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Multidimensional Deprivation in China, India and Vietnam: A Comparative Study on Micro Data[a]

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Abstract:

This study compares living standards in China, India and Vietnam using the recent multidimensional approach. A distinguishing feature of this study is the use of unit record data sets containing household level information on a wide range of variables including access to several dimensions of living, wealth and child health. The study uses household level information on a wide variety of indicators and the methodology of Principal Component Analysis to measure household wealth. The wealth index is then used to examine the distribution of deprivation and poverty by wealth percentiles. This paper uses the Lorenz curve for wealth and the pseudo Lorenz curves for deprivation and poverty to show that wealth, used here as a proxy for income, understates deprivation and poverty in all the three countries. The paper also provides evidence on child health, which is at odds with the overall progress that is portrayed by the multidimensional measures.

Key Words: Multidimensional Deprivation, Wealth Index, Principal Component Analysis, Sub group Decomposability.
JEL Classification: I10, I31, I32, O1.

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1. Introduction

Inspired by the work of Sen (1985, 1999), there is now widespread agreement that deprivation is multidimensional and cannot be adequately captured by unidimensional measures such as the expenditure poverty rate, and that nations should not be ranked simply by their per capita GDP. Sen's argument rests on a distinction between "capabilities" and "functionings" where the former refers to what a person can ultimately do, and the latter describes an individual's freedom to enjoy the "functionings". An early practical consequence of this new approach was the adoption of the Human Development Index (HDI) by the United Nations Development Program in its first Human Development Report in 1990 [UNDP (1990)]. The HDI, that implements the idea of multidimensional deprivation, is a simple unweighted average of measures of literacy, life expectancy and per capita GDP. Further evidence of this new thinking was evident in the adoption by the world's leaders in September, 2000 of the UN Millennium Development Goals "committing their nations to stronger global efforts to reduce poverty, improve health and promote peace, human rights and environmental sustainability" [UNDP (2003, p.15)]. In this new thinking, while reducing global income poverty remained an important aim, it was supplemented by a time frame for achieving progress on a wide selection of dimensions, besides poverty, namely hunger, primary education, gender equality, child mortality, access to water and access to sanitation [UNDP (2003, Fig. 2.10)]. There were national ramifications too of the move to base policy decisions on a basket of dimensions. The National Anti-Poverty Strategy of the Irish Government, as described in Layte, Nolan and Whelan (2000), or the identification of households that lived below the multi-dimensionally defined poverty line in India, referred to as BPL households [see Alkire and Seth (2009)], are examples of strategies that rested on a multidimensional view of poverty.

In the two decades that have elapsed since the HDI was first used in the UNDP's first Human Development Report in 1990, much attention has been paid to the refinement and extension of the HDI. While the continued use of the HDI in successive HDRs and elsewhere testifies to its advantages, especially as a basis for cross country welfare comparisons involving nations at various stages of development, its criticisms include the suggestion that the selection of three attributes is quite restrictive [Anand and Sen (1993)], the need to attach different weights to the three attributes by different countries that is not allowed in the simple HDI formulation [Srinivasan (1994)], and the restrictive assumption of perfect substitutability between any two of the three attributes of development underlying the measure [Kelley(1991)].

Two key criticisms of the HDI are: (a) it is a composite index that measures average achievement in three basic dimensions of human development rather than that of the most deprived who need to be targeted in policy interventions, and (b) it ignores the distribution of deprivation between attributes and between households. The former limitation led to the formulation in 1997 by the UNDP of the Human Poverty Index (HPI) that, like the HDI, is

also a composite index but is focussed on those with low incomes, and its use in the 1997 Human Development Report [UNDP (1997)] . The HPI has subsequently been generalised by Chakravarty and Majumder (2005) to allow incorporation of a wider set of dimensions and general non-linear functional forms that satisfies a set of poverty axioms. The second limitation has seen the introduction of alternative multidimensional measures of deprivation in several recent contributions that take the individual or household, rather than the country, as the unit of analysis. These measures are based on the number of dimensions that a household is deprived in and then aggregating the household level information into an overall measure of multidimensional deprivation. Examples include Bourgignon and Chakravarty (2003), Chakravarty and D'Ambrosio (2006), Jayaraj and Subramnian (2010), and Alkire and Foster (2009). A key difference between the earlier HDI, HPI measures and the more recent multidimensional deprivation, poverty measures is that while the former starts with the dimensions and aggregates the dimension specific deprivation rates (as percentage of population) into an overall measure, the latter starts with the household and then aggregates the household specific deprivation rates (as the proportion of dimensions) into the overall measure. Since the latter need household level data, the informational requirements of the recent multidimensional deprivation measures are much greater than the earlier aggregated measures such as HDI, which were based on national averages. The trade off is that the recent measures are more policy friendly in allowing the identification of dimensions and population subgroups that are the prime contributors to deprivation and need to be targeted in policy interventions. The need to come up with a single number that aggregates the deprivation failures across dimensions and over households poses challenges that have been analysed, and the relationship with the social welfare based approach examined, by Atkinson (2003). In a reflection of the developments in the literature on multidimensional deprivation during the first decade of the new millennium, the 2010 Human Development Report [UNDP (2010)], that marked the end of two decades since the first HDR was published in 1990, ranks countries on the basis of the Multidimensional Poverty Index (MPI) proposed by Alkire and Foster (2009). The calculations are reported and analysed in greater detail in Alkire and Santos (2010). Though the terms "poverty" and "deprivation" are used interchangeably in the recent literature on multidimensional deprivation, the former refers to households that are identified as "poor" based on a poverty line cut off, similar in spirit to the traditional poverty concept but based on multiple dimensions, while the latter refers to the deprivation faced by the entire population. Alkire and Foster (2009), Alkire and Santos (2010), are examples of the former, while Chakravarty and D'Ambrosio (2006) and Jayaraj and Subramanian (2010) are examples of the latter. In the following discussion, we will refer to the former as "multidimensional poverty" (MDP) and the latter as "multidimensional deprivation" (MDD).

The principal motivation of this study is to provide comparative empirical evidence on both multidimensional deprivation and poverty from three Asian countries, namely, China, India and Vietnam. These countries stand out in terms of their economic performance in the last two decades. China and India, which have been referred to as "awakening giants" by Bardhan (2010), have recorded some of the highest growth rates seen anywhere, thereby, generating a large literature comparing their economic performances. Much of this literature is based on macro indicators such as growth rates, and very little of the comparisons are based on living

standards. Bardhan (2010, Tables 6-8) contains comparative evidence on the expenditure poverty rates in India and China. However, as the evidence presented in Klasen (2000) and Ayala, et. al. (2011) show, the link between expenditure poverty and multidimensional poverty is at best a weak one. This study marks a departure by comparing these giant economies on the basis of multidimensional deprivation and poverty measures calculated from unit record data. The inclusion of Vietnam adds to the interest of this study. Vietnam is a particularly interesting example because, following the 'Doi Moi' ('renovation') reforms in the mid 1980s, there has been a dramatic improvement in living standards as measured by the conventional monetary indicators- see World Bank (2000) and the volume edited by Glewwe, et. al.(2004). As Alkire and Santos (2009) report, Vietnam, ranked 50 in a list of 104 countries based on its poverty estimates, is far ahead of India (ranked 74) and marginally below China (ranked 44). This study provides evidence on whether the improvement in Vietnamese performance revealed by the macro figures translated to a decline in multidimensional deprivation during the 1990s and beyond. The inclusion of Vietnam also helps to put the performances of India and China in perspective. The robustness of the evidence to the use of MDD or the MDP measure following the distinction between the two is a significant point of departure of this study from other recent studies all of which have used one or the other.

Other contributions of this study include the construction of a wealth index on a consistent basis across the three countries. This allows the comparison of the mean value of the wealth index and of wealth inequality between the three countries and presentation of evidence on the strength of association between the distributions of wealth and deprivation in China, India and Vietnam. The calculation of wealth inequality between China and India based on a consistently constructed wealth index helps to overcome the comparability problem encountered in making inequality comparisons between China and India based on income or expenditure, since the widely used NSS data in India does not provide income figures, while expenditure figures are rarely available in China. This paper provides evidence that confirms that wealth deprivation significantly understates dimensional deprivation, namely, deprivation in the quality of life. This provides a strong justification for the recent move away from income or wealth towards the multi dimension measures. However, a significant limitation of the multidimensional measures is that it is subject to precisely the same limitation that affects the conventional poverty measures, namely, aggregating deprivation rates over a wide range of dimensions into a single number. For example, there are some dimensions that need to be studied in isolation in view of their importance per se and the need to address deprivation in such dimensions in specifically targeted policy intervention. One such dimension is child health, which has figured prominently in the development literature. The present study adds to this literature by providing comparative evidence on child health in China, India and Vietnam.

The plan of the rest of the paper is as follows. The multidimensional deprivation and poverty measures are contrasted in Section 2. The data sets are briefly described in Section 3 along with a discussion of the construction of the wealth index. The results are presented and analysed in Section 4. The paper is concluded in Section 5.

2. Measuring Multidimensional Deprivation and Multidimensional Poverty: the contrasting approaches

Though the terms "multidimensional deprivation"(MDD) and "multidimensional poverty" (MDP) are used synonymously in the recent literature, the former is a measure of the dimensions failure of all households, while the latter measures the deprivation of only a subset of households that is defined as the "poor". While the measurement of multidimensional deprivation (MDD) requires only a dimension specific cut off that defines deprivation in that dimension, i.e., a "dimension failure", multidimensional poverty (MDP) requires an additional cut off in terms of the minimum number of "dimension failures" that defines a "poor" household. The dependence of the MDP measure on two a priori specified cut offs increases its subjectivity over the MDD. The poverty line cut off exposes the MDP measure to controversy over what that poverty line should be that has characterised the conventional unidimensional poverty measures. This can be a significant issue in international comparisons since what is a reasonable cut off in one society may not be so in another. MDD avoids this since it does not require an arbitrary definition of a "poor" household. Both measures encompass the "union" (i.e., deprivation failure in one or more dimensions) and "intersection" (i.e., deprivation in all dimensions) measures as limiting cases. The principal advantage of MDP over MDD is that it is decomposable in not only population subgroups (that MDD is as well), but also in dimensions. In other words, MDP allows not only the identification of subgroups that require targeted intervention (that MDD does as well), it also allows the identification of dimensions that are the prime contributors of deprivation (that MDD does not allow except in the union case).

Following the notation used by Jayaraj and Subramanian (2010), let n_j denote the number of households that are deprived in exactly j dimensions, $j \in \{0,1,\dots,K\}$ and let the total number of households be denoted by n. Then, three possible headcount rates of deprivation are as follows.

$$H^I = \frac{n_K}{n} \tag{1}$$

$$H^U = \frac{(n_1 + n_2 + \cdots \dots \dots \dots + n_K)}{n} = \sum_{j=1}^{K} H_j \tag{2}$$

$$H_{j^*} = \frac{(n_{j^*} + \cdots \dots + n_K)}{n} = \sum_{j=j^*}^{K} H_j \tag{3}$$

where, $H_j = \frac{n_j}{n}$, $j \in \{1,\dots,K\}$ and H^I, H^U and H_{j^*} are headcount rates of multidimensional deprivation. While H^I denotes the headcount deprivation rates of households who are derived in all the K dimensions, and is referred to as the "intersection method", H^U denotes the corresponding headcount rates of households that are deprived in at least 1 dimension and is referred as the "union method". It is clear that while H^I understates the magnitude of deprivation, H^U overstates it. Alternatively, H^I measures the magnitude of extreme deprivation, while H^U measures the aggregate of mild, moderate and extreme deprivation. A compromise is H_{j^*}, which lies between H^I and H^U, where j^* is specified a priori. It

approaches the former when j^* moves towards K, and approaches the latter when j^* moves towards 1.

The MDD measure, as formulated by Jayaraj and Subramanian (2010), is defined as follows:

$$\pi_\alpha = \sum_{j=1}^{K} \left(\frac{j}{K}\right)^\alpha H_j \ , \qquad \alpha \geq 0 \qquad (4)$$

As α increases from 1 to higher values, π_α gives greater weight to the deprivation rates of households that are deprived in more and more dimensions and, at very high α values, it measures the magnitude of extreme deprivation. At α=0, π_α coincides with the union measure, H^U. As $\alpha \to \infty$, π_α approaches the intersection measure, H^I.
π_α satisfies the following principal[1] properties:

1. Anonymity: The identity of the individuals does not affect the deprivation measure.
2. Ceteris paribus, if the range of deprivation, i.e., the number of deprivation dimensions increases, then the measure will register an increase.
3. Ceteris paribus, if a household *'i'* suffers deprivation in one more dimension but household *'j'* experiences deprivation in 1 less dimension, and household 'i' is deprived in more dimensions than household *'j'*, then the measure will register an increase in deprivation. This property will hold if $\alpha > 1$ and is analogous to the Pigou-Dalton transfer principle in the context of income transfer.
4. The deprivation measure is additively decomposable in the population subgroups, i.e., can be written as a population share weighted average of the subgroup deprivation measures. This property is satisfied if $\alpha \geq 0$, and is particularly convenient in the context of the present study.

The MDP measure that is used here for a comparison with the MDD measure can be briefly described as follows. Let z_c denote the cut off in a dimension that defines a household's deprivation in that dimension. Let *k* denote the minimum number of dimensions in which a household must be deprived in order to be classified as "poor". Let *q* denote the number of multi-dimensionally poor households, and let c_i $(i = 1 \dots q)$ denote the number of dimensions that "poor" household *i* is deprived in. The MDP measure, M_0, that has been used in the HDR, 2010 [UNDP (2010)] is a special case of the M_α class introduced by Alkire and Foster (2009) and is given by:

$$M_0(k) = \left(\frac{q}{n}\right)\left(\sum_{i=1}^{q} \frac{c_i}{qK}\right) \qquad (5)$$

where, *k* is the total number of dimensions. M_0 is the product of two components, namely, $H = \frac{q}{n}$, which measures the proportion of people who are multidimensionally poor, and $A = \sum \frac{c_i}{qK}$, which measures the "intensity of poverty". The latter reflects the proportion of the weighted deprivation indicators, *K*, in which, on average, the poor households are

[1] This is not an exhaustive listing of all the properties. The reader is referred to Jayaraj and Subramanian (2010) for a more detailed discussion.

deprived. M_0 can also be written as $\sum(\frac{c_i}{nK})$, which measures the total number of deprivations experienced by the poor households divided by the maximum number of deprivations possible (i.e., if each of the poor households was deprived in every dimension).
The M_α class of multidimensional poverty measures introduced by Alkire and Foster (2009), is given by M_α = HAS, where S is the sum of the α (≥ 0) powers of the normalised gaps of the poor divided by the sum of the normalised gaps of the poor. In the words of Alkire and Foster (2009), "M_α is the sum of α powers of the normalised gaps of the poor divided by the highest possible value for this sum". M_α is therefore a product of three components: the percentage of multidimensionally poor (H), the average deprivation share of the poor (A), and the average severity of deprivations (S). S takes the value 1, if $\alpha = 0$, as is the case for M_0 that is used here and in Alkire and Santos (2010), Alkire and Seth (2009) and in the poverty ranking of the countries in HDR, 2010. In this case, where the "severity of deprivation" of a household in a dimension is not taken into consideration, M_0(k) becomes HA as explained above. More generally, M_α (for α ≥0) satisfies all the principal properties outlined above and, additionally, is decomposable between dimensions unlike in the general formulation of π_α (for α >0).

The two measures, π_α and M_o(k) will coincide if α=1 for the former, and k=1 for the latter, i.e., $\pi_1 = M_0(1)$. In this case both indices will measure "the ratio of the number of instances of deprivation that actually obtains to the maximum possible number of such instances" [Jayaraj and Subramanian (2010,p.56)]. This equivalence ceases to hold when α in the MDP (M_α) measure of Alkire and Foster (2009) is greater than 0.

While the MDP is useful as a poverty measure, it is limited in ignoring the deprivation of the non poor as defined by the specification of the twin cut offs for defining a poor household. The ad hoc nature of the cut off that defines the "poor" makes this a significant limitation since a household that is considered "poor" by one evaluator may be judged to be "non poor" by another using a different set of cut offs. For example, Alkire and Seth (2009) provide evidence from India showing that such divergence between the number of "poor households" using the official BPL methodology and the Alkire and Foster (2009) methodology is fairly large. Even if we agreed on the definition of the poor (i.e., on both the cut offs) in the Alkire and Foster (2009) methodology, one may still be interested in the deprivation of the non poor households, if they suffer deprivation in one or more essential dimensions such as inadequate daily calorie intake or having undernourished children, as the Indian evidence on food security presented in Ray (2007) shows. However, MDP has the distinct advantage over MDD is allowing dimensional decomposability that allows the identification of items that are the prime contributors to deprivation in a country or community. This gives it a definite advantage from a policy viewpoint.

3. Data Sets and the Wealth Index

3.1 The Data Description

The Chinese data came from the China Health and Nutrition Survey (CHNS). This is an ongoing international project between the Carolina Population Center at the University of

North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. This project was designed to examine the effects of health, nutrition and family planning policies and programs implemented by the national and local governments and to see how the social and economic transformation of Chinese society is affecting the health and nutritional status of the population. A detailed description of the CHNS database has been presented in Popkin et al (2010) and is also available from the website: www.cpc.une.edu. The present study considered all the seven rounds of CHNS i.e., 1989, 1991, 1993, 1997, 2000, 2004 and 2006 data sets. The Chinese surveys took place over a three-day period using a multi stage, random cluster process to draw a sample of over 4000 households in nine provinces that vary substantially in geography, economic development, public resources and health indicators. The CHNS data sets have been used in several studies on China. Examples include the study on child health by Osberg, Shao and Xu (2009), and studies on income inequality by Goh, Luo and Zhu (2009). Unlike the NFHS data sets from India that cover more than 90 per cent of the Indian population, the nine provinces of China covered by the CHNS data consist of only 40 per cent of the Chinese population. This needs to be borne in mind in projecting a comparison of the two sets of figures into a comparison of China and India. Whether the Chinese estimates from the CHNS data sets, that we present later, are representative of the country as a whole can only be confirmed or denied by further research on a more complete data set if and when such data sets become available. Until then, and subject to this qualification, we will treat the CHNS based estimates presented later as representative of the whole of China, especially as CHNS remains the only longitudinal household survey available for any analysis of deprivation on China. For example, the Chinese data set that has been used in the study by Alkire and Santos (2010) in calculating the MDP rates, and reported in the 2010 HDR, is only available for 1 year and is not longitudinal unlike the CHNS data. In spite of its limited coverage, the CHNS data is the only one of its kind and there is now a large literature of empirical studies that treat this data as representative of the whole of China.

The Indian data set came from the National Family Health Surveys (NFHS) conducted as a collaborative project with the International Institute for Population Sciences (IIPS), Mumbai, designated as the nodal agency, responsible for providing coordination and technical guidance for the NFHS. The NFHS is a large scale, multi round survey conducted on a representative sample of households throughout India. So far, three rounds of NFHS, namely NFHS1-3 have been completed and this study is based on all three of them. The NFHS-1, which was conducted in 1992-93, collected information on population, health and nutrition, with an emphasis on women and young children. NFHS-2 was conducted in 1998-99 in all 26 states of India with added features on health. NFHS-3 was carried out in 2005-06 with added information on the anaemic status of children. Further details are contained in the NFHS website, www.nfhsindia.org. The information on various amenities, referred to as dimensions of deprivation above, that was common to all the three NFHS, was used in the calculation of the MDD and MDP estimates reported later.

The Vietnamese information came from the two Vietnamese Living Standard Surveys (VLSS) that were carried out in 1992/93 and 1997/98 and the Vietnamese Household Living

Standard Survey (VHLSS) of 2002 and 2004. While the first two surveys were conducted over a period extending into 2 calendar years, the remaining surveys were conducted exclusively in 2002 and 2004. An attractive feature of the VLSS data sets is that it is longitudinal data and involved a panel of 4300 households in the 1992/93 survey who were reinterviewed in the 1997/98 survey. These surveys were part of the Living Standards Measurement Study household surveys that were conducted in several developing countries with technical assistance from the World Bank. A detailed description of the VLSS data sets is contained in World Bank (2000).

Since the main focus of this study has been on the estimation of multidimensional deprivation and multidimensional poverty, considerable care was taken to ensure consistency in the definition and treatment of "dimensions of deprivation and poverty" both across countries and over time. For example, we have adopted the UN definition of deprivation of water and deprivation to improved sanitation facility across all the countries. Since this study also contains comparative evidence between the three counties on the state of child health, similar care was taken to ensure consistency in the age group of the children and in the definition of stunting and wasting across the three countries.

3.2 The Methodology for Consistent Calculation of the Wealth Index

The analysis of deprivation across the wealth distribution for the three Asian countries requires a proxy for wealth. While the NFHS data set has many advantages over other data sources in India, it lacks information on income and expenditure. While this information is available for Vietnam and China in the VLSS and CHNS data sets, respectively, the unavailability of income data in the NFHS database makes a cross-country comparison of multidimensional deprivation across income percentiles impossible with publicly available data. To address this issue, the present paper uses available information on ownership of assets and dwelling characteristics to construct a socio-economic determinant in the form of a linear wealth index. There were two complicated problems in construction of this wealth index viz., the choice of asset indicators and the choice of appropriate weights for these indicators. Wealth indexes provided by the NFHS databases were not suitable because the assets included in the construction of the DHS wealth index have changed across rounds (Chalasani (2010), Rutstein and Johnson (2004)). The cumbersome task of choice of asset indicators required finding a set of assets, subjected to data availability, which was common both across survey rounds for each country and across countries. For the construction of wealth index there is no universally accepted methodology except for the fact that all indexes broadly rely on three set of measures i.e., quality of water and sanitation facilities, housing quality and ownership of consumer durables (Montgomery, Gragnolati, Burke, & Paredes, 2000). The present analysis uses the statistical procedure of principal component analysis to address the second issue of computing weights for the wealth index. This technique has been used in a host of papers to construct socio-economic indicators (Montgomery, Gragnolati, Burke, & Paredes, 2000; Bollen, Glanville, & Stecklov, 2001; Filmer & Pritchett, 2001).

Principal Component Analysis (PCA) is a statistical multivariate technique based on the idea that an underlying latent variable is predictable on the basis of observed data. The objective of this technique is to use a set of observed data to reduce the number of variables in the dataset to extract orthogonal linear combinations of variables or components (referred to as first principal component, second principal component etc.) which most efficiently encompass the common information. Mathematically, from a set of *j* correlated variables X_j, PCA creates *i* uncorrelated variables i.e., principal components (PC_i) which is a linear combination of the initial set of variables where the j^{th} component of the i^{th} principal component has a weight of a_{ij} (Rutstein and Johnson (2004); Vyas and Kumaranayeke (2006)). That is,

$$PC_1 = a_{11}X_1 + a_{12}X_2 + ... + a_{1j}X_j \quad (6)$$

$$\vdots \qquad \vdots \qquad \vdots$$

$$PC_i = a_{i1}X_1 + a_{i2}X_2 + ... + a_{ij}X_j \quad (7)$$

The sum of squared weights of each principal component is equal to one. The PC's are ordered in decreasing order of explaining the variation in the original database i.e., the first extracted component explains the maximal variation of the underlying dataset and the subsequent components explain the maximal variation of the remaining variability. The weights of each PC are eigenvectors of the *i* correlation matrices of each principal component and the variance of each principal component is the eigenvalue of the corresponding eigenvector (Vyas and Kumaranayake (2006)). The first principal component has been identified in existing literature to sufficiently represent socio-economic status and the marginal benefits of including higher components is low with additional complexities in interpretations (Filmer and Pritchett (2001)).

The wealth index constructed for the present analysis uses a set of household assets and characteristics that are (i) common for all survey rounds; (ii) common in all the three countries (China, India and Vietnam). These household and dwelling characteristics are : dwelling's construction material i.e., type of flooring, type of walls, type of exterior walls, and type of roofing; the source of household's drinking water; availability of electricity in the household; type of toilet facility; per capita rooms in the house and ownership of fan, radio, sewing machine, refrigerator, bicycle, motorcycle and car. A description of the deprivation dimensions and the PCA variables used in this study is contained in Table A1.1 of Appendix 1. All the categorical variables were converted to binary variables to make data suitable for PCA. For each country separate PCA for rural and urban areas were done to find eigenvector of factor scores associated with the first principal component of wealth for a common year (1998-99). Results from the first principal component for rural and urban areas in each country are presented in Tables A2.1 (China), A2.2 (India) and A2.3 (Vietnam) of Appendix 2. The eigenvalues (or variance) for first principal component at each site indicate the percentage of variability in the total data explained. These eigenvalues associated with the rural and urban areas for each country are 3.51 (urban China), 3.13 (rural China), 4.5 (urban

India), 3.06 (rural India), 4.05 (urban Vietnam) and 3.74 (rural Vietnam).In a PCA, all variables with a positive factor score are generally associated with high socio-economic status (SES) and variables with negative factor scores are associated with poor SES (Vyas and Kumaranayeke (2006). Results in A2.1 – A2.3 suggest that having no toilet facility with a negative score is associated with poor SES, which is in line with expectations. However, it is also interesting to note that having a shared public toilet is associated with poor SES in urban India and with high SES in rural India. The factor scores for the first principal component, presented in Table A2.1, A2.2 and A2.3 of Appendix 2 are used as weights and multiplied with household's asset holding information to get a standardised variable which gives us the new household's wealth index score.

4. Results

Table 1 provides the summary information on the three countries by reporting for 1993 the per capita GNP at PPP (with the country rank), the mean value of the wealth index, and the Gini index of wealth inequality, with the latter two calculated from the three data sets by applying the PCA methodology described above. While China dominates India and Vietnam on both per capita GNP and the wealth index, the higher ranking of India over Vietnam on per capita GNP is reversed on a comparison of their mean wealth values. Since the constructed wealth index includes variables such as quality of water, sanitation facilities and housing quality that are not included in GNP estimates, this result points to the inadequacy of per capita GNP as a measure of living standards in a developing country. This table also reports for comparison the Gini inequality of income in these three countries as reported in the Human Development Report, 2010. A couple of features are worth noting. The wealth inequality magnitudes for China and India are higher than the corresponding income inequality estimates reported in HDR, 2010. The wealth and income inequality figures for Vietnam match one another quite closely. While, on these income inequality figures, China is more unequal than India, the reverse is the case on wealth inequality. Bardhan (2010, p. 97) reports, however, a finding of India's NCAER, that the inequality of Indian income in 2004-5 was much higher than in China. Bardhan (2010, p.95) also notes that "contrary to common perception, (land and education) inequalities are much higher in India than in China". This is consistent with our evidence on wealth inequalities in the two countries. The picture is confirmed by Figure 1, which presents the wealth Lorenz curves for the three countries in 1992/93 based on our calculations on the three data sets. Though an unambiguous ranking of wealth inequality between India and Vietnam is not possible because of their intersecting Lorenz curves, China is Lorenz dominated by both India and Vietnam. This raises the issue of correspondence between wealth and deprivation on which we present some evidence later. As we report below, the disconnection between wealth and deprivation and, in particular, the understatement of deprivation in dimensions by that in wealth for the less well off makes it misleading to draw welfare conclusions based on wealth alone.

The dimension specific head count rates of deprivation in the three countries in each year/round are presented in Tables 2-4. There has generally been an all round decline in deprivation in all dimensions across the wealth quintiles and in both rural and urban areas.

The improvement has been more in some dimensions, less in others, but there has been all round progress. A comparison between the "awakening giants" shows that, while China outperforms India on progress in access to drink water, electricity, and education (as measured by the literacy of the household head), it does not do as well on access to hospital. Vietnam has done particularly well on the latter recording an impressive increase in access to hospital over the period, 1997/8-2004. Another common feature between the three countries is that rural deprivation is generally higher than urban, though the rural/urban difference is smaller in China than elsewhere.

The dimension specific headcount deprivation rates are combined into a single number, via the multidimensional deprivation (MDD) measure, π_α, and reported for the three countries at three α values in Tables 5-7. Consistent with the dimension specific deprivation rates, there has been a general improvement in multidimensional deprivation in each country and across the wealth percentiles and in both rural and urban areas. These tables also exploit the subgroup decomposability of the MDD measure to report (in parenthesis) the deprivation share of rural and urban population, and of the three wealth percentiles. As expected, a disproportionately larger share of deprivation is borne by those in the rural sector and in the lower wealth percentiles. The imbalance in the deprivation distribution, both between the rural and urban areas and between the wealth percentiles, increases as we increase α, i.e. if we restrict our analysis to households who are deprived in more and more dimensions. While the rural share of deprivation has declined in India, it has held steady in China and Vietnam. The rural urban gap in deprivation in India narrowed sharply during the period, 1998/99-2005/6, to the point that in 2005/6 deprivation was (almost) equally shared between the two areas, if one recalls that the rural share of India's population is much greater than the urban share. The deprivation shares by wealth percentiles show that the bottom 50 % of the households arranged in an increasing order by their "wealth", as constructed in this study, endure a share of deprivation that is much higher than 50 % at all the α values. The deprivation share for this bottom 50 % (by wealth) increases to between 85-90 % at α=4, i.e., for the more deprived households.

Table 8 compares the dimension specific deprivation rates between the three countries by reporting them for the common year, 1992-93, and based on a common basket of 8 dimensions. While India lags behind China on access to electricity and literacy, her deprivation rates on access to drink water, fuel and in several other dimensions are quite comparable. Vietnam provides an interesting background to the India/China comparison and her deprivation rates generally lie between that in the two large countries. In general, on these dimension specific deprivation rates, Vietnam is closer to India than to China. It is worth recalling from Table 4 that the high deprivation rates on access to hospital in Vietnam in 1992/93, reported in Table 8, declined sharply during the next 10 years.

The above discussion is largely based on the MDD measure that considers the deprivation in the whole population, not just the "poor". Table 9 looks at the "multidimensionally poor" households by reporting (on the left hand side) the head count rates of the percentage of such households who are deprived in 1,2,3...,8 dimensions in the common year, 1992/93 in the three countries. The right hand side reports the estimated M_0 (k) measure (MDP) at a variety

of cut offs (k) adopted for the definition of the "poor". The M_0 estimates are not directly comparable with the π_α estimates reported earlier since, apart from the fact that M_0 looks at only the poor, while π_α considers the entire population, there is no direct equivalence between the k (cut off in M_0) and α (in π_α). The MDP estimates do decline as the adopted cut off k increases but at varying rates between the three countries. The decline is much sharper in China than in India and Vietnam. The multidimensional poverty estimates (MDP) of M_0 in Table 9 show that India and Vietnam were both multidimensionally poorer than China in 1992/93 at all the cut offs (k). The Indian and Vietnamese estimates of poverty are much closer to one another than to the Chinese estimates. In spite of her remarkable progress in the decade since the "*Doi Moi* reforms", Vietnam was, in 1992/93, the multidimensionally poorest country in this group of countries. This is also true of the multidimensional deprivation estimates of π_α reported in Tables 5-7, with Vietnam recording the highest levels of multidimensional deprivation. Overall, the picture portrayed by the MDD estimates is quite consistent with that portrayed by the MDP figures. Further evidence on the comparative picture on deprivation in China, India and Vietnam is provided in Table 10 which presents the deprivation distribution in the three countries, overall and disaggregated by rural and urban deprivation. There are some interesting cross country and rural/urban differences and similarities. In India and Vietnam, for example, a large percentage of households are deprived in 6 and 7 dimensions, but not so in China. The multidimensionally poor rural households generally suffer deprivation in more dimensions (typically, 4 or 5 out of the 8) than those in the urban areas, and this is true of all the three countries. Once again, the Indian and Vietnamese pictures are closer to one another than to China.

A significant advantage of the MDP measure, M_0, over the MDD measure, π_α is that the former allows dimensional decomposability unlike the latter except in the degenerate case where α=1. Table 11 exploits this feature by reporting, in the top half, the percentage contribution to over all deprivation in the three countries by each of the 8 dimensions in M_0 at the cut off of k=2. Lack of access to drinking water and electricity is a greater source of poverty in rural areas than in the urban in India and Vietnam, less so in China. Consistent with the earlier discussion, lack of literacy of the household head is a larger source of poverty in India than in China. Lack of literacy matters still less in Vietnam compared to China. Lack of access to clean fuel and lack of access to toilets accounted for 35-40% of multidimensional poverty in all the three countries. In all these countries, the contribution of lack of drinking water and of electricity to poverty declines, i.e., they matter less and less, as we move up the wealth distribution. A significant feature is that lack of access to Fuel is a significant source of multidimensional poverty even for the well off households (i.e., those in the top 50% of the wealth distribution) in all the three countries. The bottom half of Table 11 reports the percentage contributions and the M_0 values at three cut off values used to define the "poor". These show that the picture on the contributions of the dimensions to multidimensional poverty is generally robust to the cut off used to define the multidimensionally poor".

The evidence on the nature of correspondence between wealth and deprivation is presented in Figure 2, which compares the Lorenz curve for wealth with the pseudo Lorenz curves for multidimensional deprivation and multidimensional poverty in each country. The latter show

the deprivation and poverty share of the households arranged in an increasing order of household wealth as is done in the former. As expected, the Lorenz curve for wealth bulges towards the x-axis, the pseudo Lorenz curves for deprivation and poverty bulge towards the y axis, away from the 45^0 line. Deviation from the 45^0 line reflects the inequity in wealth, deprivation and poverty, respectively. The fact that MDP considers only the poor explains the fact that the pseudo Lorenz curve of the M_0 measure lies outside that of the MDD measure, π_α. It is also worth noting that the gap between the pseudo Lorenz curves of deprivation and poverty is much smaller in China than in the other countries, which possibly suggests that the difference between "deprivation" and "poverty" is much less significant in China than elsewhere.

Figure 3 provides quantitative evidence on the relation between the shares of multidimensional poverty and wealth. For example, a (x,y) combination indicates the bottom x % of the wealth is associated y % of poverty. The 45^0 line is the bench mark that shows exact correspondence, i.e., 10 % of the wealth, for example, is associated with 10 % of poverty. For clarity, we have reported the graphs for only the MDP measure at the cut off of k=4, though the other figures are available on request. Wealth share understates the poverty share in all the countries. For example, the bottom 20 percent of households in the wealth distribution endure a much higher share of poverty than 20 percent. However, the understatement of poverty or deprivation by wealth is smaller in Vietnam than in China or India. This is consistent with our earlier calculations reported in Table 1, which showed that the wealth inequality is much closer to income inequality in Vietnam than in China or India.

As noted earlier, a significant limitation of the multidimensional measures is that they aggregate too much information in providing a single summary measure of deprivation or poverty. It prevents separate scrutiny of deprivation or poverty in important dimensions such as child health. To go beyond the aggregative picture that we have presented so far, Table 12 presents the head count rates of "stunted" and "wasted" children aged 0-36 months in the three countries, with a child defined as "stunted" and "wasted" if the z-scores for "height for age" and "weight for height" are less than -2, respectively. China does much better than both India and Vietnam on these measures of child health. Vietnam recorded an impressive reduction in the rates of stunted children over the period, 1992-98, for which the anthropometric information is available. However, this did not extend to the head count rates of wasted children where the situation worsened in Vietnam. India's record is the worst on both measures. According to our calculations on NFHS-3 data, nearly 2 in 5 children were "stunted" and 1 in 5 "wasted" in India in 2005-6. The accuracy of our calculations is confirmed by the fact that these rates of stunting and wasting are very close to the figures reported in International Institute of Population Sciences (2007) based on the same NFHS-3 data. These rates are much higher than those in China and Vietnam, and showed hardly any progress on child health in India during the period spanned by NFHS1-3. In contrast, both China and Vietnam recorded significant progress on child stunting. Note, however, that child stunting remains a serious issue in all the three countries with one in five Chinese children still suffering from stunting in 2006. The increase in child wasting in both China and Vietnam over this period is also of concern though they are still below the high rates of child

wasting prevailing in India. Notwithstanding the many attractions of the recent multidimensional approaches, they share the feature of the earlier unidimensional measures in hiding some specific concerns such as on child health that require targeted policy interventions in reducing child stunting in China, India and Vietnam. This stems from the aggregation of too much, and often diverse, information into a single number that is meant to capture all the dimensions of deprivation and all the aspects of welfare. Table 12 underlines this limitation by showing that the pictures on multidimensional deprivation and multidimensional poverty presented earlier are clearly inconsistent with that on child health in India.

5. Conclusions

This study takes place against the background of a recent surge of interest in multidimensional deprivation. As data sets have become available, the literature has moved on from an exclusively theoretical interest in formulating multidimensional measures that satisfy a set of appealing axioms, with interest in the axioms *per se*, to their empirical implementation with policy application a key objective. The recent empirical literature on multidimensional deprivation can be traced back to the Human Development Report, 1990 that proposed and implemented the idea of the HDI in ranking countries on multiple dimensions rather than simply on per capita GNP. In the twenty years that have elapsed since that first HDR, the literature initially moved on from the country rankings based on HDI calculated from simple countrywide averages to that based on HPI using macro information but focussing on low-income households. Subsequently, the interest shifted to the measurement of multidimensional deprivation or poverty (MPI) on household level unit record data containing micro information on the household's lack of access to a much wider range of dimensions of living than was considered previously. These developments in the literature are seen quite clearly from a comparison of the HDR, 1990, HDR, 1997 and HDR, 2010. The latest HDR, which marked the two decades since that first HDR was published, ranks countries on the basis of the multidimensional poverty index (MPI) based on a wide range of dimensions and using household data sets, much of which is contained in the Demographic and Health Survey (DHS) and the World Health Survey (WHS) data bases. The journey from the HDI to the HPI and then on to the MPI in the past two decades symbolises the movement in the literature from simple summary measures based on macro level country statistics considering a limited number of dimensions to one using a richer class of measures and considering a wider range of dimensions using household level information contained in their unit records. The latter allowed consideration of the distribution of deprivation in dimensions across households, that was not possible in HDR, 1990. The present study is in this recent empirical tradition symbolised by HDR, 2010, but has the following features that distinguish it from Alkire and Santos (2010) that underpinned HDR, 2010.

First, this study considers in great detail three countries, namely, China, India and Vietnam that have attracted much recent attention because of their high growth rates and improvement in living standards in the past two decades. While China and India have shot into prominence

in recent years because of their high growth rates, along with their population size, Vietnam has been experiencing steady progress during the past three decades without attracting much attention ever since the *Doi Moi* reforms were undertaken in the mid 1980 s to kick start a struggling economy. This is the first study of these three Asian economies based on a systematic and comprehensive examination of their living standards as measured by the multidimensional measures using unit records from household expenditure surveys. It goes into greater detail than is done in Alkire and Santos (2010) and, moreover, presents the time series movements in the multidimensional deprivation and poverty indices by using repeated cross sections for India and longitudinal data in case of China and Vietnam.

Second, the study distinguishes between multidimensional deprivation (MDD) in the sense of Chakravarty and D'Ambrosio (2006) from multidimensional poverty (MDP) in the sense of Alkire and Foster (2009) that was the background study for HDR, 2010, and provides comparative empirical evidence on the difference between the multidimensional measures from these three countries. In focussing only on the "poor households", with the choice of ad hoc cut offs to define the "poor", MDP overlooks the deprivation that exists in many "non poor households". The deprivation in some dimensions for such households may exceed those in the "poor" households. MDD avoids these limitations of MDP but suffers from the disadvantage of not allowing dimensional decomposability preventing it from calculating the relative importance of a dimension in promoting multidimensional deprivation that the MDP allows. This paper provides evidence on the sensitivity of the MDP measure and the dimensional contributions to poverty to the choice of cut offs and compares them between the chosen countries. The emphasis in this study has been as much on a comparison between the three countries as on the sensitivity of the results to the multidimensional measures and the poverty line cut offs.

Third, this is the first study that uses the Principal Component Analysis on a consistent basis to measure household wealth using unit record data from household surveys in China, India and Vietnam. The construction of a wealth variable that can be compared across the three countries helps to overcome the lack of expenditure information in the Chinese household survey (CHNS) and the lack of income information in the Indian surveys (NSS) that has prevented meaningful inequality comparisons between the two countries. This paper uses the constructed wealth variable in the three countries to compare their wealth inequalities and examines the correspondence between the distributions in wealth with that in deprivation or poverty. The paper does so through the presentation of graphs that shows the relationship between the households' share of wealth and their share of deprivation and poverty. The result that the share of wealth of the poorer households is an understatement of their share of deprivation and poverty is consistent with the evidence of Klasen (2000) and Ayala, et. al. (2011) that also point to the failure of money based information to capture the true picture on deprivation or poverty. However, while those studies simply point to the lack of strong correlation between the unidimensional and multidimensional measures, the present study goes much further in quantifying the inadequacy of the expenditure figures, and the unidimensional measures that are based on them, in measuring deprivation in living. The comparison of the Lorenz curves for wealth with the pseudo Lorenz curves for deprivation

and poverty and the resulting graphs on the relationship between wealth shares and deprivation shares show the extent of this mismatch. This evidence provides added support to the case for favouring the recent multidimensional approaches over the earlier expenditure or income based unidimensional approach to poverty.

Fourth, and finally, the study provides comparative evidence from these three countries on the state of child health, both at a point in time and over time. In presenting a picture on child health that is inconsistent with the impressive progress on deprivation and poverty that is portrayed by the multidimensional measures, especially for India, this study draws attention to a limitation of such measures that aggregate too much, and diverse, information into a single number. Ironically, the multidimensional measures share this limitation of the earlier unidimensional measures that they are designed to replace. While the multidimensional approach is an advance on the earlier literature, it does not reduce the importance of examining deprivation in each of the dimensions separately, as is done in this study.

This study shares the limitation of data comparability that all cross country comparisons such as Alkire and Santos (2009) face. For example, as Alkire and Santos (2009, p.20) note, the CHNS data from China is not nationally representative, since it considers only nine provinces. It should be noted, however, that the CHNS data set is probably the only household survey available for any comprehensive analysis of multidimensional poverty on China covering multiple years, and certainly the only one with the longitudinal information that is needed for this study. The WHS information on China, which was used in Alkire and Santos (2009), for example, is inadequate for the purposes of the present study with the information limited to only one year. However, the partial coverage of China by the CHNS data in relation to the NFHS should be kept in mind in comparing the Indian and the Chinese evidence presented in this study. In contrast, the Indian and Vietnamese data sets are fully comparable since the NFHS and VLSS cover the entire country. Though we have tried to be consistent between the countries in the construction of the wealth and the dimension variables, comparability issues may well remain that must await more information and further research. The restriction of the comparisons to three countries rather than the 100 plus countries in Alkire and Santos (2009) and HDR, 2010 meant that such comparability issues pose a smaller problem in the present study. Note however that most of the other limitations of cross-country poverty comparisons that have been listed in HDR, 2010 (pgs. 99-100) apply to the present study as well.

The present study has not utilised the full range of quantitative information available in the surveys to incorporate the severity of deprivation and poverty in the calculations. To do so would have raised further comparability issues and lost focus. Such a study that examines the head count rates in conjunction with the severity of deprivation and poverty in the three countries is best left for a future exercise that builds on the present study. Further work is also required to relax the assignment of equal weights to the various dimensions in the calculation of the multidimensional measures. In the absence of strong a priori reasons for assigning a particular set of unequal weights, such an extension is also best left for a future exercise.

Table 1: Summary Information on China, India and Vietnam (1992-93)

Country	Country Rank[a]	Per capita GNP in 1993 at PPP[a]	Wealth Index[b]	Wealth Inequality[b]	Income Inequality[c]
China	116	410	0.406	0.193	0.415
India	124	310	0.294	0.220	0.368
Vietnam	136	170	0.356	0.362	0.378

[a] Source: World Bank National Accounts Data.
[b] Source: Authors' calculations.
[c] Source: Human Development Report 2010.

Table 2: Dimension Specific Head Count Rates in China[a]

Year	No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Household Head Illiterate	No Hospital	Wait time (>15min)	No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Household Head Illiterate	No Hospital	Wait time (>15min)	No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Household Head Illiterate	No Hospital	Wait time (>15min)
	Rural China									Urban China									Overall China								
1989	0.324	0.101	0.965	0.762	0.205	0.712	0.180	0.835	0.519	0.133	0.017	0.752	0.398	0.187	0.472	0.206	0.278	0.662	0.261	0.073	0.895	0.643	0.199	0.633	0.189	0.652	0.566
1991	0.270	0.056	0.939	0.682	0.204	0.587	0.172	0.909	0.428	0.076	0.003	0.671	0.381	0.188	0.387	0.207	0.264	0.706	0.208	0.039	0.854	0.586	0.199	0.523	0.183	0.703	0.517
1993	0.219	0.021	0.922	0.697	0.208	0.577	0.167	0.907	0.334	0.126	0.003	0.571	0.344	0.220	0.372	0.168	0.328	0.612	0.191	0.015	0.815	0.589	0.212	0.514	0.167	0.730	0.419
1997	0.113	0.009	0.781	0.666	0.278	0.595	0.149	0.928	0.275	0.085	0.003	0.394	0.320	0.302	0.368	0.131	0.342	0.526	0.104	0.007	0.652	0.551	0.286	0.519	0.143	0.733	0.358
2000	0.147	0.011	0.726	0.658	0.305	0.628	0.112	0.906	0.167	0.083	0.004	0.356	0.253	0.336	0.446	0.103	0.442	0.378	0.127	0.009	0.607	0.528	0.315	0.569	0.109	0.757	0.235
2004	0.123	0.004	0.725	0.612	0.390	0.757	0.086	0.924	0.183	0.092	0.003	0.338	0.196	0.458	0.578	0.088	0.477	0.318	0.113	0.003	0.598	0.475	0.412	0.698	0.087	0.777	0.227
2006	0.132	0.004	0.617	0.577	0.431	0.853	0.118	0.905	0.135	0.072	0.002	0.261	0.174	0.486	0.677	0.108	0.477	0.357	0.112	0.003	0.501	0.445	0.449	0.796	0.114	0.765	0.208
	Bottom 20 percentile																										
1989	0.467	0.475	0.998	0.856	0.294	0.925	0.233	0.904	0.444	0.305	0.059	1.000	0.898	0.403	0.797	0.318	0.492	0.644	0.413	0.338	0.999	0.870	0.330	0.883	0.261	0.768	0.510
1991	0.458	0.276	1.000	0.906	0.289	0.749	0.249	0.971	0.278	0.154	0.005	0.991	0.878	0.416	0.719	0.317	0.489	0.552	0.362	0.190	0.997	0.897	0.329	0.740	0.270	0.818	0.365
1993	0.328	0.097	1.000	0.918	0.313	0.847	0.242	0.973	0.256	0.316	0.010	0.995	0.845	0.388	0.650	0.272	0.617	0.354	0.324	0.070	0.999	0.896	0.336	0.787	0.251	0.865	0.286
1997	0.213	0.044	0.998	0.904	0.367	0.789	0.186	0.975	0.255	0.267	0.004	0.932	0.898	0.407	0.619	0.216	0.631	0.390	0.231	0.031	0.976	0.902	0.380	0.733	0.196	0.862	0.299
2000	0.267	0.053	0.993	0.918	0.349	0.795	0.165	0.965	0.119	0.288	0.016	0.852	0.864	0.377	0.626	0.175	0.681	0.191	0.274	0.041	0.948	0.900	0.358	0.741	0.168	0.874	0.142
2004	0.114	0.014	0.968	0.912	0.418	0.842	0.161	0.956	0.132	0.246	0.011	0.886	0.721	0.532	0.675	0.157	0.743	0.214	0.158	0.013	0.941	0.849	0.455	0.787	0.160	0.886	0.159
2006	0.171	0.017	0.900	0.922	0.486	0.917	0.193	0.934	0.091	0.240	0.007	0.698	0.684	0.594	0.826	0.205	0.764	0.191	0.193	0.014	0.834	0.844	0.522	0.888	0.197	0.878	0.124
	20th to 50th percentile																										
1989	0.433	0.015	0.999	0.907	0.247	0.802	0.187	0.818	0.492	0.147	0.011	0.986	0.555	0.207	0.569	0.224	0.405	0.580	0.340	0.014	0.994	0.792	0.234	0.726	0.199	0.684	0.521
1991	0.365	0.004	1.000	0.824	0.221	0.713	0.166	0.916	0.388	0.119	0.006	0.943	0.558	0.161	0.445	0.236	0.412	0.675	0.288	0.005	0.982	0.741	0.202	0.629	0.188	0.758	0.478
1993	0.273	0.001	1.000	0.863	0.192	0.615	0.159	0.910	0.265	0.153	0.000	0.827	0.476	0.241	0.469	0.218	0.427	0.596	0.237	0.001	0.947	0.745	0.207	0.571	0.177	0.762	0.366
1997	0.173	0.000	0.975	0.852	0.259	0.656	0.178	0.961	0.253	0.064	0.003	0.567	0.444	0.346	0.394	0.179	0.394	0.545	0.137	0.001	0.839	0.717	0.288	0.569	0.178	0.772	0.350
2000	0.151	0.001	0.938	0.880	0.306	0.706	0.143	0.949	0.136	0.057	0.003	0.499	0.270	0.401	0.488	0.141	0.470	0.375	0.120	0.002	0.796	0.683	0.337	0.636	0.143	0.794	0.213
2004	0.177	0.000	0.894	0.841	0.386	0.786	0.090	0.960	0.178	0.091	0.002	0.423	0.160	0.533	0.667	0.112	0.486	0.323	0.149	0.001	0.740	0.618	0.434	0.747	0.097	0.805	0.225
2006	0.173	0.001	0.780	0.817	0.441	0.867	0.137	0.940	0.110	0.051	0.002	0.315	0.117	0.585	0.729	0.120	0.468	0.327	0.135	0.002	0.632	0.595	0.487	0.824	0.132	0.790	0.179
	50th to 100th percentile																										
1989	0.200	0.002	0.931	0.637	0.144	0.572	0.155	0.817	0.565	0.055	0.003	0.513	0.103	0.087	0.283	0.149	0.117	0.719	0.153	0.002	0.794	0.461	0.125	0.477	0.153	0.587	0.616
1991	0.139	0.001	0.879	0.507	0.159	0.447	0.145	0.880	0.512	0.021	0.000	0.388	0.086	0.115	0.224	0.147	0.091	0.783	0.101	0.001	0.721	0.371	0.145	0.375	0.146	0.626	0.599
1993	0.142	0.001	0.844	0.508	0.175	0.443	0.141	0.879	0.407	0.035	0.002	0.250	0.066	0.140	0.203	0.097	0.153	0.725	0.109	0.001	0.662	0.372	0.164	0.370	0.127	0.656	0.505
1997	0.038	0.001	0.579	0.460	0.254	0.481	0.117	0.889	0.296	0.025	0.002	0.078	0.018	0.233	0.253	0.068	0.197	0.568	0.034	0.001	0.412	0.313	0.247	0.405	0.100	0.659	0.386
2000	0.098	0.000	0.495	0.423	0.286	0.515	0.072	0.858	0.205	0.017	0.000	0.074	0.002	0.280	0.348	0.052	0.330	0.453	0.072	0.000	0.360	0.288	0.284	0.461	0.066	0.688	0.284
2004	0.095	0.001	0.525	0.352	0.381	0.705	0.053	0.889	0.206	0.030	0.000	0.066	0.007	0.383	0.486	0.046	0.364	0.356	0.074	0.001	0.374	0.239	0.382	0.633	0.051	0.716	0.255
2006	0.091	0.000	0.407	0.296	0.403	0.819	0.076	0.872	0.168	0.019	0.000	0.060	0.007	0.389	0.590	0.064	0.370	0.438	0.067	0.000	0.291	0.200	0.398	0.743	0.072	0.705	0.258

[a] All the dimensions have been described in Table A1.1 in Appendix 1.

Table 3: Dimension Specific Head Count Rates in India[a]

Year	No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Illiterate Household Head	No Hospital	Wait time (>15min)	No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Illiterate Household Head	No Hospital	Wait time (>15min)	No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Illiterate Household Head	No Hospital	Wait time (>15min)
	Rural India									Urban India									All India								
1992-93	0.329	0.526	0.937	0.812	0.622	0.632	0.480	0.063	N/A	0.086	0.142	0.392	0.299	0.534	0.361	0.206	0.069	N/A	0.251	0.403	0.763	0.649	0.594	0.546	0.393	0.065	N/A
1998-99	0.283	0.459	0.870	0.771	0.563	0.645	0.406	0.600	0.154	0.075	0.073	0.459	0.369	0.496	0.434	0.165	0.706	0.199	0.216	0.335	0.738	0.642	0.541	0.577	0.329	0.634	0.168
2005-06	0.238	0.327	0.220	0.687	0.500	0.653	0.392	0.182	0.182	0.098	0.050	0.700	0.222	0.504	0.566	0.185	0.289	0.220	0.175	0.202	0.437	0.476	0.502	0.614	0.298	0.230	0.199
	Bottom 20th Percentile																										
1992-93	0.782	0.938	0.990	0.996	0.782	0.975	0.649	0.052	N/A	0.298	0.623	0.840	0.776	0.744	0.729	0.456	0.079	N/A	0.628	0.838	0.942	0.926	0.770	0.897	0.588	0.061	N/A
1998-99	0.518	0.951	0.899	1.000	0.916	0.978	0.623	0.591	0.103	0.216	0.317	0.893	0.868	0.666	0.760	0.338	0.570	0.192	0.412	0.729	0.897	0.954	0.828	0.902	0.523	0.584	0.134
2005-06	0.396	0.831	0.122	0.987	0.574	0.920	0.566	0.154	0.161	0.229	0.235	0.340	0.626	0.652	0.829	0.353	0.204	0.220	0.320	0.558	0.222	0.822	0.610	0.879	0.469	0.177	0.188
	20th - 50th Percentile																										
1992-93	0.269	0.778	0.989	0.957	0.717	0.796	0.587	0.063	N/A	0.073	0.050	0.512	0.403	0.573	0.434	0.237	0.076	N/A	0.206	0.545	0.836	0.780	0.671	0.680	0.475	0.067	N/A
1998-99	0.241	0.655	0.918	0.969	0.528	0.763	0.479	0.611	0.139	0.065	0.024	0.621	0.552	0.602	0.503	0.193	0.690	0.211	0.187	0.462	0.827	0.842	0.550	0.684	0.392	0.635	0.161
2005-06	0.181	0.417	0.134	0.909	0.611	0.791	0.482	0.166	0.180	0.063	0.012	0.620	0.173	0.634	0.715	0.222	0.275	0.237	0.128	0.235	0.352	0.579	0.621	0.757	0.366	0.215	0.205
	50th to 100th Percentile																										
1992-93	0.183	0.209	0.884	0.653	0.501	0.397	0.348	0.067	N/A	0.008	0.003	0.141	0.047	0.427	0.170	0.088	0.062	N/A	0.128	0.143	0.648	0.460	0.478	0.325	0.265	0.065	N/A
1998-99	0.228	0.157	0.828	0.562	0.460	0.451	0.283	0.596	0.182	0.023	0.003	0.185	0.055	0.362	0.260	0.078	0.772	0.193	0.162	0.107	0.622	0.400	0.429	0.390	0.217	0.653	0.185
2005-06	0.152	0.096	0.309	0.412	0.439	0.515	0.264	0.200	0.189	0.015	0.001	0.891	0.042	0.399	0.409	0.093	0.329	0.208	0.090	0.053	0.575	0.243	0.421	0.467	0.186	0.259	0.198

[a] All the dimensions have been described in Table A1.1 in Appendix 1

Table 4: Dimension Specific Head Count Rates in Vietnam[a]

Year	No Drink Water	No Electricity	No Toilet	No Bicycle	Household Head Illiterate	No Radio	No Hospital	No Drink Water	No Electricity	No Toilet	No Bicycle	Household Head Illiterate	No Radio	No Hospital	No Drink Water	No Electricity	No Toilet	No Bicycle	Household Head Illiterate	No Radio	No Hospital
	Rural Vietnam							Urban Vietnam							Overall Viet Nam						
1992-93	0.235	0.612	0.525	0.352	0.755	0.146	0.997	0.110	0.121	0.271	0.208	0.558	0.084	0.994	0.210	0.514	0.474	0.323	0.716	0.134	0.997
1997-98	0.196	0.293	0.413	0.275	0.570	0.375	0.879	0.068	0.017	0.161	0.225	0.513	0.484	0.816	0.159	0.214	0.340	0.260	0.554	0.406	0.861
2002	0.191	0.186	0.650	0.311	0.719	0.613	0.119	0.065	0.026	0.250	0.328	0.720	0.402	0.093	0.161	0.149	0.556	0.315	0.719	0.564	0.112
2004	0.163	0.097	0.612	0.292	0.789	0.531	0.191	0.057	0.018	0.221	0.321	0.784	0.389	0.226	0.137	0.078	0.516	0.299	0.788	0.496	0.200
	Bottom 20 percentile																				
1992-93	0.443	1.000	0.964	0.767	0.897	0.219	0.998	0.333	1.000	0.833	0.667	0.833	0.222	1.000	0.441	1.000	0.962	0.764	0.895	0.219	0.998
1997-98	0.439	0.964	0.778	0.639	0.678	0.349	0.891	0.128	0.487	0.564	0.615	0.436	0.282	0.846	0.426	0.943	0.768	0.638	0.667	0.346	0.889
2002	0.469	0.740	0.989	0.603	0.740	0.852	0.100	0.183	0.123	0.612	0.613	0.756	0.557	0.078	0.401	0.594	0.899	0.606	0.744	0.782	0.095
2004	0.402	0.399	0.978	0.615	0.794	0.408	0.157	0.164	0.078	0.644	0.578	0.799	0.454	0.144	0.344	0.321	0.897	0.606	0.795	0.419	0.153
	20^{th} to 50^{th} percentile																				
1992-93	0.296	0.940	0.626	0.407	0.807	0.151	0.995	0.321	0.964	0.571	0.071	0.607	0.071	1.000	0.297	0.940	0.625	0.398	0.802	0.149	0.995
1997-98	0.264	0.313	0.536	0.388	0.589	0.345	0.895	0.033	0.000	0.283	0.133	0.633	0.633	0.733	0.254	0.299	0.524	0.377	0.591	0.358	0.888
2002	0.228	0.127	0.852	0.421	0.746	0.683	0.104	0.067	0.006	0.312	0.351	0.748	0.434	0.094	0.190	0.098	0.724	0.404	0.747	0.624	0.101
2004	0.195	0.041	0.820	0.356	0.835	0.544	0.193	0.046	0.003	0.242	0.345	0.824	0.411	0.223	0.159	0.031	0.677	0.353	0.832	0.511	0.200
	50^{th} to 100^{th} percentile																				
1992-93	0.090	0.236	0.259	0.163	0.718	0.091	0.999	0.196	0.022	0.217	0.087	0.348	0.022	0.978	0.092	0.231	0.258	0.161	0.709	0.090	0.998
1997-98	0.048	0.002	0.184	0.067	0.527	0.396	0.863	0.010	0.000	0.093	0.072	0.320	0.443	0.784	0.046	0.002	0.180	0.067	0.518	0.398	0.859
2002	0.065	0.007	0.418	0.140	0.723	0.466	0.140	0.017	0.000	0.069	0.203	0.697	0.316	0.099	0.053	0.006	0.336	0.155	0.716	0.431	0.130
2004	0.055	0.002	0.337	0.137	0.790	0.574	0.212	0.021	0.000	0.033	0.215	0.780	0.349	0.267	0.046	0.002	0.263	0.156	0.787	0.519	0.225

[a] All the dimensions have been described in Table A1.1 in Appendix 1.

Table 5: Multidimensional Deprivation, contribution to Deprivation in China[a] (CHNS, All Years)

Year	π_1[b]					π_2[b]					π_4[b]				
	Rural	Urban	Wealth Index Percentile			Rural	Urban	Wealth Index Percentile			Rural	Urban	Wealth Index Percentile		
			0- 20th	20th-50th	50th-100th			0- 20th	20th-50th	50th-100th			0- 20th	20th-50th	50th-100th
1989	0.511	0.345	0.597	0.500	0.374	0.286	0.155	0.377	0.272	0.172	0.106	0.044	0.174	0.096	0.048
	(59.70)	(40.30)	(40.56)	(34.01)	(25.43)	(64.94)	(35.06)	(45.96)	(33.14)	(20.90)	(70.80)	(29.20)	(54.59)	(30.27)	(15.14)
1991	0.472	0.320	0.552	0.474	0.343	0.246	0.133	0.323	0.245	0.144	0.082	0.033	0.129	0.079	0.035
	(59.58)	(40.42)	(40.32)	(34.65)	(25.03)	(64.84)	(35.16)	(45.38)	(34.35)	(20.26)	(71.03)	(28.97)	(53.18)	(32.47)	(14.35)
1993	0.450	0.305	0.535	0.446	0.330	0.224	0.124	0.303	0.216	0.136	0.069	0.030	0.113	0.061	0.032
	(59.62)	(40.38)	(40.82)	(34.02)	(25.16)	(64.36)	(35.64)	(46.24)	(32.95)	(20.80)	(69.56)	(30.44)	(54.97)	(29.63)	(15.40)
1997	0.422	0.274	0.512	0.428	0.284	0.202	0.107	0.279	0.205	0.107	0.058	0.024	0.097	0.058	0.022
	(60.59)	(39.41)	(41.83)	(34.95)	(23.21)	(65.50)	(34.50)	(47.28)	(34.65)	(18.07)	(70.38)	(29.62)	(54.52)	(32.95)	(12.53)
2000	0.407	0.267	0.494	0.414	0.278	0.190	0.099	0.262	0.194	0.101	0.052	0.022	0.088	0.053	0.020
	(60.40)	(39.60)	(41.66)	(34.88)	(23.46)	(65.66)	(34.34)	(47.13)	(34.75)	(18.13)	(70.41)	(29.59)	(54.72)	(33.08)	(12.20)
2001	0.423	0.283	0.490	0.424	0.303	0.200	0.107	0.255	0.203	0.115	0.057	0.023	0.081	0.059	0.024
	(59.88)	(40.12)	(40.26)	(34.86)	(24.88)	(65.29)	(34.71)	(44.51)	(35.41)	(20.08)	(71.07)	(28.93)	(49.39)	(35.87)	(14.74)
2006	0.419	0.291	0.499	0.419	0.304	0.198	0.108	0.264	0.198	0.113	0.056	0.023	0.087	0.056	0.022
	(59.05)	(40.95)	(40.84)	(34.31)	(24.85)	(64.68)	(35.32)	(45.98)	(34.43)	(19.59)	(71.15)	(28.85)	(52.65)	(34.04)	(13.31)

[a] The percentage contribution of each subgroup's π to overall π appears in parenthesis.

[b] These π s are based on the 9 dimensions described in Table A1.1 in Appendix 1.

Table 6: Multidimensional Deprivation, contribution to Deprivation in India[a] (NFHS, All Years)

Year	π_1[b]					π_2[b]					π_4[b]				
	Rural	Urban	Wealth Index Percentile			Rural	Urban	Wealth Index Percentile			Rural	Urban	Wealth Index Quintile		
			0- 20th	20th-50th	50th-100th			0- 20th	20th-50th	50th-100th			0- 20th	20th-50th	50th-100th
1992-93	0.489	0.232	0.628	0.473	0.279	0.273	0.091	0.414	0.257	0.111	0.105	0.024	0.198	0.090	0.025
	(67.82)	(32.18)	(45.48)	(34.29)	(20.22)	(74.96)	(25.04)	(52.93)	(32.90)	(14.18)	(81.24)	(18.76)	(63.32)	(28.82)	(7.86)
1998-99	0.528	0.331	0.662	0.527	0.352	0.313	0.143	0.462	0.304	0.154	0.135	0.040	0.249	0.119	0.042
	(61.49)	(38.51)	(42.99)	(34.19)	(22.83)	(68.69)	(31.31)	(50.19)	(33.04)	(16.77)	(77.05)	(22.95)	(60.72)	(29.13)	(10.15)
2005-06	0.376	0.315	0.472	0.384	0.277	0.168	0.119	0.243	0.167	0.094	0.046	0.024	0.079	0.041	0.016
	(54.41)	(45.59)	(41.64)	(33.94)	(24.43)	(58.63)	(41.37)	(48.22)	(33.14)	(18.64)	(65.97)	(34.03)	(58.19)	(30.32)	(11.49)

[a] The percentage contribution of each subgroup's π to overall π appears in parenthesis.
[b] These π s are based on the 9 dimensions described in Table A1.1 in Appendix 1.

Table 7: Multidimensional Deprivation, contribution to Deprivation in Vietnam[a] (VLSS, All Years)

Year	π_1[b]					π_2[b]					π_4[b]				
	Rural	Urban	Wealth Index Percentile			Rural	Urban	Wealth Index Percentile			Rural	Urban	Wealth Index Percentile		
			0- 20th	20th-50th	50th-100th			0- 20th	20th-50th	50th-100th			0- 20th	20th-50th	50th-100th
1992-93	0.518	0.335	0.754	0.601	0.363	0.311	0.146	0.583	0.380	0.150	0.147	0.048	0.372	0.174	0.034
	(60.70)	(39.30)	(43.90)	(34.99)	(21.12)	(68.07)	(31.93)	(52.38)	(34.15)	(13.47)	(75.42)	(24.58)	(64.24)	(29.94)	(5.82)
1997-98	0.425	0.328	0.666	0.472	0.299	0.224	0.131	0.475	0.249	0.106	0.091	0.031	0.281	0.087	0.018
	(56.45)	(43.55)	(46.37)	(32.84)	(20.79)	(63.08)	(36.92)	(57.25)	(30.02)	(12.73)	(74.91)	(25.09)	(72.92)	(22.50)	(4.58)
2002	0.382	0.260	0.580	0.409	0.258	0.185	0.094	0.369	0.194	0.087	0.064	0.021	0.177	0.056	0.015
	(59.46)	(40.54)	(46.52)	(32.81)	(20.68)	(66.32)	(33.68)	(56.75)	(29.82)	(13.43)	(75.56)	(24.44)	(71.31)	(22.71)	(5.99)
2004	0.369	0.287	0.491	0.390	0.282	0.164	0.105	0.266	0.174	0.098	0.045	0.021	0.096	0.045	0.017
	(56.31)	(43.69)	(42.21)	(33.52)	(24.28)	(60.95)	(39.05)	(49.39)	(32.32)	(18.29)	(68.23)	(31.77)	(60.77)	(28.61)	(10.62)

[a] The percentage contribution of each subgroup's π to overall π appears in parenthesis.
[b] These π s are based on the 7 of the 9 dimensions described in Table A1.1 in Appendix 1.

Table 8: Comparison of Dimension specific HCRs between China, India and Vietnam in 1992-93[a]

Year: 1992-93	No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Household Head Illiterate	No Hospital
China								
All Country	0.190	0.015	0.794	0.589	0.204	0.502	0.164	0.709
Rural	0.220	0.021	0.913	0.698	0.207	0.576	0.169	0.883
Urban	0.122	0.002	0.518	0.335	0.196	0.331	0.152	0.305
0-20th wealth percentile	0.324	0.070	0.999	0.894	0.331	0.785	0.254	0.866
20-50th wealth percentile	0.239	0.001	0.935	0.739	0.204	0.570	0.175	0.772
50-100th wealth percentile	0.105	0.001	0.624	0.370	0.151	0.343	0.120	0.606
India								
All Country	0.251	0.403	0.763	0.649	0.594	0.546	0.393	0.065
Rural	0.329	0.526	0.937	0.812	0.622	0.632	0.480	0.063
Urban	0.086	0.142	0.392	0.299	0.534	0.361	0.206	0.069
0-20th wealth percentile	0.628	0.838	0.942	0.926	0.770	0.897	0.588	0.061
20-50th wealth percentile	0.206	0.545	0.836	0.780	0.671	0.680	0.475	0.067
50-100th wealth percentile	0.128	0.143	0.648	0.460	0.478	0.325	0.265	0.065
Vietnam								
All Country	0.210	0.514	0.887	0.474	0.323	0.716	0.134	0.997
Rural	0.235	0.612	0.965	0.525	0.352	0.755	0.146	0.997
Urban	0.110	0.121	0.573	0.271	0.208	0.558	0.084	0.994
0-20th wealth percentile	0.441	1.000	0.989	0.962	0.764	0.895	0.219	0.998
20-50th wealth percentile	0.297	0.940	0.992	0.625	0.398	0.802	0.149	0.995
50-100th wealth percentile	0.092	0.231	0.938	0.258	0.161	0.709	0.090	0.998

[a] All the dimensions have been described in Table A1.1 in Appendix 1.

Table 9: Multidimensional Poverty Index in China, India and Vietnam in 1992/1993

Poverty Cut-off (k)	Multidimensional Headcount Ratio (H)						M_0					
	Rural	Urban	All	Wealth Index (percentile)			Rural	Urban	All	Wealth Index (percentile)		
				0-20	20-50	50-100				0-20	20-50	50-100
China												
1	0.989	0.792	0.929	1.000	0.998	0.859	0.466	0.269	0.407	0.565	0.458	0.310
2	0.950	0.596	0.842	1.000	0.968	0.703	0.461	0.245	0.396	0.565	0.454	0.290
3	0.856	0.420	0.723	0.984	0.860	0.535	0.438	0.201	0.367	0.561	0.428	0.249
4	0.581	0.221	0.471	0.850	0.558	0.265	0.335	0.126	0.272	0.511	0.315	0.147
5	0.241	0.079	0.192	0.459	0.193	0.083	0.164	0.053	0.131	0.315	0.131	0.054
6	0.083	0.022	0.065	0.188	0.062	0.017	0.065	0.017	0.050	0.145	0.048	0.013
7	0.016	0.003	0.012	0.045	0.008	0.001	0.014	0.003	0.010	0.039	0.007	0.001
8	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.001	0.000	0.000
India												
1	0.987	0.809	0.930	1.000	0.985	0.869	0.551	0.261	0.458	0.707	0.533	0.314
2	0.947	0.543	0.818	0.999	0.923	0.683	0.546	0.228	0.444	0.707	0.525	0.291
3	0.857	0.349	0.695	0.983	0.819	0.505	0.523	0.179	0.413	0.703	0.499	0.246
4	0.710	0.210	0.551	0.930	0.712	0.303	0.469	0.127	0.359	0.683	0.459	0.171
5	0.515	0.115	0.388	0.824	0.536	0.125	0.372	0.080	0.278	0.631	0.372	0.082
6	0.290	0.049	0.213	0.608	0.264	0.024	0.231	0.039	0.170	0.498	0.203	0.018
7	0.091	0.012	0.066	0.293	0.021	0.002	0.081	0.011	0.059	0.262	0.019	0.002
8	0.003	0.001	0.002	0.012	0.000	0.000	0.003	0.001	0.003	0.012	0.000	0.000
Vietnam												
1	1.000	0.999	1.000	1.000	1.000	1.000	0.574	0.365	0.531	0.784	0.650	0.435
2	0.992	0.847	0.963	1.000	1.000	0.984	0.573	0.346	0.526	0.784	0.650	0.433
3	0.927	0.542	0.850	1.000	1.000	0.843	0.556	0.269	0.497	0.784	0.650	0.397
4	0.745	0.285	0.653	1.000	0.974	0.488	0.487	0.173	0.423	0.784	0.640	0.264
5	0.513	0.151	0.441	0.994	0.780	0.141	0.372	0.106	0.318	0.780	0.543	0.091
6	0.287	0.067	0.243	0.826	0.340	0.021	0.234	0.054	0.197	0.675	0.268	0.016
7	0.109	0.023	0.092	0.381	0.097	0.002	0.101	0.021	0.085	0.342	0.086	0.001
8	0.016	0.006	0.014	0.067	0.008	0.000	0.017	0.006	0.015	0.067	0.008	0.000

Table 10: Distribution of households by number of dimensions of deprivation in China, India and Vietnam in 1992-93[a]

Number of Dimensions	China (1993)			India (1992-93)			Vietnam (1992-93)		
	Rural	Urban	All	Rural	Urban	All	Rural	Urban	All
0	1.07	20.8	7.09	1.32	19.09	6.99	0	0.1	0.02
1	3.89	19.63	8.69	3.98	26.64	11.21	0.76	15.21	3.65
2	9.44	17.59	11.93	9.03	19.39	12.34	6.59	30.52	11.38
3	27.51	19.92	25.19	14.65	13.86	14.4	18.13	25.63	19.63
4	33.96	14.19	27.92	19.47	9.51	16.29	23.24	13.44	21.28
5	15.81	5.64	12.7	22.57	6.56	17.46	22.61	8.44	19.77
6	6.75	1.94	5.28	19.83	3.72	14.69	17.77	4.38	15.09
7	1.54	0.29	1.16	8.81	1.16	6.37	9.27	1.67	7.75
8	0.04	0	0.03	0.34	0.06	0.25	1.64	0.63	1.44
	100	100	100	100	100	100	100	100	100

[a] All the numbers are in percentages.

Table 11: Percentage Contribution of each Dimension to the Multidimensional Poverty Index: China, India and Vietnam in 1992-93[a]

Group		No Drink Water	No Electricity	No Fuel	No Toilet	No Bicycle	No Radio	Household Head Illiterate	No Hospital	M_0
CHINA										
All China		6.01%	0.47%	25.08%	18.59%	6.44%	15.85%	5.17%	22.39%	0.396(100%)
Rural		5.96%	0.56%	24.78%	18.93%	5.62%	15.62%	4.58%	23.95%	0.461(100%)
Urban		6.23%	0.10%	26.41%	17.07%	10.02%	16.87%	7.73%	15.57%	0.245(100%)
0-20th Wealth Percentile		7.16%	1.55%	22.08%	19.77%	7.33%	17.36%	5.61%	19.14%	0.565(100%)
20-50th Wealth Percentile		6.58%	0.03%	25.71%	20.34%	5.60%	15.69%	4.82%	21.23%	0.454(100%)
50-100th Wealth Percentile		4.54%	0.03%	26.91%	15.96%	6.51%	14.79%	5.15%	26.11%	0.290(100%)
INDIA										
All India		7.01%	11.29%	20.81%	18.02%	15.16%	15.00%	11.00%	1.72%	0.444(100%)
Rural		7.50%	12.00%	21.09%	18.49%	14.02%	14.43%	11.05%	1.41%	0.546(100%)
Urban		4.50%	7.63%	19.39%	15.61%	21.00%	17.88%	10.71%	3.28%	0.228(100%)
0-20th Wealth Percentile		11.09%	14.80%	16.76%	16.36%	13.61%	15.85%	10.47%	1.07%	0.707(100%)
20-50th Wealth Percentile		4.85%	12.93%	19.64%	18.34%	15.40%	15.94%	11.35%	1.56%	0.525(100%)
50-100th Wealth Percentile		5.38%	6.10%	26.02%	19.28%	16.43%	13.15%	11.13%	2.52%	0.291(100%)
VIETNAM										
All Vietnam		4.79%	11.95%	21.00%	11.08%	7.90%	17.51%	2.98%	22.79%	0.526(100%)
Rural		4.92%	13.14%	21.05%	11.29%	7.95%	17.07%	2.97%	21.60%	0.573(100%)
Urban		3.98%	4.32%	20.68%	9.73%	7.58%	20.30%	2.99%	30.42%	0.346(100%)
0-20th Wealth Percentile		7.04%	15.95%	15.78%	15.34%	12.20%	14.29%	3.49%	15.92%	0.784(100%)
20-50th Wealth Percentile		5.71%	18.09%	19.07%	12.02%	7.66%	15.43%	2.87%	19.15%	0.650(100%)
50-100th Wealth Percentile		2.67%	6.68%	27.10%	7.44%	4.67%	20.48%	2.59%	28.38%	0.433(100%)
Percentage Contribution for k=2,4,6										
China	k=2	6.01%	0.47%	25.08%	18.59%	6.44%	15.85%	5.17%	22.39%	0.396(100%)
	k=4	7.31%	0.67%	21.70%	18.49%	7.47%	18.18%	6.09%	20.07%	0.272(100%)
	k=6	11.46%	1.97%	16.16%	15.48%	13.66%	15.63%	9.86%	15.78%	0.050(100%)
India	k=2	7.01%	11.28%	20.81%	18.02%	15.16%	15.00%	11.00%	1.71%	0.444(100%)
	k=4	7.73%	12.73%	18.83%	17.39%	14.14%	15.46%	11.90%	1.53%	0.359(100%)
	k=6	9.45%	14.21%	15.80%	15.50%	14.61%	15.14%	13.64%	1.64%	0.170(100%)
Vietnam	k=2	4.79%	11.95%	21.00%	11.08%	7.90%	17.51%	2.98%	22.77%	0.526(100%)
	k=4	5.84%	14.22%	18.81%	12.86%	9.14%	16.53%	3.48%	19.11%	0.421(100%)
	k=6	8.46%	14.58%	15.48%	14.24%	12.53%	14.34%	4.91%	15.45%	0.197(100%)

[a] All the dimensions have been described in Table A1.1 in Appendix 1.

Table 12: Child Health Statistics[a]-China, India and Vietnam.

Country/ Year	Stunted[b]			Wasted[b]		
	Boys	Girls	Total	Boys	Girls	Total
China						
1993	30.40	27.60	29.10	4.30	2.00	3.20
1997	20.40	24.80	22.40	4.90	3.40	4.20
2006	22.20	19.60	21.00	6.50	6.50	6.50
India						
1992-93	52.40	48.10	50.20	22.60	18.90	20.80
1998-99	49.50	47.80	48.70	18.90	17.80	18.30
2005-06	42.70	40.00	41.40	20.70	19.50	20.10
Vietnam						
1992	53.30	50.50	51.90	7.60	5.70	6.70
1998	37.30	32.90	35.10	12.30	10.40	11.40
2002	N.A	N.A	N.A	N.A	N.A	N.A
2004	N.A	N.A	N.A	N.A	N.A	N.A

[a] The numbers are percentage of children aged 0 to 36 months with a z-score less than -2.
[b] Source: Authors' calculations using the WHO *Anthro* software.

Figure 1: Lorenz Curve for Wealth in China, India and Vietnam – 1992/1993

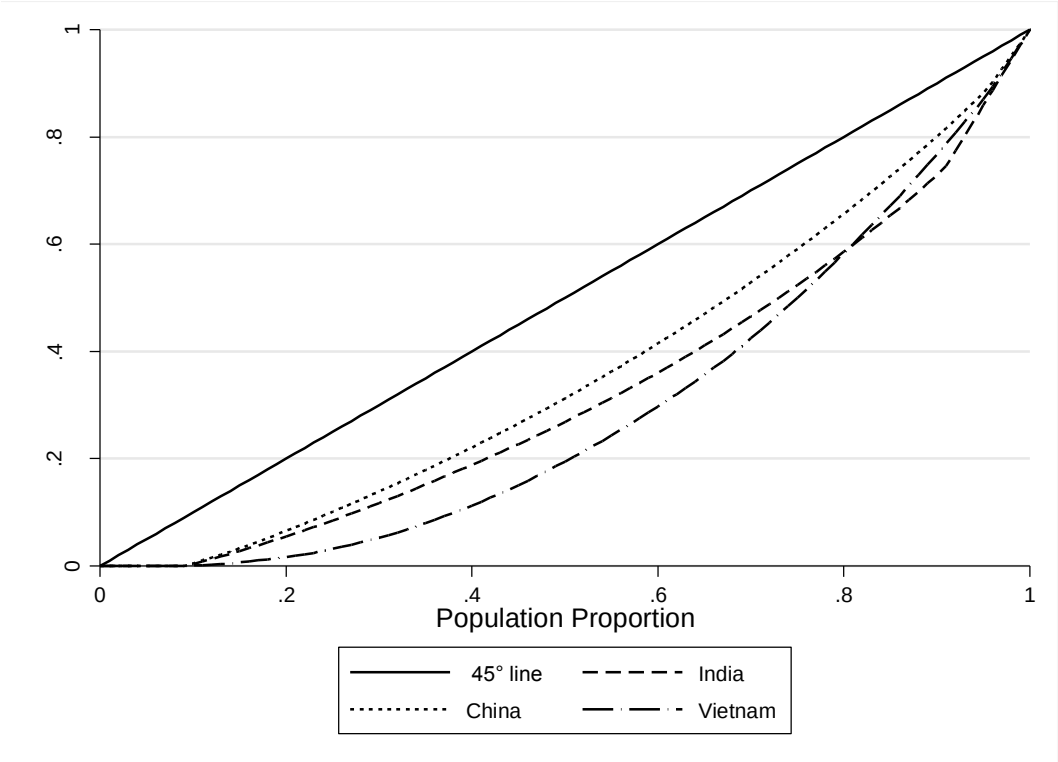


Figure 2: Comparison of Lorenz Curves for Wealth and Pseudo Lorenz Curves for Deprivation, Poverty

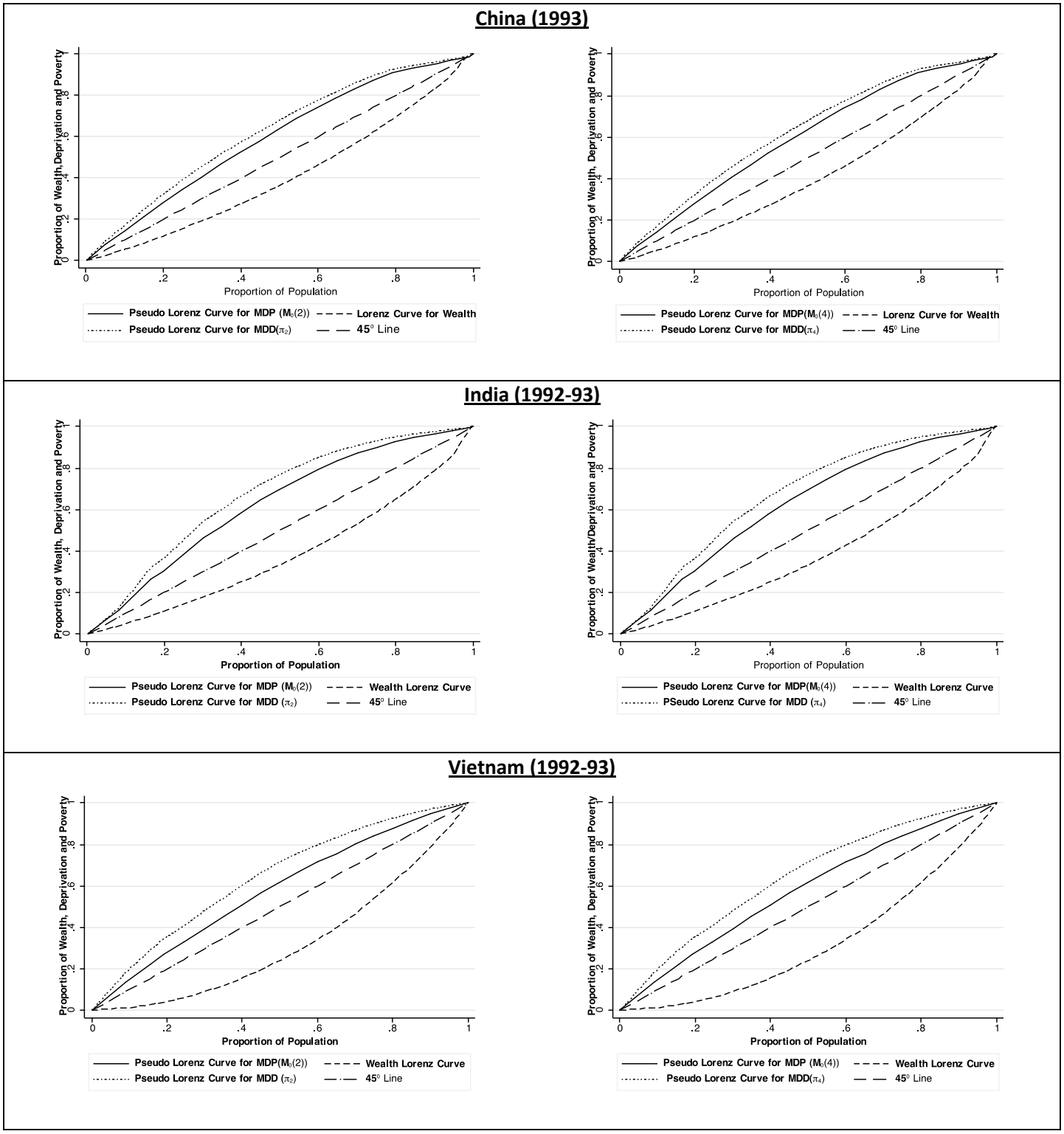
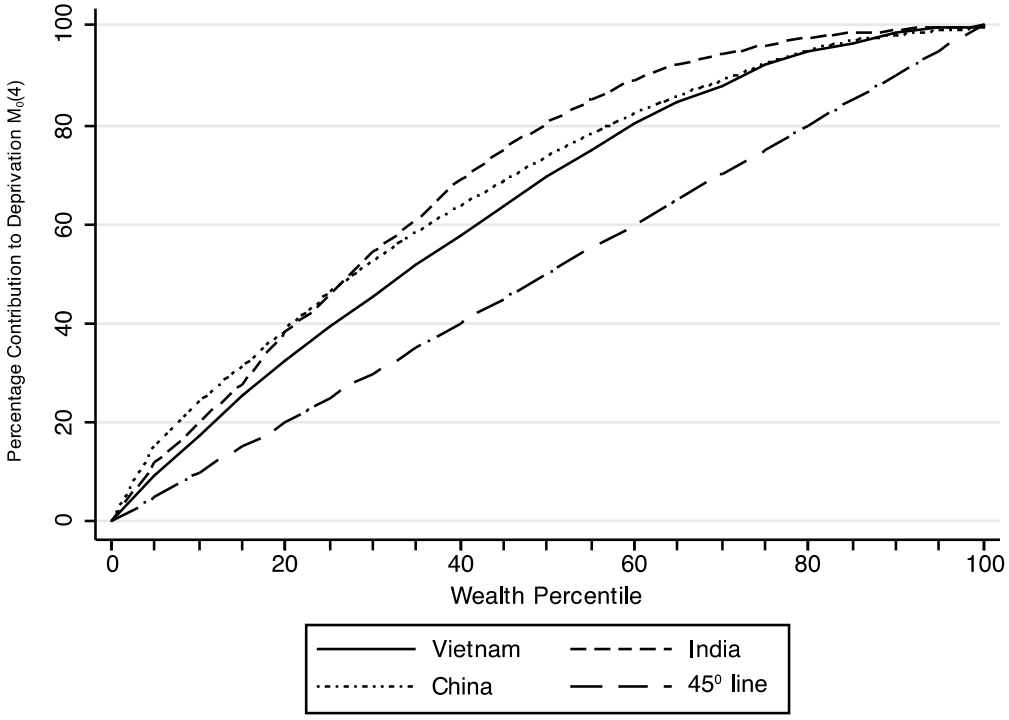


Figure 3: Relation between Deprivation in Living and in Wealth in China, India and Vietnam (1992/1993)



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APPENDIX 1

Table A1.1: Description of the Dimensions and variables used in the PCA

Variable	Definition
Multidimensional Deprivation Dimensions	
No Drinkwater	Household does not have access to improved drinking water source. UN defines improved drinking water source as piped water into dwelling, plot or yard, public tab/standpipe, tube well, borehole, protected dug well, protected spring and rainwater.
No Electricity	Household does not have access to electricity.
No Fuel	Fuel used for cooking is not kerosene, electricity, LPG and Biogas.
No Toilet	Household does not have improved toilet facility as per UN norms. UN defines improved facility as having own flush toilet, own pit toilet, traditional pit toilet, ventilated improved pit latrine, pit-latrine with slab, flush toilet, and composting toilet.
No Bicycle	Household does not have a bicycle.
No Radio	Household does not have radio.
Household Head Illiterate	Household head has not completed primary education.
No Hospital	Household members would not go to hospitals and clinics for sickness
Wait time (>15min)	Household members using medical facilities have to wait more than 15 minutes before being attended by a health care worker.
Principal Component Analysis Variables	
Kuchha House	1 if dwelling Is constructed using temporarily material such as mud, clay etc; 0 otherwise.
Semi-Pucca House	1 if dwelling is constructed using partly temporary and partly permanent material; 0 otherwise.
Pucca House	1 if dwelling of household is made of permanent construction material; 0 otherwise.
Piped/ well/public/rain/bottle	1 if drink water source is piped water, rain water, bottled water; 0 otherwise.
Unprotected Well	1 if drink water source is an unprotected well, hand dug well, uncovered; 0 otherwise.
Unprotected: Spring/river	1 if drink water source is spring or river which is classified unprotected; 0 otherwise.
Tanker	1 if source of drinking water is tanker classified as unsafe drinking water; 0 otherwise.
Other	1 if other source of drinking water; 0 otherwise.
Electricity	1 if household has access to electricity; 0 otherwise.
Own Flush, Latrine	1 if household has private flush toilet classified as improved sanitation facility; 0 otherwise.
Pit/ Ventilated Pit Toilet	1 if household has pit toilet or ventilated toilet considered improved facility; 0 otherwise.
Shared/Public: Flush/Pit Toilet	1 if household has shared or public toilet considered unimproved facility; 0 otherwise.
No Toilet Facility	1 if household members have no facility of toilet and use the bushes; 0 otherwise.
Own Fan	1 if households owns a fan; 0 otherwise.
Own Radio	1 if household owns a radio; 0 otherwise.
Own Television	1 if household owns a television; 0 otherwise.
Own Sewing Machine	1 if household owns a sewing machine; 0 otherwise.
Own Refrigerator	1 if household owns a refrigerator; 0 otherwise.
Own Bicycle	1 if household owns a bicycle; 0 otherwise.
Own Motorcycle	1 if household motorcycle; 0 otherwise.
Own Car	1 if household owns a car; 0 otherwise.

APPENDIX 2

Table A2.1: Principal Component Analysis –China (Base Year: 1998)

	Urban China			Rural China		
Variables	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score
Permanent House	0.344	0.475	0.221	0.143	0.350	0.181
Semi-Permanent House	0.019	0.135	-0.101	0.052	0.223	-0.154
Temporary House	0.002	0.049	-0.072	0.007	0.085	-0.069
In house tap water	0.769	0.421	0.391	0.370	0.483	0.367
In yard tap water	0.148	0.355	-0.249	0.194	0.396	-0.030
In yard well	0.050	0.217	-0.200	0.333	0.472	-0.250
Other	0.033	0.179	-0.185	0.103	0.303	-0.157
Inside house flush	0.509	0.500	0.385	0.171	0.377	0.376
Inside house no flush	0.021	0.144	0.018	0.039	0.194	-0.049
Outside house flush	0.089	0.285	-0.002	0.029	0.167	0.053
Outside house no flush	0.063	0.244	-0.047	0.096	0.295	0.041
Cement open pit	0.179	0.383	-0.225	0.356	0.479	-0.044
Earth open pit	0.098	0.298	-0.283	0.281	0.450	-0.276
None	0.022	0.146	-0.051	0.014	0.118	-0.001
Other	0.019	0.135	-0.042	0.013	0.111	-0.072
Electricity	0.998	0.049	0.020	0.991	0.096	0.079
Own Fan	0.796	0.403	0.197	0.706	0.456	0.270
Own Radio	0.636	0.481	0.187	0.402	0.490	0.193
Own Television	0.722	0.448	0.359	0.391	0.488	0.377
Own Sewing Machine	0.528	0.499	0.072	0.445	0.497	0.149
Own Fridge	0.559	0.497	0.373	0.184	0.387	0.370
Own Bicycle	0.699	0.459	0.097	0.720	0.449	0.112
Own Motorcycle	0.151	0.358	0.064	0.111	0.315	0.222
Own Car	0.026	0.159	0.019	0.021	0.145	0.082

Table A2.2: Principal Component Analysis – India (Base Year:1997-98)

Variable	Urban India			Rural India		
	Mean	Std. Dev.	Factor Score	Mean	Std. Dev.	Factor Score
Kuchha House	0.657	0.475	0.328	0.205	0.404	0.295
Semi-Pucca House	0.250	0.433	-0.211	0.403	0.490	0.000
Pucca House	0.093	0.290	-0.223	0.393	0.488	-0.244
Piped/well/public/rain/bottle	0.925	0.263	0.158	0.716	0.451	0.097
Unprotected Well	0.054	0.226	-0.124	0.212	0.409	-0.073
Unprotected: Spring/river	0.012	0.110	-0.091	0.065	0.247	-0.052
Tanker	0.004	0.061	-0.022	0.002	0.040	-0.007
Other	0.005	0.070	-0.031	0.004	0.065	-0.014
Electricity	0.927	0.260	0.245	0.541	0.498	0.312
Own Flush, Latrine	0.500	0.500	0.325	0.089	0.285	0.272
Pit, Ventilated Pit	0.131	0.337	-0.070	0.140	0.347	0.104
Shared/Public: Flush/Pit	0.210	0.407	-0.115	0.030	0.170	0.033
No Facility	0.158	0.365	-0.252	0.740	0.439	-0.271
Own Fan	0.818	0.386	0.301	0.344	0.475	0.362
Own Radio	0.566	0.496	0.205	0.355	0.478	0.237
Own Television	0.734	0.442	0.317	0.243	0.429	0.365
Own Sewing Machine	0.412	0.492	0.254	0.171	0.377	0.274
Own Refrigerator	0.337	0.473	0.306	0.051	0.220	0.278
Own Bicycle	0.504	0.500	0.129	0.437	0.496	0.139
Own Motorcycle	0.262	0.440	0.269	0.070	0.255	0.269
Own Car	0.055	0.228	0.146	0.008	0.090	0.125

Table A2.3: Principal Component Analysis –Vietnam (Base Year: 1997-98)

	Urban Vietnam			Rural Vietnam		
Variable	Mean	Std Dev	Factor Score	Mean	Std Dev	Factor Score
Permanent House	0.366	0.482	0.295	0.080	0.271	0.108
Semi-Permanent House	0.503	0.500	-0.102	0.629	0.483	0.321
Temporary House	0.132	0.338	-0.270	0.291	0.454	-0.406
Private tap/rainwater	0.561	0.496	0.323	0.141	0.348	-0.027
Public standpipe	0.057	0.232	-0.061	0.002	0.046	-0.013
Deep drill Well	0.128	0.335	-0.088	0.127	0.333	-0.006
Hand dug Well	0.136	0.343	-0.152	0.423	0.494	0.189
Bought Water	0.049	0.216	-0.115	0.116	0.321	0.109
Other	0.068	0.252	-0.159	0.191	0.393	-0.296
Electricity	0.983	0.131	0.177	0.713	0.452	0.367
Flush with septic tank	0.604	0.489	0.379	0.042	0.200	0.107
Double vault compost latrine	0.083	0.276	-0.061	0.095	0.294	0.145
Simple toilet	0.152	0.359	-0.217	0.455	0.498	0.183
Other Toilet	0.032	0.177	-0.079	0.175	0.380	-0.176
No Toilet	0.128	0.335	-0.229	0.233	0.423	-0.209
Own Fan	0.934	0.248	0.223	0.587	0.492	0.373
Own Radio	0.486	0.500	0.116	0.424	0.494	0.066
Own Television	0.805	0.396	0.273	0.486	0.500	0.203
Own Sewing Machine	0.279	0.449	0.167	0.131	0.338	0.041
Own Refrigerator	0.336	0.472	0.318	0.018	0.133	0.088
Own Bicycle	0.775	0.418	0.059	0.722	0.448	0.290
Own Motorcycle	0.429	0.495	0.306	0.163	0.369	0.174
Own Car	0.006	0.076	0.062	0.001	0.031	0.024