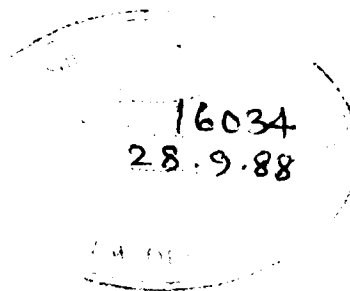ON THE MEASUREMENT OF UNEMPLOYMENT

SATYA PAUL

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OF PUBLIC FINANCE AND POLICY
ATSANG VIHAR MARG
SPECIAL INSTITUTIONAL AREA
NEW DELHI 110067

ABSTRACT

This paper discusses issues in the measurement of
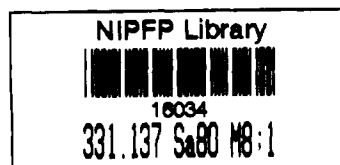unemployment. A new index of unemployment is suggested. The
proposed index is also generalised to a parametric family of
measures where the parameter is interpreted as an indicator of
aversion to unemployment. It also possesses the property of addi-
tive decomposability which enables us to quantify the contribu-
tion of a specific group towards total unemployment. An empirical
exercise based on Indian National Sample Survey data illustrates
the usefulness of the proposed index.

ON THE MEASUREMENT OF UNEMPLOYMENT

1. Introduction

Two crucial issues are involved in the measurement of unemployment. One relates to the problem of identifying unemployment and the other to the problem of constructing a suitable index of overall unemployment using available information on the unemployed. While some significant contributions have been made to tackle the first problem [see, e.g., Pigou (1983) Dandekar and Rath (1971), Krishna (1973) 1976), Sen (1975), Visaria (1981), Hashim and Paul (1987) and Paul (1988)], relatively very little work has been done on the second problem with which this paper will mainly be concerned. But since the two problems are not strictly unrelated, we shall start with a discussion on the identification of unemployment in Section 2. Section 3 briefly discusses the limitations of existing measures of unemployment. In Section 4, we suggest a new measures of unemployment which is free from the limitations of existing measures. The proposed measure is also generalised to a parametric family of measures where the parameter is interpreted as an indicator of 'aversion to unemployment'. In addition, it possesses the property of additive decomposability which enables us to quantify the contribution of a specific group towards total unemployment. In Section 5, we illustrate an empirical applicability of the proposed measure using Indian National Sample Survey data relating to 32nd (1977-78) and 38th (1983) rounds. Section 6 concludes the study.

2.   Identification of Unemployment

In the existing literature several criteria have been
discussed for identifying unemployment.   One is the income
criterion advocated by Dandekar and Rath (1971), according to
which a person may be considered unemployed if his income falls
short of some 'minimum level'.   The minimum level of income may
either be defined arbitrarily or be taken at par with the so-
cially accepted poverty line.[1] In the latter case, unemployment
is identified in the sense of poverty and thus the distinction
between the two is abandoned.   However, all the poor in the sense
of income shortfall may not be unemployed in the 'idle' sense.
And all unemployed persons may not be poor if they have income
from property[2].   Sen (1975) has rightly commented: "There is a
good case for keeping 'poverty' as a concept different from the
'unemployment' without of course assuming them to be independent
of each other....   To identify unemployment with poverty seems to
impoverish both notions since they relate to two somewhat dif-
ferent categories of thought".

A second approach to the identification of unemployment
is based on the criterion of productivity.   According to this
criterion, a person may be considered unemployed if his marginal
productivity is lower than some cut-off level.   The cut-off level
is often taken at zero. Thus this concept of unemployment is for-
mally akin to the concept of disguised unemployment.   This notion
of unemployment is of great importance for all issues and ques-
tions relating to the development of agriculture and industry be-
cause it recognises the existence of surplus labour which can be
physically removed from agriculture/industry without affecting

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the existing production. The empirical support for zero marginal productivity of labour is, however, weak. Some, e.g., Mellor and Stevens (1956), Sarkar (1957), International Labour Organisation (1961), Mehra (1966), Sanghvi (1969) seem to have found evidence of its existence, whereas others, e.g., Oshima (1958), Schultz (1956, 1956b, 1964), Jorgenson (1967), Hansen (1966) have presented evidence to the contrary.

Still another approach put forward by Sen (1975) is based on what he terms as 'recognition criterion'. Even if a person is employed, he may well recognise himself unemployed if the 'employment' does not come to his expectations in terms of self-esteem or social-esteem or full use of his training. That is, a person may be considered unemployed if he is not satisfied with his work. Clearly the set of persons classified as unemployed by this criterion will be different from those who do not have sufficient work to do. Moreover, identification of unemployment by this criterion would involve the subjective judgement of the respondents. There is hardly any empirical study which has made use of this criterion for identifying unemployment.

Then there is a time criterion according to which a person may be considered unemployed if his actual days in employment fall short of his actual labour force days during the reference period. Suppose during some reference period, say a week, a person was in gainful employment for m_{1i} days and was not working but was either seeking or was available for work at current rate of wages for m_{2i} days so that he may be considered in labour force for m_{0i} ($=m_{1i} + m_{2i}$) days. He may then be identified as unemployed if

$$u_i = \frac{m_{oi} - m_{1i}}{m_{oi}} > 0 \qquad (1)$$

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where $m_{oi} > 0$. Note that $u_i = 0$ will refer to the status of full employment and $u_i = 1$ to that of full unemployment. All other values of u_i between zero and unity will refer to different degree of unemployment[2].

In our formulation (1) the labour supply m_{oi} is not only voluntary but is also permitted to vary from person to person (while in practice it may be identical for some persons) and everyone with positive labour supply is a member of labour force. However, "government may well regard the voluntary labour supply of particular sections of the population as deficient or excessive from the social point of view. More working time may be expected from some workers than they are willing to offer under existing socio-economic arrangements. Voluntary female labour supply, in particular, may be considered deficient and the voluntary labour supply of children or artisans as excessive" (Krishna, 1976, p.9). Fixation of standard norms for computing the time of different sections of the population, which ought to be available for productive work, would involve not only an element of arbitrariness but would also invite tremendous problems of a practical nature. The most non-arbitrary procedure would be to retain every one with voluntary positive labour supply in the labour force.

Time as a criterion for identifying unemployment is the most fundamental and the least arbitrary. This criterion will form the basis of our analysis in the rest of this paper.

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3. Measurement of Unemployment

Having discussed the problem of identification we turn to the problem of measurement of unemployment. Two popular measures are: (1) Person-rate of unemployment (PRU) and (2) Time-rate of unemployment (TRU). PRU is defined as the ratio of total number of unemployed (n) to the total number of persons in labour force (N) during the reference period. That is,

$$PRU = n/N \tag{2}$$

TRU is defined as the ratio of total person day unemployed to the total labour force person days during the reference period. That is,

$$TRU = \{ \sum_{i=1}^{n} (m_{oi} - m_{1i}) \}/m_{oo} \tag{3a}$$

where

$$m_{oo} = \sum_{i=1}^{N} m_{oi}$$

TRU can alternatively be expressed as the weighted average of u_i's, the weights being their proportions in total labour force person days. That is,

$$TRU = \sum_{i=1}^{n} (\frac{m_{oi} - m_{1i}}{m_{oi}}) \frac{m_{oi}}{m_{oo}} \tag{3b}$$

PRU does not reflect the intensity of unemployment suf-
fered by each unemployed person. The intensity of unemployment is
likely to vary from person to person. Some persons may be fully
unemployed whereas others only moderately. Hence any sensible
measure of unemployment must take into account the intensity
aspect of unemployment.

TRU provides a reasonable picture of over-all under-
utilisation of time of the existing labour force. But it ignore
the distribution of unemployed according to their intensities.

4. A New Index of Unemployment

A good measure of unemployment must take into account
both the intensity and distribution aspects of unemployment. If
we assume that the misery of a person in labour force varies
proportionately with the intensity of his unemployment, then a
simple average of these intensities might be a good measure of
unemployment. That is,

$$I = \frac{1}{N} \sum_{i=1}^{N} u_i = \frac{1}{N} \sum_{i=1}^{N} (\frac{m_{oi} - m_{1i}}{m_{oi}}) \qquad (4)$$

The value of index I will lies between zero and unity.
It will assume value zero when all members of labour force are
fully employed and value unity when all members of labour force
are fully unemployed. The index is, of course, independent of the
size of labour force. These two properties are also satisfied by
the traditional measures PRU and TRU.

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While the assumption that the misery of a member of labour force varies proportionately with the intensity of his unemployment seems to be sensible, there is no reason why we should not think of alternative assumptions. If we assume that the misery of a person in labour force increases more than proportionately with the increase in the intensity of his unemployment, then the index I can be generalised to a class which contains the unemployment measures that do so. For $\varepsilon \geq 1$, I may be defined as

$$I(\varepsilon) = \frac{1}{N} \sum_{i=1}^{N} \left(\frac{m_{oi} - m_{1i}}{m_{oi}}\right)^{\varepsilon} \qquad (5)$$

The measure I (0) is simply the PRU. The measure I is obtained by setting $\varepsilon = 1$. The parameter $\varepsilon \geq 1$ may be viewed as an indicator of unemployment aversion. A larger ε gives greater emphasis to the severally unemployed. For $\varepsilon = 2$, (5) may be expressed as

$$I(2) = \frac{1}{N} \sum_{i=1}^{N} u_i^2 \qquad (6)$$

where the intensity of unemployment u_i itself serves as a weight.

As $\varepsilon \to \infty$ the measure $I(\varepsilon)$ will reduce to the person rate of full unemployment. That is,

$$\underset{\varepsilon \to \infty}{Lt} \ I(\varepsilon) = n^*/N \qquad (7)$$

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where n* are the number of fully unemployed persons in the labour force of size N. Clearly this ignores all the underemployed completely.

The government can choose a particular value of ϵ depending on its attitude towards unemployment. If the government is concerned more with severally unemployed and less with marginally unemployed, then a suitable value of ϵ for computing $I(\epsilon)$ might be 1 or 2. However, if the government is concerned largely with the fully unemployed, then the index $I(\epsilon)$ with higher value of or simply the person rate of full unemployment might serve the purpose.

The proposed unemployment index $I(\epsilon)$ can be shown to have the property of additive decomposability. Let there be G mutually exclusive groups of population. If N_g is the size of labour force (measured in terms of persons) in the g-th (g = 1,2,......., G) group, then $N = \sum_{g=1}^{G} N_g$. During the reference period if a person i in the g-th group spends m_{ogi} person-days in the labour force and m_{1gi} person days in employment, then

$$\sum_{i=1}^{N} \frac{m_{oi} - m_{1i}}{m_{oi}} = \sum_{g=1}^{G} \sum_{i=1}^{N_g} \frac{m_{ogi} - m_{1gi}}{m_{ogi}} \qquad (8)$$

Substituting (8) into (5) we have

$$I(\epsilon) = \sum_{g=1}^{G} (N_g/N) \, I_g \, (\epsilon)$$

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where

$$I_g(\varepsilon) = \frac{1}{N_g} \sum_{i=1}^{N_g} \left(\frac{m_{ogi} - m_{lgi}}{m_{ogi}}\right)^{\varepsilon} \tag{10}$$

is the generalised index of unemployment for the g-th group. This leads to the following theorem:

Theorem 1:   If the labour force is divided into a number of mutually exclusive groups, the unemployment index for the whole labour force is equal to the weighted average of the group specific unemployment indices, the weights being proportional to their shares in the total labour.

The contribution of g-th group towards total unemployment will be given by

$$F_g = \{(N_g/N)\ I_g(\varepsilon)\} / I(\varepsilon) \qquad (g=1,\ 2,\ldots,G) \tag{11}$$

Note that $\displaystyle\sum_{g=1}^{G} F_g = 1.$

5.   An Illustrative Application

In this Section, we apply the new unemployment index to the Indian National Sample Survey data on employment and unemployment relating to its 32nd (July 1977 – June 1978) and

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38th (January - December 1983) rounds. The data refer to a week and have been collected in four sub-rounds during the year separately for rural and urban sectors[4]. Interview method has been followed to get information about work-activities of a person (in the population of 'aged 5 years and above') for each day of the seven days preceding the date of survey. Each person is assigned one or at the most two activity statuses on each day of the week. A person is considered employed for the entire day if he/she worked for four hours or more on the day. However, if he/she worked for one hour or more but less than four hours, he/she is considered employed for the half day and unemployed or 'not in labour force' for the other half of the day depending on whether he/she was seeking/available for work or not on the day. On the other hand, if a person was not engaged in any gainful work even for one hour on the day but was seeking/available for work for four hours or more, he/she was considered unemployed for the entire day. But if he/she was available for work for less than four hours, he/she was considered unemployed for half day and 'not in labour force' for the other half of the day. A person, who was having neither any gainful work to do nor was available for work even for half of the day, was considered 'not in labour force' for the entire day. Aggregating across half day units over the week, total person-days unemployed and total person days employed are counted for each person in the sample.

Since the information for individual observations are not available to us, we computed the new index $I(\epsilon)$ for $\epsilon = 1,2$ and 3 and the traditional measures PRU and TRU separately for rural and urban sectors using the aggregate data available in the form of distribution of labour force and the number of unemployed days by

the number of days worked (specified with the interval of half day unit) in the week[5]. The unemployment indices for India as a whole are obtained as the weighted average of the sectorial indices. The values of all these indices for 1977-78 and 1983 are presented in Table 1.

The estimates of the index $I(\epsilon)$ at $\epsilon = 1,2,$ and 3 show an increase in the level of unemployment in 1983 over 1977-78 in India. The traditional measure PRU which ignores the intensity aspect, provides a picture contrary to this. As per the index $I(1)$, rural sector contributes 78.46 and 59.46 per cents towards total unemployment in 1977/78 and 1983 respectively. PRU overestimates the contribution of rural sector towards total unemployment in both the years. All the indices of unemployment, however, show some decline in the contribution of rural sector towards total unemployment in 1983 over 1977-78.

6. Concluding Remarks

This paper has suggested a new measure of unemployment which is free from the limitations of the traditional measures. The proposed measure is also generalised to a parametric family of measures where the parameter serves as an indicator of aversion to unemployment. Easy decomposability and computation are the other salient features of the proposed measure. An empirical exercise based on Indian National Sample Survey data illustrates the usefulness of the method.

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TABLE 1

Level of Unemployment in India, 1977-78 and 1983: Decomposition by Sectors

Sectors	1977-78					1983				
	New Measures of Unemployment			Traditional Measures of Unemployment		New Measures of Unemployment			Traditional Measures of Unemployment	
	I(1)	I(2)	I(3)	PRU	TRU	I(1)	I(2)	I(3)	PRU	TRU
1.Rural Sector	0.0858	0.0576	0.0481	0.2478	0.0770	0.1216	0.0784	0.0599	0.2294	0.0861
2.Urban Sector	0.1073	0.0911	0.0837	0.2069	0.1034	0.2981	0.1962	0.1502	0.2072	0.0950
India (1+2)	0.0896	0.0636	0.545	0.2404	0.0819	0.1594	0.1036	0.0793	0.2246	0.0844

Contribution of j-th Sector towards Total Unemployment (Percentages)

Rural Sector	78.46	74.21	72.29	84.52	76.70	59.91	59.46	59.40	80.23	76.31
Urban Sector	21.54	25.79	27.71	15.48	23.30	40.09	40.54	40.60	19.77	23.69

Notes: 1. $I(\varepsilon) = \sum_{j=1}^{15} u_j^\varepsilon \cdot w_j$, where w_j is the proportion of labour force (measured in persons) in the j-th group of labour force. The labour force groups are classified according the number of days worked in the interval of half day unit.

2. Rural sector contributed 82.0 and 78.57 percentages towards total labour force (measured in persons) in India during 1977-78 and 1983 respectively. Its contribution towards total labour force person days in India was 81.59 per cent during 1977-78 and 78.93 per cent during 1983. These latter figures were used in the decomposition of TRU.

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1. This view of unemployment has also appeared in the studies of International Labour Organisation (1972) and Hauser (1973).

2. In a recent empirical study, Paul (1988) observes that unemployment exists among both the poor and non-poor. However, the rate of unemployment declines as we move from low to higher per capital consumption expenditure classes.

3. Paul (1983); also see Krishna (1976).

4. The details of sampling design and the method of collection of these data are given in Sarvekshana, Vol. V, Nos. 1 and 2, July-October 1981 and the National Sample Survey Report No. 341, June 1987.

5. The data for 1977-78 are taken from Sarvekshana (ibid) and the National Sample Survey Report No. 341 (ibid).

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