

Reverse Brain Drain: Korean Policies to Utilize Talent Educated Abroad

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I. Introduction

Now at an important juncture of its development, Korea has pursued technological sophistication as a means of maintaining the momentum of the nation's progress. A corps of scientists and engineers is needed to enhance the national capacity to design, market, and manufacture products as well as to teach students and to carry out research and development activities. A major potential source of high-quality manpower in science and engineering is the pool of talent previously drained to advanced countries. A successful policy to repatriate personnel from advanced countries might turn the brain-drain curse into a blessing. Yet, little attention has been paid to the sensitive subject of how to manage this flow of human (rather than material) resources.

During the brain-drain controversy of the 1960s, some analysts believed that social and economic incentives would drive talented people from developing countries to migrate to advanced countries. Given the resources then available to developing countries, this problem seemed unlikely to be solved soon. Today, most third world countries still lose their best talents to advanced countries. China and India, with more than 20,000 students each in U.S. colleges and universities, currently suffer major losses from brain drain.

In recent years, many Korean scientists and engineers have returned to Korea from America. In fact, the proportion of Koreans who return home after a U.S. education has increased dramatically. Two-thirds of Korean scientists and engineers who earned Ph.Ds during the 1980s returned to Korea within three years of their degree. Taiwan has experienced a similar rush of returning expatriates.

Both traditional brain drain and the unanticipated return of long-time expatriates ("reverse brain drain") pose some complex policy issues for nations such as Korea and Taiwan. While both countries would like to retrieve talent educated abroad, it can be difficult to ensure that proper jobs are available to returning

expatriates. Instead of focusing simply on the potential loss of talents, discussions of brain drain must now consider another aspect of the issue: how to optimize the expertise of available human resources to meet the goals of national advancement. To the extent that policies are designed to maximize the number of returning students, they must rely on incentives rather than command-and-control approaches. This requires a consideration of both the student's home and host country cultures, and the characteristics of the student's decision process. This paper recommends Korean policies to utilize the foreign educated talents after analyzing how they make choices of residence and what are the factors influencing decisions.

II. Analysis Framework

1. Analysis points

Economic factors are a critical aspect of the brain drain phenomenon. As discussed in numerous researches, difference of economic structure and level between host and home countries are the initial point of the problem. And in the case of several newly industrializing countries (NICs), the return of expatriate scientists and engineers seems due in large part to the establishment of science and engineering infrastructure, accompanied by substantial economic progress. There is still a large discrepancy of living standard and social infrastructure between advanced countries and NICs. If Korean scientists and engineers (hereafter referred to as KSEs) return to Korea, despite the lower living standard there, non-economic factors must affect their decisions. Especially we expect that the cultural background that shapes the frame of reference would be an important aspect of KSEs' choices.

2. Data and analysis

The analysis focuses on Koreans who have earned their doctoral degrees in American institutions in the fields of natural science and engineering (KSEs).¹⁾ According to the National Science Foundation, 3,242 KSEs received their Ph.D degrees in America between 1960 and 1987.²⁾ Using a mail questionnaire (distributed May through August 1988) and personal interviews, we collected data on two groups of KSEs: those who work in America (the home of more than 80% of expatriate KSEs) and those who have returned to Korea. The response rate for the mail questionnaire survey is 43%, yielding samples of 432 KSEs in America and 406 in Korea. While the survey data provides information on individual KSE's family situation, job and career, and perception and attitude, indicators of the external situation (economic, social, and political) on America and Korea are taken from published statistics.

We analyze the collected data adopting several complementary approaches — descriptive comparison of KSEs who return to Korea and stay in America, analysis of an observed discrepancy between intention and action, and discrete choice analysis.³⁾

3. Assumptions for decision analysis

We assume that KSEs will choose whether to stay in America or to return to Korea by comparing the two alternatives. Concealed within this apparently binary choice, however, there is probably another choice. Among KSEs who remain in America, some may have a conscious intention of returning to Korea later whereas others would describe themselves as “undecided.” How we identify the dynamic aspects of KSEs’ decision-making behavior depends on analytical approach and its underlying assumptions on their revealed choices.

According to traditional expected utility theory, an actor will choose the option that maximizes his utility after evaluating the consequences of various alternatives. The underlying assumptions of the theory — rational behavior and perfect information — are not problematic or unrealistic when applied to simple choices. In the real world, however, one encounters many complex decision-making situations for which a pure rationality assumption cannot account.

Economists tend to subsume the unexplainable aspects of human decision making under the rationality assumption; they argue that exceptional or random phenomena will not be problematic in dealing with the aggregated behavior of an entire population. Some scholars, however, emphasizing the psychological and behavioral aspects of decision making, try to capture the underlying elements of so-called “irrationality.” They assume that the elements of decision making can be made comprehensible by scrutinizing decision-making behaviors in specific situations. There are many situations in which an understanding of the irrational elements is critical for the development of coherent explanation of decisions.

A decision maker who faces a multidimensional choice involving hard-to-calculate intangibles is often plagued by ignorance or false information on some aspects of the alternatives. If alternatives cannot be clearly distinguished, decision-making behavior may not follow the rationality axioms. Sometimes decision makers exclude relevant but unclear information or simply decide on the basis of established custom or intuition. In particular, when a decision maker must choose between his current status and alternatives to it, he is more likely to stick to the present choice. We assume that the alternative will not be chosen unless it offers a ‘premium’ of utility that will offset the inherent bias (implicit or explicit) toward the present choice (status quo). We use the term “status quo bias” to denote the broad psychological inclination toward the present choice and the disinclination to change.⁴⁾

Because KSEs face a choice between sticking with their present residence and switching to new one (from Korea to America or vice versa), we expect to find that their decisions are significantly influenced by the status quo bias. However, the mechanism and effect of this bias will be difficult to quantify because it varies by individual and by context. Furthermore, status quo bias is not the only reason for sticking to the present choice; the transition costs associated with switching may play an important part in a rational decision. If the recognition of transition cost is intertwined with a bias toward the status quo, it would be difficult to distinguish whether the observed decision behavior is due to bias or a rational weighting of costs and benefits. In analyzing relevant decision factors, we try to identify the possible extent of the status quo bias in KSEs' behavior.

III Korean students in America and changes of KSEs' residence

1. Korean students in America

The number of Korean students who went abroad for higher education increased sharply in the 1980s. While this phenomenon was backed by the strong economic performance of the country, it was launched by a change in the Korean government's policy on foreign study.

Throughout the 1960s, the Korean government took a restrictive position on sending students abroad. Minor changes were made in the regulation of study abroad during late 1970s, followed by a major liberalization in 1981. As is shown in Table 1, Korea's liberalization of the rules governing foreign study was followed by a large increase in the number of Korean students in America in the 1980s. Also the number of Korean students receiving U.S. Ph.Ds increased fast.

2. Changing trend of KSEs' residence choice

Survey result shows that the prevailing residence choice of KSEs has shifted from America to Korea over the last three decades. Most of the KSEs who received Ph.Ds in the 1960s chose to stay in America, with less than 20% of them returning to Korea up to now. In contrast, about two-thirds of KSEs who received their Ph.Ds during the 1980s returned to Korea. A substantial proportion of the 1980s Ph.Ds return after a short stay in America — mainly postdoctoral appointments.

When KSEs first arrived in America, a majority of them expected to return to Korea after their Ph.D award. A higher proportion of the 1960s Ph.Ds changed their minds and stayed in America, whereas a smaller proportion of the 1980s Ph.Ds changed their minds during the Ph.D work period.

IV. Major factors of individual KSE's choice

We do not find a significant difference of the KSEs' personal conditions and perceptions when they first came to America over the thirty years' span. KSEs who received Ph.Ds in the 1960s and in the 1980s, for example, are similar when they first came to America: their average ages was about 27 years old; 52% was single; 86% of them came to America as students; 62% of them had worked in Korea before coming to America for a period of four years on average; and more than 60% of them planned to return to Korea after finishing degrees. However, their experience and changes during the graduate work and later seems to play a major role in their residence decisions. Aside from changes in personal situation, the most important influence of KSEs' choice is economic conditions of America and Korea when they make decisions.

Although economic conditions exert a critical influence, the value framework stemming from the cultural difference of the two countries became more apparent on return-rate trend when Korea's economic situation improved in recent years. We found that prestige attached to teaching jobs is a major influence to KSEs' decision. Because teaching jobs have traditionally been an occupation of an educated elite, they carry a very high level of prestige within the Confucian hierarchical value structure of Korean society. Also, when KSEs have major family related responsibilities either in Korea or in America, those become another critical decision factor.

1. Job and career

When KSEs receive the Ph.D, their need for training/experience and desire for accomplishment are the primary reason for staying in America. Also if KSEs find good jobs in America, they are more likely to stay. If they have been sent by Korean organizations — especially educational institutions, their obligations seem to prompt their immediate return.

While the need for experience naturally decreases as they stay longer, many KSEs in America find that the opportunity for career growth in their present jobs is lower than they originally expected, and they expect better career prospects if they return to Korea. However, a majority of them express difficulties in finding desirable jobs in Korea. This is reflected in their identification of having a good job in America as a major reason for staying in America. More than half of the KSEs in America are willing to accept Korean jobs, if they are their preferred ones — mostly teaching jobs. A slightly lower but still substantial proportion of KSEs in America responded favorably to accepting temporary Korean jobs.

Among the KSEs who worked in America after their Ph.Ds, more KEs re-

turned to Korea when they felt their further career development was blocked. Although their self-evaluation of accomplishment in America did not differ from that of KSEs in America, more KSEs who returned to Korea than KSEs who stayed in America report that they felt that their career prospects in America were unfavorable. In addition, race or national origin was more commonly identified as a serious disadvantage by KSEs who returned to Korea than those in America.

Among KSEs who returned to Korea, a significant pattern of job change is observed in favor of teaching jobs. A high proportion of KSEs in Korea with teaching jobs (84 percent) do not want to change their jobs. On the other hand, corporate research jobs that have the opposite characteristics of teaching jobs have more defectors than other jobs. Social prestige and job security are strong points of teaching jobs, while corporate research jobs are paid higher (about 50 percent more than teaching jobs) but have less security and much less social prestige or honor. The same preference for teaching jobs and their merits are identified by KSEs in America in describing their preferred jobs in Korea.

KSEs' reported income in America is currently two to three times more than that in Korea. Since their reported income in America was ten times larger than that of Koreans in 1960, KSEs' income in Korea has improved considerably over the last thirty years. Differences in prevailing salaries for an individual's present job in America and Korea do not appear to be a major factor in KSEs' residence choice. Besides differently identified job characteristics among Korean jobs, other personal considerations seem to offset the income difference between the two countries.

While KSEs in America report diverse job types and work activities, more than 90 percent of KSEs in Korea are presently engaged in teaching and R & D jobs. Private companies' recruitment of KSEs is gaining only recently, with higher income as the major attraction.

2. Family, personal situation and children's education

KSEs presently in America regard their family situation as another major reason to stay in America. However, for KSEs who returned to Korea, rejoining family and friends in Korea was a major motivation for their return. Because most KSEs in Korea lived in America for a relatively short period, their concerns about family in Korea (e.g., parents) are serious considerations. When KSEs stay longer, family's adjustment and assimilation to American lives are likely to make them shift their family concerns from Korea to America.

This family situation of KSEs who stayed longer is especially represented by the problem of children's Korean language proficiency. In particular, when KSEs' children are of middle school or high school age (11 to 18), the problem of their Korean language ability is an important concern in KSEs' return decision. About

one-third of KSEs in America would expect their children to have serious adjustment difficulties if they returned to Korea. A high proportion of KSEs who actually returned to Korea in spite of their children Korean language problem want their children to live in America.

Few KSEs are female. This reflects the bias of Korean society that discourages women from pursuing professional careers in science and engineering. Surprisingly, there is no significant difference in residence choice among eldest sons. As eldest sons are primarily responsible for taking care of their parents and family, we expected more eldest sons to return to Korea.

KSEs spent on average five years for their Ph.D work and received degrees at the median age of 32. Reflecting the increasing tendency for recent graduates to return, KSEs in America are seven years older on average than those in Korea. There is no noticeable difference in the quality of KSEs' Ph.D awarding institutions between KSEs in America and Korea.

KSEs finance their graduate study mainly through university related support. In recent years, more KSEs have received financial support from Korea. If they are financially supported by Korean institutions, they are more likely to return to Korea.

Many KSEs who came to America as students changed their immigration status to permanent residents over the Ph.D work period, and they are likely to stay in America. This tendency is stronger among KSEs who married during their graduate work period.

3. Perception and attitude

Both groups of KSEs — in America and Korea — evaluated America more favorably than Korea in various aspects — work attitude, education system, trustworthiness of people, fair evaluation of job performance, work environment, and resources for work. However, they agree that Korean “personal relationships” are better, while each group favors the way of life of their present residence. This implies that KSEs preserve their intrinsic emotional framework regardless of their assimilation to American lives.

Both groups of KSEs expressed a belief in American dominance as a political power in the world and a leader in science and engineering. They are doubtful, however, about the future improvement of the American economy and social situation. Prospects for improvement in the Korean social situation have received a mixed review; KSEs in Korea have a considerably more positive attitude than KSEs in America have. Both groups are strongly optimistic that economic and political development of Korea will continue in the next ten years. Although Korean science and engineering is not expected to be a major contender for world leadership, a small but significant proportion of KSEs think Korea has the poten-

tial to be a major player at the world level. They take a reserved position as to the possibility of Japanese emergence as a new leader in science and engineering.

KSEs in America generally view their friends in Korea as satisfied with their return, and evaluate their friends' accomplishments in Korea more favorably than KSEs in Korea evaluate themselves. By contrast, a lower proportion of KSEs in Korea think that their friends in America are satisfied with their lives in America.

In recent years, many KSEs in America have visited Korea to see their family or friends or do business. Before they returned, most KSEs maintained contacts with their friends in Korea. As a group, the KSEs remaining in America do not maintain as much contact their friends in Korea as the returnees did. The information KSEs in America have about Korea is mostly acquired from American sources.

V. Korean policy background

1. Benefit from KSEs; externalities generated by KSEs

The innovation and improvement of production are mostly carried out by those with formal education. Therefore, training and education is an indispensable factor to enhance the capacity of those talented human beings. We may admit, in this regard, that the expertise of KSEs is not solely an asset of Korea. Rather the best utilization of KSEs' expertise and externalities generated by them can be viewed from the perspective of its benefit to all human society. The brain drain argument is fundamentally a dispute about the goal between maximizing efficiency (internationalists) and the ultimate even distribution of benefits (nationalists).

So far, the market mechanism is presumably the best way to attain efficient outcomes from the endowed talents of those scientists and engineers. However, an overall increase of the pie does not necessarily mean a fair distribution of the slices among related groups of people or individuals. As various reasons for the justification of government intervention (e.g., externalities, lack of information, market failure) suggest, the mediation of a third party is necessary in many cases to ensure the efficient distribution of the happiness (equality), though it may occasionally lower efficiency. Korea's position is presumably close to that of the nationalists; the imperfect market mechanisms should be complemented by government interventions.

2. Value of not having all KSEs return

If Korea's economy maintains its current expansion, the gap with America will be narrowed. In addition, if the present momentum of Korea's political development is sustained, the proportion of KSEs who intend to return to Korea should

increase. In spite of this favorable trends, some KSEs will prefer to remain in America for a variety of reasons: some would find better chances for professional career development; others might like the lifestyle; or economic concern could be a major reason for staying. As long as America's science and engineering work force recruit foreign students, therefore, some proportion of Korean students will remain in America. It is neither desirable nor realistic if all Korean students returned immediately after getting degrees. Because the remaining KsEs will serve as a well-placed channel to funnel the advance of American science and technology to Korea, they will be an important component of Korea's overall scientific and technological development.

3. Past policies and present momentum for government policies

The past incentives Korean government provided were effective only in a limited sense. For example, the reimbursement of moving expenses to returning KSEs was helpful for those who were about to return to Korea. Even though that program served to ease the Korean institutions' burden, it was too brief to significantly influence KSEs' residence choice itself. The strings attached to financial aid for foreign studies were occasionally disregarded once the students left Korean jurisdiction, e.g., there were numerous waiver conditions to change the legal status among J-1 visa holders (visiting scholars). Patriotism influenced only a limited number of KSEs. All the Korean government could effectively do was to control through the qualification requirement of Korean students going abroad.

The ineffectiveness of past policy incentives cannot be attributable to the Korean government's ineptness. Rather, the reason must be sought from the fundamental one — their reluctance to return to Korea. The recent reversal of this trend suggests both the increasing leverage of government incentives and the importance of the government role in "controlling" the flow.

Our study indicates that KSEs' choices are no longer dominated by economic matters. Numerous concerns influence their choices — family, personal compatibility, and better career prospects. Because some of these matters are susceptible to policy incentives, Korean government has now important leverage to control KSEs' decisions. Unless the Korean government takes a "do nothing" position, two policy directions are possible; 1) repatriate as many KSEs as possible in the earlier period of their careers, or 2) scout the most needed personnel among the experienced KSEs. These policy directions may be taken separately or adopted at the same time. Based on the findings about KSEs' choice patterns and the influencing factors, the latter policy direction is expected to require higher level incentives than the former one. However, it is also the main area where the greatest opportunities lie for technology transfer or countering brain drain effects,

since it is hard to believe that the return rate for new Ph.Ds will ever see more than a modest rise above the current rate of 70 percent.

4. Boundary, limit of the policy regarding utilization of KSEs

In choosing policy directions, our discussion suggests that the policies should be proposed within a certain boundary.

First, the Korean government should treat KSEs as members of Korean society and consider them in terms of the overall welfare of society. In these days of a small world — convenient communication and travel — KSEs' happiness is not solely under the resident country's control. They should be covered by the home society's concern; *laissez faire* is no longer appropriate, since most Koreans abroad identify themselves as Koreans. If KSEs are regarded also as members of Korean society, irrespective of their residence, ensuring their happiness would be a major concern of public policy. If a KSE does not return to Korea despite his desire to return, the over-all happiness of Koreans will also be lowered. In addition, Korean society will lose the possible benefit from utilizing his talent.

Second, KSEs should not be exploited. Even if the return of KSEs back home is desirable, they cannot be forced to return to Korea. In the past, the Korean government occasionally asked KSEs to make sacrifice "for the sake of society." However, if they do not have good opportunities to use their expertise and creativity, trying to coerce them to return would be a waste of their talent as well as detrimental to KSEs' own happiness. Further, the country's social progress will make it difficult to persuade people solely on the basis of patriotism or authoritarian measures.

Third, policies should recognize that the incentive provisions to KSEs may provoke feeling of envy among scientists and engineers educated in Korea or who returned before such policies went into effect, even though the policy will bring about overall betterment for the public. In terms of efficiency, attracting the necessary talents from abroad would be a good policy option if the KSEs improve the productivity of the company or lead to an innovation. However, negative externalities incurred by the repatriation process should also be weighted when policy alternatives are considered. From the perspective of equality, foreign-educated Ph.Ds are already a privileged group in Korean society. A repatriation policy to offer incentives may make them even greater objects of unfair treatment.

VI. Policy recommendation for Korea

1. Need for top scientists and engineers in industry as well as academia

There was a rapid increase of KSEs who found industry research jobs in Korea

during the 1980s (17% of new jobs during the period of 1985 to 1988). Because KSEs' expertise is needed not only for R & D activities but also manufacturing and management of Korea's high-tech areas, the share of private sector employment is expected to increase continuously in the coming years. According to the projection of the Center for Science and Technology Policy (Korea), private sector is expected to spend 75% of the country's total R & D expenditure in the year 2001.⁵⁾ As the private sector shared 32% of R & D spending in 1980, the expected change represents a shift of the leading role in country's science and technology activities to private sector. Korean government aims to expand the science and technology investment to 5% of GNP and to raise the R & D manpower to three persons per 1,000 Korean population (equivalent to 1985 Japan level) in 2001. The projection and government objectives indicates that private sector will be the main source of new jobs for KSEs.

The present study suggests that most KSEs prefer university positions in Korea to those of private companies or research institutions. They highly value the prestige and the social status of professor than better income or other economic incentives of private sector jobs. Although the market mechanism and changing public perception may balance the mismatch between industry and academia, that process may require a considerable period of time. Here, appropriate policy incentives of Korean government to direct the KSEs' interest to private sector jobs are warranted.

Manpower in academia in Korea is the most potent but less utilized source for research activities. As Korean professors evaluated their jobs, their tasks are not "challenging." In addition to a large teaching burden, they do not have resources for R & D.⁶⁾ Because the research activities of Korean universities were so sparse, Korean companies did not provide research funds to universities in the past. This vicious circle was partly due to the non-existence of the need for cooperation and partly due to the lack of established mechanism between them. Consequently, KSEs will hardly keep up with the international advances in their fields, once KSEs find jobs, in academia. In order to mobilize the potential capacity of universities, Korean government should try to raise the R & D performed in universities by lowering teaching burden and drawing resources from the industry. Also it is necessary to enhance the public recognition of the research jobs, whether they are in universities or industry.

Here we recommend two strategies: the first one will be to achieve the specific purposes described above, and the second one is to ease the general difficulties KSEs have in returning to Korea. For the first goal, we recommend two specific policy initiatives: the creation of temporary teaching positions (visiting scholar, professor) in Korean universities; and the creation of the joint appointment positions for universities and corporate research institutions. For the second strategy, we recommend to reinforce Korean language program for Korean children living

abroad, and better communication and cooperation with organizations of Korean scientists and engineers in foreign countries. Additionally, Korean government may consider other incentives for repatriated KSEs, such as special programs for children, housing, or moving expense support. Of course, these policies should be applied to all Korean scientists and engineers abroad.

2. Creation of new positions

(1) Temporary teaching positions in universities

Temporary teaching positions in universities will focus on midcareer scholars with research or teaching experience (presumably more than five years) in America. Because the main purpose of this proposal is to provide opportunities for careered professionals to experience the Korean situations, the term may be from a semester to two years as a visiting scholar. At the initial stage of the implementation, their responsibilities would focus on teaching. As the university research capacity expands in the future, those positions would incorporate more research activities. The funds for such positions would be provided either through specially assigned government account or funnelled through the Korean National Science Foundation. Even though the compensation for them would not exceed the similar careered existing faculties, their moving and living expenses would be partially supported.

Even if they would prefer a permanent appointment, a substantial proportion of KSEs (37 percent of those in America) responded that they would favorably consider a temporary appointment in Korea. Such a temporary option may have merits to KSEs who are more firmly established in America. They may utilize their sabbatical periods or arrange for leaves of absence without disrupting their appointments in America. If KSEs who have been in America for a long time are uncertain about the current Korean social and political situations, a temporary appointment might be a chance to see what has changed in Korea. Also, some KSEs may use the time to find out whether they and their families could comfortably adjust to current Korean society if they returned permanently. While KSEs may have the feeling of contributing to Korean society, they can utilize the chance to renew their relationships with friends and relatives, and they will develop personal contacts in science and technology areas that will provide additional avenues for the technology transfer to Korea in the future.

The appointments would provide chances for Korean academia to make better contacts with international advances. Fields that requires a large investment in equipment but rarely generate commercially applicable technologies, e.g., physics, would benefit most. Also the position would provide a flexibility to meet the changing need of specific fields. Temporary appointments could be a stepping stone for a more open system in academia. While KSEs may lower the teaching

burdens of existing faculties, they may also stimulate the existing faculties' research activities. The creation of temporary appointments would preserve the existing hierarchy of faculty. Therefore, it would reduce the resistance from faculty members who fear that their prestige and established positions might be jeopardized if experienced KSEs abroad were offered permanent teaching positions.

If those who hold temporary positions with recent expertise attract private companies' interests, they may come up with a consulting or research contract with the companies. In addition to this spin-off effect, an established communication channel between KSEs and Korean institutions would facilitate future cooperation.

On the other hand, the creation of temporary positions could result in administrative abuses or some resentment within university departments. The appointment might be used to distribute favors by powerful figures in university departments. If visiting scholars think their jobs are simply temporary positions, they would not try to accommodate to Korean attitudes, causing some disharmony within the organization. If these problems did occur, the funds used for temporary appointments might be seen as wasted.

(2) Joint industry/university appointments

The industry/university appointment will focus on young professionals who received Ph.Ds recently. They would hold responsibilities both as adjunct professors in universities and as researchers in corporations. The term for these positions would be for a certain period by contracts — perhaps starting at two years and extendable to five years — and the people holding the appointments would be free to choose jobs after the contract period. However, by making the position being financed by the industry, KSEs would feel more affiliated to industry. In order to encourage creation of such positions Korean government would compensate the expenses by tax breaks or write offs. One of the main purposes of these positions would be to expose KSEs to both environment of industry and academia in Korea. By promoting the joint appointment positions, Korean government would promote cooperation between universities and corporations. This proposal could eventually activate the existing pool of domestic manpower in universities. If the program works appropriately, public perception of the prestige or status of research jobs will be improved, i.e., by identifying the research jobs with teaching jobs.

By participating both teaching and research, KSEs can keep both the prestige of academic jobs and the opportunity for professional career development that industry offers. Since a normal teaching load is more than three courses per semester, joint appointment as adjunct professors for one course each would allow three KSEs to have teaching appointment instead of just one KSE. Even if

the KSEs originally have a preference for teaching jobs, they may find advantages to corporate jobs during this period, and may eventually choose to work for industry. Their experience in industry will also give more practical flavor to teaching in applied fields. Conversely, their adjunct professor appointments may, over time, transfer some of their prestige to corporate R & D jobs. By increasing job opportunities, especially access to the prestige of teaching, more KSEs may decide to return to Korea.

Industry will be able to evaluate the expertise and professional potential of the KSEs as well as their compatibility with organizational environment. In addition, industry might have the best resources to help young professionals maintain their ambitions and continue their professional development. Industry would have a pertinent access channel to academia: KSEs would help industry to recruit college graduates; if industry want to perform an urgent project, KSEs will work as a liaison between the industry and research pool of academia. Industry may regard the provision of financial support for the position as contribution to society.

When KSEs' activities stimulate the existing faculty members, they may be motivated too. If KSEs eventually take permanent teaching jobs, their past relationship with industry will work as channel for further cooperation. Of, through industry funding, this proposal increases the available teaching manpower in universities, it will lower the teaching burden of existing faculty. This will lead to better education of students as well as providing room for existing faculty members' research activities. The system may eventually lead to information and manpower exchanges between industry and academia.

However, if KSEs do not feel firm affiliation with either organization, they may try to leave the jobs. If majority of them want to get teaching jobs at the end of initial contract period, industry will be reluctant to provide future financial support for such joint appointments. If the economic situation in Korea turns bad, industry may cut out the positions, so KSEs' perceptions of the economic future may cause them to see these appointments as potentially unstable jobs. People in both universities and corporations might feel young KSEs are disrupting the existing order.

3. Family-oriented repatriation incentives and maintaining contact with KSEs abroad

(1) Korean language training for children of KSEs abroad

Korean language education will ease the adjustment difficulties of KSEs' children who have grown up abroad. At the same time, it will help the children to keep their Korean identities and would demonstrate Korea's concern about its people abroad. The most serious problem KSEs expect to have among the family matters are children's adjustment in Korean school system, which would mainly

be a matter of their language proficiency. Because many young KSEs want to make their children reach the age to enter the elementary school, it is difficult to teach them without paying special attention to their Korean language. The Korean government could help by supplying Korean elementary school text books or video/audio tapes about Korea, in addition to financial aid to Korean language schools abroad. This support may be provided through organizations that teach Korean language to children (e.g., volunteer groups who teach Korean) or direct mailing the material to KSES who request it. This program will work as a medium to help KSES' children recognize their identity.

In order to alleviate the worries of returning KSEs regarding children's education, special programs may be provided. A re-entry training program for children who do not speak Korean or special treatment for them in college or high school entrance exams can be introduced. Special treatment for entrance exams may be regarded as unfair, unless special exams are developed that the perceived to be just as hard as the standard ones. For this reason the re-entry adjustment program may be more feasible, even though it will cost more.

Considering the serious housing problem in Korea, the provision of an apartment for returning KSEs might be an attractive incentive. Reimbursement for moving expenses would be another option to ease KSES' return. These two programs are presently implemented for limited cases and may be expanded.

(2) Continuous communication with KSEs abroad

It was found that more KSEs who maintained good contacts with Korea were more likely to return to Korea. A useful information channel may be effectively constructed through professional organizations of Korean scientists and engineers abroad. Database collected through the organizations will serve to connect the domestic demand and the KSEs with needed expertise. Also, the professional organizations could serve to disperse information about Korea's progress in their members' fields as well as general changes in the country's situation. More complete information about Korea will help KSEs make choices properly by removing sources of misjudgment and bias.

Also an established channel will enable Korean industry or academia to keep track of experts in various fields and to recruit them when specific needs arise. A central organization in Korea might maintain a database of KSE expertise and availability for consultin, collected through the professional organizations, which could serve as a match-making tool to connect needs in Korea with KSEs abroad. Because of rapidly changing technology and competition, Korean compainies, may need consulting for advancing technologies. The professional networks and the database may be utilized to provide information about KSEs with appropriate technologies. If the Korean government wishes to take a more a affirmative position in utilizing the talents of KSEs abroad, some incentive, such as a tax

write-off could be provided to companies for hiring expatriate KSEs for consulting. Or a small amount of each government agency's budget could be reserved for hiring expatriate KSEs as consultants or on temporary assignments. This will accomplish both technology transfer goals and exposure of KSEs to Korean employers, which often leads to job offers and acceptance.

VII. Conclusion

The future of Korea depends on the availability and utilization of human resources. As a country poor in natural resources, Korea pursues a return from investments in its people to keep its momentum for progress. Fortunately, Korea has already built up a substantial degree of infrastructure and accumulated potent human capital, domestically and abroad. The work force of relatively well-educated hardworking technicians was a driving force of Korea's development during the 1960s and 1970s. Now, Korea's goal of establishing a sophisticated science and technology infrastructure depends on its endowment of high-quality human capital. This paper recommends policies to utilize one important group — foreign educated scientists and engineers. The analysis of KSEs' decisions shows that the effective policies should base on the well-being of the individual scientists and engineers.

Notes

- 1) Sometimes, "KSEs" denotes Korean scientists and engineers in general. In this study, we exclude Koreans with degrees in psychology and the social sciences.
- 2) This figure does not include a few naturalized American citizens of Korean origin.
- 4) Detailed data and analysis is in H. Song's study. Ha-Joong Song, *Who Stays? Who Returns? The Choices of Korean Scientists and Engineers* (Ph.D dissertation, Harvard University, 1991).
- 4) Various concepts such as escalating commitment, status quo bias, anchoring, habit formation, systematic irrationality, regretavoidance, disappointment avoidance, loss aversion, endowment effect, and cognitive dissonance have been proposed to account for such irrational (or exceptional) behaviors on the part of decision makers. The usefulness of particular explanatory concepts varies depending on situation-specific factors.
- 5) The Center for Science and Technology Policy, *A Research to Promote the Science and Technology Investment of Korea to 5% of GNP*, (Seoul, Korea: KAIST, 1988), pp. 97-140.
- 6) In 1987, the student/faculty ratio as 30:1 in engineering College, Seoul National University. The Center for Science and Technology Policy, *A Research to Raise the R & D Capacity and Utilization of R & D Manpower in Universities*, (Seoul, Korea: KAIST, 1988), p. 32.