

Reprint Series: Number 9

Centre for Research on
Federal Financial Relations
The Australian National University

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Australian assistance plan
to take account of interregional
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by C.P. Harris

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A Method of Allocating Block Grants under the Australian Assistance Plan
to Take Account of Interregional Differences in Social Needs

C.P. Harris*

In the initial formulation of the Australian Assistance Plan it was envisaged that under the Plan block grants would be made by the Australian Government to Regional Councils for Social Development, and it was suggested that "grants will be available on a basis of \$2 per capita per local government area, but that a system of 'needs' weighting should operate".¹ The purpose of this Report is to outline a method by which block grants can be made to regions in a way which will take account of differences in their social structures.

BASIS

The distribution formula which is outlined below has been formulated to comply with the following 7 criteria:

- (i) To allow financial estimates to be incorporated into budget submissions, it is assumed that the block grants to all regions (i.e. throughout the nation as a whole) will be made on the basis of an average of \$2 per head of population (or whatever other amount is subsequently approved).
- (ii) Actual grants to each region will not be on the basis of \$2 per head, but at rates such that the weighted average rate for all regions will be \$2 per head.
- (iii) The allocation formula should involve simple calculations, and be easily understood and varied if desired.
- (iv) Data required for the formula should be readily available.
- (v) The formula should not be based on the requirement that all regions are known. It should be applicable to any region considered in isolation; i.e. in cases where the nation is only partially regionalised for the purposes of the Plan.

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¹ Social Welfare Commission, *Australian Assistance Plan*, Canberra, AGPS, 1973, p. 6 (Discussion paper No. 1).

(vi) Moreover, the formula should be such that the amount provided to any region, say in an experimental stage of the Plan, should equal the amount that would have been provided to that region if the Plan had been operating on a full-scale regional basis.

(vii) The method of allocation should remain as a block grant related to population levels, and reasons for regional grants differing from the national \$2 per head average should be readily understood by Regional Councils.

THE PROPOSED FORMULA

A distribution formula which meets all of the above criteria is outlined below. It is based on what is called a partial standardisation approach.²

(a) Characteristics

The standardisation approach evolves from the analysis of deviation about the arithmetic mean, and has methodological aspects similar to the analysis of variance. The primary characteristic of an arithmetic mean $\bar{x}$ is that the algebraic sum of the differences between the actual observed values x_j and the mean is zero; i.e. $\sum (x_j - \bar{x}) = 0$. In more general terms, the arithmetic mean is a value such that the sum of the differences between actual values greater than the mean and the mean is, in absolute terms, equal to the sum of the differences between the mean and the actual values smaller than the mean.

In the real world, when a number of observations of a particular quantifiable variable are taken (either at a particular point in time or at different points of time) it is generally the case that the values of the observations are not the same, and frequently the results are summarised

² The methodology of the approach was developed in C.P. Harris, *Interregional Variation in Levels and Rates of Increase of Personal Income Per Head*, 1953/4 and 1960/1. Unpublished Ph.D. thesis, University of Leeds, 1965. The approach has been applied by the writer in several areas, as evidenced by the following publications. 'A Method of Analysing Interregional Variations in Levels and Rates of Increase of Per Capita Income', *Yorkshire Bulletin of Economics and Statistics*, November 1966; 'Interregional Variations in Cyclical Sensitivity to Unemployment in the United Kingdom 1949-1964', *Oxford Bulletin*, February 1968; 'Economic Aspects of Social Security Programmes: an Application to Age Pensions', *Social Service*, September/October 1969; and 'Changes in the Burden of Personal Income Tax 1955-6 to 1965-6', *Economic Analysis and Policy*, March 1970.

by use of the mean value. This is the case with such statistical series as national unemployment rate (the rate in each employment district is different); quarterly increases in consumer prices (the change in the price of each item included in the index is not uniform, and the change is not the same in all capital cities); increases in average earnings (all workers do not experience the same rate of increase). The census data, which record a large number of series of demographic characteristics of the population, also have this feature, in that national proportions of the population with each characteristic are not the same as the proportions in each State, statistical division, or local authority area.

Standardisation techniques utilise the observed tendency for a series of actual values of a particular variable to be non-uniform, and hence to exhibit deviation about the mean.

(b) Standardisation

The approach outlined in subsection (a) above can be better understood by explaining it in a specific sense within the framework of the AAP and the block grant proposal. If uniform per capita grants are made to each region, a region with a population twice the size of another region will receive a grant twice as large. However, the second region may have a 'needs characteristic' which, on the basis of equity, would require that its grant be greater than one-half of the grant to the larger region. In the formula developed below a method of apportioning the grant between regions is indicated. The method shown does not attempt to measure absolute need, but assesses relative need. Greater or lesser need is measured by comparing the position in any region with the average position in the nation (i.e. in all regions as a whole).

The proposition that grants should be related to population levels is supported because it is a simple proposition, and because annual estimates of population are available. To allow for differences in regional needs, it is suggested that a notional or partially standardised population be calculated for each region, and that the grant to each region be at the rate of \$2 per head for its notional population not for its actual population. If notional populations are calculated by use of standardisation techniques, the total amount distributed will be the same as if actual populations were used.

An individual in any region is classified at the census in a number of different ways, according to such characteristics as age, sex, nationality, conjugal condition, occupation, length of residence in Australia and so on. The demographic structure of a region reflects the ways in which its population is distributed among all these characteristics, and the demographic structure of each region is unlikely to be the same. The national demographic structure may therefore be viewed as the weighted average demographic structure of all of its regions.

When these demographic characteristics are analysed, it may be judged that, from the viewpoint of social welfare, some characteristics may generate a greater requirement for social expenditure than other characteristics.

This judgment is, of course, a value or subjective judgment. Further, it can also be shown that the degree of interregional variation in the values of each characteristic (expressed as a proportion of the total population) is not identical. For example, it will be found that for some characteristics (e.g. Christians) the proportion of the population with that characteristic will be much the same in each region so that the coefficient of interregional variation is small (i.e. the regional proportions do not differ much from the national or average proportion); conversely, in other cases (e.g. non-British nationality) the regional proportions will differ a great deal, and the dispersion about this national average is large.

Where a particular demographic characteristic is fairly evenly distributed among regions (in a proportional sense), and if that characteristic generates a need for social expenditure, grants based on regional population levels will to a reasonably acceptable degree take account of the inter-regional variations in the intensity of the problem created by that characteristic. However, if a particular demographic characteristic is not evenly distributed among regions, uniform per capita grants will not produce any equalising tendency. Given this proposition, it is suggested that, with a grants formula which uses population as its distribution statistic, only demographic characteristics which exhibit a high degree of interregional variation will not be encompassed within the formula of uniform per capita grants. In other words, if a formula which gives unequal per capita grants is sought, only characteristics which exhibit a relatively high degree of interregional variation need be considered for adjustment purposes.

(c) *The Allocation Formula*

Given the above considerations, it is suggested that a distribution formula can be derived as follows:

(i) Calculate coefficients of interregional variation for all demographic characteristics recorded at the 1971 census, using the DURD regions and/or local authority areas as the spatial unit for actual observations. These coefficients will be based on proportions of populations with the given characteristic.

(ii) Arrange the coefficients in descending order of size and determine the level of variation which it is judged will be acceptable for a uniform per capita block grant.

(iii) Analyse all characteristics with coefficients above the cut-off point decided in (ii) and judge which characteristics generate sufficient need for social expenditure to warrant inclusion in any allocation formula.

(iv) When the relevant characteristics have been selected as in (iii), calculate for a given region its notional or partially standardised population. This is done by adjusting the region's actual population as follows:

(a) For a given characteristic, calculate the number of people there would be in that region with that characteristic if that region had the same proportion with that characteristic as the nation (the all-regions mean proportion). This is a standardised value.

(b) Compare the standardised value with the actual value in that region. If the standardised value is larger, this implies that the region has less than the average proportion of people with that particular characteristic; if the actual value is larger this implies that the region has more than the average proportion. In the former case, to take account of inter-regional differences in social need, a deduction will be made from the region's actual population in calculating its notional population. In the latter case, an addition will be made. Regions which have the national proportion will require no adjustment to their actual population. This approach emphasises that the formula is based on the measurement of relative not absolute need, and relative need is assessed in terms of variation from the national or all-regions mean position.

(c) Repeat the procedure outlined in (b) for all selected characteristics and sum the population adjustments (taking account of the sign) to give the aggregate population adjustment for that region.

(d) Add this aggregate population adjustment figure to the region's actual population to obtain the region's notional or partially standardised population.

(e) The regional grant is given by multiplying the region's notional population by \$2.

(f) The adjustment to the actual population may be made either by weighting each particular demographic characteristic or by using an unweighted adjustment.

(v) The above procedure is illustrated algebraically in Table 1.

(vi) In applying the above formula in practice, the following additional assumptions may be made:

(a) The regional and national demographic compositions as given by the 1971 census are both assumed to remain the same until further data of that kind are available. In other words, proportions of the population with each characteristic are assumed to be those at 30 June 1971.

(b) The population of the region for the calculation of the block grant will be the latest population estimate available.

(vii) To apply the formula the following data are required:

(a) Coefficients of interregional variation for each demographic characteristic as at 30 June 1971. These could be calculated for DURD regions and/or for local authority areas. To reduce the number of calculations, a prior selection of characteristics could be made from all those recorded in the census publications.

TABLE 1
Calculation of a Region's Notional or Partially
Standardized Population

Method 1 Weighted Adjustment

$$p_1^* = p_1 + [W_a(n_{1a} - n_{1a}^*) + W_b(n_{1b} - n_{1b}^*) + \dots] \\ = p_1 + \sum_x W_x(n_{1x} - n_{1x}^*)$$

Method 2 Unweighted Adjustment

$$p_1^* = p_1 + [(n_{1a} - n_{1a}^*) + (n_{1b} - n_{1b}^*) + \dots] \\ = p_1 + \sum_x (n_{1x} - n_{1x}^*)$$

(in effect the weights for each calculation in Method 2 are taken as unity)

Calculation of a Region's Block Grant

$$G_1 = p_1^* (\$2)$$

It follows that the actual per capita grant to that region (i.e. the grant based on its actual population) is

$$\frac{G_1}{p_1} \text{ or } \frac{p_1^*}{p_1} (\$2)$$

Terminology

Where:

p = population of nation (all regions)

p_1 = population of a particular region 1

N_a = number of persons in nation with a particular demographic characteristic "a"

R_a = proportion of nation's population with a particular demographic characteristic "a", which is given by $\frac{N_a}{p}$

n_{1a} = number of persons in region 1 with demographic characteristic "a"

r_{1a} = proportion of population of region 1 with demographic characteristic "a", which is given by $\frac{n_{1a}}{p_1}$

n_{1a}^* = standardized number of persons in region 1 with demographic characteristic "a", which is given by $R_a(p_1)$

$(n_{1a} - n_{1a}^*)$ = adjustment to region 1 population to allow for demographic characteristic "a"

W_a = weight applied to characteristic "a" in adjusting population of region 1 if a weighted formula is used

p_1^* = notional or partially standardized population of region 1

G_1 = block grant to region 1 = $p_1^* (\$2)$

(b) National proportion of the population which at 30 June 1971 had a given characteristic which it is judged is to be included in the allocation formula.

(c) Proportions of the population in each region under consideration which had a given characteristic at 30 June 1971.

(d) The latest estimate of the population of the region to which a grant is being made.

(d) Interregional Variations

A preliminary investigation of the degree of interregional variation for each demographic characteristic has been made for the State of Queensland by Dr H. Sohn and Mr S. Hussain of the James Cook University. This investigation was based on the complete data for the 1966 census and partial data for the 1971 census. Further studies are being carried out using the complete 1971 data which are now available.

The investigation made by Sohn and Hussain examined interregional variations in demographic characteristics recorded at the census using 3 different spatial areas into which the State of Queensland may be divided - 14 statistical divisions, 20 employment districts, and 131 local authority areas. Additional work will utilise the 10 regions identified by the Coordinator-General.

An important conclusion emerging from the study so far is that amalgamations of local authority areas into regions (statistical divisions, employment districts), while reducing the degree of interregional dispersion, did not significantly alter the rank ordering of the characteristics as to the values of the variation coefficients. If this conclusion is generally true for the whole of Australia, it is significant because it implies that the degree of interregional variation, and hence the selection of the characteristics to be included in the population adjustment process, do not to any high degree depend upon, or are not dependent upon, the delineation of regional boundaries.

The results from the Queensland study at this stage suggest that the demographic characteristics for which allowance should be made in any allocation formula are:

- Non-British immigrants of less than 4 years residence
- institutional inmates
- unemployed
- persons aged 65 and over
- divorced
- widowed
- children aged 0 to 4

(e) *Additional Work*

If the above procedure is accepted, the position for the whole of Australia in 1971 must be calculated. These calculations would probably be carried out in cooperation with DURD.

If it is decided that each characteristic for which an adjustment is to be made should be weighted, a weighting system must be devised. In this respect it must be stressed that there is no scientific or objective way in which the weighting system can be devised. The weighting system reflects the value judgments of the government or other bodies as to the urgency for expenditure in certain directions (e.g. on children of pre-school age). If a weighting system is adopted, it may be viewed as a kind of indicative planning approach, whereby the government indicates to the Regional Councils the areas in which it would like expenditure to be directed. Such an approach need not destroy the autonomy of the Regional Councils.

Finally, if it was judged necessary or worthwhile to include non-demographic elements in the formula (e.g. allowance for the region's area or other spatial elements) this could be done with little difficulty provided adequate data are available.

AN ILLUSTRATION OF THE USE OF THE FORMULA

A hypothetical example of the use of the formula is given in Table II below. In this example, which shows both unweighted and weighted distributions, it is assumed that the nation has been divided into three regions and that it had been judged that three demographic characteristics (a, b, c) should be included in the adjustments to calculate each region's notional population.

TABLE II

Item	1	Region 2	3	Nation
population (p)	10,000	15,000	25,000	50,000
number of persons with characteristic:				
n_a	500	1,500	1,500	3,500
n_b	1,000	300	1,250	2,550
n_c	200	150	2,500	2,850
proportion of population with characteristic:				
f_a	0.05	0.10	0.06	0.07
f_b	0.10	0.02	0.05	0.051
f_c	0.02	0.01	0.10	0.057
standardized number of persons with characteristic:				
n_a^*	700	1,050	1,750	3,500
n_b^*	510	765	1,275	2,550
n_c^*	570	855	1,425	2,850
$(n_a - n_a^*)$	- 200	450	- 250	
$(n_b - n_b^*)$	490	- 465	- 25	
$(n_c - n_c^*)$	- 370	- 705	1,075	
unweighted adjustment				
population adjustment				
$\sum (n - n^*)$	- 80	- 720	800	
notional population	9,920	14,280	25,800	50,000
block grant	\$19,840	\$28,560	\$51,600	\$100,000
actual per capita grant	\$1.984	\$1.904	\$2.064	\$2.00
weighted adjustment (it is assumed that the weights are 0.8 for characteristic "a", 1.2 for characteristic "b", and 1.0 for characteristic "c").				
$W_a(n_a - n_a^*)$	- 160	360	- 200	
$W_b(n_b - n_b^*)$	588	- 558	- 30	
$W_c(n_c - n_c^*)$	- 370	- 705	1,075	
population adjustment				
$\sum W(n - n^*)$	58	- 903	845	
notional population	10,058	14,097	25,845	50,000
block grant	\$20,116	\$28,194	\$51,690	\$100,000
actual per capita grant	\$2.0116	\$1.8796	\$2.0676	\$2.00
Summary				
Block Grant				
	1	Region 2	3	Nation
uniform per capita grant	\$20,000	\$30,000	\$50,000	\$100,000
non-uniform per capita grant:				
unweighted	\$19,840	\$28,560	\$51,600	\$100,000
weighted	\$20,116	\$28,194	\$51,690	\$100,000
Grant Per Capita (Actual Population)				
uniform per capita grant	\$2.00	\$2.00	\$2.00	\$2.00
non-uniform per capita grant:				
unweighted	\$1.984	\$1.904	\$2.064	\$2.00
weighted	\$2.0116	\$1.8796	\$2.0676	\$2.00

