

The Interchange of Researchers and Engineers Between Japan and Other Countries

- A Study Based on Statistical Data -

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1. Purpose of Study

In recent years the international community has become borderless and interchange among countries has become active. It has been pointed out that there are imbalances in interchange between Japan and other countries, and a variety of discussion is going on. In the area of science and technology, as one of such problems, the imbalance in interchange of researchers between Japan and other advanced countries has been highlighted. This is a claim that while Japan has been sending a massive number of researchers to the US and other advanced countries to acquire knowledge and has been connecting this to product development back home by having them bring back their achievements, Japan is closed when it comes to acceptance of researchers from other countries and has not been taking positive acceptance measures. Such complaints are prominent in the US, but the realities of interchange of researchers, which should be known as the basis of argument, has not necessarily been fully grasped. Given such a situation, this study has studied and analyzed the record of interchange of researchers and engineers between Japan and other countries by using statistical data made available by the Justice Ministry and the Foreign Office (Annual Report of Statistics on Legal Migrants) to contribute to future interchange policy making by providing a basic material.

2. Study Subjects and Study Period

(1) Researchers and engineers, those engaged in study of cultural, social and natural sciences as well as those involved in provision or acquisition of industrial technology and skills. (In this study they are called researchers and engineers.)

(2) Numbers of researchers and engineers involved in interchange are total numbers. Hence they include numbers of reentry and re-departure in addition to those who entered or left for the first time.

(3) The study collected data for 41 countries in the world.

(4) The period of study was the 20 years from 1970 to 1989.

3. Outline of Study Results

The following are the trends in the 20 years from 1970 to 1989.

(1) General Trends

During the 20 years from 1970 to 1989 Japan sent 730,218 researchers and engineers abroad (0.9% of all Japanese departures) and accepted 461,445 foreign researchers and engineers (1.6% of all foreign entries).

The trend of dispatches and acceptances in the 20 years shows that dispatches exceeded acceptances until 1981 but they were on a par after 1982 and dispatches again exceeded acceptances after 1985 (Fig. 1). The increase of acceptances in 1982 is believed to have been due to the addition of "training" as a new qualification to stay, but technical trainees were accepted even before that, so the difference between numbers of dispatched and accepted must be much smaller. Comparing the rate of increase of the numbers of dispatched and accepted in 1989 and 1970 shows that the number of dispatched in 1989 was 13.8 times that in 1970 and the number of accepted was 25.4 times. Hence the rate of increase of acceptances has exceeded that of dispatches. The interchange ratio

(dispatch/acceptance) during the same period showed a tendency of gradual decrease until 1981, a big fall in 1982, and then a tendency of increase again.

(2) Trends by Country

Let us examine the state of interchange by country. The U.S. has accounted for nearly 50% (353,852, 48.5%) of all dispatches from Japan, followed by the U.K. (59,353, 8.1%) and France (39,727, 5.4%). In contrast Taiwan has been the greatest source of researchers and engineers coming to Japan (97,614, 21.2% of all), followed by Korea (87,145, 18.9%) and China (63,290, 13.7%). The top three countries were Western countries for dispatch, and neighboring Asian countries for acceptance.

(3) Trends by Social System and Developmental Stage

Of the 730,218 Japanese researchers and engineers dispatched in total, 570,014 (78.1%) were sent to developed countries, 148,730 (20.4%) to developing countries, and 11,474 (1.5%) to the Soviet Union and Eastern Europe. On the other hand, of the 461,445 foreign researchers and engineers accepted in total, 380,176 (82.4%) were from developing countries, 79,581 (17.2%) from developed countries, and 1,688 (0.4%) from the Soviet Union and Eastern Europe. As for the interchange ratio, it was 7.16 for developed countries, 6.80 for the Soviet Union and Eastern Europe, and 0.39 for developing countries (Fig. 2).

(4) Trends by Region

In terms of dispatch by region, 377,132 (51.6%) went to North America, followed by 192,433 (26.4%) to Europe and 129,955 (17.8%) to Asia. In terms of acceptance, 347,706 (75.4%) came from Asia, followed by 52,150 (11.3%) from North America and 31,286 (6.8%) from Europe. Thus North America and Europe together account for nearly 4/5 of the total number of dispatch, and Asia for 3/4 of acceptance.

(5) Trends by Purpose of Visit

Of the Japanese researchers and engineers dispatched, 494,013 (67.7%) were for "study, training and acquisition of technology" and 236,205 (32.3%) for "academic investigation and research". In terms of acceptance of foreign researchers and engineers, 265,923 (57.6%) were accepted for "study," 143,966 (31.2%) for "training," 29,906 (6.5%) for "artistic and academic activities," 20,743 (4.5%) for "instructive activities" and 907 (0.2%) for "provision of advanced technology". Nearly 70% of researchers and engineers dispatched aimed at acquiring knowledge and technology abroad through "study, training and acquisition of technology". On the other hand, nearly 90% of foreign researchers and engineers accepted aimed at acquiring knowledge and technology in Japan through "study" and "training".

(6) Characteristics of Recent Interchange

Both dispatch and acceptance of researchers and engineers by Japan started to rapidly increase after 1985. The increase of dispatch in particular has exceeded that of acceptance, and the gap between dispatch and acceptance tended to widen. Since 1985 is believed to be a turning point when the past tendencies greatly changed, let us examine the tendencies during the five years after 1985 and the 15 years before 1985 for developed countries, developing countries, the Soviet Union and Eastern Europe.

Examination of these regions' shares in the dispatch and acceptance shows that while the developed countries' and the Soviet Union and Eastern Europe's have been declining in the recent five years both in terms of dispatch and acceptance, that of developing countries has been rising both in terms of dispatch and acceptance. Therefore the developing countries can be said to be activating their interchange compared to the developed countries and the Soviet Union and Eastern Europe.

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Next, examination of the interchange ratio during the recent five years and the 15 years before 1985 shows that the ratio for the developed countries during the recent five years was 8.41 as compared to 5.93 for the 15 years before 1985. Those for the Soviet Union and Eastern Europe were 7.50 for the recent five years and 6.30 for the 15 years before 1985 and those for the developing countries 0.41 (recent five years) and 0.36 (15 years before 1985). In all three regions the ratio for the recent five years has exceeded that during the 15 years before 1985. Particularly marked has been the rise of the ratio in the case of the developed countries. Moreover, examining the purpose of visit during the recent five years and the 15 years before 1985 shows that, with some exceptions, the shares of "study" and "training" have generally been rising in both dispatch and acceptance, which indicates an ever increasing tendency of acquisition of knowledge and technology from other countries.

Particularly notable points in the recent trends are: (1) interchange between Japan and developing countries has become very active; and (2) in interchange between Japan and developed countries, the growth of dispatch is much larger than that of acceptance. Point (3) is thought to be one of reasons for the criticism against Japan from the US and other developed countries. To counter this, Japan should construct centers of excellence to provide attractive research environment and invite developed countries to have interest in Japan and to deepen their understanding on Japan.

4. Problems

The friction with the US and other developed countries over interchange of researchers should be discussed based on accurate data that reflects reality well. The data by the Justice Ministry that we used for this report is useful for accurately grasping the general situation of entry and departure, but it is insufficient for detailed analysis on human interchange in a specific area, such as interchange of researchers and engineers. The data has many problems, such as that the frameworks of dispatch and acceptance are not symmetric, and that separation of researchers and engineers is impossible. Therefore the results of this study are not sufficient for discussion on the problem of imbalance in interchange of researchers between the US and Japan, but it could be a first step toward deeper discussion in the future, because at present no other study has comprehensively analyzed data on interchange of researchers and engineers. Remaining challenges are: to improve the statistics system so that one can obtain accurate and detailed data on interchange of researchers and engineers; and to request other countries where such statistics is said to be insufficient, to improve their statistical data.