Technology Transfer and the Transition in the United States: Beyond the "Fortress"

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1. Introduction

On April 21, 2009, Japan's Diet passed bills to revise the Foreign Exchange and Foreign Trade Act (FEFTA ; known as Japanese Export Control Laws) and Unfair Competition Prevention Act.[1] The revision of FEETA will prevent short-stay visitors in Japan from stealing specified and/or sensitive technology and other related information from Japanese companies to countries of concern. [2] The revision of the Unfair Competition Act will punish those who embezzle or take out copies confidential information (i.e. trade secret) from Japanese companies without authorization.[3]

The amendments came after the many incidents happened in the United States and Japan : Foreign national employees and foreign students had stolen the technical information from the major companies and universities. In Japan, on August 2006, Tokyo police asked prosecutors to investigate a former employee of an optical equipment Company A on suspicion of stealing a classified item, a variable optical attenuator (VOA) which can help stabilize optical transmissions in long-distance fiber optic communications and handing the VOA to a former member of Russia's Trade Representation office in Tokyo. The official indeed requested some information of the most advanced technology.[4] And on March 2007, a Chinese employee of automobile parts Company B was arrested on suspicion of taking out a laptop with the company's information including over 130,000 product designs such as sensors and industrial robots. Some of them were considered top company secrets.[5] The prosecutions for both Company A and B cases were eventually suspended. Also, Company C was reported to have subcontracted some of the works including the simulation software for evaluation of the surface-to-air missile (SAM) ordered by Japan Ministry of Defense to "a company" which was thought to be linked to an affiliate of a broader, umbrella organization of Country Z. The technology of the missile seemed to be leaked to Country Z.[6] Thus, to protect technology, the needs for strict regulations or guideline grew.

The "Final Proposal on Technology Transfer by Foreign Nationals" was submitted by the members of the Security Control Policy Subcommittee whose last working group was held on January 24, 2008. The subcommittee discussed the issue for the "Technology Transfer by Foreign Nationals." However, Japanese Immigration Plan to accept foreigners still needs to be improved. The problem is that there is a lack of awareness toward threat of technology and knowledge (Know-How) transfer in Japan. Indeed, the foreign population in the United States is 38.34 million (12.9 % of the total population), in the U.K. 5.84 million (9.7% of the total population), and in Japan 2.01 million (1.6% of the total population) [7]. The percentage might affect the Japanese less awareness of the issue. While Japan has been working for development of legal systems to respond the issue of "Technology Transfer" to foreign nationals, the United States with huge immigrant population already started since early times and have been challenging for "Technology Transfer."

In this paper, first, I am going to clarify the definition of the term "Technology" in the U.S. Export Administration Regulations (EAR). Then, I am going to look back on the historical development along with the technology and knowledge (Know-How) transfer in the United States which has been established by

immigrants to “E Pluribus Unum,” because the historical development in the U.S. might give some future directions which Japan has to consider. Finally, as my conclusion, I will clarify “to protect technology and competition for national interests” to highlight the challenge of its paradox in such a globalized world. Also, please note that in this paper, I will use the term “knowledge” and “Know How” as a synonym for “Technology.”

2. Definition of the Term “Technology” in the EAR

> According to the definition of the term “Technology” in EAR, “Technology” is Specific information necessary for the “development” which is related to all stages prior to serial production such as design, design, research, design analyses, design concepts, assembly and testing of prototypes, pilot production schemes, design data, process of transforming design data into a product, configuration design, integration design, layouts, “production” which means product engineering, manufacture, integration, assembly (mounting), inspection, testing, quality assurance, or “use” which is operation, installation (including on-site installation), maintenance (checking), repair, overhaul and refurbishing of a product. The information takes the form of “technical data” or “technical assistance”. Technical assistance may take forms such as instruction, skills training, working knowledge, consulting services. “Technical assistance” may involve transfer of “technical data.” “Technical data” may take forms such as blueprints, plans, diagrams, models, formulae, tables, engineering designs and specifications, manuals and instructions written or recorded on other media or devices such as disk, tape, read-only memories.[8]

Export of Technology is (i) Any release of technology or software subject to the EAR in a foreign country; or (ii) Any release of technology or source code subject to the EAR to a foreign national. Such release is “deemed” to be an export to the home country or countries of the foreign national (so-called “Deemed Export”).[9] The export is “Transfer” and “Flow”, threats the balance of power because of changing states power. The export is subject to the controls. There is ITAR [10] which controls export of technology in addition to the EAR in the United States. But I am not going to explain ITAR in this paper because the definition in the EAR is more detailed, and the provision overlaps with EAR.

3. The Challenge for Protecting Technology and Ensuring Competitiveness for National Interest

1. From the Foundation to the Establishment of COCOM (1790‐1940 s)

Technology is thought to be known an individual inspiration, experience, energy, investment consisting the knowledge, Know How and Information. Furthermore, the technology is protected by countries, which affect on Balance of Power because it changes the states economic and military powers. In the United States, not only EAR but also Patents, Trademarks, Copyright, Trade Secret and others in intellectual and industrial property protect technology and knowledge.[11] According to the section 8 of Article I in the U.S. Constitution, at the time of 1790, the intellectual property is to be protected ordaining in “To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries; [12] There were issues arose for the flow of technology and products, but until 1940 s, there was no structure or mechanism of Export Controls System on technology and products. However, when expansion of battle lines in Europe were acknowledged, the U.S. congress decided to move and to give the authority to the President to control the export of militarily significant goods and technology providing Section 6 of Public Law 703 in July 2, 1945. By escalation of the war, the Public Law 703, supposed to be a temporary with a 2-year term limit, was extended. And finally, at 1949, the Export Administration Act (EAA) was established.[13]

Current controls of commercial items derive, although the U.S. was aware of signs from Japan, before the World War II to stop scrap metal shipment from going to Japan because the scraps were used for the purpose of manufacturing munitions.[14] After the lesson of trade with Japan, the U.S. expanded the range of selective

controls in EAA to prevent the flow of technology and the goods from the Iron Curtain, especially the Soviet Union and Eastern European countries. While the new tension with communist bloc was increasing, the U.S. and its allies (including former enemy country, Japan) established Coordinating Committees for Multilateral Strategic Export Controls (COCOM). [15]

2. Revision of the Immigration Act and the Competition in Missile Development (1950s)

With the establishment of the Internal Security Act of 1950, foreign nationals were required to report their current address every 90 days or face deportation in the event of noncompliance. In 1952, the Immigration and Nationality Act was established, which placed restrictions on the entry of foreigners into the United States. Under this Act, foreigners were legally required to report their current address annually within 30 days of January 1, report any change of address within 10 days of moving, and continue reporting their current address every 90 days. Those who fail to comply were to pay a fine not exceeding 200 dollars or face imprisonment for not more than 30 days; to be removed from the United States.[16]

Furthermore, the establishment of the Secrecy of certain inventions and withholding of patent Law in 1951 allowed the U.S. Department of Defense to order an invention be kept secret, if the invention has the possibility of being diverted for military purposes.[17] Behind the establishment of this law was the intention to restrict and control the entry and departure of foreigners, and particularly science engineers, to and from the United States. It indicated a change in the perception of knowledge as something more than a source of economic benefit.

A long time has passed since Peter Ferdinand Drucker announced the phrase of “Knowledge Economy.” The term implies that knowledge is a production element, and refers to the use of knowledge to produce economic benefits. Knowledge as a social infrastructure came to be associated not only with economy but also with military issues when the Soviet Union launched the first Sputnik in 1957.[18] In a way, this was an incidental shock that specifically spotlighted the risk of an outward flow of knowledge and technologies in today’s society. This was the defection to the United States and Soviet Union of German scientists who engaged in the development of missiles during World War II (particularly the development of the V-2, the world’s first military liquid fuel rocket ;
ballistic missile). And this resulted in promoting missile development in the East and West and escalating their competition.

3. The Bucy and Corson Reports (1970s)

A Defense Science Board task force report issued in 1976 and called the “Bucy Report” after the task force chairman, J. Fred Bucy, recommended that the United States should shift its emphasis on the export control from “products” that is conventionally considered critical, to “technologies” that develop, produce, and utilize those critical products, and greatly influenced later policies of the U.S. Department of Defense.[19]

In reference to the role of military in commercial computers, the Bucy Report claims that computer installations “transfer the know-how of software, lead to the training of programmers, and are eventually used for strategic applications.” [20] In other words, “Give a man a fish, and he eats for a day; teach him to fish and he eats for life!” [21]

With the Soviet Union’s invasion into Afghanistan in 1979, the United States attempted to expand its control on the transfer of technology. This, in effect, restricted the presentation of scientific papers and the research activities of scientists and foreign students from communist states.[22] However, a report thereafter compiled and presented by Dale Corson, President of Cornell University, as head of the panel on Scientific Communication and National Security (called the “Corson Report”), denied any relevance between the two issues. It concluded that “There has been a substantial transfer of U.S. technology…The Soviet Union is exploiting U.S.-U.S.S.R. exchange programs by giving intelligence assignments to some of its participating nationals…there is serious doubt as to whether the Soviets can reap significant direct military benefits from this flow in the near term...” [23]

4. The Young Report (1980s)

In the 1980s, U.S. exports stagnated, and its trade deficit of US$9.5 billion in 1976 grew to US$31.1 billion in 1977, US$67.1 billion in 1983, and surpassed US$100 billion in 1984, to US$112.5 billion. [24] Given this situation, in 1983, by Executive Order 12428, the President Reagan ordered to establish President's Commission on Industrial Competitiveness, composed of representatives of the academic and business worlds, and appointed John A. Young, President of Hewlett-Packard, Inc., as chairman.

Young submitted a report titled "Global Competition: the New Reality" (also called the "Young Report") in 1985, in which he pointed out that U.S. competitiveness has declined over the past 20 years. He concluded key findings and recommendations, and as countermeasures and solutions to this issue, he identified four subject areas that should be addressed: to secure technical dominance, reduce capital costs to American business, develop human resources, and place emphasis on international trade.[25] In regard to the decline of U.S. competitiveness, Young also indicated in his report that they need to review patent laws, and protection of intellectual property rights is inadequate, and under the existing system, the United States cannot properly maintain its dominance of new technologies.[26]

Around this time in the United States, the Patent Law and the Copyright Law were established. The amended Copyright Law made federal statutory protection available to computer programs on December 12, 1980, and to semiconductor chip mask works, on November 8, 1984.[27] Going back a few years, the Court of Appeals for the Federal Circuit was established in 1982, to strengthen the protection of patents and intellectual property rights. Therefore, these changes helped properly control the registration of patents and the application of copyrights and other intellectual property rights, and provided support for the establishment of companies with strengths in product design and innovation.[28]

In 1982, an incident occurred, which appeared to justify the series of events relating to the protection of intellectual property rights in the United States. The Federal Bureau of Investigation (FBI) placed Japanese companies in the United States, and particularly electronics manufacturers, under investigation on suspicion of stealing confidential technical information from U.S. companies. This was just one in a subsequent development of industrial espionage cases that occurred around this time. As even software developed independently could have copyright infringing similarities (infringe on copyrights), the Japan side was to expose all products to the U.S. company side. Ultimately, the Japanese company that was brought to criminal trial under trade secret laws said, "The U.S. company side's aim from the start was to get us to recognize its copyright." [29]

The 1987 Central Intelligence Agency (CIA) report "Japan: Foreign Intelligence and Security Services" noted that one of Japan's intelligence service priorities is on collecting information on technological and scientific developments (especially in relation to computers) in the United States and the western European countries, and emphasized the important role of Japan's semi-official organizations and multinational corporations in intelligence gathering activities.[30] The report gave the impression that intellectual property rights and intelligence gathering activities are inextricably linked.

"The Young Report" reports from an international perspective on the apprehension and countermeasures concerning U.S. competitiveness, as well as on the protection of intellectual property rights within the country. It is clear that the linkage of this report with U.S. policies on intellectual property rights helped form U.S. diplomatic strategies in the 1980s. Apparently, issues concerning intellectual property rights, including patents, trademarks, copyrights, and trade secrets, were intertwined with the technology transfer (theft) issue to control changes in the balance of power in international competition. However, the United States is a country of immigrants, and the entry/departure of foreigners is an issue that sparks debate. As illustrated by the earlier mentioned example of German scientists who engaged in missile development, there were always concerns that the rejection of foreigners could lead to a lack of outstanding human resources and to an ultimate weakening of U.S. competitiveness.

5. The Economic Espionage Act and the Cox Report (1990s)

The 1990s brought to the United States an increasing awareness of the significance of information, perhaps because a certain degree of awareness—that the flow of corporate information and knowledge to

other countries is a serious threat—had already been cultivated in the 1980s. The United States International Trade Commission (USITC) estimated the damage from such flow of technology and knowledge at US$23.8 billion in 1986, and the American Society for Industrial Security (ASIS) estimated the loss at US$300 billion by 1997. As a progress in the Internet and other information technologies has facilitated the acquisition of confidential corporate information and measures were needed to protect U.S. companies from industrial espionage and the stealing of technical information from the United States, President Clinton signed into law the Economic Espionage Act of 1996 (EEA) on October 11, 1996.[31] The law also places emphasis on the protection of trade secrets, and provides that their confidentiality be preserved consistently with other laws and regulations.

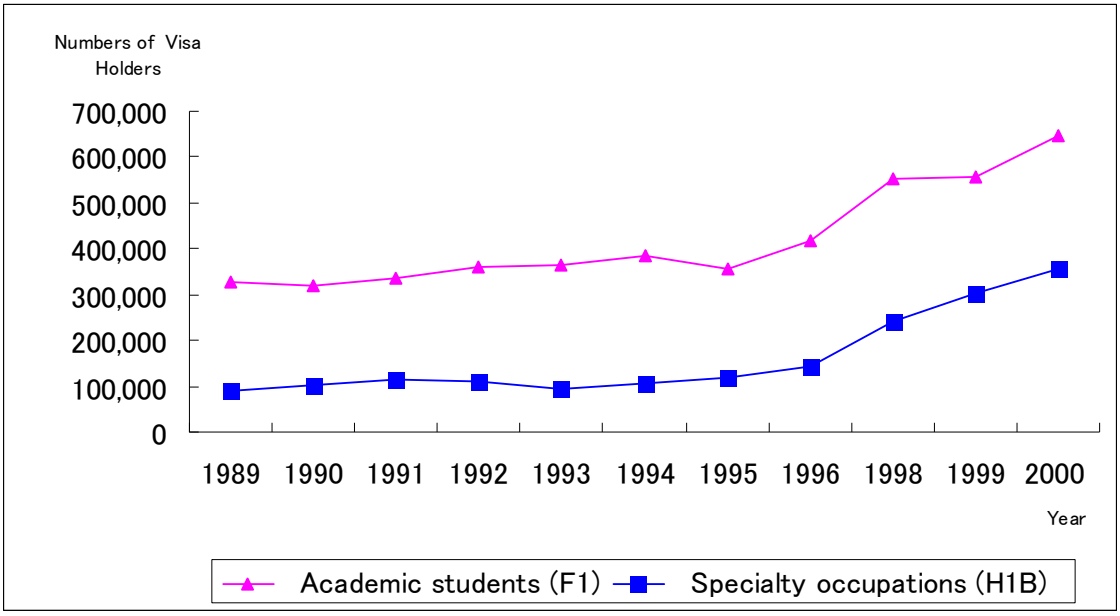
On May 25, 1999, less than 3 years of the establishment of the EEA, a report of a select committee in the House of Representatives was disclosed to the public by Christopher Cox, the chairman of the committee. The report (called "the Cox Report") alleged that China stole nuclear warhead information from the United States, and stated that China has spun an extensive spy network around the United States.[32] The allegations of the report caused a resurfacing of the technology transfer issue in relation to foreign researchers and students, as well as highlighted the issue regarding illegal acquisition of information (such as espionage activities by intelligence services of a hypothetical enemy nation), which has always been a source of concern.

Suspicions against China had been intensifying in the United States from around the first half of the 1990s. The growth of its military power was remarkable, to say nothing of its economy. Since 1989, all last 12 years have grown 10 percent more than the previous year. However, with respect to China's defense budget, there were also views that "the official annual budgets of $8.7 billion… nuclear weapons development and soldiers' pensions…the cost of research and development…proceeds from arms sales…Taking all these factors into account, a conservative estimate of China's actual military spending would be at least ten times the officially announced level…minimum of $87 billion per year, roughly one-third that of the United States and percent more than Japan's" [33]

Though the "China's modernization," including its military was encouraged, it can be said that the 1996 crisis in the Taiwan Strait made the United States realize anew China's influence in Asia. When China conducted the missiles off to Taiwan as a warming against Taiwan's attempt to gain independence from China, no Asian countries did support the United States or Taiwan. One Asian statesman who was asked about this incident from the U.S. is said to have responded as follows: "China has been around here for 3,000 years. The U.S. has been out here in Asia for about 50 years. We figure you're maybe good for another 20 years. But after that you'll be gone, and we'll be left here alone with China. We can't afford a confrontation." [34] In any event, China's increasing military power and modernization were threats to the United States, and there were always concerns that the issue of technology transfer lurked behind its growth.

Technology transfer (theft) involves the actual acquisition of confidential information, and anyone who wishes to acquire such information must place himself in a location where acquiring it is possible. The Clinton Administration (1992 – 2000) endorsed the increase of the H-1B visa. The H-1B visa was originally established under the 1990 Immigration Act. The act specified that the H-1B workers to hold at least a bachelor's degree or higher or its equivalent in the relevant specialty field, and limited their stay in the United States to a maximum of 6 years. However, due to the shortage of U.S. workers particularly in the IT industry, the H-1B program was expanded to accept more workers.[35] With the issuance of this visa, a large number of workers with high-tech skills began flowing into the United States. Also note that the numbers of H-1B visa holders and F-1 student visa holders have increased at the same rate since 1996.

[Chart 1] Trends in the numbers of H-1B and F-1 visa holders



(Source) Compiled based on U.S. Department of Homeland Security, <http://www.dhs.gov/xlibrary/assets/statistics/yearbook/2000/Table37.xls>. The material provides a note saying "No reliable data available for 1997," and thus there is no data for 1997 in the material.

A look at the numbers of H-1B visa holders by nationality shows a dramatic two-fold increase on the whole between 1996 and 1999, but the figures showing increase rate by nationality are more revealing. The numbers of H-1B visa holders from India and China have increased 2.91 times and 2.6 times, respectively, so that their increase rates were among the highest among all non-Western countries.

[Chart 2] Nationalities and Increase Rates of H-1B Visa Holders (1996 – 1999)*

	1996 年		1999 年		
Region and Country Citizenship of H-1B visa Holders	Numbers of the Holder	Composition Ratio (%)**	Numbers of the Holder	Composition Ratio (%)**	Increase Rate (%)
All countries	144458	100	302326	100	209
Europe	52054	36	96618	32	186
France	6076	4	12866	4	212
Germany	6117	4	12359	4	202
Russia	2190	2	3502	1	160
United Kingdom	18221	13	30289	10	166
Asia	56981	39	136738	45	240
China ***	4377	3	11367	4	260
India	29239	20	85012	28	291
Iran	153	0	217	0	142
Iraq	81	0	102	0	126
Japan	7401	5	10714	4	145
Korea	1934	1	4015	1	208
Pakistan	1760	1	3964	1	225
Philippines	4173	3	4367	1	105
Syria	173	0	213	0	123
Africa	3577	2	6988	2	195
North America	12525	9	27834	9	222
Canada	4192	3	10235	3	244
Mexico	5273	4	12257	4	232
Other Regions	16662	12	31443	10	189

(Note) *Figures for major countries and regions only.
** Composition ratios (%) do not include decimal fractions. Therefore, “0” means “less than 1%”, and not the actual value of 0.
*** Includes the Chinese mainland and Taiwan, but not Hong Kong.

(Source) Compiled based on U.S. Department of Homeland Security, *1996 Statistical Yearbook* from table40.xls at <http://www.dhs.gov/xlibrary/assets/statistics/yearbook/statyearbk96.zip> in <http://www.dhs.gov/ximgtn/statistics/publications/archive.shtm> and *1999 Statistical Yearbook* from table38.xls at <http://www.dhs.gov/xlibrary/assets/statistics/yearbook/1999/Table_38.xls>.

Even the figures alone show the effectiveness of Clinton’s policies in increasing the numbers of foreign researchers. There was little room for optimism that the issue of illegal acquisition of information in the United States by non-U.S. nationals, or foreigners, which has been highlighted in ‘the Cox Report,” would not occur.

6. Visa Mantis and Deemed Exports (2000 – 2007)

Given the above background, in 2000 the Inspectors General of the Departments of Commerce raised the issue of restricting foreign students and engineers access to confidential information to Bureau of Industry and Security work with the National Security Council, but no action was taken until March 2004.[36]

Furthermore, in the wake of the 9/11 incident, immigration checks on foreigners (process of screening the identity of science students and scholars by involving multiple U.S. agencies, called Visa Mantis) were tightened. The screening is part of the procedure for visa issuance, and if the consular officer finds no special problem that the applicant is eligible to receive the visa, the visa is issued within 24 hours. However, if the consular officer determines that “the applicant may engage in research or studies of sensitive technology and therefore requires further examination,” a Security Advisory Opinion (SAO) becomes necessary. When a SAO is required, further examinations are carried out by multiple ministries and agencies (known as Visa

Mantis Process). This process may take 60 days in some cases, or more than 120 days, as it did in a certain case.[37]

The U.S. government admits that the delay of visa application procedures served to discourage foreign students and scholars from entering the United States and has impacted the economy as well. According to the Department of Commerce, foreign students contribute US$13.5 billion annually to institutions in the United States.[38] The number of foreign students to the United States during the 2002/03 fiscal year was 585,323 (corresponding to 4.6% of the total number of students across the U.S.), but the figure dropped to 564,766 (corresponding to 3.9% of the total number of students across the U.S.) in the 2005/06 fiscal year owing to the tightening of immigration controls after 9/11. There were growing concerns about the decrease of foreign students particularly in the science and technology sectors. In math and computer sciences, the number of foreign students dropped from 76,736 in the 2001/02 fiscal year to 45,518 in the 2005/06 fiscal year. [39]

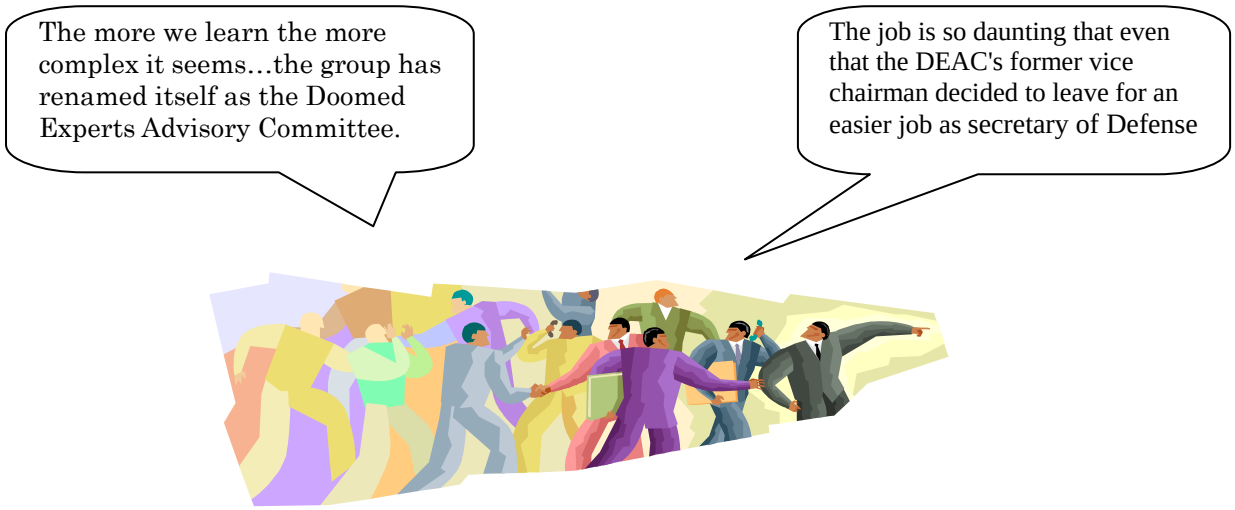
The United States feared not only the decrease in the number of outstanding researchers from foreign countries, but also the decrease in economic profits that they would bring to the United States. However, around the same time in April 2002, the General Accounting Office (GAO) submitted to the Governmental Affairs Committee a report on the transfer of semiconductor technologies. The report claims that the transfer of semiconductor technologies is not being regulated properly by the U.S. government, and gave warning that the gap between the semiconductor manufacturing capabilities of the United States and China is 2 years or less.[40] It indicates that acquiring semiconductor technologies on the open market for both commercial and military use is a priority issue for the Chinese government,[41] and adds that the advance semiconductor manufacturing facilities will improve China's military industrial base by providing a conduit for technology transfer, including transfer of technical specifications, production and process technology and management and marketing skills that can aid indirectly in military production. Furthermore, the report states that these technologies and know-how are useful in a broad range of applications including command, control, communications, surveillance, and missile guidance equipment.[42]

The report "Deemed Export Controls May Not Stop the Transfer of Sensitive Technology to Foreign Nations in the U.S." issued in 2004 made specific recommendations for "Deemed Exports." While NSDD-189 (1985) prepared based on "the Corson Report" stated the policy of not restricting fundamental research to the maximum extent possible.[43] It also recommended expanding the definition of the "use" of controlled equipment for research to "use" by foreign nationals, and to determine the identity of foreign nationals based on country of origin and not an individual's most recent citizenship or residency status. These recommendations gave rise to full-scale debates on the technology transfer issue and the restrictions on Deemed Exports.

Under the concept of "Deemed Export," any release of technology subject to the Export Administration Regulations (EAR) to a foreign national is deemed to be an export to the home country of the foreign national, and therefore subject to the EAR.[44] The regulation focuses on the transfer and flow of technologies by individuals, and aims to prevent U.S. technologies from falling into the hands of foreign nationals who may be a threat to U.S. national security. However, it poses a large contradiction, in that it regulates the entry of even outstanding foreigners, when the United States must survive the economic and industrial competition against the world and establish its economic dominance.

The U.S. Department of Commerce, poised to strengthen regulations based on the above-mentioned recommendations made in 2004, sought public comments on the issue on pages 15607-15608 in Federal Register No. 70 dated March 28, 2005. Of the 310 comments that were ultimately received, 201 were from universities (including 4 from university-related institutions). The American Electronics Association (AeA), an association representing high-tech companies in the United States, was not negative about the definition of "use," but was critical of its ambiguousness. The Center for Strategic & International Studies (CSIS) expressed objection against placing restrictions on fundamental research, and the National Council on International Trade Development (NCITD), an organization representing import/export related businesses in the United States, was also negative about determining the identity of foreign nationals based on country of origin and wary about increases in the number of license applicants.[45] As the comments were negative views on the whole, hard-line measures were rejected, and the Deemed Export Advisory Committee (DEAC) was established on May 22, 2006, to begin meetings from October 12 of that year.

Scene from the June 19, 2007 DEAC meeting [46]



On December 20, 2007, Norm Augustine, former CEO of Lockheed Martin Corporation and DEAC member, submitted a final report to the Department of Commerce Bureau of Industry and Security. The report's main points of recommendations are summarized below, as items 1 – 8.

1. Replace the current Deemed Export licensing process with a simplified new process that will both enhance national/homeland security and strengthen America's economic competitiveness.

2. Increase the focus on elements of technical knowledge and military advantage that could have the greatest consequences in the national/homeland security sphere by systematically reviewing the Commerce Control List (CCL), to eliminate those items and technologies that have little or no such consequences.

3. Establish a category of "Trusted Entities" involving both academia and industry that voluntarily elect to qualify for special, streamlined treatment in the processing of Deemed Export license applications by meeting certain specified criteria.

4. Expand the determination of the national affiliation of potential licensees to include consideration of country of birth, prior countries of residence, and current citizenship, as well as the character of a person's prior and present activities, to provide a more comprehensive assessment of probable loyalties.

5. Involve a panel of outside experts in the fields of science and engineering to conduct an annual "sunset" review (i.e., "zero base" analysis) of the list of technologies subject to the Commerce Control List. The burden of proof should reside with those seeking to add or preserve items on the proscribed list.

6. Render moot the current distinction drawn between the product of a research endeavor and knowledge regarding the equipment supporting that research.

7. Render moot the "ordinarily published" definition of fundamental research used in the current licensing process by considering new criteria based on more conventional definitions but allowing for government agencies to explicitly preclude publication of certain research results

(e.g., classified research).

8. Increase the use of interactive, web-based self-teaching programs to more broadly familiarize those impacted by the Deemed Export regulatory regime with its understanding and implementation.[47]

In the meetings, discussions revolved around the industries' desire to place stronger restrictions on designated technologies, or to place "higher fences around fewer technologies," [48] as well as on the technology transfer issue and the definitions of relevant terms. It was found that while many companies implement internal control programs (ICP) to protect trade secrets, universities are not sufficiently aware of such programs or issues. For instance, in the DEAC meeting held May 2, 2007 at the Georgia Institute of Technology in Atlanta, Dr. James N. Siedow from Duke University commented on the difference between industry and universities in his opening speech, saying that "prior to the Department of Commerce's Inspector General's March 2004 report (Deemed Export Controls May Not Stop the Transfer of Sensitive Technology to Foreign Nationals in the U.S.), educational institutions had not paid much attention to export controls. After the report, there was an attempt to establish processes and fully consider and apply the regulations. We need to define a set of rules that apply to the present-day playing field, recognizing that industry and universities do not always operate in the same way." [49]

7. New Advisory Committee and the Case of John Reece Roth (2008 -)

After the final report was submitted by DEAC on December 20, 2007, the department of Commerce was forced to make a decision and concluded the two pillars as follows:

(1) Develop more simplified new deemed export licensing process that will enhance not only the national/homeland security but also American's economic competitiveness

(2) Expand the educational outreach program which has been conducted by BIS to familiarize the deemed export rules to all parties who might be potentially subject to licensing with rules [50]

The Bureau of Industry and Security (BIS) began establishing an Emerging Technologies Advisory Committee (ETAC) to be a partial response to one of the recommendations made in the final report of its DEAC, which was directed by BIS Under Secretary Mario Mancuso on January 25, 2008 though he did not mention clearly what the ETAC would do in details at that time.[51]

On May 23, 2008, BIS announced the establishment of the Emerging Technology and Research Advisory Committee (ETRAC) evolving from ETAC once mentioned. The new committee would assist BIS to evaluate currently controlled technologies and emerging technologies that have dual-use applications and that may have national security significance. Under Secretary Mancuso said, "The formation of the ETRAC is a significant step towards the continued refinement of U.S. export control policies through public-private sector collaboration…The ETRAC will help ensure that we are protecting U.S. national security interests while preserving U.S. leadership in scientific and commercial technology innovation." The committee would also study the implication of "the release" of dual-use technology to foreign nationals under current deemed exports licensing requirements. At a same time, BIS started recruiting individuals for the technical advisory committee who have in-depth knowledge of U.S. research and emerging technology that could affect U.S. national security.[52] ETRAC would be composed of maximum of 25 members, and the members would serve a term of not more than one year.[53] At the ETRAC's first meeting September 23, 2008, BIS announced the appointment of 23 ETRAC members. The members included not only the top academic research community but also leading researchers from industry and federal laboratories. Dr. Richard McCullough, vice president for research at Carnegie Mellon University, and Dr. Thomas Tierney IV, project leader at Los Alamos National Laboratory were selected as the co-chair for the panel. [54]

From the first meeting, members of the committee found their numerous assignments confusing and outside their expertise. Even some members disagreed with some of the findings and recommendations of the DEAC and would want to revisit the DEAC's report.[55] Then, the second meeting was held on December 8, 2008, but the same questions and concerns were rose. Many members commented that the deemed export regulations and the responsibilities were not shared and/or not known those in universities and laboratories.

Moreover, the concern was raised by Kevin Kurland, the director of the BIS office of technology evaluation for zero-based review on CCL to proceed evaluation of currently controlled technologies and emerging technologies. Director Kurland said "There are 458 Export Control Classification Numbers (ECCNs) subject to deemed export controls. How do they affect the conduct of global research? We are not trading off economic security versus national security. If a defensible methodology filter spits our zero, then it's acceptable."[56] During the meeting, Co-chair McCullough recommended forming six subcommittees to conduct the review. The six are: (a) biology, biotech, and health sciences; (b) chemical and materials sciences; (c) communications, advanced computing and software; (d) nuclear technologies and directed energy research; (e) space and remote sensing technologies; and (f) nanotechnologies and microelectronics.[57]

At the third meeting held on February 10, 2009, State's Directorate of Defense Trade Controls (DDTC) and BIS explained the overview of control lists, jurisdiction over items, technology transfers, and deemed exports for ETRAC members. And the members showed confusion about the lack of clarity in the International Traffic in Arms Regulations (ITAR), and Claude Canizares, vice president for research at MIT, suggested the deemed export rules in the Export Administration Regulations (EAR) should be eliminated. Pamela Ann Abshire from the University of Maryland said "A discussion on tossing deemed exports would be valuable….It is not clear how valuable the regulations are."[58]

Four days before ETRAC was announced officially, and those, who had been involved with the issue, were discussing how to respond the recommendations submitted by DEAC, the public comment was opened and published in Federal Register: May 19, 2008 (73 FR 28795). The originally comments were due August 18, 2008, but the comment period was extended up to September 22, 2008. The comments were requested by BIS for the DEAC recommendations about narrowing the scope of technologies on the commerce control list subject to deemed export licensing requirements and implementing a more comprehensive set of criteria for assessing probable country affliction for foreign nationals. There were 22 comments from export and academic communities[59]. Companies were generally welcome to the recommendation by DEAC on "Technical Scope of Deemed Export Controls" but not "Foreign National Affiliation."

One of comments submitted from on behalf of the EDA Consortium says,

> Expanding this to "affiliation" would require a detailed review and questioning the citizenship status of every foreign national employee in every country. Potentially hundreds of thousands of Country Group D1 employees with access to AT level technologies would now require licensing reviews. Potentially millions of Country Group B employees with access to AT and NS level technologies would face the same review…We would foresee these practitioners applying for countless Deemed Export and Deemed Re-Export licenses in the attempt to shift the burden of proof back to BIS, reversing twenty years of BIS policy intent on lessening licensing requirements and processing.[60]

Another comment from Qualcomm Incorporated also insists,

> Narrowing the scope of technologies on the CCL subject to deemed export licensing requirements would be beneficial since current deemed export licensing requirements are ineffective at protecting national security when similar technology is not controlled for deemed exports and technology has been on the market for a long period of time or there is high foreign availability. Expanding the assessment of foreign national affiliation …would overburden industry and lessen the effectiveness and enforceability of the deemed export rule…responsibility on industry to screen foreign workers…[61]

As of October 1, 2009, ETRAC has moved to create "Deemed Export Control List (DECL)" after having discussed for creating a scoring system like consumer credit scores for credit card applicants to judge whether technology should be subject to Deemed Export Controls, which had been discussed during its June 2009 meeting. Members discussed about proposing initial questions to determine or filter technologies as the first stage before the scoring system as the second stage. However, the concerns were raised that there are risks for the range of scores to be extreme variation, less expertise to answer all questions, difficulties to follow up the fast-pace of technological innovation to revise the questions occasionally, and "political risk" for possible overriding the method for political reasons.[62]

While the comments for the DEAC recommendations were asked, “the case example” which symbolized the establishment of ETRAC broke out.

On May 20, 2008, a federal grand jury in the Eastern District of Tennessee charged John Reece Roth, a Professor Emeritus at The University of Tennessee, and Atmospheric Glow Technologies Inc. (AGT), a Knoxville-based technology company, with conspiring to defraud and to disclose export-controlled data related to a restricted U.S. Air Force contract to develop plasma actuators for a munitions-type Unmanned Aerial Vehicles (UAV), or “drone,” to foreign nationals including a citizen from the PRC who was a graduate research assistant.[63] Without obtaining the required U.S. government license or approval, fifteen different “defense articles” was illegally exported to the graduate research assistant in 2005 and 2006, which violated the Arms Export Control Act.[64]

The Arms Export Control Act (AECA) prohibits the export of defense-related materials, including the technical data, to a foreign national or a foreign nation, without the required U.S. government license. The maximum punishment for the conspiracy conviction is 5 years imprisonment and a fine of $250,000. The maximum penalty for each of the Arms Export Control Act offenses is 10 years imprisonment, a criminal fine of $1,000,000, and a mandatory special assessment of $100 for each offense.[65]

On July 1, 2009 at the U.S. District Court in Knoxville, Judge Thomas Varlan finally sentenced Dr. Roth to 48 months in prison and 2 years supervised release for violating AECA.[66] Judge Varlan did not impose any monetary penalty on Dr. Roth at this time eventually. Indeed, Dr. Roth was supposed to have been sentenced on May 13, 2009, after being found guilty for the violation. Judge Varlan delayed the sentencing for Dr. Roth because Judge Varlan listened to arguments about the appropriate penalty for Dr. Roth from a Justice Department lawyers and Dr. Roth’s attorney. More time for reviewing the arguments presented at the hearing that was considered necessary since Judge Varlan had to cover not only from Justice Layers and Dr. Roth’s attorney but also the government which had a U.S. Air Force colonel testify to the case. The government insisted the national security threat posed by Roth's release of defense technology to the Chinese graduate student who was working with him on an Air Force contract.[67]

Daniel Max Sherman, a co-researcher with Dr. Roth, was sentenced Aug. 10, 2009, to 14 months in prison and two years of supervised release for his role in the transfer of controlled defense technology to a Chinese graduate student. Sherman was a physicist who was an employee of Atmospheric Glow Technologies, Inc. (AGT) He was also doctoral graduate from University of Tennessee whom Dr. Roth supervised. He was a director in AGT leading the project contracts at issue in this case. [68] As of October 19, 2009, one more entity, AGT, is still waiting for a sentence in this case. AGT was a plasma technology company located in Knoxville, Tennessee. AGT will be sentenced on October 28, 2009 in violation of ACEA as the Dr. Roth's alleged co-conspirator.[69]

Meanwhile, the University of Tennessee (UT) was not convicted eventually, because UT was considered to be victimized by the conspirators and cooperated throughout with the Federal Bureau of Investigation (FBI) led federal investigation. Mark D. Menefee, former director of the BIS Office of Export Enforcement, is with the law firm of Baker & McKenzie LLP in Washington, D.C. summarizes the Four facts which were critical to distinction between UT and Dr. Roth by Department of Justice:

(1) UT had an export compliance program;
(2) Dr. Roth's contract of employment with UT required him to comply with applicable state and federal laws as well as UT's administrative procedures;
(3) Dr. Roth was explicitly advised by UT's export compliance administrator that his use of foreign national graduate research assistants on the Phase II Munitions Contract was prohibited by the AECA and ITAR; and
(4) UT reported the matter to the enforcement authorities when Dr. Roth defied that specific guidance [70]

The sentence for Dr. Roth seems to satisfy to those who were involved for the investigation. And they warned“to those who would betray the trust of our nation by violating the export control laws by providing our military information to foreign nationals,” and “to anyone who knowingly discloses restricted military data in violation of our laws” [71]

Although Dr. Roth received the sentence, has the Roth case sent a message to the academic community as

those noted above? If so, has this case become or will become a milestone for the value of deemed export regulations among industry and academic communities? Is the U.S. supposed to restrict so much on science and technology which threaten the U.S. national security? Is the U.S. supposed to stay with science and technology in the Fortress “America” in such a globalized world?

8. Beyond “Fortress America”

Back in the third ETRAC meeting held on February 10, 2009, one of the member Samuel Stanley from Washington University was indeed waiting to hear from Claude Canizares, a vice president for research at MIT and also a member of the Committee on Science, Security, and Prosperity, on the National Research Council report.[72] The report was “Beyond ‘Fortress America’: National Security Controls on Science and Technology in a Globalized World” and released on January 2009. The report studies : (1) the changes in scientific and technological advances, interlocking global economies, and current geopolitical factors that have occurred since this regulatory system was established at the end of the Cold War; (2) the problems with the current federal regulatory system related to national security that oversees the conduct of science and technology. There are three recommendations for making fundamental changes of export and visa controls by the committee:[73]

Recommendation 1

Reform the export control process within the federal government by establishing new administrative entities under the National Security Council structure. The entities shall be “Coordinating Center for Export Controls” which would coordinate interactions with businesses or universities seeking export licenses and manage agency processes with respect to granting or denying export licenses from national security and economic competitiveness factors and “Export License Appeals Panel” which would hear disputes on licensing decisions and "sunset" requirements to all items in control lists to be reviewed periodically and to be removed from the lists after the review unless there is a justification for maintaining their restrictions with respect to national security interest.

Recommendation 2

Ensure scientific and technological competitiveness by maintaining the proper Fundamental Research Exemption which NSDD-189 provides, and by creating an economic competiveness exemption to eliminate export control restrictions on dual-use technologies which are available in global open markets outside the United States.

Recommendation 3

Improve the non-immigrant visa system for visitors, graduates, scholars and researchers with strong background in science and technology fields by streamlining the visa process and extending the duration of stays to strengthen the U.S. science and technology base.[74]

About two weeks after the third ETRAC meeting, which was on February 25, the House Science and Technology Committee held a hearing on “Impacts of U.S. Export Control Policies on Science and Technology Activities and Competitiveness” to reply and to examine a growing concern that the current system of export controls is weakening the U.S. national security though the export controls are supposed to protect the nation’s science and technology. Eventually, the system is to strength the nation’s competitiveness in the global economy and national security as the result of protecting the science and the technology. The Chairman Bart Gordon (D-TN) concluded by the hearing’s opening statement, “I think that it is time for Congress to take another look at the nation’s export controls regime to ensure that it is working effectively and without unintended adverse impacts.” [75]

Witnesses at the hearing were the NAS committee chairman, Lt. Gen. Brent Scowcroft, Ret., NAS committee member Claude Canizares of MIT, A. Thomas Young, co-chair of a Center for Strategic and International Studies (CSIS) Working Group on the Health of the U.S. Space Industrial Base and the Impact of Export Control and Gen. Robert Dickman, Ret. of the American Institute of Aeronautics and Astronautics (AIAA). All four criticized that the U.S. current export controls because they stated that the current export

controls were affecting negatively on U.S. scientific development and technology industry sectors. Here is the testimony of the four witnesses.

Lt. General Brent Scowcroft, President and Founder of the group, gives the following testimony:

> The national security control science and technology are broken. They established during the Cold War to help maintain the United States' superiority in military-related science and technology... (current) unilaterally controlling dual-use items here prevents others from obtaining them elsewhere…if we sustain…control and visa barriers…we will…lose touch with the cutting edge of science and technology...and risk missing emerging national securities threats.[76]

Mr. Thomas Young Co-Chair Center for Strategic and international Studies stated his testimony from the Working Group on the Health of the U.S. Space Industrial Base and the impact of Export Controls:

> The United States must have export controls that protect technologies critical to our national security and maximize…our leadership…However…our current export controls have had an adverse impact on our national security, a negative impact on our industrial base…Most obvious are commercial communications satellite systems…are widely available commodities…other countries conclude it is more advantageous to develop indigenous capabilities rather than be subject to our export control requirements…The current export control policy is…growing separation between the U.S. and en emerging, non-U.S. space community.[77]

Professor Claude Canizares Vice President for Research and Associate Provost Massachusetts Institute of Technology, gives the testimony as follows:

> President Ronald Reagan's National Security Decision Directive 189…as national policy…is still in force today. It provides the basis for…Fundamental Research Exclusion…in current export control regulations in order to protect the enormous benefits derived from the "free exchange of ideas."…For universities, the primary area of concern…involves restrictions on the sharing of technical data and information…with non-U.S. persons…despite a Presidential directive…export controls continue to inhibit, retard or eliminate research projects that do not involve militarily relevant technology…One colleague … NASA mission…had to wait 18 months for Technical Assistance Agreement so her French graduate student could access…data from a NASA…[78]

Maj. Gen. Robert Dickman, USAF (Ret). Executive Director, American Institute of Aeronautics and Astronautics stated the following testimony:

> We all understand the reasons why our export control policies were put in place…To maintain that superiority…we need to make a realistic evaluation of how these policies are being implemented, and what effects they are having….Today, the reality is that these policies are counterproductive to their stated objectives…At AIAA, we are performing an independent evaluation…similar to the suggestions in the "Fortress America" report…there is widespread agreement that the time has come to fully address these issues…[79]

As described above in his opening statement, the Chairman Bart Gordon acknowledged the witnesses' statements. The chairwoman Rep. Gabrielle Griffiths (D-AZ) showed her acknowledgements on the statements as well. However, Rep. Dana Rohrabacher (R-CA) addressed his concerns for China as a military threat in the context of technology transfer. By referring the Cox Report, he insisted, "Since 1998, U.S. export controls have prohibited the use of Chinese rockets to launch satellites containing American made parts… U.S. technology transfers to the Peoples Republic of China helped to improve and enhance the efficiency of China's arsenal of missiles that were aimed at us." [80] In addition, he is concerned of the recent movement by Eutelsat to sell satellite services for a long march rocket, because there is a great possibility that by having the deal with China, Eutelsat, which has sold satellite services to the U.S. government through Defense Information Systems Agency (DISA) contract, will provide the service through "transferring technology" to the Peoples Republic of China which Rep. Rohrabacher describes as "proliferators of weapons of mass destruction." [81]

4. Conclusion

The issue of technology transfer in the United States is extremely complicated, as it could restrict the flow of human resources to the country. The United States is a nation of immigrants. Since its founding, and has expanded its territory and achieved economic, international, and military development by assimilating immigrants. On the pedestal of the Statue of Liberty is written a 14-line sonnet that says America welcomes all, whether poor or wretched, who seek freedom.

> Give me your tired, your poor, Your huddled masses yearning to breathe free, The wretched refuse of your teeming shore. Send these, the homeless, tempest-tost to me, I lift my lamp beside the golden door![82]

Ellis Island in southern New York City was once the gateway entrance to immigrants. The warm words of the sonnet no doubt gave courage and hope to the immigrants who arrived at the island to be processed through immigration procedures.

It is worthy of note that 7 of America's 55 founding fathers were born in a foreign country. They included Alexander Hamilton, the first Secretary of the Treasury in the first U.S. government established in 1789 (originally from the West Indies), and James Wilson, one of the first 6 associate justices of the Supreme Court (originally from Scotland).[83] Refusing to accept foreigners certainly goes against the very development that the United States has achieved through the assimilation of immigrants.

However, there is no denying that attaining and maintaining technological dominance is important, particularly in light of the shadow cast by ongoing intelligence gathering activities since before the Cold War. The incidents of technology theft by Chinese engineers, as alleged in the Cox Report, still spark debate in the U.S. government. Even as recently as January 29, 2008, Larry M. Wortzel, Chairman of the United States-China Economic and Security Review Commission, gave a testimony on the theft of technology through intelligence activities by the Chinese, before the Subcommittee on Crime, Terrorism, and Homeland Security of the House Committee on the Judiciary Hearing on "Enforcement of Federal Espionage Laws."[84]

Moreover, note that fact that the technology transfer issue is constantly reflected on international economic and military balance. At least during the Cold War, the United States was constantly wary of the Soviet Union and the Communist bloc and their industrial espionage. In the 1980s, it sounded a warning against Japan's expanding economic power, as is also evident in the Young Report. In 1990s, as China gained increasing power, the United States began to consider China a threat. The above-mentioned April 2002 report by the General Accounting Office mentions this wariness in a moderate tone, saying that "U.S. companies created and dominated the semiconductor equipment and materials industries until the early 1980s, when Japan gained a greater market share," but that "during the 1990s, U.S. companies regained market share and share worldwide leadership with Japan, although Japan still dominates the key silicon manufacturing and lithography markets"[85] In other words, while the report acknowledged Japan's dominance in semiconductor technologies, the United States chose to direct its ire not toward Japan, but toward China.

The Young Report focuses the issues of international competitiveness and intellectual property rights, while the Cox Report recognizes on military technologies. Both reports, however, emphasize the need to protect technologies and knowledge that could impact the balance of international economic and military power, and propose *external policies to control the flow of technologies and knowledge to countries that the United States deems a threat, as a means of protecting national interests*.

Today, the development of the Internet and other information technologies has simplified the acquisition of confidential information, knowledge, and know-how, and intelligence activities, including cyber attacks, are intensifying. However, awareness of the significance of acquiring and protecting technologies has existed since ancient times. During the Bronze Age, the Hittite Empire's steel-making process was a tightly-kept secret that was not revealed until its fall.

Also, at the era of British Empire, a British law was banning the emigration of textile workers who might provide the information outside of the England which could be a threat to the Britain's commerce. However, as it has been, it was impossible to stop anyone with knowledge (know-how) who was looking for the

fortune. Samuel Slater was 21 years old when he arrived in the United States from England in 1789. That year, the first Congress of the United States was begun and held, the Bill of Rights was passed, and George Washington took the first presidential oath. The United States was a rising as a new country apart from the Suzerain politically, economically and industrially. When he was in England, he leaned that Benjamin Franklin and the Pennsylvania Society for the Encouragement of Manufactures and Useful Arts were offering prizes for any inventions that would improve the textile industry in the United States.[86] And the 7 years apprenticeship at a textile factory in England seemed to be enough for Slater to memorize textile works, business and believed to have gained the trade secret. To enter the new country against the British law and to seek his fortune there, he disguised as a farmer. Slater landed in New York and soon started textile business building factories with spinning mills. He became the "Hero" praised as the "Father of American Industry" and "Founder of the American Industrial Revolution" in the Untied States. At a same time, he became the "Threat" and the "Traitor" against his homeland England.[87]

Technology controls are important since there is also the risk of restricting technological development and the flow of outstanding human resources. It is necessary to properly understand *how* the transfer (flow) of technologies and knowledge (know-how) to other countries poses a threat, consider *why* certain technologies need to be controlled, and identify *what* needs to be controlled and *how* it should be controlled. And it is important to acknowledge that the issue of technology controls involves so many different aspects and can not be separated from immigration issue, international competition, and national interests.

Generally, unlike the United States and Europe, Japan's labor market is not open for foreigners. We have seen many people from abroad at "3-K" jobs that are kitsui (hard), kitanai (dirty) and kiken (dangerous) which Japanese people avoid. Now, industries have diversified and advanced. It is becoming increasingly difficult to rely solely on Japanese population to compete internationally. It is important to accept and hire excellent skilled foreign human resources for seeking advice from them to compete in the global context. We will see more and more non-Japanese workers who actively engaged in high tech industries as well. Thus, the issue of technology transfer will be definitely a challenge for Japan.

The United States is still today expanding for the number of immigrants permitted to enter the country, and is increasingly urging immigrants and workers who possess advanced technologies to acquire the H-1B visa for specialty occupations, albeit to a limited extent.[88] In fact, the numbers of H-1B visa holders have shown an increasing trend, from 386,821 in 2004, to 407,418 in 2005 and 431,853 in 2006.[89] In 2007, the number also increased up to 461,730 though it declined to 409,619 in 2008.[90] Although each country has its own political and economical system, there is a challenge common to both the United States and Japan. Thus, for the coming challenge for "technology transfer," Japan still could consider on how the United States, as an immigrant country that has accepted diverse human resources from various countries, has worked to achieve technological and knowledge dominance in order to survive international competition, and learn from its successes and failures from a historical perspective more closely. Some day, "Hero" and "Traitor" may go down in the Japanese history.

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