result in time deprivation, but also long hours of unpaid work together with paid work or sufficiently long hours of unpaid work by themselves may also result in time deprivation. For instance, in South Africa a single parent with two/more children living in an ex-homeland spends more than ten hours doing unpaid work, while her counterparts living in rural commercial areas spend almost thirteen hours on average.

Similarly, a taxi driver in a metropolis such as in New York City, an unemployed single parent with children living under poverty who has to collect water for cleaning, cooking, even bathing children and herself, or a live-in housekeeper (male or female) working under informal conditions in many parts of the world (especially in developing countries) are often on call 24-hours a day and can also be time deprived. While the young lawyer is subjected to very long paid working hours, household production activities can be reduced close to zero due to high received income and available market

generating a total of 12.5 hours per day and 87.5 hours per week required for personal subsistence for each adult.

substitutes. Also, the expectation of gaining more control over the allocation of his/her length of the working day down the road is a reasonable one. In the other examples we provided, people have no such prospects, neither in the immediate or distant future. This qualitative difference, based on the interconnectedness of one's earning ability and what we may call *necessary time* for paid work and unpaid work, is important to bring to the forefront.

Both the lawyer and the taxi driver are certainly time-deprived, but their time-deprivation status does not necessarily indicate that they are both time poor. In this simple example it is possible to observe that the former owns a larger capability set than the latter. Let us illuminate the difference between time deprivation and time poverty with the help of a hypothetical example from a developing-country perspective.

Assume we have two single-adult households (adult member A and B respectively) equal in size with the same composition. Assume also that both person A and person B have to spend 12 hours a day for personal necessary activities, which corresponds to their societal average (T_n^A). Then the total available time to allocate to paid and unpaid work (T_m) would also be 12 hours a day (24 hours- T_n^A) for both. As the household compositions are the same, the required amount of unpaid work (T_1) and hence available time for paid work (T_p^A) would be equal to four hours, obtained as the residual available time from total available time for work (T_m) after the required time for unpaid work (T_1) is subtracted. A summary of these statements is provided by the figures in table 3.1.

Table 3.1 Benchmark Levels (hours per day)

	Personal Necessary Time (societal average) (T_n^A)	Total Available Time for Work (T_m)	Required Time for Unpaid Work (T_1)	Available Time for Paid Work (T_p^A)
Person A	12	12	8	4
Person B	12	12	8	4

Given the societal averages for each category above, assume that actually observed time use patterns of A and B are as shown in table 3.2. Both participate in paid work, i.e., employed in the market, but while person A spends nine hours doing paid work, person B has a part-time job working only three hours per day. With respect to

unpaid work time, they actually spend five hours and eleven hours, respectively. Consider the case where person B lives in a rural area where access to water and electricity is not available and/or person B has to take care of a child who needs long hours of supervision. Hence, as shown below, B spends more than twice the amount of time spent by person A on cleaning, cooking, and/or taking care of children. Lastly, both A and B actually spend ten hours on personal necessary activities: sleeping, bathing, eating, and other personal activities—two hours less than the societal average level of personal necessary time. Given these we observe that both A and B are time deprived, with a degree of time deprivation equal to two hours per day.

Table 3.2 Time Actually Spent (hours per day)

	Actual Paid Work Time (T_p)	Actual Unpaid Work Time	Actual Necessary Time (T_n)	Time Deficit ($T_p^A - T_p$)	Time Deprivation ($T_n^A - T_n$)
Person A	9	5	10	-5	2
Person B	3	11	10	0	2

Note that despite both A and B being time deprived at equal degree, the amount of time deficit they face is different. We observe this clearly when we implement Harvey and Mukhopadhyay's modified time deficit measure. Subtracting T_1 from total available time for work (T_m) we obtain available time for paid work. Available time for paid work is equal to four hours for both. Since person A actually spends nine hours in the market she/he faces a time deficit of five hours. However, person B faces no time deficit and, in fact, it appears B has a time surplus (one hour), working only three hours in the market. As can be seen in table 3.2, regardless of the fact that both A and B spend fourteen hours for total work (unpaid work plus paid work time), only person A is identified as time poor with (five hours deficit), whereas person B shows up as time wealthy.

The traditional income poverty threshold for both households would be set at the same level of income given the same compositional characteristics of their households. However, the time-adjusted poverty threshold (by Harvey and Mukhopadhyay's measure) detects the need for a time adjustment in case of A, who works longer hours in the market. On the other hand, the standard income poverty threshold would be suggested as

relevant and sufficient for person B, even though she/he spends the same amount of time working, yet more of unpaid in nature. Thus, placing time-adjusted poverty measurement issues within the context of developing countries reveals some peculiarities of these countries, in which case adopting measures relevant for advanced countries may lead to a bias totally undesirable in poverty measurement.

Here in section 3, we tried to hypothetically show how a time-adjusted poverty measure may lead to biased results against people who also work long hours and be time deprived, but are not identified as time poor because they do more of unpaid work. Next we move to our empirical results obtained using South African data implementing, Harvey and Mukhopadhyay measure without any modifications.

4. DATA AND EMPIRICAL RESULTS: THE CASE OF SOUTH AFRICA

Data we use in our empirical analysis is provided by the first time use survey implemented in South Africa in the year 2000 (TUS 2000). The survey covers all nine provinces. Within each household, at most two people (aged ten years or above) were selected and asked what activities they had performed on the previous day. A list of all activities is provided in table A1 in appendix A.

The total sample size is 8,327 households, comprising 14,290 respondents. The subsample (6,387 households) we use is comprised of one-, two-, and three-adult households. Thirty-two percent (2,019 households) of these households are single adult, where 42 percent (2,720 households) are two-adult households. The remaining 26 percent corresponds to three-adult households (1,648 households). Full information only exists at most for two adults.⁸

We grouped households together based upon the location of the household and poverty status. Households were first categorized by an urban and rural divide. Urban households were further divided into two, as formal and informal. Formal urban residential areas include traditional residential suburban areas and city or town centers; those residing within these areas are typically middle-income or wealthy households. Informal areas, on the other hand, include shantytowns and slums.

⁸ See appendix B for the imputation method we used to include three-adult households.

Demographic structure and other selected characteristics of our sample are summarized in table A2 in appendix A. The majority of the households in the subsample live in formal urban areas (51 percent), followed by families living in informal urban areas (11 percent). The rest of the population is settled in rural areas, either in rural commercial or rural ex-homeland areas (32 percent and 7 percent, respectively). For more information on the sample, see tables A2.1–A2.4 in appendix A.

We grouped households also according to their poverty status using household income level as a criterion. TUS 2000 contains only one categorical variable on the usual monthly income of the household. Respondents were asked to indicate their monthly income based on a range of ten values and, for the purposes of this study, the midpoint value for each category was allocated as the actual monthly income per household. Midpoint levels obtained were compared with the income poverty line (table A3) based on the Bureau of Market Research's Minimum Living Level, derived using the Oxford equivalence scale for different household sizes.

Accordingly, 52 percent of total population in South Africa is living under poverty (table 4.1). Being female, African, living in a three-adult household, having at least two children, being employed, and living in rural/ex-homeland or in urban informal areas are all highly associated with income poverty. The female population corresponds to 58 percent of the people living in income-poor households and 92 percent of the income-poor population are African. The unemployed or economically inactive population comprises 30 percent of the total. In terms of residential location, 47 percent of the income-poor population is residing in ex-homeland areas and 13 percent in urban informal areas. Thirty-three percent of them are living in urban formal areas (table 4.1).

Table 4.1 Sample Characteristics: Income Poverty Status

	Income Poor (52 %)	Not Income Poor (48 %)	All (100 %)
% Female	58	53	56
% African	92	53	73
% Colored/Asian	7	14	10
% Urban Formal	32	70	51
% Urban Informal	13	8	11
% Ex-Homeland	47	16	32
% Rural	8	6	7
% Employed	34	58	4
% Not Economically Active	9	4	7
% Unemployed	27	19	23
% Not Working Age	29	19	24
% Single Adult	19	23	21
% Two Adult	44	51	47
% Three Adult	38	26	32
% No Child	25	52	38
% One Child	22	22	22
% Two or More Children	52	26	40

Going beyond the traditional income-poverty measure, in order to identify time-poor households and estimate the depth of their time deficit we follow Harvey and Mukhopadhyay's (2007) measure, as explained in the following steps:

Step 1. Derivation of Personal Necessary Time and T_m

Similar to Harvey and Mukhopadhyay, for personal necessary time we derived the median level of the time spent on each activity taking into account only the individuals who are of working age (>15 and <66). We exclude children and the elderly from our sample who are not of working age simply because the necessary time for sleeping (in a similar manner for other necessary time categories as well) might be very different from an adult of working age. In addition, we keep our reference group limited to employed adults given the fact that unemployed/economically inactive individuals spend a significantly longer time sleeping, as well as on leisure activities. Figure A1 presents distribution of time spent on sleep, leisure, and necessary care. The median levels of leisure, sleep, and necessary care time for the employed of working age are equal to 210,

540, and 120 minutes, respectively, which adds up to 870 minutes (14.5 hours) in a day.⁹ Then time available for total work (T_m) is calculated as a residual obtained when personal necessary time is subtracted from 24 hours, which corresponds to 9.5 hours in South African case.

Estimates for personal necessary time have been identified as 12.5 hours in Harvey and Mukhopadhyay, while it is 10.5 hours in a day in Vickery. Vickery uses the average of 10.2 hours per day; this estimate consists of sleeping (7.6 hours), resting (.3 hours), eating (1.2 hours), and personal care (1.1 hours), derived from the Michigan (United States) 1966 time use survey and adds to that ten more hours as the necessary free time per week for each adult. Then each adult is assumed to need 81 hours of maintenance each week. Harvey and Mukhopadhyay use the comparable figure of 10.5 hours from the 1998 Canadian study and they add two more hours per day to this necessary personal activity time, generating a total of 12.5 hours per day and 87.5 hours per week required for personal subsistence for each adult. Compared to earlier estimates, South African adults spend longer hours sleeping, which might indicate a higher rate of unemployment in South Africa relative to the United States and Canada.

Step 2. Derivation of Required Household Work Minimum (T_1)

Following Harvey and Mukhopadhyay, we calculate the average required minimum for unpaid work conditional on the number of adults in the households and the number of children living in the household younger than 16 years. Similar to their method, the means are established from households in which one of the adult members reported herself/himself as the homemaker, i.e., main responsible person for house work¹⁰ (5,425 households out of 6,387). Table 4.2 below presents the conditional means for unpaid work time specific to different types of households in the case of South Africa.

⁹ On average, South African adults of working age spend 9 hours 20 minutes sleeping, 2 hours 38 minutes on necessary care activities, 3 hours 5 minutes doing unpaid work, and 2 hours 40 minutes on paid work.

¹⁰ For the benchmark time spent on home maintenance (housekeeping in her case), Vickery only takes into account the time allocation of women who are employed full time in the market, arguing that housekeeping is subject to great variation unlike other types of unpaid work time. Harvey and Mukhopadhyay do not find a significant variation on that and do not make the distinction among the unemployed and employed respondents. Here, following Harvey and Mukhopadhyay, we also do not make that distinction.

Table 4.2 Estimates of T_1 per Adult (in minutes)

	No Children	One Child	Two or More Children
Single Adult	151.11	306.80	392.54
Two Adult	145.80	203.83	234.43
Three Adult	130.52	166.60	201.48

Step 3. Derivation of Time Deficit/Surplus

Subtracting T_1 from T_m we obtain the available time for market work. Then comparing available time for market work with the actual time South Africans spend on paid work, we are able to find whether they face a time deficit or surplus. Time deficit implies they need more money income to substitute the unpaid work time they lack. For those households, the time-adjusted poverty line also covers the amount of income that is needed to compensate for the difference between the time actually spent unpaid work and the amount that is necessary.

Accordingly, our estimates show that 18 percent of the total population face a time deficit. Supporting Harvey and Mukhopadhyay's findings, a higher percentage among the single-adult households (34 percent) are time poor (table 4.3). Among single-adult households who are time poor, 25 percent have two or more children and 14 percent have one child (tables A.4 and A.5 in appendix A).

Table 4.3 Percent of Population with Time Deficit/Surplus

	Households with Time Surplus	Households with Time Deficit	Total
% Single Adult	66	34	100
Col. Per.	17	38	21
% Two Adult	82	18	100
Col. Per.	47	46	47
% Three Adult	91	9	100
Col. Per.	36	16	32
% Total	82	18	100
Col. Per.	100	100	100

Table 4.4 provides information on the depth of the time deficit/surplus. Except for the single-adult households who are employed in the market and living with at least one child, all other households, on average, have a time surplus.

Table 4.4 Mean Time Deficit/Surplus per Adult (in minutes)

	All Adults Unemployed/Inactive	One Adult Employed	Two/Three Adults Employed
Single Adult			
No Children	345.72	62.41	
One Child	215.96	-31.22	
Two or More Children	112.07	-64.05	
Two Adult			
No Children	383.79	225.09	85.72
One Child	299.30	161.81	96.42
Two or More Children	260.48	136.43	11.88
Three Adult			
No Children	337.26	265.24	154.89
One Child	301.79	195.28	139.75
Two or More Children	279.70	195.49	131.51

Using the estimates above, one can set up a new time-adjusted poverty threshold for South Africa via adding the monetized value of the time deficit onto the traditional poverty threshold for the households with a time deficit. Rather than establishing time-adjusted poverty threshold levels, for our purpose here, we show that there could be some people who are not included among the time-poor group despite the fact that they are time deprived when these measures are adapted to developing countries without any modifications.

We grouped households according to their time-deprivation status, i.e., calculating the difference between the amount of time people actually spent on necessary personal activities and the benchmark level for necessary personal activities (median level as explained in step 1, above) and we identify the households whose adult members spend less/more time on doing necessary personal activities than the benchmark. By this, we categorize households whose adult members are time deprived (TD) versus not time deprived (NTD). Combining time-deprivation and income-poverty status, we are also able to categorize households identified as: 1) income poor and time deprived (PTD); 2) not income poor, but time deprived (NPTD); 3) income poor, but not time deprived (PNTD); and 4) neither income poor nor time deprived (NPNTD).

Table 4.5 presents the demographic characteristics of our sample, taking into account their time-deprivation status. As can be observed, being female, being African,

living in ex-homeland, being elderly (not working age), living in a single-adult household, and having at least two children are all highly associated with being income poor and, at the same time, being time deprived.

Table 4.5 Sample Characteristics: Income Poverty and Time Deprivation Status

	PTD	NPTD	PNTD	NPNTD	All
% Female	61	47	58	55	56
% African	92	54	92	52	73
% Colored/Asian	7	16	7	13	10
% Urban Formal	24	70	34	70	51
% Urban Informal	13	10	14	7	11
% Ex-Homeland	51	11	46	17	32
% Rural	12	9	7	5	7
% Employed	49	81	31	52	46
% Not Economically Active	12	6	30	22	23
% Unemployed	7	2	10	5	7
% Not Working Age	32	11	28	22	24
% Single Adult	44	35	13	19	21
% Two Adult	39	50	45	51	47
% Three Adult	17	15	42	30	32
% No Child	21	52	26	52	38
% One Child	19	22	23	22	22
% Two or More Children	60	26	51	26	40

Note: The row total does not add up to 100 since each cell corresponds to the percentage of the group living in the households in the header row. For example, 61 in the top first cell shows that 61 percent of the people living in PTD households are female.

In addition, figures in table 4.6 show that 52 percent of the total population is living under income poverty in South Africa. Almost 10 percent of the total population is living under income poverty as well as being time deprived. However, among the income-poor and time-deprived group, 46 percent of them appear to have a time surplus rather than deficit (highlighted cells in table 4.6) and thus no time adjustment is considered for these people. The other 54 percent of time-deprived and income-poor households are identified as time poor by Harvey and Mukhopadhyay's measure and their standard threshold level of poverty is suggested to be adjusted by the amount of time deficit they face.

Table 4.6 Percent of Population with Time Deficit/Surplus: Income Poverty and Time Deprivation Status

	PTD	NPTD¹¹	PNTD	NPNTD	Total
% Time Surplus HHs	5	2	50	43	100
Column Percentage	46	15	96	93	82
% Time Deficit HHs	28	49	9	15	100
Column Percentage	54	85	4	7	18
% Total	9	10	43	37	100
Column Percentage	100	100	100	100	100

Among the PTD households, some are considered as time poor and some appear as time wealthy. At this point it is possible to ask the question, what makes this difference between the two groups, why do some of the PTD households not appear to have a time deficit? Who are these income-poor and time-deprived people that as time wealthy?

Table 4.7 presents some characteristics of this missing group among the time-poor households. As can be seen, 65 percent are female and 92 percent African. While 42 percent correspond to single-adult households, 35 percent are living in two-adult households. Among the single-adult households, 71 percent have two or more children (see table A6). Living in an ex-homeland is highly associated with falling into this group (see table 4.7 and table A7). In addition, not being of working age, being a single adult, and also having at least two children are among other likely characteristics of the group.

¹¹ We discuss the characteristics the PTD who appear as time wealthy in detail in the following because we think that all PTD households should be considered as time poor by any measure. However, note that there might be some people among NPTD households who should be counted as time poor, but show up in time-wealthy group. In order to determine who would be time poor among this group, we need a modified measure, which will be discussed in another paper. Thus, here we limit our discussion to the income-poor and time-deprived group.

Table 4.7 Characteristics of Missing PTD Households

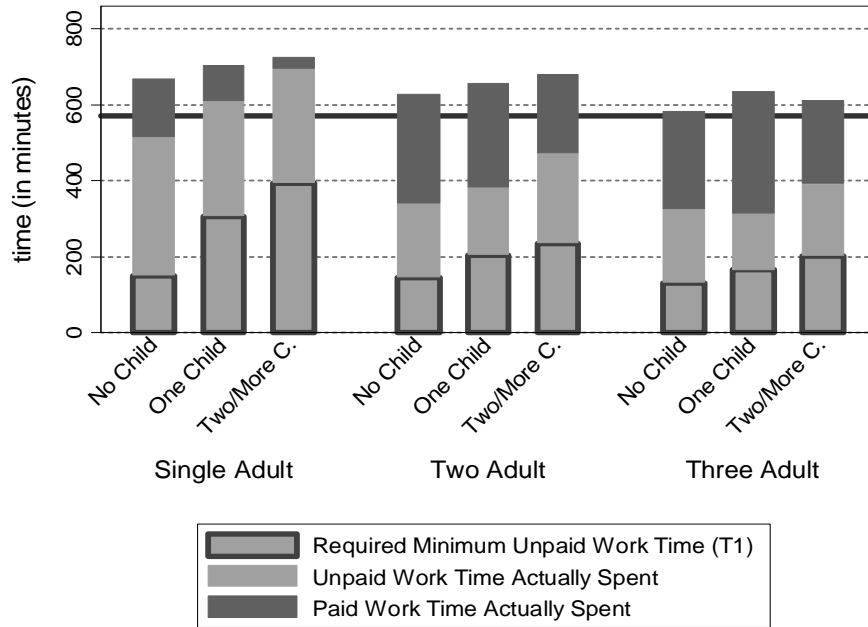
	PTD with Time Surplus	All
% Female	65	57
% African	92	74
% Colored/Asian	7	10
% Urban Formal	17	49
% Urban Informal	11	11
% Ex-Homeland	62	35
% Rural	9	6
% Employed	34	39
% Not Economically Active	21	27
% Unemployed	7	7
% Not Working Age	38	26
% Single Adult	42	17
% Two Adult	35	47
% Three Adult	23	36
% No Child	13	37
% One Child	17	23
% Two or more Children	70	40

Note that a majority of the adult members of the missing group are women (65 percent). This is particularly true for single-adult households. Demographic characteristics based on the sex of the adult member show that 86 percent of the adult members are women in single-adult households (table A8 in appendix A). Among the single-adult households where the adult member is female, we observe that 76 percent of them are living in an ex-homeland and 10 percent live in urban informal areas. In addition, with respect to their employment status, we observe that more than half of them are either unemployed (13 percent) or economically inactive (38 percent).

When we compare the time use pattern of the PTD households with time surplus with societal averages we find some evidence to answer why some of them are missing among the time-poor group. As can be observed in figure 4.2, these PTD households spend a much higher amount of time on unpaid work in comparison to the society's average (shown as the light gray portion of the bars bordered with dark gray outline). As expected they spend a very limited amount of time in the market (shown with dark gray parts). Allocation of total work time among unpaid and paid work presented in figure 4.2

shows that the missing group members spend almost twice as much as the societal average of required unpaid work time (T_1).¹²

Figure 4.2 Unpaid and Paid Work Time by PTD with Time Surplus (per adult)



We observe that adult members in this missing PTD group spend more time doing unpaid work than the societal average of required minimum (T_1). A more detailed analysis of their time use pattern is needed in order to understand the underlying reasons, yet some simple estimates may provide insights on the issue. For instance, while, on average, a single-adult households without children spends only four minutes on water and fuel collection, among these missing PTD households, single adults without children spend thirty-two minutes and single adults with children spend one hour. Similarly, we also see that this subgroup spends more time on home maintenance activities (the difference is one and a half hours for single adult with one child where the difference is more than two hours for single adult with two/more children), as well as on social care

¹² The thick horizontal reference line at the top shows the benchmark level for total work time (T_1 + paid work time). If an adult spends more time on work than this benchmark then she/he is identified as time poor. If we add up the paid work time to the required unpaid work time (leaving the part of unpaid work time above the required unpaid work benchmark outside) then we can see that the total amount would be less than the time available for total work. Note that when compared to two-adult and three-adult households, single-adult households (and among them, particularly the single adult with two or more children) are the most severely time-deprived group.

(the difference is one and a half hours for a single adult with one child, where the difference is around forty minutes for single adult with two/more children). Analysis of the group according to different sample characteristics may provide better explanations on why they appear time wealthy although they are time deprived. Figure A2 in appendix A presents time use patterns of each subgroup according to the different residential location. Observations on the variations in terms of the depth of time deprivation and the underlying reason behind time deprivation can be derived from these figures. This type of analysis helps to identify the subgroups that are in desperate need of some policy intervention relative to others and might improve understanding of income poverty and time-deprivation status in terms of the specifics of their needs.

5. CONCLUSION

Traditional poverty measures do not consider inequalities across households with respect to their time resources. Few studies consider time as a limited resource and discuss the relevance of time inequalities in poverty analysis. Among these, one strand of research constructs and discusses time-adjusted poverty thresholds, on which this study centers. The thresholds are built using several assumptions that may work well with advanced country cases, but do not fit in the context of developing countries.

Here, we raise issues particular to developing countries, suggesting that there is a need for a different approach to time-poverty issues, particularly in some developing countries. Given the close association of unpaid work burden and poverty, which is stronger in case of developing countries, we argue that a nonsubstitutable amount of unpaid work time can be as binding as paid work time. Consider the fact that unpaid work activities in some developing countries include activities such as collection of water and fuel for which market substitutes do not usually exist or reachable. Nonmarketable unpaid work activities are fundamentally necessary for households living under poverty and, in general, hinder people's paid work participation. Thus unpaid work time can be as restrictive as paid work time in determining the time deficit/wealth of people.

Introducing the concept of time deprivation, we analytically construct our arguments and provide supporting empirical evidence by reproducing Harvey and

Mukhopadhyay's (2007) measure of time-adjusted poverty using South African time use data. We show that though their method works well for Canada, it might discriminate against certain social groups when adopted in a developing country case without any modification, for instance, in a country like South Africa. The results we obtain present that the measure cannot capture some income-poor and time-deprived households whose adult members also spend long hours doing work, yet appear as time wealthy due to the nature of work they do—unpaid work.

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APPENDIX A

Table A2.1 Demographic Characteristics (% of total population)

Number of Adult Members		Number of Children	
Single Adult	21	No Child	38
Two Adult	47	One Child	22
Three Adult	32	Two/More Children	40
Total	100	Total	100
Race		Sex	
African	73	Female	56
Colored/Asian	10	Male	44
White	17	Total	100
Total	100		
Employment Status		Residential Location	
Employed	46	Urban Formal	51
Unemployed	7	Urban Informal	11
Not Economically Active	23	Ex-homeland	32
Not Working Age (age <16 or >65)	24	Rural	7
Total	100	Total	100

Table A2.2 Characteristics (cont.)

Main Source of Household Income (% of total population)	
Wage/Salary/Piecework Pay/Commission	55
Earnings From Own Business or Farm	9
State Grants	16
Private Pension	3
Unemployment Insurance Fund	1
Investments	1
Money from Other Household Members	12
Remittances from People outside the HH	1
Private Maintenance	2
Total	100

Table A2.3 Characteristics (cont.)

	Emp.	Unemp.	Not Econ. Active	Not Working Age	Total
Wage/Salary/Piecework Pay/Commission	74	40	40	38	55
Earnings From Own Business or Farm	13	5	6	8	9
State Grants	5	12	21	32	16
Private Pension	1	2	5	4	3
Unemployment Insurance Fund	0	4	1	1	1
Investments	0	1	1	2	1
Money from other Household Members	5	26	23	13	12
Remittances from People outside the HH	0	2	2	1	1
Private Maintenance	1	8	2	1	2

Table A2.4 Characteristics (cont.)

Dwelling Type (% of total population)	
House or Brick Structure on a Separate Stand or Yard	56
Traditional Dwelling/Hut/Structure Made of Traditional Materials	15
Flat in a Block of Flats	7
Town/Cluster/Semi-Detached House	3
House/Flat/Room in Backyard	2
Informal Dwelling in Backyard/Shack in Backyard	2
Informal Dwelling/Shack Elsewhere, e.g. in Informal Settlement or Traditional Area	13
Room(S)/Garage not in Backyard, but on a Shared Property	1
Caravan/Tent	0
Other, Specified	2
Total	100

Table A3. Poverty Income by Household Size

Household Size	Rand per month
1	587
2	773
3	1028
4	1290
5	1541
6	1806
7	2054
8+	2503

Source: South African Regional Poverty Network (SARPN), 2004.

Figure A1. Distribution of Sleep, Leisure, and Necessary Care

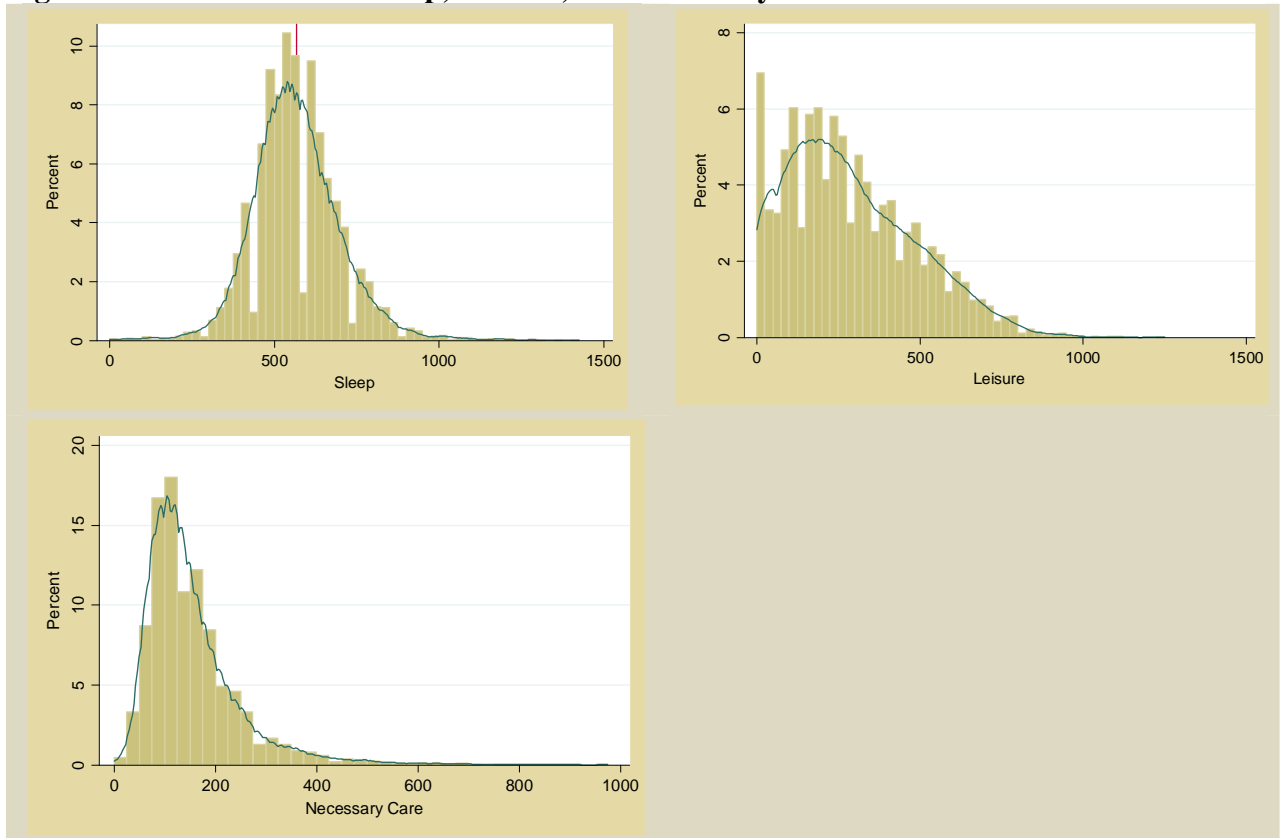


Table A4. Population Distribution According to Time Poverty Status (cont.)

Households	With Time Surplus	With Time Deficit	Total
Single Adult	17	38	21
No Children	9	23	12
One Child	3	5	3
Two/More Children	5	10	6
Two Adult	47	46	47
No Children	18	17	18
One Child	11	9	11
Two/More Children	18	19	18
Three Adult	36	16	32
No Children	9	4	8
One Child	9	5	9
Two/More Children	17	7	15
Total	100	100	100

Table A5. Distribution of Households According to Time Poverty Status (cont.)

Adult Number	Living in HHs with Time Surplus				Living in HHs with Time Deficit			
	No Children	One Child	Two/More Children	Total	No Children	One Child	Two/More Children	Total
Single Adult	53	16	31	100	61	14	25	100
	24	12	13	17	53	27	27	38
Two Adult	39	23	38	100	37	21	42	100
	50	48	45	47	39	46	55	46
Three Adult	26	26	48	100	24	35	42	100
	26	40	43	36	8	27	18	16
Total	37	23	40	100	44	20	36	100
	100	100	100	100	100	100	100	100

Table A6. Characteristics of PTD Households with Time Surplus—Household Composition

	No Children	One Child	Two/More Children	Total
% Single Adult	8	21	71	100
Column Percentage	26	51	43	42
% Two Adult	21	11	69	100
Column Percentage	56	22	35	35
% Three Adult	10	21	69	100
Column Percentage	18	27	22	23
%Total	13	17	70	100
Column Percentage	100	100	100	100

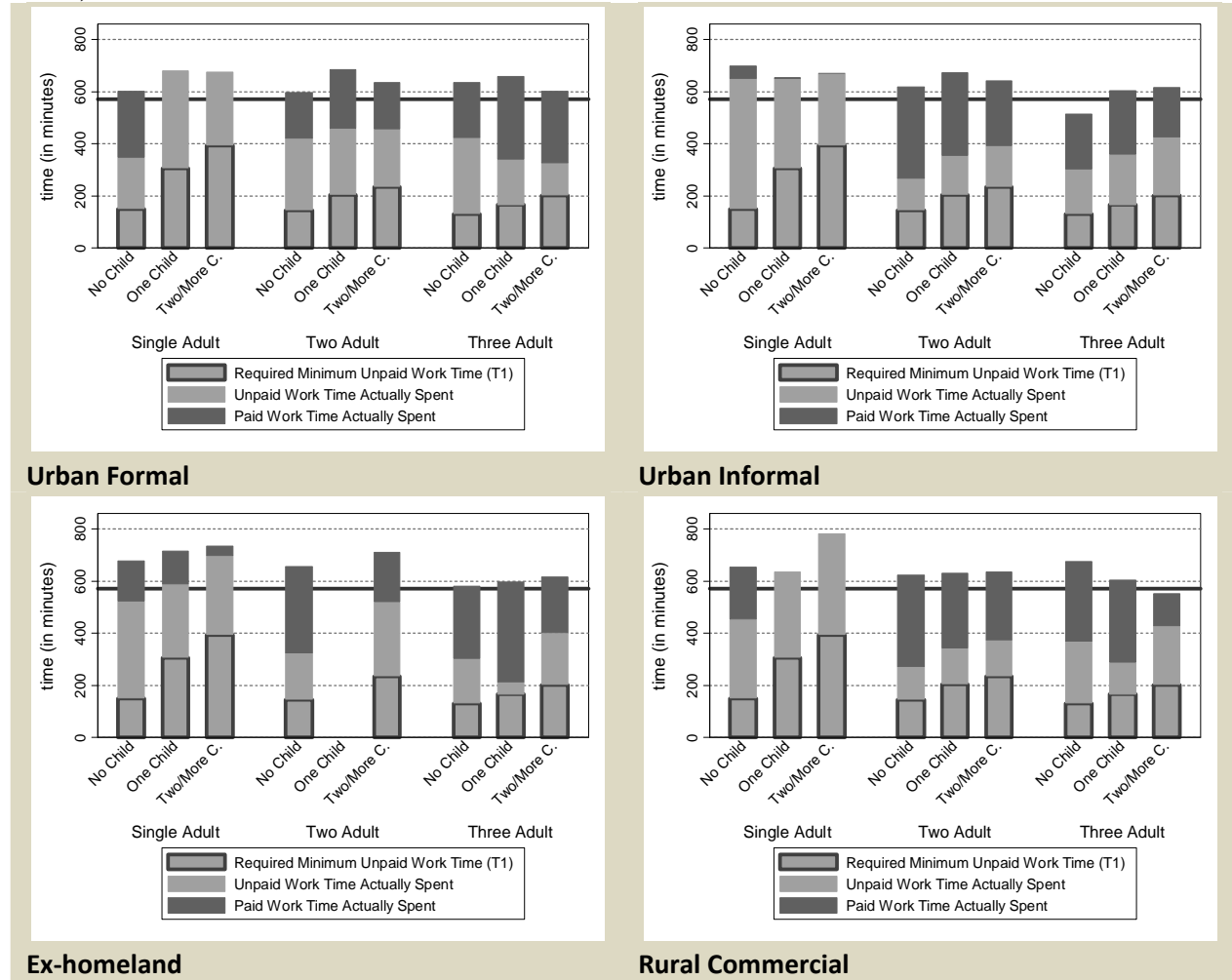
Table A7. Characteristics of PTD Households with Time Surplus—Residential Location

	Urban Formal	Urban Informal	Ex- homeland	Rural	Total
% Single Adult	9	9	78	3	100
Column Percentage	23	35	53	15	42
% Two Adult	22	12	48	18	100
Column Percentage	45	37	27	70	35
% Three Adult	25	14	55	6	100
Column Percentage	33	28	20	15	23
%Total	17	11	62	9	100
Column Percentage	100	100	100	100	100

Table A8. Characteristics of the PTD Households with Time Surplus—Gender

Adult Members			
	Male	Female	Total
% Single Adult	14	86	100
Column Percentage	18	41	34
% Two Adult	40	60	100
Column Percentage	58	34	41
% Three Adult	27	73	100
Column Percentage	24	26	25
%Total	28	72	100
Column Percentage	100	100	100

Figure A2. Mean Time Spent on Unpaid and Paid Work According to Location (per adult)



APPENDIX B

In this part, we first summarize the imputation method we used in order to include three-adult households into our analysis and present problems we addressed due to lack of data availability while working with South African TUS 2000 data.

1. Data is collected from a limited number of people in each household

Two people, aged ten years or above were selected systematically for TUS 2000 within each household and asked what activities they had performed on the previous day. We do not have time use information of every member of the household. In case data were available, we would be able to calculate, for instance, required time for unpaid work for each household. In addition, complete information on personal diaries is only available for the single-adult and two-adult households on the condition that both adults are selected as respondents for demographic questionnaires and time use diaries. The total amount of unpaid and paid work time spent by all members of the households could only be calculated for these households.

Lack of time use diaries of the adults who are not selected made us use an imputation method to impute the values missing. The problem of missing data is sometimes solved by using only the available instances of complete cases or using some indicator variables that are filled with the mean or mode of the nonmissing values of that variable. Some approaches allow for missing data. The multiple imputation method is a general and more appropriate method for dealing with missing data (Rubin 2004). Here we used the multiple imputation method¹³ in order to include three-adult households in our sample by imputing the required variables for the third adult analyzed. Here, switching regression method of multiple multivariate imputation is implemented as described by van Buuren, Boshuizen, and Knook (1999). The procedure followed is summarized in Royston (2004:233).

Through imputation we were able to cover single- to three-adult households, after which our sample added up to 77.1 percent of the whole survey data. When three-adult households are excluded, only 57.2 percent of the data set would be covered. Imputation

¹³ See Rubin (2004) and Royston (2004) for a detailed discussion on multiple imputation of missing values.

of paid work time and unpaid work time has been done in two steps. First, a probabilistic imputation is addressed in order to determine whether the third adult is employed in the market or not. Information on the employment status of the adults that are not selected is not available in the data. While imputing the amount of paid work time we excluded people who are not employed in the market. Missing values imputed correspond to 23.6 percent of the sample. Kernel density functions obtained for paid and unpaid work time are provided by figures B1 and B2, below.

Figure B1. Paid Work Time

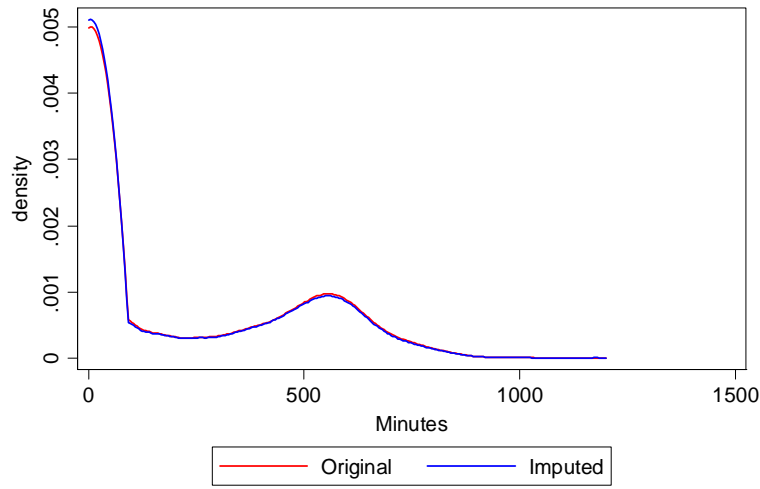
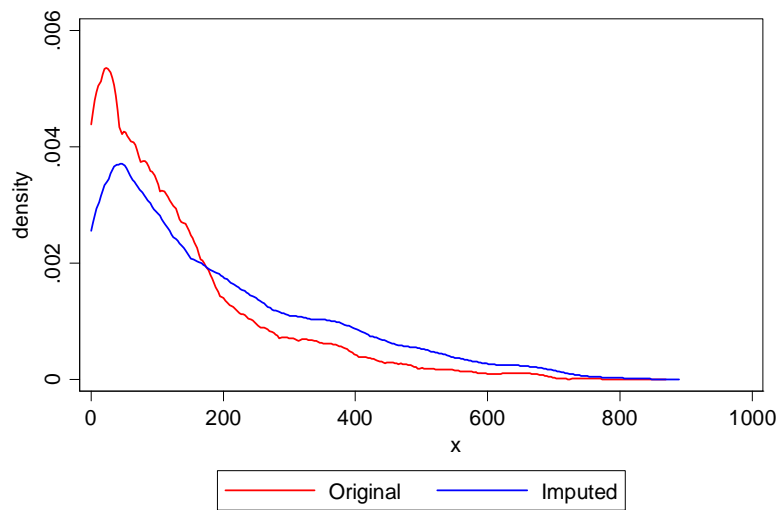


Figure B2. Unpaid Work Time



2. Lack of data availability with respect to income variables

TUS 2000 questionnaires do not include information of the actual level of income earned. Instead, the usual total monthly income of the household/individual (including all sources) is provided in income ranges, thus the available income variable is a categorical one. In order to classify households according to their poverty status, we calculated the midpoint within each range of income levels and used these midlevel values in

identifying the poverty status of the households. Categories for the households' income given are as follows (with midpoint shown in brackets):

R0–R399	(R200)
R400–R799	(R600)
R800–R1 199	(R1000)
R1 200–R1 799	(R1 500)
R1 800–R2 499	(R2 150)
R2 500–R4 999	(R3 750)
R5 000–R9 999	(R7 500)
R10 000 or more	(R15 000)

The personal questionnaire provides information on income earned by each respondent; however, categories assigned for the household income level do not match with the categories designed for the individual monthly income. Thus, given the possibility that the midpoint of personal income might be higher than the midpoint of the corresponding household income range, we avoid using personal income in our calculations. Classifications for the usual total monthly personal income from all sources are as follows:

No personal income
R1–R500
R501–R1 000
R1 001–R5 000
R5 001–R10 000
R1 001 plus
Payment only in-kind
Don't know
Refusal