THE 1972 POSTCENSAL SURVEY OF PROFESSIONAL SCIENTIFIC AND TECHNICAL MANPOWER

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The need for meaningful data on a Nation's resources of all types of manpower has become more urgent in recent years as Government (at all levels) has become more involved in the planning, funding, and evaluation of many economic, educational, and scientific policies and programs affecting all sectors of the economy. It is generally taken for granted today that the stock of trained scientific and technical personnel in the U.S. is one of the controlling and essential resources determining scientific and technological activity for economic growth, technological change, and the advancement of knowledge. Furthermore, scientific and technical manpower has, over the past decade, assumed a national and international importance far beyond its numerical size.

In pursuit of more meaningful information about this resource, the NSF decided that the 1970 Census of Population presented a once-in-ten years opportunity (as it did after the 1960 Census) to obtain on a nationwide basis a large array of detailed information on high level manpower.

In the 1970 Census of Population, 20 percent of the enumerated population supplied information on labor force status, occupation, and level of education (i.e., number of years of schooling completed). Utilizing this 20 percent sample, the Foundation planned (with the cooperation of the Census Bureau) to exploit this comprehensive source of information by surveying in detail two sample populations of persons in the civilian labor force: (1) those classified in the Census in scientific, engineering, technical, and related occupations, and (2) those with 4 or more years of higher education (post-H.S.) regardless of current occupation. This project provides the opportunity to obtain, in much greater detail than would be available from the regular Census, data on occupations, functional activities, types of employment, formal education and supplementary training, salary, and mobility, and the relationships among these various characteristics.

Broadly speaking, the Postcensal Project provides three main inputs to assessing our scientific and technical manpower resources:

(1) A nation-wide inventory of the characteristics of U.S. manpower resources, employed and/or trained in scientific, engineering, and technical fields;

(2) Insights into the career patterns of the scientific, engineering and technical manpower resources as related to education and training and other demographic variables for various cohort groups; and

(3) A comprehensive and basic statistical benchmark for evaluating and reconciling data on scientific and technical manpower obtained from a variety of sources.

The postcensal survey also provides the opportunity to obtain two unique sets of information not available from other sources:

(1) Detailed data representing the entire work force of natural and social scientists, engineers, and technicians currently employed for all sectors of the economy at a specific point in time.

(2) General information representing the entire college-educated population (i.e., four or more years of college education) regardless of current occupation at a specific point in time.

A brief review of some of the substantive outputs to be obtained through this project follows:

To begin with, because in the 1970 Census schedule, the amount of information available pertaining to a person's occupation and work activities is quite limited, an attempt is being made to obtain some insight into the extent to which interdisciplinary work in science and technology has resulted in persons classified as engineers working in an area of the physical or life sciences, physicists concerning themselves primarily with some aspect of the medical sciences, or mathematicians calling physics their present field of work.

Another equally important area of job information is the activities or duties that are actually performed; that is, what do people classified in professional and technical occupations "really do" in their jobs. Although we may have some indication that a certain number of engineers may be involved in "research", what the varied job requirements or duties of these personnel are, has not been too well known. For some, this may mean that aside from engaging in research, the job may entail supervising a team of other professional personnel, and writing technical reports; for others, there may be sales duties, and making estimates of markets for new products. For persons in other occupations, there are of course a similar wide range of activities which make up the different types of jobs in which such personnel are engaged.

If our knowledge in the past concerning the current employment and job activities of professional and technical personnel has been limited, this has been even more so about the process over time by which cohorts of such highly trained persons are allocated to various jobs and employers, the career paths which may characterize different groups, and the movement of scientific and technical personnel between various types of employers, occupations, and work activities. Insights into this complex area would be helpful in dealing with an assort-

ment of problems including the one that policy makers always want a definitive answer to--the supply and demand of scientific and technical personnel. To this end, detailed information on employment and work activities has been obtained for the most current job and the two prior jobs held as well as for the entry job into the labor force. It is obvious, of course, that such information cannot encompass complete work histories but it should provide a broad overview of mobility patterns. It will be possible to analyze many factors in relation to changers and non-changers among the various occupational group.

What insights can be provided by such data? The past decade, up to the present time, has been marked by, among other things, changes and shifts in emphasis in vast Federal Government expenditures for research and development, a build-up and cut-back of activities in both government and industry for the space and defense programs, an increase in existing as well as new programs for medical and health research, more emphasis on the development of new products in many technologically-oriented industries, and a considerable expansion and then leveling off of educational facilities to accommodate the influx of new students and provide for ongoing research programs. Against this background, the recent mobility data will provide an evaluation of the movement between employers, jobs, activities, and geographic locations. For example, have more scientists been moving from academic employers to industrial jobs than vice versa? Are a greater proportion of engineers concerned with administrative or supervisory duties than heretofore? Are certain industries attracting a higher proportion of the mobile personnel? Does there appear to be a shifting or upgrading of persons in non-professional jobs (i.e., the technician occupations) to professional occupations? To what extent have these various movements among occupations, employers, functions, etc., resulted in substantial shifts geographically?

By going back to the entry point for job histories, it may be possible to establish typical and variant career histories for specific occupations and occupational groups, for respondents with specific levels and types of training, and for those with certain demographic characteristics.

Several additional items of employment and labor market interest on which data is being obtained relate to reasons for changing jobs, how these persons acquired their different jobs, whether their work was supported or sponsored by Government funds, and levels of salary and income.

In the area of training, a considerable amount of detail was sought on various facets of both formal education and informal types of training. By and large, persons in the occupations covered in this survey have a fairly high level of training, especially when compared to the general population. Requirements for employment in these scientific and technical occupations generally require this background--even more so in the past few decades.

To begin with, since information on training has been obtained as of 1972, it will be possible to update the Census occupational information on number of years of formal training completed. However, the primary interest lies beyond this data, in that we want to determine some of the specifics of higher education obtained in relation to subsequent employment, and data was therefore requested on major fields of study for different types of degrees granted, where appropriate. In addition, because of the general knowledge that a substantial amount of training takes place outside of the formal educational system, inquiry was made about informal types of training received, such as company training programs, military training applicable to civilian occupations, home study correspondence courses, etc.

Some of the more apparent uses of this information includes: a detailed description of the formal education and training of persons in various professional, scientific, and technical occupations; an analysis of current occupation and work activities as well as overall job histories in relation to major fields of study at both undergraduate and graduate levels; the extent to which persons are employed with less than a college in professional occupations, and what types of informal training as well as experience may have contributed to their attaining such positions; and, an analysis of the personal and other background characteristics of the respondents to determine whether any insight can be obtained regarding differences in levels of training and subject matter studied.

Last (but not least), for these occupational groups, information was sought on background and personal characteristics both to supplement data available from Census and other sources and as factors to relate to data obtained in the areas dealing with employment and training.

As indicated previously, a sample of the 4-year college group was surveyed (outside of the target occupations) from whom similar information was obtained in order to provide a general analysis of the Nation's college-educated population. Insights are being sought on the extent to which persons trained in scientific and technical fields were, in 1970 (or beyond), working in occupations seemingly unrelated to this training; the same for persons who started their careers in scientific and technical occupations and were employed elsewhere in 1970, and finally, despite present conditions, what potential might exist for reemployment in scientific and technical fields.

It should also be mentioned here that with all of the information being obtained in this study, there exists the possibility of developing manpower models using multiple regressions and similar techniques which would enable us to relate data on income to other factors such as age, education, industry, geographic location, activities, etc. One additional and important note relating to the problem of occupational information remains to be mentioned. Because data on scientists, engineers, and technicians have been obtained over the years from various sources (i.e., individuals' self-reporting, employer surveys, household surveys, etc.), it has been difficult to reconcile the different counts obtained for persons in such occupations. Using the postcensal data based on the Census nation-wide occupational sample, it is our intention to redefine the populations in the target occupations employing various criteria which will combine such reported items as occupation in different jobs, self-identification in terms of education and experience, level of education attained, fields of study, current national society membership, and valid professional licensure or registration. For example, in the case of engineers, whereas the Census categorized as such only those currently working as engineers, or in the case of the unemployed those last working as engineers, we will use the aforementioned criteria to estimate different engineering populations for specific points in time. This will entail eliminating some persons originally identified as engineers by Census (drop-outs), and transferring into the engineering group some persons originally classified in the other occupational groups or in the broad college-educated group (drop-ins). With newly estimated populations in hand, various inventory and analytical tabulations will be obtained.

In closing, the body of information to be obtained in the Postcensal Survey will be substantial, however, the requirement for timely answers to manpower questions and problems continues to grow. Data collection and analysis of scientific and technical manpower issues will continue to face greater challenges in the years ahead. The growing awareness of the need for better information on these resources are increasing, and it is anticipated that the postcensal survey results will provide a meaningful base for future work.