Foreign-Born Engineers in the United States

LOUIS J. PIGNATARO

IN RECENT YEARS, the increasing number of foreign-born engineers in the United States has affected many segments of our society. The impact on the engineering profession, universities, the economy, and our culture is of sufficient concern that the National Research Council undertook a study two years ago of the issues associated with this phenomenon. The findings and recommendations of the study (see box) detailed in the report *Foreign and Foreign-Born Engineers in the United States* were summarized by Alan E. Fechter, executive director of the NRC's Office of Scientific and Engineering Personnel, in a session sponsored by the Committee on Transportation Education and Training at the 1989 TRB Annual Meeting. Following this presentation, panelists representing various segments of the transportation community focused on foreign-born engineers in the United States and the implications for transpor-

Report Findings

- The proportion of foreign-born engineers in the U.S. work force increased from 8 to 18 percent from 1972 to 1982; of the 18 percent, 82 percent work in industry (see Figure 1). The proportion of those receiving advanced degrees was even larger. Of the engineering labor force working at the Ph.D. level in the United States in 1982, 36 percent was of foreign origin.
- In the academic sector, the proportion of foreign-born engineering assistant professors rose from 10 to more than 50 percent between 1975 and 1985.
- The largest proportion of foreign-born engineering students and workers in the United States is from India, the Middle East, and the Far East (see Figure 2).

Impacts of the Findings

- Without the presence of foreign-born engineers in the work force and graduate schools, it would be hard for the U.S. to achieve national goals.
- The effect of language barriers on engineering education was considered

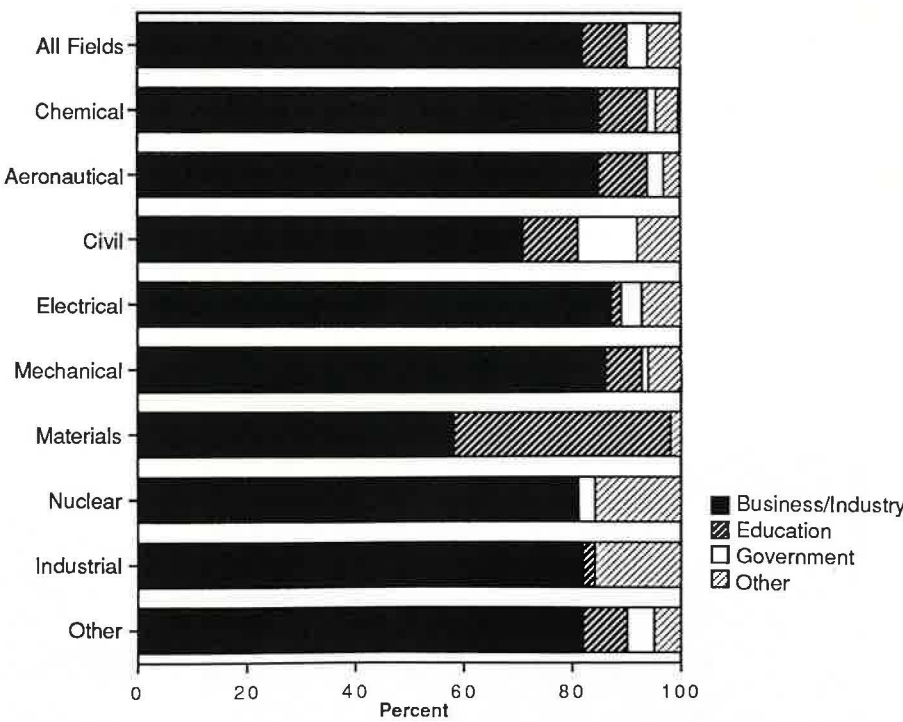

FIGURE 1 Distribution of foreign engineers, by sector of employment, 1982.

Source: Special tabulations of Oak Ridge Associated Universities, based on National Science Foundation's 1982 Postcensal Survey.

tation engineering. Representing the different viewpoints were Lester A. Hoel, chairman of the Department of Civil Engineering, University of Virginia, academic institutions; Walter H. Kraft, Edwards and Kelcey, Inc., transportation consultants; George E. Gray, California Department of Transportation (CALTRANS), the public sector; and Michael Rougas, Association of American Railroads, the transportation industry.

Panel Viewpoints

Despite their different transportation perspectives, the panel members made similar observations. The major findings of the panelists included the following:

1. Deficiencies in the communication skills of foreign-born engineers were cause for concern, felt most acutely by academic institutions. Panelists suggested remedial action such as daily application of communication skills and greater emphasis on teaching effectiveness in hiring and promotion policies of academic institutions.
2. Technical competence and positive job attitudes were noted as characteristic of foreign-born engineers.
3. Social and cultural differences present potential problems. These could include dietary and religious restrictions, rejection of women and minorities as equals, disdain for field activities, family responsibilities transcending professional obligations, and a lack of understanding of the socioeconomic environment in the United States.
4. The anticipated shortage of engineers born in the United States was perceived to be a serious problem. It is expected that foreign-born engineers will continue to make up a substantial portion of the U.S. work force. For example, of the 690 entry-level engineers hired by CALTRANS in 1988, about one-half were foreign educated or foreign born, and it is expected that the future will show little change. The attraction of engineering and academic positions and the high regard in which these professions are held by the foreign-born may well provide an additional impetus for a larger number of U.S. students to pursue advanced degrees.

Improving Engineering Education for U.S. Students

In the ensuing discussion, comments from participants at the session underlined the findings of the panelists. Participants discussed the need to provide a greater differential in compensation between recipients of bachelor and advanced degrees in order to attract more American students to graduate study in engineering. In addition, a proposal

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negligible, but no consensus was reached on other questions such as the effect on under-represented groups in engineering (e.g., women and minorities) because of different cultural attitudes; and the effect on the character of engineering education, because little evidence was available on these issues.

- It is a wise policy to subsidize the education of foreign-born students, many of whom have had their earlier education subsidized elsewhere, because a large fraction of these students stay in the United States and contribute to its development.
- Foreign-born engineers do not displace U.S. citizens in the work force and in graduate schools and do not have a depressing effect on wages.

Recommendations

1. No restrictive policy should be adopted to reduce the number of foreign-born engineers entering the United States.
2. Full-time graduate study in engineering should be made more attractive to U.S. students by providing adequate stipends.
3. Universities should ensure that faculty and teaching assistants are proficient in the English language before employing them in the classroom.
4. Precollege mathematics and science education in the United States must be improved dramatically to increase the pool of potential engineering students.
5. More quantitative data must be provided to evaluate whether differences exist in teaching effectiveness and attitudes toward female and minority students between U.S. faculty and teaching assistants and their foreign-born counterparts.
6. The impact, if any, of foreign-born faculty on the quality and character of engineering education should be determined.

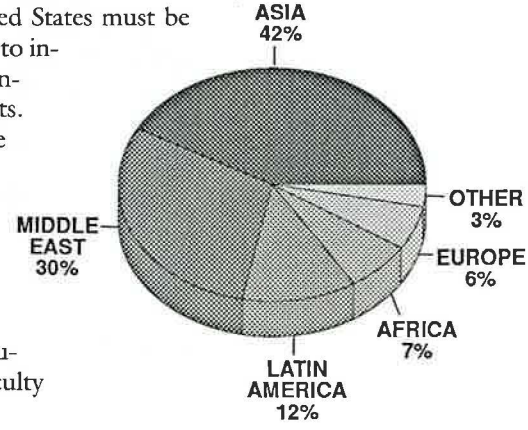

FIGURE 2 Foreign engineering students, by area of origin, 1983–1984.
Source: Profiles, *1983–1984, New York: Institute of International Education, 1985.*