RESEARCH NOTE/NOTE DE RECHERCHE

EDUCATION AND THE EFFICIENCY OF MIGRATION*

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Introduction

One of the most consistent findings of research on internal migration is that the more-educated have higher rates of migration than the less-educated.[1] Several explanations for these results have been suggested. Schwartz [12] states that the human capital model predicts that the better-educated will search a larger area when seeking work and that a firm's area of search will increase with a job's educational requirements, generating more geographic moves among the better-educated. Schultz [9] suggests that the migration behaviour of the more educated is one example of education's role in improving people's ability to allocate resources. The educated are expected to be better able to obtain, analyze, and make use of information on job opportunities.

Furthermore, the risks associated with moves by the higher-educated may be lower than for the less-educated. Saben [8] reports that most migrants in professional and technical occupations moved to take a particular job or were transferred, thus eliminating the risk of being unemployed at their destination. Related Canadian evidence comes from the studies of Grant and Vanderkamp [3] and Marr and Millerd [7]. Grant and Vanderkamp found professional and managerial migrants to have the greatest percentage gains in income within a year of migrating while Marr and Millerd report that, over the long-term, "blue-collar" migrants have the greatest

[1]Marr, McCready, and Millerd [5] and Stone and Fletcher [17] confirm this using 1971 Census of Canada data.

gains in income. These findings are consistent where migrants who are managers or professionals have jobs to go to and suffer no interruption in income, while migrating "blue-collar" workers must first move and then find employment, resulting in a period of reduced earnings. The higher percentage income gains of "blue-collar" migrants over the long term, compared with managers and professionals, is probably due to the income equalizing effects of the high rates of migration among managers and professionals.

Another contribution of education is the lowering of the psychic costs of moving through the reduction of cultural barriers and an increased receptivity to new environments. Also, as Schwartz [10] suggests, the attitude of a person towards the psychic cost of mobility may affect their decision regarding the amount of education desired, in view of the greater mobility associated with higher education.

A second frequent finding of migration research is that migration flows between a pair of regions are seldom in one direction. Ravenstein's 1885 observation that "each main current of migration produces a counter-current" has been verified many times.[2] The net migration or difference in flows between regions is a fraction of the gross migration or total flows between regions. No doubt because this appeared to be wasteful or inefficient, Shyrock [14] suggests that the term "efficiency" be used to describe the ratio of net to gross migration for any given population.

Several have hypothesized that education should increase the efficiency of migration. The better-educated are expected to be more informed about opportunities and make fewer random moves, resulting in more movement with the income gradient and an increased ratio of net to gross flows. The testing of this hypothesis, however, has not always resulted in its acceptance. Shyrock and Folger and Nam [2], examining the 1949-50 migration streams in the United States, found efficiency to be positively associated with education. When Folger and Nam examined migration between 1950 and 1960, however, they found the reverse to be true. They concluded that the data did not support the contention that the migration of the better-educated was more efficient. Shin [13] computed efficiency indices for interregional migration streams of black males for 1960 and 1970 and found migration efficiency to be more often inversely correlated with educational level than positively correlated.

Schwartz [10] has pointed out that the efficiency of migration in a particular time period cannot be examined in isolation, but the

[2]The quotation is from E. G. Ravenstein, "The Laws of Migration," *Journal of the Royal Statistical Society*, 48 (1885) as quoted in Greenwood [4]. Marr, McCready, and Millerd [5] present provincial in-migration and out-migration rates for 1971.

effects of past and present migration on relative incomes must be kept in mind. Using American interregional migration flows disaggregated by age and education and omitting those returning to the region in which they were born, he found efficiency to be inversely related to education but, in a separate analysis, strongly related to the degree of regional earnings equality. The greater the regional earnings equality of a group, the less efficient was migration. Thus, the decreasing efficiency evident as education increased was interpreted as being due to the efficiency of past and present migration which had reduced regional earnings inequality. The hypothesis that more education leads to better information and consequently more efficient migration was not rejected.

Despite Schwartz's conclusions, the results of testing the effect of education on the efficiency of the labour market remain indefinite. Schwartz does not test the relationship between education and efficiency while controlling for differences in regional earnings. Also, he uses only seven educational categories. This degree of aggregation of the labour market may mean that an educational category shown as having an inefficient migration could, in reality, contain several efficient flows and vice versa.

Statement of Hypothesis

Part of the problem may be that the hypothesis that education leads to more efficient migration is an improper interpretation of the effect of education on migration flows. Previously, education has been hypothesized to increase the ratio of net to gross migration by improving the flow with the income gradient. Certainly those with higher levels of education would be expected to have higher rates of gross migration. Better information, increased ability to make use of this information, lower psychic costs of migration, and an increased likelihood of having a job waiting will all increase the rate of gross migration. It is not clear, however, that these considerations will also increase migration efficiency or the ratio of net to gross migration.

One of the reasons for better information in the labour markets for those in the higher education categories is that the labour market becomes much more specific when dealing with occupations requiring high levels of training. Employers find it worthwhile to thoroughly search for the individuals who will best fit the positions they wish to fill. Potential employees wish to find the highest return for their training, making the best match with their qualifications, experience, and ambitions.[3] No data on any type of aggregated

[3]Schwartz [12] derives similar propositions from human capital theory.

migration flows can capture this complexity. Many separate employment markets are responsible for each flow of highly trained manpower. Thus the increased information present in the employment markets for the more educated may not improve the net flows of migrants with the income gradient, when such flows are measured in any aggregated form.

There is even reason to expect that the ratio of net to gross migration may be lower for those occupations requiring more education. For many of these occupations, income differences between provinces may not play the same role in encouraging migration as they do in other occupations. Many of the moves by those in occupations requiring high levels of training are financed by employers, either because the employer finds this to be cheaper than hiring and training someone in the destination province or, in the case of a new employee, because the employer has been forced to hire in another province. The migrant, with no moving costs or time lost finding employment after migration, needs much less of an income difference to induce migration than if he had to bear these costs. This would tend to decrease the migration efficiency of the educated groups because of the lessened importance of interprovincial income gradients.

Thus, the hypothesis to be tested here is that there is an inverse relationship between the efficiency of migration and education. Income differences between provinces are standardized to account for the varying effects of past migration. Migration flows are disaggregated by occupation and the level of education associated with each occupation is used to test the relationship between education and efficiency.

Methodology

Several matters of measurement must be discussed before presenting the formal test of the hypothesis. The first concerns the measurement of interprovincial income equality. Any indicators used should account for both differences in average provincial incomes and the extent to which provincial income distributions overlap. Differences in average provincial incomes may be measured by the coefficient of variation of provincial average incomes, the standard deviation of provincial average incomes divided by the Canadian mean. Use of the coefficient of variation standardizes the distribution of provincial average incomes, taking into account the fact that even though two occupations may have equal percentage differences in their provincial average incomes, the standard deviations will differ if there are differences in their Canadian average incomes. The migration efficiency of an occupation is expected to be positively related to the coefficient of variation of provincial average

incomes since, between any two provinces, the wider the difference in average incomes the greater the advantage of migrating in one direction and thus the larger the ratio of net to gross flows.

The second component of the measurement of interprovincial income equality, the overlap of provincial income distributions, is needed because overlapping income distributions encourage moves counter to that predicted by differences in average provincial incomes. Even if province A has a higher average income than province B, a move from A to B can result in income gain if the two income distributions have some commonality and the move is from the bottom part of A's distribution to the top part of B's. Since most moves will be with the income gradient, from B to A, this type of move will decrease the efficiency of the migration flow. Its propensity depends on the extent of the overlap of the income distributions, which may be measured by the coefficient of variation of the combined distributions or, when considering migration between all pairs of provinces, the coefficient of variation of the income distribution for Canada as a whole. The coefficient of variation is again used to standardize for differences in the Canadian average incomes of occupations. The migration efficiency of an occupation is expected to be inversely related to the coefficient of variation of the income distribution for Canada since the larger the coefficient of variation the greater the overlap of income distributions and the greater the possibility of movement against the income gradient with consequent lowering of migration efficiency.[4]

The educational level associated with each occupation is measured by the "general educational development" and "specific vocational preparation" scales developed for the *Canadian Classification and Dictionary of Occupations* [1]. Both are indicators of the training time required for an occupation. General educational development, normally obtained through formal education, includes the education which contributes to reasoning development, the ability to follow instructions, and knowledge of language and mathematical "tools." Specific vocational preparation is measured by the amount of time needed to acquire the information, techniques, and skills necessary for a specific occupation. Both are presented as separate, although related, numerically coded scales.

The hypothesis may now be formulated as the following equation:

$$EFF_i = A + B_1 CVP_i + B_2 CVC_i + B_3 EDUC_i + e_i$$

where EFF_i is the efficiency of migration for the ith occupation, the ratio of net to gross migration; A, B_1, B_2, and B_3 are regression coefficients; and e_i is a stochastic error. CVP_i and CVC_i are measures

[4]Schwartz [10] uses measures of regional earnings equality similar to these.

of interprovincial earning equality for the ith occupation, CVP_i being the coefficient of variation of provincial average incomes, for whose coefficient a positive sign is expected, and CVC_i being the coefficient of variation of the income distribution for Canada as a whole, for whose coefficient a negative sign is expected. $EDUC_i$ is a measure of the educational preparation necessary for the ith occupation. A negative sign is expected for this coefficient. General educational development (GED) and specific vocational preparation (SVP) are each used as measures of educational preparation in separate regressions. Linear multiple regression is used to estimate the efficiency equations. Detailed descriptions of the variables and the sources of data are available in the Appendix.

Results

The regression results for the efficiency equations are presented in Table 1. The measures of earnings equality are significant and have the expected signs in both equations. Migration efficiency increases as the variation in provincial average earnings increases and decreases as the variation in the Canada-wide income distribution increases. Efficiency is greatest when the variation in provincial average incomes is widest and the overlap of provincial income distributions is least.

The expected signs are also found for the measures of education associated with an occupation. In both the equation using general educational development as a measure of the training required for an occupation and that using specific vocational preparation, negative signs are shown for their coefficients. After controlling for differences in interprovincial income equality, the efficiency of migration is found to be inversely related to education.

The efficiency relationship was also estimated using several other functional forms and definitions of income differences. The results were essentially the same as those reported here.

Summary and Conclusions

The reasons advanced for the high rates of gross migration among the better-educated - more information on opportunities, greater ability and incentive to make use of this information, lower psychic costs of migration, and an increased likelihood of having a job waiting - are not also arguments for higher ratios of net to gross migration or higher rates of migration efficiency. In fact there are several reasons why lower ratios of net to gross migration would be expected for the better-educated. Increased specificity of labour markets and a diminished role for interprovincial income differences

may mean that migration is less efficient for those in occupations requiring higher levels of training. This is confirmed by the results presented here. Using occupational migration flows and controlling for the income equalizing effects of past migration, education is found to be inversely related to the ratio of net to gross migration, or migration efficiency.

Appendix

DEFINITION OF VARIABLES AND SOURCES OF DATA

Efficiency

$$EFF_i = \frac{N_i}{G_i}$$

$$G_i = \sum_{j=1}^{8} \sum_{k=j+1}^{9} (M_{ijk} + M_{ijk})$$

$$N_i = \sum_{j=1}^{8} \sum_{k=j+1}^{9} (M_{ijk} - M_{ijk})$$

where EFF_i = the efficiency of migration for the ith occupation

G_i = the sum of all migrants or the total gross flows between provinces for the ith occupation

N_i = the sum of the net flows or the total of the differences in flows between pairs of provinces for the ith occupation

M_{ijk} = the flow of migrants in the ith occupation from province j to province k

M_{ijk} = the flow of migrants in the ith occupation from province k to province j

All migration to and from Prince Edward Island was omitted because of the low values of the flows. The data are from special tabulations of 1971 Census of Canada data supplied by Statistics Canada.

The occupational categories used are mostly at the minor group of 3-digit level of aggregation. This is the greatest level of disaggregation which still allows a viable number of migrants in each category. The sixty-five occupation categories used include all occupations.

Measures of Provincial Income Equality

Coefficient of variation of provincial average incomes

$$CVP_i = \frac{p^s i}{\overline{Y}_i}, \ p^s i = \sqrt{\Sigma_j (p^{\overline{Y}}_{ij} - \overline{Y}_i)^2 \ W_{ij}}, \ W_{ij} = \frac{n_{ij}}{\Sigma_j n_{ij}}$$

where $CVP_i =$ the weighted coefficient of variation of provincial average incomes for the ith occupation

$p^S i =$ the weighted standard deviation of provincial average incomes for the ith occupation

$\overline{Y}_i =$ the Canadian average income for the ith occupation

$p^{\overline{Y}}_{ij} =$ the average income in province j for the ith occupation

$W_{ij} =$ the fraction of the ith occupation in the jth province

$n_{ij} =$ the number in the ith occupation in the jth province

In computing the standard deviation the squared differences between provincial average incomes and the Canadian average were each weighted by the portion of the occupation found in that province. The coefficient of variation will thus more heavily reflect the income differences associated with provinces with large numbers of migrants and therefore give a more accurate picture of the income differences facing migrants.

Coefficient of variation of the Canadian income distribution

$$CVC_i = \frac{c^s i}{\overline{Y}_i}$$

where $CVC_i =$ the coefficient variation of the income distribution for Canada as a whole for the ith occupation

$c^s i =$ the standard deviation of the income distribution for Canada as a whole for the ith occupation, calculated from grouped data.

The data available on income distributions for Canada as a whole are grouped into income categories with an open-ended upper income group. This necessitates an assumption about the mid-point of the upper income group. Standard deviations were calculated under several assumptions, but the regression results were insensitive to the assumption used.

The income data used for the measures of provincial income equality are employment income values for those who worked full-time for the full 1970 year and are for the Canada-wide majority sex in that occupation. The data are from *Employment Income for Full-time, Full-year Workers by Sex and Occupation* [15]. The occupational distributions, by province, are from the same publication.

References

1. Canada Department of Manpower and Immigration. *Canadian Classification and Dictionary of Occupations* (two volumes). Ottawa: Information Canada, 1971.
2. Folger, John K. and Charles B. Nam. *Education of the American Population*. 1960 Census Monograph. Washington, D.C.: U.S. Government Printing Office, 1967.
3. Grant, E. K. and J. Vanderkamp. *The Economic Causes and Effects of Migration: Canada 1865-71*. Ottawa: Economic Council of Canada, 1971.
4. Greenwood, Michael J. "Research on Internal Migration in the United States: A Survey," *Journal of Economic Literature*, 8 (1965), 397-433.
5. Marr, William, Douglas McCready, and Frank Millerd. "Canadian Resource Reallocation: Interprovincial Labour Migration, 1966-1971," *Canadian Studies in Population*, 4 (1977), 17-31.
6. Marr, William, Douglas McCready, and Frank Millerd. "Canadian Interprovincial Migration and Education, 1966-1971," *Canadian Studies in Population*, 5 (1978), 1-11.
7. Marr, William and Frank Millerd. "Employment Income Levels of Migrants Versus Non-Migrants, Canada, 1971," *Research in Population Economics*, II (1979), 43-62.
8. Saben, S. "Geographic Mobility and Employment Status, March 1962 - March 1963," *Monthly Labour Review*, 87 (1964), 873-881.
9. Schultz, T. W. "The Value of the Ability to Deal with Disequilibria," *Journal Disequilibria of Economic Literature*, 13 (1975), 827-846.
10. Schwartz, A. "On Efficiency of Migration," *Journal of Human Resources*, 6 (1971), 193-205.
11. Schwartz, A. "Interpreting the Effect of Distance on Migration," *Journal of Political Economy*, 81 (1973), 1153-1169.

12. Schwartz, A. "Migration, Age, and Education," *Journal of Political Economy*, 84 (1976), 701-719.
13. Shin, Eui Hang. "Trends and Variations in Efficiency of Black Interregional Migration Streams," *Sociology and Social Research*, 62 (1975), 228-245.
14. Shyrock, H.S. Jr. "The Efficiency of Internal Migration in the United States," in *Proceedings of the International Population Conference*, Vienna, 1959, 685-694.
15. Statistics Canada. *Employment Income for Full-time, Full-year Workers by Sex and Occupation, 1971 Census of Canada*, (catalogue no. 94-767).
16. Stone, Leroy O. "What We Know About Migration Within Canada - A Selective Review and Agenda for Future Research," *International Migration Review*, 8 (1974), 267-281.
17. Stone, Leroy O. and Susan Fletcher. *Migration in Canada*. 1971 Census of Canada Profile Study. Statistics Canada (catalogue no. 99-705).