

A Note on the "Balancing Factor" Terms
in Entropy-Gravity Migration Models

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May 1975

WP-75-57

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The A_i and B_j terms in the entropy model, fitted to the Canadian migration data by Waldo Tobler, would appear to be of some interest. Although they can be used simply as mechanical balancing factors, it is perhaps more interesting to give them a substantive interpretation.

$$A_i = \frac{1}{\sum_j B_j D_j e^{-\beta c_{ij}}}$$

can be interpreted as an index of the remoteness of city i to all other cities in their role of migration sinks¹. That is, each of the cities is attracting migrants from other cities. A_i is an inverse measure of the total attractive power of all other cities. Large values of A_i indicate a remoteness from such attractions and small values a proximity.

The pattern for the Canadian system of Census Metropolitan Areas (C.M.A.'s) is shown in Figure 1. The most striking characteristic of the map is the boundary effect--places in the central part of the map tend to be less remote

¹Because of the recursive relationship between A and B , each sink is weighted by its remoteness from all sources. This tends to dampen the variance of both A_i and B_j .

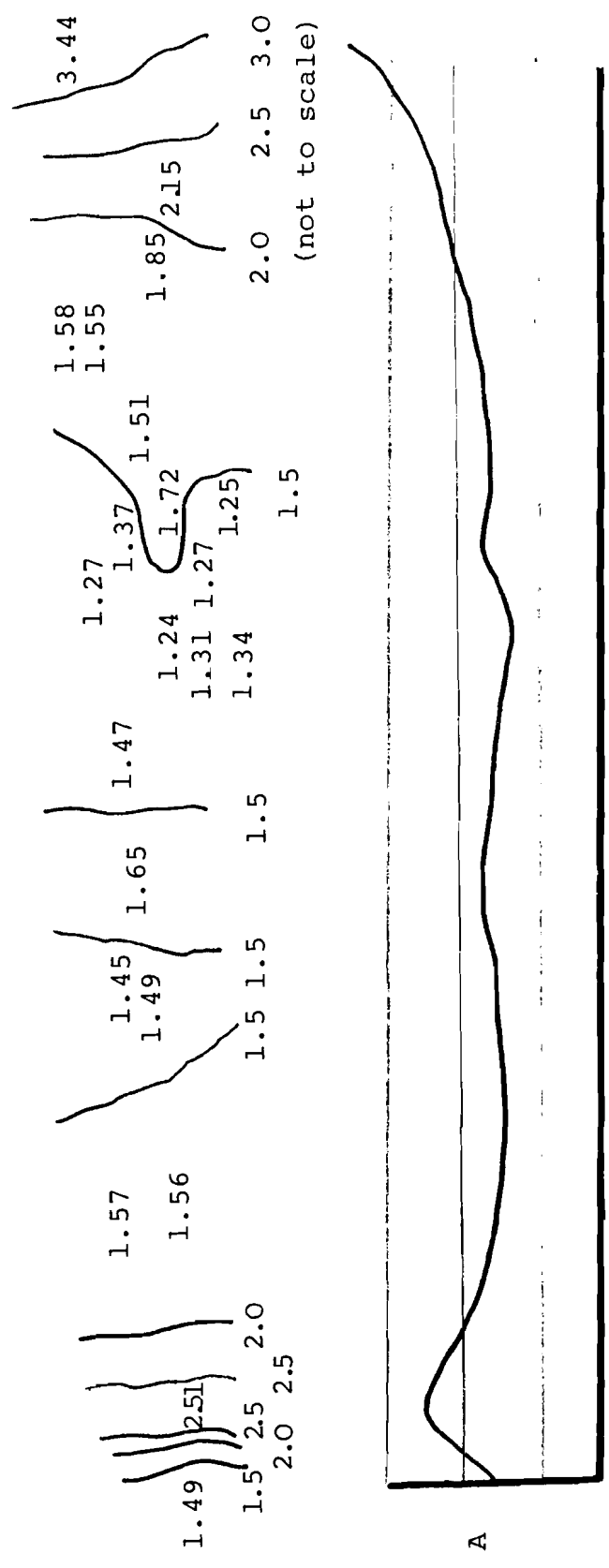


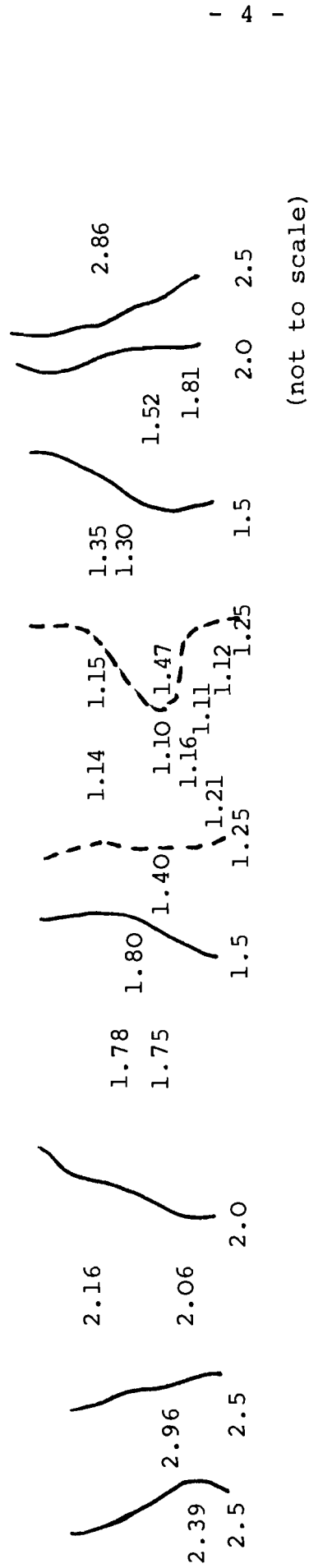
Figure 2. Pattern of A coefficients for 1966-71.
Canadian Migration Data.
(Remoteness from Migration Sinks).

than places on the periphery. This is a characteristic pattern of virtually all accessibility measures. A second tendency is for large centres to be more remote than would result from their locations alone. Thus, Toronto and Vancouver are farther away from migration sinks than, say, Ottawa and Victoria. The reason for this is, of course, that these centres do not feel the attractiveness of themselves as migration sinks. The migrants from Ottawa, for example, are close to the quite considerable sinks of Montreal and Toronto whereas neither of the latter centres can send inter-metropolitan migrants to itself.

The distribution of

$$B_j = \frac{1}{\sum_i A_i O_i e^{-\beta c_{ij}}}$$

in Figure 2 has a similar trough shaped pattern. B_j is an index of the remoteness from outmigrants of all other cities. Vancouver, because of its location, is the most inaccessible metropolitan area in Canada in terms of this measure; in spite of this, the in-migration rate for Vancouver is by far the largest. Note also, the B_j index is relatively higher in western Canada than A_i whereas the reverse is true for eastern Canada. This arises from western Canada's relatively large distance from the large outmigration centres in central and eastern Canada. The remoteness from sinks is less because of the relatively



(not to scale)

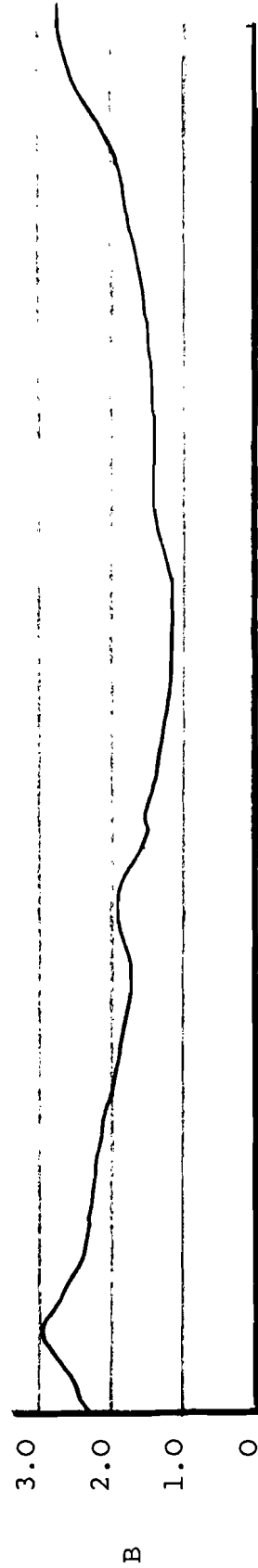


Figure 2. Pattern of B coefficients for 1966-71.
 Canadian Migration Data.
 (Remoteness from Migration Sources)

large movements of population to cities of Alberta and British Columbia, particularly Vancouver.

These maps, although not without their limitations, are useful descriptive contexts within which to discuss interregional migration tendencies.

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