The definition and measurement of social reference spaces

van Praag, B.M.S.; van Herwaarden, F.G.; Kapteyn, A.J.

Published in:
Netherlands' Journal of sociology: Sociologia neerlandica

Publication date:
1979

The Netherlands' Journal of Sociology, 15 (1979) 13–25

THE DEFINITION AND MEASUREMENT OF SOCIAL REFERENCE SPACES

BERNARD M.S. VAN PRAAG, ARIE KAPTEYN and FLOOR G. VAN HERWAARDEN

1. INTRODUCTION

It will not be an unfamiliar idea to sociologists that individual behaviour and attitudes can be only partially explained by innate psychological characteristics. A major part has to be ascribed to exogenous factors influencing the individual's attitudes, opinions and behaviour. These exogenous factors define the individual's environment. One of the most important behaviour-determining factors is certainly the behaviour of other people in the individual's environment. Norms, values, attitudes and behaviour seem to be influenced to a large extent by other people. However, some people are more influential than others. We say that the people who have influence constitute the *reference group* of the individual, while the others do not belong to his reference group. This concept may be refined by assigning different weights to different people in the reference group, yielding the concept of what we call a *social reference space* (SRS).

It is clear that any individual, in principle, has his own reference group (or space) and that this group may even vary with the behavioural aspect concerned. For instance, an individual might have different reference groups for his business and for his religious behaviour. We can try to define an individual's SRS (with respect to a particular behavioural aspect) by looking at his behaviour and by figuring out to what extent it conforms or is in contrast with that of other individuals. The delineation of reference groups requires that we have data on behavioural aspects of individuals. In this paper we employ data on how people evaluate different levels of income, i.e. their *individual welfare function of income* (WFI). The SRS concept is formally introduced in Section 2 and the WFI-concept in Section 3. The empirical results with respect to the social reference spaces of individuals have been derived from a data set of 2,774 Dutch individuals. The results are of interest in two respects. First how do they shed light on the process of social communication in (Dutch) society, and secondly how are people influenced by each other in their evaluation of incomes? These two questions will be considered in

Sections 4 and 5. Section 6 concludes.

This article aims to be a non-technical exposé stressing concept and results only. Therefore we shall not attempt to give an exhausive survey of the literature. For a more elaborate report Kapteyn, Van Praag, Van Herwaarden (1976) and Kapteyn (1977) must be consulted. It should be kept in mind that the authors are econometricians whose knowledge of sociological literature is superficial.

2. THE CONCEPT OF SOCIAL REFERENCE SPACES

Let us focus on a specific aspect of an individual's behaviour, e.g. dressing. It is frequently said that a mans's way of dressing reveals his character. But also, an individual's way of dressing tells us a lot about which people he takes as an example. Generally he will borrow his style not from *one* individual but from several individuals, where some individuals have considerable influence and some have only a minor influence on him, while the influence of a great number of others will be negligible. We may conceive of his dressing habits as being a weighted average of the dressing styles in his environment, where he assigns considerable weight to some individuals and little or no weight to others. We formalize this idea as follows.

Consider an individual ω_0 who lives in a society Ω with other individuals, say, $\omega_1, \ldots, \omega_n$. Then ω_0 assigns what we call *reference weights* (RWs) to his fellow-citizens, say $p(\omega_1|\omega_0), \ldots, p(\omega_n|\omega_0)$. We assume that the RWs are non-negative and add up to one. The distribution of RWs may take on various forms. For instance, if $p(\omega_1|\omega_0) = \ldots = p(\omega_n|\omega_0) = \frac{1}{n}$ all citizens exert the same influence on ω_0. On the other hand, if

$$p(\omega_1|\omega_0) = 1, p(\omega_2|\omega_0) = \ldots p(\omega_n|\omega_0) = 0, \tag{2.1}$$

individual ω_0 would only refer to individual ω_1 as far as his way of dressing is concerned. We call the system $(\Omega, p(.|\omega_0))$ the *social reference space* (SRS) of individual ω_0. One observes that any individual ω_i has his own SRS, reflected by a weight distribution $p(.|\omega_i)$. This allows for the possibility of asymmetry, i.e. $p(\omega_1|\omega_0)$ may be nearly one and $p(\omega_0|\omega_1)$ may be nearly zero. In that case ω_1 has a strong influence on ω_0's behaviour, but ω_0's influence on ω_1 is negligible.

The question is how can we estimate these RWs? Let us assume for the sake of illustration that we are able to measure dressing style on an interval scale (developed by *Harper's* for instance) and that individuals' dressing styles were measured by $x_0, x_1, \ldots, x_n$ respectively. In that case, ω_0's dressing style might be assumed to follow from

$$x_0 = p(\omega_1|\omega_0)x_1 + \ldots + p(\omega_n|\omega_0)x_n. \tag{2.2}$$

If for instance $p(\omega_1|\omega_0) \approx 1$ it implies that ω_0 dresses himself very much like ω_1. This gives us the clue to how to estimate the p's, viz., by observing and comparing dressing, or in general, aspects of individual behaviour.

The dressing example has been chosen in order to convey the line of reasoning in an informal way. However, the example indicates at the same time two major difficulties in implementing the method. First, we assumed that dressing style can be measured on an interval scale in order that the average defined by (2.2) makes sense. However, the existence of such a scale may be doubtful in many cases. Therefore we concentrate on behavioural aspects which lend themselves to measurement on an interval scale.

Second, with respect to dressing an individual might have two (or more) reference groups, e.g. depending on whether he thinks of formal dressing or of his leisure outfit. We conclude that in estimating individuals' SRSs we implicitly define the SRS with respect to a particular aspect of behaviour (or norms or values) and, moreover, that this aspect can be measured on an interval scale.

In the next section we introduce the concept of the *individual welfare function of income* (WFI) which will be used as our basic tool for estimating the SRS.

3. THE INDIVIDUAL WELFARE FUNCTION OF INCOME

A basic aspect of an individual's attitude to life and society is how he evaluates different levels of income. For instance, let an individual evaluate an annual income of $ 10,000 as "bad" and an income of $ 15,000 as "excellent," then the present authors would say that this individual has fairly modest needs; on the other hand if he feels that $ 25,000 is "bad" and that his income has to approach $ 50,000 to be "excellent" we would say that he has rather large needs. Obviously an individual's evaluation of income levels is determined to a large extent by his SRS.

To measure an individual's evaluation of income levels we employ the concept of the *individual welfare function of income* (WFI). A WFI is measured by asking an individual the following so-called *income evaluation question* (IEQ).

In answering the following question it is advisable to start with the underlined words. Try at any rate to fill in all amounts asked for to the best of your judgement.

Taking into account my (our) present living circumstances, I would regard a net weekly/monthly/yearly (encircle the period) family income as:

excellent	*if it were above . . . .*
good	*if it were between . . . . and . . . .*
amply sufficient	*if it were between . . . . and . . . .*
sufficient	*if it were between . . . . and . . . .*
barely sufficient	*if it were between . . . . and . . . .*
insufficient	*if it were between . . . . and . . . .*
insufficient	*if it were between . . . . and . . . .*
very insufficient	*if it were between . . . . and . . . .*
bad	*if it were between . . . . and . . . .*
very bad	*if it were below . . . .*

The verbal evaluations ("excellent", "good", "amply sufficient", etc.) are transformed into numbers on a zero-one scale by identifying these evaluations with equal quantiles [1]. That is the qualification "excellent" is identified with 0.888, the qualification "good" is identified with 0.777, etc. Denoting the amount in the left-hand column in the i-th row of the income evaluation question by z_i and the corresponding numerical evaluation by $U(z_i)$, we obtain a sequence

$$\{(z_i, U(z_i))\}_{i=1}^{8}, \text{ where } U(z_i) = (9 - i)/9, i = 1, \ldots, 8.$$

(Note that the amount in the ninth row may be discarded because it will equal the amount in the eight row).

On the basis of theoretical considerations (see Van Praag (1968)) it has been derived that a WFI approximately follows the shape of a lognormal distribution function, i.e.,

$$U(z) \approx \Lambda(z; \mu,\sigma) \equiv N(\ln z; \mu\sigma) \tag{3.1}$$

where Λ is the lognormal distribution function and $N(.;\mu,\sigma)$ is the normal (Gaussian) distribution function with mean μ and variance σ. This theoretical result has been tested rather extensively (see Van Praag, 1971; Van Praag and Kapteyn, 1973; Van Herwaarden et al., 1977) on the answers of about 20,000 different individuals in The Netherlands, Belgium and other countries of the European Community with corroborative results.

The parameters can be roughly interpreted as follows. The value $\exp(\mu)$ is the medium value, i.e. $U(\exp(\mu)) = 0.5$ (see Fig. 1), so $\exp(\mu)$ is a *location* parameter. Roughly speaking an increase in μ implies an increase of wants, i.e. a shift to the right of the WFI. The value σ determines the slope of $\Lambda(z)$ about $\exp(\mu)$ (see Fig. 2).

It has been found that the parameters μ and σ vary substantially among individuals. This variation may be explained to a large extent by the individuals' socio-economic characteristics. In the sequel we assume that the family head represents his family and in particular that his answer to the IEQ

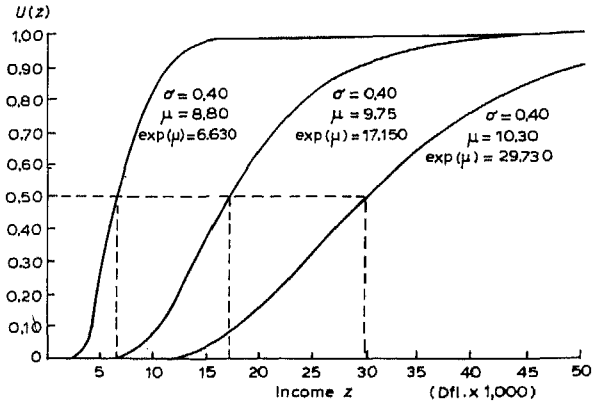

Fig. 1. The individual welfare function of income for some values of μ.

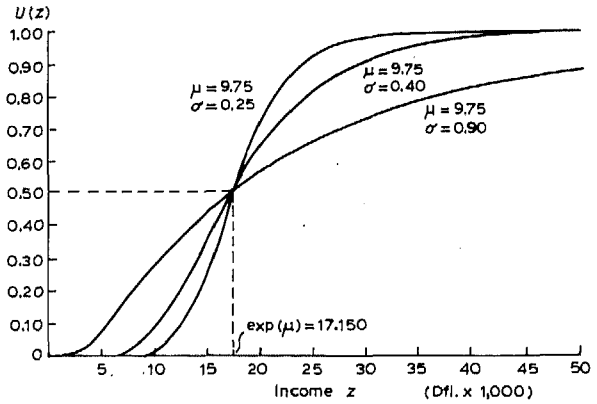

Fig. 2. The individual welfare function of income for some values of σ.

represents his family's WFI. Let $\mu(\omega)$ and $\sigma(\omega)$ be the estimates of the parameters of individual ω's WFI on the basis of his answer to the IEQ. Let $fs(\omega)$ be the size of his family, $y(\omega)$ the net income of his family and $m(\omega)$ the average log-income in ω's SRS. The following relationship will be considered in the sequel:

$$\mu(\omega) = \beta_0 + \beta_1 \ln(fs(\omega)) + \beta_2 \{\ln y(\omega) - m(\omega)\} + \beta_3 m(\omega). \tag{3.2}$$

A statement about the probable signs of the coefficients is not difficult to make. If the family size fs increases we assume a shift of the WFI to the right (cf. Fig. 1), because the family income has to be shared by more persons. Hence we expect $\beta_1 > 0$; β_1 is called the *family size elasticity*. If $m(\omega)$, the average log-income in ω's SRS, increases we expect this to influence the level of wants of ω as well, in that it raises his standards; hence we assume $\beta_3 > 0$. The parameter β_3 is called the *reference drift rate* (see Kapteyn, 1977).

Finally the difference $\ln(y(\omega) - m(\omega)$ reflects the log-difference between ω's family income and the average income level in his SRS. Assuming that someone who is rich compared to the individuals in his SRS, $(\ln y(\omega) - m(\omega) > 0)$, will have wants exceeding the average wants in his SRS while the reverse will hold for the relatively poor $(\ln y(\omega) - m(\omega) < 0)$, we hypothesize $\beta_2 > 0$ as well. The term $(\ln y(\omega) - m(\omega))$ may be seen as correction term for individuals who have the same $m(\omega)$ but different incomes. The coefficient β_2 has been called the *preference drift rate* (Van Praag, 1971). It reflects how individual preferences adapt to individual circumstances.

Analogously, $\sigma^2(\omega)$, the parameter defining the slope of ω's WFI (see Fig. 2) is supposed to be related to the income variation in his SRS plus a correction term for ω's personal position in his SRS's income distribution. Let $s^2(\omega)$ be the variance of log-incomes in ω's SRS, then we hypothesize

$$\sigma^2(\omega) = \alpha_0 + \alpha_1 s^2(\omega) + \alpha_2 \{\mu(\omega) - m(\omega)\}^2 \tag{3.3}$$

The larger the income differences in ω's SRS, the flatter his WFI will be. We assume $\alpha_1 > 0$. The coefficient α_2 is assumed to be positive as well. A theoretical motivation for specification (3.3) has been given by Kapteyn (1977). The two equations (3.2) and (3.3) have been estimated on the basis of a survey of 2,774 members of the Dutch Consumer Union, conducted in 1971, described in Van Praag and Kapteyn (1973) in more detail. In the equations (3.2) and (3.3) the RW-concept plays a role since the variables $m(\omega)$ and $s^2(\omega)$ are reference-weighted averages.

4. THE REFERENCE WEIGHT SPECIFICATION AND EMPIRICAL ESTIMATES

In Section 2 we defined the SRS of individual ω_0 by a distribution of reference weights (RWs) $p(\omega|\omega_0)$, where $p(\omega|\omega_0)$ is the weight which ω_0 assigns to individual ω. The p's add up to one. In this approach it is possible that each individual gets a different RW. In empirical practice individuals can be distinguished only with respect to a limited number of social characteristics. Let c be a vector of social characteristics (SC), then we classify any individual according to his SC-vector. All individuals with the same SC-vector are said to belong to the same social type. Individuals of a social type c are also called c-individuals, for short. To fix ideas we present the table of social characteristics distinguished in the 1971 Consumer Survey (see Table I). Every individual is described by a six-dimensional vector. The relative frequency of social type c will be denoted by $p(c)$. We assume that all individuals of the same social type c have the same SRS. Then we may denote the RW of social type c in the SRS of individuals belonging to social type c_0 by $p(c|c_0)$ where the sum of the $p(c|c_0)$ over all c's sum to unity.

TABLE I

Definition of Social Characteristic Values

Rank number	Name of social characteristic	1	2	3	4	5
1	Education	Primary education	Extended primary education	Secondary education	University degree	
2	Working Environment	Wage-earner	Independent	Not working		
3	Job-type	Skilled/unskilled worker	Administrative personnel	Lower/middle executives, non-civic army/police personnel	Teacher, professor, professional expert, free profession, commercial profession, agrarian	Not working
4	Degree of Urbanization	Less than 50,000 inhabitants	50,000 inhabitants or over			
5	Age[a]	Under 25	25 through 34	35 through 49	50 through 64	
6	Geography	Eastern and southern parts of The Netherlands	Western conurbation of The Netherlands			

[a]Age of the husband. If there is no husband, the woman's age is taken.

The functional specification of the RWs is complicated and rather than spelling this out we refer to Kapteyn et al. (1976) for details. The basic idea may roughly be sketched as follows. We assume the $p(c|c_0)$ to follow from

$$p(c|c_0) = A(c_0)r(c,c_0)\pi(c) \tag{4.1}$$

The factor $p(c)$ reflects the idea that the reference weight of social type c will depend on the relative frequency of social type c in society. If there are relatively few c-individuals, the RW of their class will be small for that matter. However, there is more than mere numbers that count. This idea is reflected by the factor $r(c,c_0)$ which we call the *attraction factor* (between types c and c_0). If $r(c,c_0) > 1$, there is "attraction" between social types c and c_0; $r(c,c_0) < 1$, indicates "repulsion". On the average $r(c,c_0) = 1$. $A(c_0)$ is a normalizing constant. The attraction factor is assumed to be decomposable in a multiplicative way according to the six social characteristics:

$$r(c_1,c_2) = \prod_{i=1}^{6} r_i(c_{i1},c_{i2}) \tag{4.2}$$

This specification gives rise to the definition of *partial reference weights* (PRWs) corresponding to each social characteristic c_i by

$$p_i(c_i|c_{i0}) = A_i(c_{i0})r_i(c_i,c_{i0})\,\pi_i(c_i) \tag{4.3}$$

where $\pi_i(.)$ describes the relative frequency in society of the i^{th} social characteristic. The PRWs add up to one, when summed over all values of c_i. The attraction factors $r_i(c_i, c_{i0})$ are asymmetrical in order to allow for the fact that one social type (e.g. less educated people) may assign considerable weight to (feel more attracted by) the opinion of another social type (e.g. well educated people) but not the reverse. The exact functional specification of the attraction factors is beyond the scope of this article. This model is used to define the reference-weighted averages $m(\omega)$ and $s^2(\omega)$ in (3.2) and (3.3). As a consequence it is possible to estimate, by means of maximum likelihood, at the same time the $p(c|c_0)$ and the parameters in (3.2) and (3.3) on the basis of our data.

Let us now briefly discuss the results with respect to the RWs. In Table II we present the PRWs, i.e. each row in the table represents the weights which individuals of the class corresponding to that row assign to individuals in classes corresponding to the various columns. For instance, Table II shows that individuals with primary education assign a positive PRW only to those in their own educational category. The other PRWs equal zero. Individuals with extended primary education not only assign a positive PRW to their own education class, but also to individuals with a higher education than their own. Still, these individuals also tend to give others of the same education level a disproportionally high weight. The last line in the table gives the fre-

TABLE II

Partial Reference Weights and Frequencies of Social Characteristics $d\pi_i$(k) (Standard errors in parentheses)

I. Education (i = 1)

j \ k	(1)	(2)	(3)	(4)
(1) Primary education	1	0	0	0
	(-)	(-)	(-)	(-)
(2) Extended primary education	0	0.68	0.24	0.07
	(-)	(0.13)	(0.10)	(0.03)
(3) Secondary education	0	0	0.62	0.38
	(-)	(-)	(0.11)	(0.11)
(4) University degree	0	0	0	1
	(-)	(-)	(-)	(-)
$d\pi_1(k)$	0.61	0.23	0.12	0.04

II. Working Environment (i = 2)

j \ k	(1)	(2)	(3)
(1) Wage-earner	0.81	0.15	0.04
	(0.01)	(0.01)	(0.02)
(2) Independent	0.26	0.50	0.24
	(0.15)	(0.13)	(0.08)
(3) Not working	0.81	0.08	0.11
	(0.04)	(0.00)	(0.04)
$d\pi_2(k)$	0.82	0.08	0.10

III. Job-type (i = 3)

j \ k	(1)	(2)	(3)	(4)	(5)
(1) Skilled/unskilled worker	0.96	0	0	0	0.04
	(0.02)	(-)	(-)	(-)	(0.02)
(2) Administrative personnel	0	0.27	0.52	0.18	0.03
	(-)	(0.26)	(0.24)	(0.08)	(0.03)
(3) Lower/middle executives, non-	0	0.11	0.59	0.26	0.04
civic army/police personnel	(-)	(0.10)	(0.12)	(0.12)	(0.02)
(4) Teacher, professor, professional					
expert, free profession, com-	0	0.03	0.07	0.87	0.04
mercial profession, agrarian	(-)	(0.04)	(0.14)	(0.16)	(0.02)
(5) Not working	0.31	0.11	0.20	0.28	0.11
	(0.02)	(0.02)	(0.01)	(0.02)	(0.04)
$d\pi_3(k)$	0.29	0.10	0.21	0.30	0.10

continued

IV. Degree of Urbanization ($i = 4$)

j \ k	(1)	(2)
(1) Less than 50,000 inhabitants	1	0
	(-)	(-)
(2) 50,000 inhabitants or over	0.64	0.36
	(0.23)	(0.23)
$d\pi_4(k)$	0.57	0.43

V. Age ($i = 5$)

j \ k	(1)	(2)	(3)	(4)
(1) Under 25	0.89	0.05	0.03	0.03
	(0.06)	(0.03)	(0.02)	(0.01)
(2) 25 through 34	0.16	0.79	0.03	0.02
	(0.08)	(0.07)	(0.03)	(0.01)
(3) 35 through 49	0.06	0.26	0.65	0.04
	(0.02)	(0.09)	(0.09)	(0.04)
(4) 50 through 64	0.03	0.12	0.39	0.45
	(0.01)	(0.04)	(0.12)	(0.15)
$d\pi_5(k)$	0.07	0.24	0.36	0.32

VI. Geography ($i = 6$)

j \ k	(1)	(2)
(1) Eastern and southern parts of The Netherlands	0.93	0.07
	(0.16)	(0.16)
(2) Western conurbation of The Netherlands	0.56	0.44
	(0.21)	(0.21)
$d\pi_6(k)$	0.53	0.47

quencies in the Dutch population of the SC considered ($d\pi_1(k)$). We see that whereas 23% in the Dutch population (1971) has received extended primary education, these individuals give their own class a PRW which is about three times as high, 68%. Individuals with secondary and university education are assigned about twice as high a PRW as their population share. Individuals with lower than extended primary education are virtually ignored [2] by the extended primary education class. It appears that in general individuals are looking only upwards on the education ladder. Like those whose education is limited to the primary level, individuals with university education also appear to assign a positive PRW only to individuals of their own educational level.

In the same way the other subtables may be interpreted. We notice with respect to "working environment" that wage-earners overweight the self-employed and under-weight the non-working individuals. Regarding "job-type" one observes that "administrative personnel" assign a rather high PRW to "lower /middle executives" (their superiors?) As regards "urbanization" it is striking to see that individuals in smaller townships or in the countryside only give weights to their own class while inhabitants of larger municipalities even underweigh their own class. The PRWs for the "age" characteristic may reflect a tendency for the young to set the trend in Western society. Individuals apparently do not refer to older individuals, but mainly to individuals of at most the same age. Finally, the results with respect to "geography" confirm those with respect to degree of urbanization. Individuals in less-urbanized regions (East and South) give more weight to their own class than individuals in the western conurbation of The Netherlands.

5. RESULTS WITH RESPECT TO INCOME EVALUATION

The equations (3.2) and (3.3) have been estimated with the following results.

$$\mu(\omega) = \underset{(0.32)}{1.94} + \underset{(0.02)}{0.121nfs(\omega)} + \underset{(0.01)}{0.49}\{1ny(\omega) - m(\omega)\} + \underset{(0.03)}{0.78}\, m(\omega)$$

$$R^2 = 0.64$$

$$N = 2{,}774 \qquad (5.1)$$

$$\sigma^2(\omega) = \underset{(0.01)}{0.12} + \underset{(0.10)}{0.53}\, s^2(\omega) + \underset{(0.03)}{0.21}\{\mu(\omega) - m(\omega)\}^2$$

$$R^2 = 0.064$$

$$N = 2{,}774 \qquad (5.2)$$

The figures in parentheses are the corresponding standard errors. We notice that the statistical quality of the estimates is very good, although the variance explained by the second equation is relatively small, viz. 6½%. The proportion of variance in μ explained by equation (5.1) on the other hand is quite high for individual data. The meaning of (5.1) is illustrated by the example in Fig. 3.

Let individual ω with income $y(\omega)$ and WFI A at a certain moment expect an income increase by a factor $(1+\alpha)$. He evaluates his present income by 0.70. The expected future income $y(\omega)\,(1+\alpha)$ is evaluated by 0.95. Once he receives the income $y(\omega)\,(1+\alpha)$, equation (5.1) implies that his WFI shifts to position B so *ex post* he evaluates the new income by only 0.85. The phenomenon that the WFI shifts with income is the *preference drift effect* (mentioned in Section 3). If, moreover, all other individuals receive the same

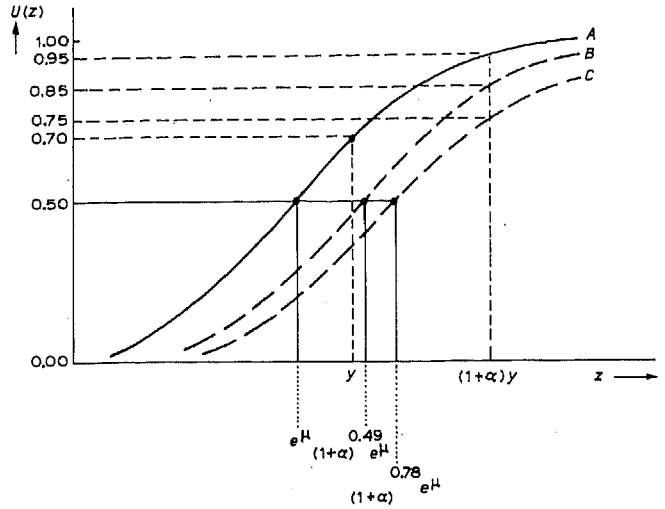

Fig. 3. Illustration of equation (5.1). (The figures do not follow exactly from (5.1) but are merely illustrative; the argument ω is omitted).

income increases, $m(\omega)$ rises to $m(\omega) + \ln(1+\alpha)$, and the WFI shifts to position C implying a welfare evaluation of the new income by only 0.75. The phenomenon that an individual's WFI shifts with incomes in his SRS is the *reference drift effect* (cf. Section 3). The combination of preference and reference drift effects is seen to cause a substantial disappointment with economic growth (i.e. general income increases) since the high *ex ante* expectation with regard to the welfare effect of a higher future income materializes in only a modest *ex post* realization. The positive coefficient of $fs(\omega)$ finally implies that with a larger family the WFI lies more to the right. Hence a larger income is required to attain a certain evaluation level. This observation allows for the construction of constant welfare family income equivalence scales (Kapteyn and Van Praag, 1976). Regarding (5.2) similar interpretations may be provided.

Obviously these findings yield important insights into the interdependency between the feelings of well-being of individuals in society, and consequently on matters of income policy and inequality. These issues will not be pursued here. We refer to Kapteyn and Van Herwaarden (1976) and Van Praag (1977).

6. CONCLUSION

In the present article a brief account has been given of some of our recent findings on income evaluation, especially with respect to their application to the definition and measurement of Social Reference Spaces. Since the subject

matter of our research is situated in the borderland between economics, sociology and social psychology we would welcome comments, especially from representatives of our sister-sciences.

NOTES

1 This transformation rests upon an information maximization argument developed by Van Praag (1971) and generalized by Kapteyn (1977).
2 Obviously the figures presented are estimates subject to error; the corresponding standard deviations are presented in parentheses. The figures 0 and 1 are limiting figures, indicating that the estimates in the iterative maximum likelihood procedure converge to 0 or 1 respectively. In that case, no meaningful standard errors can be calculated.

REFERENCES

Kapteyn, A. (1977). "A Theory of Preference Formation", unpublished Ph.D. thesis, Leyden University.

Kapteyn, A. and F.G. van Herwaarden (1976). *Optimal Income Distribution with Interdependent Utility Functions.* Report 76.12, Leyden University, Center for Research in Public Economics, Leyden.

Kapteyn, A. and B.M.S. van Praag (1976). "A New Approach to the Construction of Family Equivalence Scales", in: *European Economic Review*, vol. 7, pp. 313–335.

Kapteyn, A., B.M.S. van Praag, F.G. van Herwaarden (1976). *Individual Welfare Functions and Social Reference Spaces*, Report 76.01, Leyden University, Center for Research in Public Economics. Leyden.

Van Herwaarden, F.G., A. Kapteyn and B.M.S. van Praag (1977). "Twelve Thousand Individual Welfare Functions", in: *European Economic Review*, vol. 9, pp. 283–300.

Van Praag, B.M.S. (1968). *Individual Welfare Functions and Consumer Behavior*, North-Holland Publishing Company, Amsterdam.

Van Praag, B.M.S. (1971). "The Welfare Function of Income in Belgium: an Empirical Investigation", in: *European Economic Review*, vol. 2, pp. 337–369.

Van Praag, B.M.S. (1977). "The Perception of Welfare Inequality", in: *European Economic Review*, vol. 10, pp. 189–207.

Van Praag, B.M.S. and A. Kapteyn (1973). "Further Evidence on the Individual Welfare Function of Income: an Empirical Investigation in The Netherlands", in: *European Economic Review*, vol. 4, pp. 33–62.