

Tracking change: A standard of living index for Matlab

Hassan Zaman
Senior Staff Economist
BRAC

BRAC-ICDDR,B Joint Research Project Matlab
December 1995

Abstract

This paper is intended to show how an index measuring changes in living standards can be constructed by applying a fundamental economic concept on household expenditure data. Data from a small scale panel survey on 240 households in the four clusters of the Matlab research project is used to show the methodology can be put into practice. The first cluster of villages are those which are covered by both BRAC's Rural Development Programme (RDP) and ICDDR,B's Maternal Child Health and Family Planning (MCH,FP) . The second cluster of villages is where only BRAC operates in isolation the third where only ICDDR,B implements its activities and the fourth cluster is where neither organization works. However, inferences on the merits of BRAC and ICDDR,B's inputs will be more relevant when the methodology is applied to the large expenditure survey currently being carried out by the BRAC-ICDDR,B Matlab research team since individual indices can be created for each cell.

The basic theoretical premise underlying this study is that price indices can be used as standard of living indices using an economic tool called 'revealed preference' theory. This theory uses actual household expenditures per person to yield insights into changes in household welfare as consumers 'reveal their preferences' through their expenditure decisions. After data cleaning the items used were rice, daal, vegetable, onion, sugar/guur, chicken, duck, spinach, edible oil, sari and children's clothes for 215 households. The index was computed for the four cells and the results suggest that there has been a rise in living standards in the comparison cell and no change in the other three cells. However these results need to be interpreted with extreme caution and the following qualifications are in order. Firstly the results are based only on two years of data and changes in living standards ought to be monitored only over a longer time period. More importantly the sample size is relatively small. Thirdly the bundle of goods used in this preliminary index ought to be widened to encompass more expenditure items. The issue of a relative scale with which to place the figures in context also needs to be deferred due to the fact that this is only the first of a series of indices which will be constructed using annual panel data.

This research paper therefore intends to present a methodological framework from which inferences on standard of living can be made but does not intend to draw conclusions regarding the merits of the various development interventions due to the limited nature of the data. The paper also by no means intends to have the final word on the multifaceted 'standard of living' issue and recognises that many facets of a household's quality of life may have been ignored by using only one indicator (expenditure) as the basis for comparison.

1.0 Background

Living standards can be conceptualized in a variety of forms. However no measure is complete and each has its limitations and merits.

Income, expenditure per capita and net assets are commonly used economic indicators. However the 'basic needs approach' stresses other critical facets of an individual's quality of life such as 'health, food, education, water, shelter, transport' (Streeten et al 1981). There are associated indicators for each element: nutritional (calorie intake, weight for height, body mass index), educational ('persistance to grade four', primary school enrollment, teacher - pupil ratios, adult illiteracy), environmental (total annual deforestation, internal renewable level of water resources) and health related (infant, child and maternal mortality, population per physician etc). The Physical Quality of Life Index (PQLI) is an indicator constructed from the health perspective; it consolidates three indicators namely infant mortality, life expectancy at age one and literacy giving equal weight to each. Moreover gender specific indicators are available indicating differences in male and female access to resources and in status.

Sen's pioneering contribution to the literature on poverty measurement was in terms of his 'capabilities' approach where goods are not an end in themselves but as one determinant of people's capabilities to function. His approach rejected the prevailing notion in 'poverty economics' that consumer utility maximisation should be the sole measure of wellbeing. Social indicators relating to power, status, decision making and control over resources are difficult to quantify but are nevertheless an integral part of a household's 'well-being'. 'Quality of life' is defined by WHO as the *'condition of life resulting from the combination of the effects of the complete range of factors such as that determining health, happiness, education, social and educational intellectual attainments, freedom of action, justice and freedom of oppression.'* A more recent definition of quality of life (Nagpal and Sell) is a composite measure of physical, mental and social wellbeing as perceived by each individual or group of individuals. Within the 'economic indicators' current consumption is considered a better measure than current income due to the fact that current consumption is a better proxy for permanent income and also because it is easier to measure. Whilst income fluctuates sharply during an individual's lifecycle, consumption is relatively much smoother due to periods of saving and dissaving. Hence a cross sectional figure for current consumption is a far better proxy of permanent income than is current income. Measurement difficulties also plague income figures. The diversity of income sources in rural Bangladesh, problems

with accurately recording the costs and returns of both farm and non farm activities, irregular remittances and a tendency to under report income flows all contribute to the problem.

The choice of measure for policy decisions is an important one in that it implies a value judgement on the relative importance of the different components of an individuals 'quality of life' (Lipton and Ravallion, 1995). In this paper consumption is chosen as it is one of the most fundamental components of well being (it forms the backbone of poverty line estimates) and because it poses fewer measurement difficulties compared to other indicators such as income or calorie intake.

2.0 Objective

The objective of this paper is to show how a simple economic tool can be used to construct a numerical measure of changes in living standards and to apply it using data from a small panel expenditure survey. The broad purpose is to apply this standard of living index to larger expenditure surveys such as that being conducted by the Matlab research project in Bangladesh in order to give a first glance indication of changes in living conditions.

This paper is intended as a methodology paper and not one which will offer any judgement as to the relative efficacy of the various development interventions in place due to the fact that the results are obtained from a small sample survey.

3.0 Analytical framework

3.1 The Matlab research project

The broad purpose of the Matlab research project is to investigate the joint effects of socioeconomic inputs and health interventions in rural Bangladesh. The research is being carried out in Matlab 'thana' (region) by the two programme implementors, BRAC and ICDDR,B (International Centre for Diarrhoeal Diseases Research, Bangladesh).

BRAC is the largest NGO (Non Government Organization) in Bangladesh offering multifaceted development interventions, ranging from rural credit, non formal primary education and health services, to the rural poor of Bangladesh. BRAC's Rural Development Programme has been operating in Matlab since late 1992 with its main focus being on developing viable microenterprises through credit, training, technical assistance and marketing support for the functionally landless.

ICDDR,B is an international health research centre and has been involved in Matlab thana for the last three decades. The organization has been operating a 'Demographic Surveillance System' (DSS) recording births, deaths and marriages for about 200,000 households in Matlab thana. ICDDR,B's Maternal Child Health and Family Planning (MCH-FP) program in Matlab dates back to 1977 with the objective of reducing fertility and improving child survival. The program covers around 100,000 people with health services delivered at household level by eighty community health workers (CHW's). Regular fortnightly visits cover family planning lessons and distribution, immunization, vitamin A and safe delivery kit distribution. A chain of referral has been established from CHW's to four medical subcentres to ICDDR,B's Matlab hospital.

The research is based on a four cell design composed of clusters of villages. The first cluster are those which are covered by both BRAC's Rural Development Programme (RDP) and ICDDR,B's Maternal Child Health and Family Planning (MCH,FP). The second cluster of villages is where only BRAC operates in isolation the third where only ICDDR,B implements its activities and the fourth cluster is where neither organization works.

The standard of living index is constructed using a basic theory of consumer behaviour used in economics called revealed preference theory.

3.2 Revealed preference theory

Revealed preference theory originated from the desire to develop a theory of consumer demand based on observable behaviour, namely spending patterns, rather than the norm of modelling unobservable consumer preferences. However although revealed preference using utility curves is an alternative approach it is in fact equivalent to utility maximization theory in that a consumer who satisfies the preference assumptions (ie of utility maximization) will also satisfy the behavioural assumptions (of revealed preference). The most fundamental assumption behind revealed preference theory is that consumer choices are consistent. This means that if bundle 'x' is chosen when the consumer had the means to buy bundle 'y' then if bundle 'y' is chosen 'x' can no longer be a feasible alternative (ie 'x' is outside the consumers budget constraint). Hence revealed preference takes into account the effect of price changes (inflation) or income changes on consumer welfare. The other assumption, realistic over a period of a few years, is that tastes are held constant over

time. In time period 1 households purchase a bundle of goods q_1 at a price p_1 thereby spending p_1q_1 taka. The following year they maximise their utility by purchasing q_2 at price p_2 spending p_2q_2 taka.

If the bundle q_2 purchased at the prevailing second year prices costs them more than if they had purchased bundle q_1 at second year prices (p_2q_1) we can conclude that their living standards have risen relative to their first year. This is because they preferred bundle q_2 to bundle q_1 even though bundle q_2 was more expensive (and therefore bundle q_1 was within their budget constraint) i.e. if $p_2q_2 > p_2q_1$ living standards have risen. Similarly if $p_1q_1 > p_1q_2$ then one can infer that the standard of living has fallen in the second year relative to the first since the bundle of goods q_2 , which was purchased in the second year, could have been bought at time period 1 but the household chose to buy a more expensive bundle q_1 thereby suggesting that q_1 is superior in quality to q_2 . Any other combination such as $p_2q_2 < p_2q_1$ or $p_1q_1 < p_1q_2$ gives indeterminate inferences regarding changes in living standards since we do not know whether the particular bundle was chosen because it was cheaper or because it was superior in 'quality'.

An index can be formed by using the ratio $(p_2q_2)/(p_2q_1)$ for increases in living standards and $(p_1q_1)/(p_1q_2)$ for decreases in living standards. The conceptual challenge is to translate the numerical values of the index into a meaningful scale measuring the extent of changes in living standards. The ratio $(p_2q_2)/(p_2q_1)$ is known as the 'Laspyres quantity index'. The relationship between the 'Laspyres Quantity Index' and the more commonly known indicator of inflation, the Laspyres price index is that the former uses second year prices as constant and compares the cost of the two different bundles of goods whereas the latter compares the cost of the first years bundle of goods in first year prices with the following year's prices. The Laspyres price index¹ is $(p_2q_1)/(p_1q_1)$ and it overstates the true rise in cost of living because it does not take into account the fact that consumers substitute away from more expensive goods to cheaper items (ie assumes consumers still consume bundle q_1 even in the second period). Similarly the ratio $(p_1q_1)/(p_1q_2)$ is known as the Paasche quantity index. An alternative measure of inflation is the Paasche price index which is the ratio p_2q_2/p_1q_2 which understates the true increase in the cost of living.

The problem of changing household size over time can be overcome by taking the quantity purchased per head in a particular household. Note that index numbers are by definition averages and are designed for the "representative individual". Dividing by the number of individuals is the most basic form of an equivalence scale as it assumes that there are no real scale economies in consumption (ie an additional

¹ See appendix 1 for more detail on Laspyres and Paasche measures of inflation

child leads to an equiproportionate increase in household expenditure - for more details on equivalence scales see Deaton and Muelbauer 1980). For rural poor households this is a reasonable assumption due to the high proportion of basic items such as food in their budget. More details on the calculations involved are in appendix 2.

The hypothesis that we are essentially testing is that households in the BRAC-ICDDR,B cell experience the largest improvement in their standard of living compared to the other three cells. Moreover there ought to be a 'ranking' of standard of living improvements; the BRAC-ICDDR,B cell ought to have the largest rise, the only BRAC cell the second largest, the only ICDDR,B cell the third largest and the control cell should in theory register the smallest improvements. The reasoning behind suggesting the only BRAC cell ought in theory to register greater improvements than the only ICDDR,B cell is that BRAC's RDP provides more direct income generating inputs than does ICDDR,B. Hence the maintained hypothesis is that $P1Q1 > P1Q0$ in the cells where there are program interventions (i.e. as a result of program interventions households can consume a higher value bundle of goods) with the standard of living index $P1Q1/P1Q0$ being larger according to the aforementioned hypothesised ranking.

4.0 Methodology

This methodology can be applied to the panel survey of 3500 households in Matlab region, Bangladesh. The vilages in the study area are divided into four clusters. The first cluster of vilages are those which are covered by both BRAC's Rural Development Programme (RDP) and ICDDR,B's Maternal Child Health and Family Planning (MCH,FP) . The second cluster of vilages is where only BRAC operates in isolation, the third where only ICDDR,B implements its activities and the fourth cluster is where neither organization works. A two stage random sampling technique was used to select the vilages from each cell and then households were randomly chosen from the preselected vilages. In the BRAC vilages a random sample of BRAC members was chosen. After data cleaning only 215 households could be used for this exercise. Eighteen items were used in the expenditure survey but only eleven could be used in this analysis. The items used were rice, daal, vegetable, onion, sugar/guur, chicken, duck, spinach, edible oil, sari and children's clothes. The reason is that many expenditures could not be subdivided into quantity and price due to the fact that unit prices for categories like 'education' and 'household repair' do not exist. However these eighteen items included different types of the same product; for instance the rice

category was calculated for two varieties. However in future the expenditure survey needs to be designed to capture a greater variety of goods which can be discretely subdivided into quantities and prices.

Thirty households were selected in one village, Uddamdi, to pilot test the expenditure questionnaire. The questionnaire took self produced goods which are consumed into account for which an imputed value was attached. Two rounds of pretesting were done and the questionnaire suitably refined before the fieldwork commenced in January 1994. Data was collected over a period of three weeks by three field investigators, a field supervisor and the principal investigator.

5.0 Results

The results indicate that there has been a marginal improvement in living standards in the comparison cell where no interventions took place and no change in the other three cells.

6.0 Conclusion

Once again in the final summing up one must stress that this is a methodological paper to be applied to larger sample sizes such as the panel survey on 3500 households currently being carried out in Matlab. The results based on a small sample are to be used only for illustrative purposes. Moreover a larger range of goods needs to be used for more conclusive results. The rationale behind this paper is to show how a first glance indicator of changes in living standards can be constructed using only expenditure data and that this can be monitored over time in the various cells. However this index will not shed any light on the mechanisms of the changes and it is left to the more detailed studies to provide explanations regarding the reasons for such changes.

Appendix 1

Laspeyres Price Index

This measures the inflation rate between now and some base year by dividing the total cost of the quantities of the goods bought by consumers in the base year valued at today's prices by the total cost of those same quantities valued at base year prices.

eg

	Base quantity(Q ₀)	Base price(P ₀)	New price(P ₁)	
Rice	10		3	5
Fish	20		2	4

The Laspeyres price index is 13/7.

i.e. (Sum of base quantities x new prices) over (sum of base quantities x old prices).

The Laspeyres price index overstates the cost of living increase since it does not take into account the fact that consumers switch product quantities as relative prices change i.e. they buy less of the product whose price has risen relatively more.

Paasche price index

This index uses new quantities chosen as the reference point as opposed to the Laspeyres index which uses base quantities. The Paasche index measures inflation by dividing the total cost of the new purchases at new prices by the total cost of the new purchases at prices prevailing at the base date i.e. P_1Q_1/P_0Q_1 . The Paasche index understates the true increase in the cost of living since it avails of the new bundle of goods and amalgamates it with the old prices.

Appendix 2

We have data on the amount of rice consumed (expenditure plus consumption from own production) in the household - Q_r scaled up by seven to get a weekly figure

We have the number of household members and therefore can calculate the consumption of rice per head.
We can do the same for all the households in the cell and then calculate average rice consumption per head.
Multiply by the unit price of rice to get the total value of rice consumption per head per week.
Do the same for the next item.
Sum for all items to get total value of consumption per head per week in that cell.
Do the same for the following year, bearing in mind new household demographics.
For each cell see if conditions for increase or decrease in living standards hold.