DOCUMENT RESUME

ED 068 046   HE 003 491

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TITLE   Demographic and Social Accounting and Its Application
              to Educational Activities.
PUB DATE   Mar 72
NOTE   10p.

EDRS PRICE   MF-$0.65 HC-$3.29
DESCRIPTORS   *College Graduates; *Demography; *Higher Education;
              Job Market; Labor Market; Manpower Development;
              *Manpower Needs; Subemployment; *Unemployment

ABSTRACT
        The study of manpower requirements has received much
attention since 1960, but it may be argued that the results of these
studies did not come up to the expectations of those involved in the
conduct of manpower research. The high percentage of unemployed
professionals we are now experiencing brings us to formulate vigorous
objections toward certain economic theories concerning the rate of
return on education. The expectations of higher education would be
less deceiving if a body of information were provided to people
concerned. For example, research results about graduates or drop-outs
at the beginning of their earning careers would be beneficial. This
study would follow up the students in their year-to-year progression,
in their graduation and their integration into the labor force. Such
a study would not consider university dropouts as wastage but would
follow up these human resources so as to know the reasons why they
quit school and to clarify to what extent their partial studies
helped them in their jobs. (Author/HS)

DEMOGRAPHIC AND SOCIAL ACCOUNTING AND ITS

APPLICATION TO EDUCATIONAL ACTIVITIES

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Demographic and Social Accounting and its Application
to Educational Activities

The study of manpower requirements has received much attention since 1960.
The emerging of newly independent countries called for solutions to their development
by training a labor force that would contribute to their economic growth. UNESCO
and OECD were at the origin of many studies in this field, as were the U.S.A.,
Canada and other industrialized countries which have made estimates of their highly
qualified manpower needs. Recent bibliographies on the subject convince us about
the importance of the problem and the serious efforts that were made to bring about
significant contributions.[1]

Today, it may be argued that the results of these studies did not come up to
the expectations of those involved in the conduct of manpower research. The high
percentage of unemployed professionals we are now experiencing brings us to formulate
vigorous objections toward certain economic theories concerning the rate of return
on education. The periodic shortages and surpluses of scientists and engineers or
the imbalanced cycles of demand and supply of a qualified manpower oblige us to
revise our policy of action. Also, the crecendo of the early sixties that considered
the prolongation of schooling as a mechanism that would generate additional production
and returns is diminished by the actual economic crisis and the protest of university
graduates looking for work.

The expectations of higher education would be less deceiving if a body of
information was provided to people concerned, university authorities and students
alike. For example, research results about graduates or drop-outs at the beginning
of their earning careers; or the results of a longitudinal study of student population
by cohorts. This study would follow up the students in their year-to-year progression,
in their graduation and their integration to the labor force. Such a study would
not consider university drop-outs as wastage but would follow up these "semi-finished"
and
human resources so as to know the reasons they quit school to clarify up to what
extent their partial studies helped them in their job. A longitudinal study could

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1. "International Development Education, "AERA Review of Educational Research, XXXVIII,
3 (June 1968), bibliographies of the different reviews; K. Lederer and P. Bourgette,
Selected, Annotated Bibliography on Manpower Evaluation. Alberta: H.R.R.C., 1970;
A.P. Contandriopoulos, Previsions des besoins en main-d'oeuvre hautement qualifiée
et planification de l'éducation. Montréal: La Conférence des Recteurs et des
Principaux des Universités du Québec, May 1971, Bibliography.

reveal some social aspects on which we shall elaborate later on.

The aim of this paper consists of showing the need for a demographic accounting of the student population, containing life-sequences or social aspects that may be used as indicators in the decision-making of universities or of the students themselves. Also, demographic information may be easily linked with educational and may employment statistics or to aspects of professional and social mobility. Once integrated, this body of information contributes to an amplified social accounting.[2]

The functionning of the demographic accounting applied to educational activities.

The demographic accounting is a means of arranging within the same framework incongrous demographic and social data. A longitudinal analysis is the logical way to deal with population phenomena. Like other types of accounts, the demographic version is based on the balance of inflows and outflows during a certain period. By borrowing from economics the concept of semi-finished and finished products, the approach consists of taking human beings as a basic unity around which different categories of social statistics are integrated, and to establish a series of input-output matrices. The latter provide an account of student stocks and flows, from one year to another and from one educational activity to a different one, as the national economic accounting gives information on stocks and flows of capital, labor, goods and services.

From an operational point of view, the student population should be considered by cohorts and should be distributed by school-years; each school-year should be divided in categories reflecting the characteristics in which we are interested: age, sex, discipline, level of studies, profession desired, etc. The combination of the different data written down in matrices provides a number of composite categories or "situations" that enables us to discern the gradual transformation of human stocks. Thus, demographic accounting becomes a tool for educational planning.[3]

The difference between the accounting method and the traditional approach in university management is due to the fact that the latter looked for data concerning its administrative needs only. University administrators collected statistics on

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2 R. Stone, Demographic Accounting and Model-Building. Paris: OECD, 1971. The author describes some aspects of demographic accounting and its links with the economic accounts. This paper borrows from his report.

3 R. Correa, Quantitative Methods of Educational Planning. Scranton, Pa.: International Textbook Co., 1969, p. 71-100.

student stocks and did not pay attention to student flows, though it is known quite well that changes in student flows is what really characterizes a university system. The traditional approach created its own limits when it considered drop-outs as a wastage and ignored them. This attitude was encouraged by certain economic studies which considered school graduates as finished products and the school investment for drop-outs as a loss. From a human capital standpoint, a semi-finished product can integrate in the labor force and the resources invested in its training is not considered as wastage. This aspect of human resources development is valorized in demographic accounting. The process would be to follow up by questionnaires students that have left school so as to know why they quit. Did the training they received correspond to their expectations? Are they working? Are they working in the field they were prepared for? Up to what extent the training received helped them find a job or is helping them in their present occupation? etc... These specific questions and others could also be put to graduates during the period following their graduation. Thus, the university will systematically receive a feedback to its curricula and a better information about its activities.

Sociological aspects that may explain student mobility are reflected in the answers to the questionaire. These aspects would contribute to clarify the relation existing between the university as a training institution and the labor force as well as the relation existing between the university community and the public in general. Data collected from this inquiry may help to foresee the reasons and factors that bring about change and may enlighten about the university evolution in different circumstances.

The setting up of a demographic accounting

As in other accounts, demographic accounts are based on inflows and outflows balance during a given period. In our case, these flows consist of students that are following a university term (one school-year) or are leaving the term wether to pursue the following year's curriculum or to become part of the "outside world". The surviving ones of the preceding year constitute the initial stock for the present year and the survivors that pass on to the following year are considered as the terminal stock. For a given period the balance between inflows and outflows implies that the difference between the two stocks represent the contribution of the outside world (students entering the second or the third year of the curricula).

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To build a demographic accounting system, the student population must be dis-
tributed by grades on a yearly basis, taking into account characteristics that might
be helpful such as Faculty, department, programmes, undergraduate or graduate levels,
etc. Once data have been structured within a taxonomic framework, they may be presented
as entries in an account showing, on one side, in what formation each group enters
the period and on the other side, how it redistributes itself among the various
categories before leaving the period. The accounting identities connecting the flows
and stocks will ensure that the same number of students will flow out of a category
as have flown into it. Nevertheless, before setting up accounts, it is necessary
to have a clear idea of how one intends to determine the elements. What is a student
population? What are the main characteristics that ought to be brought out and how
should they be combined? Which is the best way of presenting the information?
Here are some points we would have to solve. A) The time interval - In economic
accounts the time interval consists of a year and is based on the civil year. In
education it would be logical to retain the first of October, since this would give
us the student repartition at the beginning of the academic year. It would be difficult
to calculate the inscriptions on a semester, half-time or part-time periods. The
initial choice favors student cohorts based on year-to-year flows. This choice
may be reconsidered later on when the acquired experience will facilitate adaptations.
B) Definitions of categories and situations - Categories and classifications appropriate
to demographic accounting are partly institutional, partly economic, partly familial
and partly personal.@ Concerning students, the age, the sex, the object and level
of studies, the occupation of those who have quit or graduated, etc. constitute
the categories and situations. The interaction of these classifications create com-
posite categories or situations that allow to divide the population in differentiated
groups or life-sequences such as being 23 years old, having terminated a B.A. with
honors and working in one's specialization. C) Horizontal analysis and cohorts -
As in economics, in demographic accounting a distinction is made between the horizontal
analysis (in a particular year) and the time-series analysis. We can consider the
changes of state occuring in a particular year for all the students who flow into
that year; we can also follow up through succession the evolution of a student cohort.
It is quite obvious that a study which does not extend over a "generation"(the period

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@ The same longitudinal studies may be pursued for student groups as well as for
labor cohorts in the principal economic sectors and the services.

which covers a university undergraduate or graduate program and the integration
of the students following the program to the labor force) would be incomplete.
D) Methods of presentation - Whatever the system we use to register the informations -
working sheets, perforated cards, etc., the information must contain a numerical
expression that would facilitate the comprehension of the system by showing the
manner in which the elements are related and the validity of the arithmetical
expression.

The Utility of Demographic Accounting

A demographic account model is based on year-to-year flow of educational activities.
It brings to light the students repartition, and its precision depends mainly on
the informations that can be included in the model. It can be imporved in a later
stage. Like all input-output models, the demographic version is based on fixed-choice
assumptions that are rigid at times; in its initial phase some questions remain
which it cannot answer. It may help in the following cases.

a) When making educational projections it is necessary to take into account
changes in the educational system. Educational statistics, those of the universities
included, concentrate much more on stocks than on flows. Thus, it is difficult
to study the system's dynamism. Our model combines the different educatioanl activities
and brings out a more comprehensive and coherent frame of reference. Information
gathered on graduates or drop-outs may be of great utility as feedback in university
program evaluation or may serve as university and public relations control.

b) The model provides productivity indices (transition coefficients) and makes
possible a number of detailed analyses. In this context it becomes a tool for
educational planning (see a demographic accounting model in Appendix).

c) Our model may be linked to other demographic accounting models such as those
concerning community colleges. Access to higher education depends on the combined
factors such as previous courses taken, family and environment that condition the
desire to pursue further studies. The linking of the community college outflows
with our inflows may guide the authorities concerned with future university population.

d) Similarly, for employment reasons, it is necessary to link the outflows
of our system with the inflows of the labor force. The combination of educational
and employment data may help students in the choice of their careers and provide
feedback to the university activities.

e) An integrated system helps to find out up to what extent the existing data
may be adapted to analytical needs. Thus, outflow data concerning students entering
their professional life is seldom collected, our model may contribute to the data
needed for economic planning.

f) An integrated system is indispensable for computing purposes. An exact understanding of the connections among considerable bits of information gives all the importance to a framewok in which every bit is seen to have its place.

g) The demographic accounting enables the quantitative expression of certain life-sequences. It is helpful when the information gathered contribute to decision-making and planning. The student population accounts of a certain university may be added to the total student population of the province or the country so as to become a national accounting. Compilations based on student inflows and outflows linked with the employment data contribute to educational planning, to manpower forecasting and to the economic development in general. It is helpful to many ends.

It matters little that in the early phases gaps and inconsistencies appear in a well conceived system, since these deficiencies may facilitate the establisment of priorities for the collection of new data.

Demographic Accounting and its relationship to Institutional Research

What is the relationship of the demographic accounting to institutional research? The latter also developed in the sixties. It is diversified and may be defined as the effort made by an organization to study itself so as to reach its objectives in a better way. It consists of a systematic analysis of the functionning of the organization and the efficiency with which the latter uses its resources. The aim of this analysis is to enable the administration to reach better decisions resulting from a more detailed information.

Today, institutional research in higher education goes beyond the practices existing in the early sixties. Besides solving management problems and looking for better utilisation of buildings and equipment, the research tries to reach the heart of the problem and estimate what is really going on in the classrooms.[4]

The demographic accounting is linked with institutional research in the following manner. If the research constitutes a way of studying the system's operation, it does it in a certain sense from within by testing its different dements, while the demographic accounting contributes to study the operation from the exterior by providing a larger frame of reference and by reflecting the feedback of university training and employment relation.

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4 F. Rourke and G. Brooks, The managerial Revolution in Higher Education. Baltimore: John Hopkins Press, 1966, 44-67.

Demographic accounting, as has been said, has substantive uses. It makes possible institutional projections and arrangements and contributes to the formulation of consistent educational and manpower policies. It allows the university to link its accounts to those of other universities or other social and economic systems of the province and the country.

Appendix

Table 1

A demographic matrix

(A year-to-year outflow, University X, 1970-71 and 1971-72) *

		Outside world	Faculties		Total outflows
			1970-71 (This year)	1971-72 (Next year)	
New students			2,050	2,100	
Faculties	1969-70 Last Year	2,000	10,150		12,150
	1970-71 This year	2,200		10,000	12,200
Total inflows			12,200	12,100	

* Fictitious name and figures.

Table 2 *

A symbolic version of Table I

		Outside world	Faculties		Total outflows
			This year	Next year	
New students			e'	$\Lambda\, e'$	
Faculties	Last year	$\Lambda^{-1} a$	$\Lambda^{-1} Si$		$\Lambda^{-1} P$
	This year	a		Si	P
Total inflows			P'	$\Lambda P'$	

* This symbolic version as well as the following model are adapted from Stone, op. cit., p. 92-93

Meaning of the symbols :

P   the vector of population flows,
e   the vector of new students,
a   the vector of leaving students (graduates, drop-outs),
S   the matrix of survivors,
i   the unit column vector, so that Si denotes the row sums of S,
Λ the lag operator which shifts in time the variable to which it is
            applied, so that if S denotes this year's survivors, Λ^{-1} S denotes
            last year's survivors, and ΛS denotes next year's survivors,

            the prime superscript(') indicates transpositions; P' is a row vector
            formed from the elements of the column vector P, S' is a matrix formed
            by interchanging the rows and columns of S.

Model based on outflow coefficients (transition coefficients)

From the row for this year, in Table 2, we can see that the population outflow,
consists of this year's leaving students (graduates, drop-outs) plus the survivors
into next year. That is :

$$P = Si + a \qquad (1)$$

from the column for this year, in Table 2, we can see that the flows of population
into this year consist of the survivors from last year plus this year's new students.
That is :

$$P' = \Lambda^{-1} Si + e' \qquad (2)$$

or, on transposing the variables :

$$P = \Lambda^{-1} S'i + e \qquad (3)$$

A matrix of transition coefficients C, can be formed by dividing the elements of
each row of $\Lambda^{-1}S$ by the corresponding element of $\Lambda^{-1}P$. Thus :

$$C = \Lambda^{-1} \hat{P}^{-1} \Lambda^{-1} S \qquad (4)$$

where $\Lambda^{-1}\hat{P}$ denotes a diagonal matrix, that is, a matrix with the reciprocals of the
elements of $\Lambda^{-1}P$ in its leading diagonal. The matrix C shows the proportion in
which the survivors from last year distribute themselves among the various states
open to them this year.

By transposing (4) and post-multiplying by $\Lambda^{-1}\hat{P}$, we can write

$$\Lambda^{-1}S' = C' \Lambda^{-1}\hat{P} \qquad (5)$$

and by substituting for $\Lambda^{-1}S'$ from (5) into (3) we can write

$$P = C' \Lambda^{-1}P + e \qquad (6)$$

Equation (6) connects this year's population flows, P, with last year's population
flows, $\Lambda^{-1}P$, and this year's new students, e. On the assumption that C remains constant,
these equations can be used to make forward projections.