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Reflexive Risk Governance in Newly Industrialized Countries

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This article compares the risk policies of GMO and issues on genetic medicine in Taiwan and the Republic of Korea as the thesis of developmental state. Through an analysis of strategic investment, R&D construction and incentives for biotech and biomedicine, we discuss the fact that the role of developmental states has never faded in the fields of economics and technology. On the contrary, both the developmental states and their societies have simultaneously encountered transformative challenges of governance capacity and social trust since the beginning of 2000.

In the case of GMO in Taiwan in early 2000, technocrats ignored and concealed technological risks involving serious scientific, ethical and social disputes, even delaying risk governance. And society weakened its scrutinizing capacity. This structural phenomenon leads to a risk culture of delays and cover-ups. In contrast, South Korea prompted the state to be proactive in risk regulation with its active social movements and media reports. Thus, the public was aware of GMO risks. Unlike the relative silence surrounding the 2005 stem cell scandal of Dr. Huang Woo-suk in South Korea, social movement groups in Taiwan paid strong attention to the risks associated with the Taiwan Biobank and criticized the government's policy on technology over genetic medicine disputes.

A comparison between these two cases makes us see that both the government and civil society have been undergoing transformation in newly industrializing countries. Proponents of "bringing the state back in" seek to reinstate the government's ability for governance and problem-solving in areas such as social injustice caused by globalization. It shows that if the state is still limited by a narrow positivistic regulatory science that prioritizes economic and industrial development, the state's role becomes contradictory in the sense of cosmopolitan risk governance.

Keywords: *GMO, Stem Cell, Taiwan Bank, Risk Governance, Cosmopolitanism, Globalization*

The Developmental State and Risk Governance

From the mid-1980s onwards, resurgence of discussions over the role of the state — particularly its involvement and intervention in the technological and industrial policies of developmental states — has been a continued focus of social theory (Skocpol, 1985). Many studies emphasize the historical and structural factors of successful East Asian developmental states such as Taiwan and South Korea. These studies note the special cold war environment and the necessity of national security that gave political authority and autonomy to these governments. Such authority manifests itself in society in many forms that guide technological, industrial and economic development (Skocpol, 1985; Evans, 1995).

What deserves more consideration is how the state autonomously maps out and guides industrial development, and how the state conducts public-private cooperation to bring about development and transformation of industries (Weiss, 1998). From the mid-1990s, industrial and economic sectors faced the problem of structural transformation as they matured. The role of the state transformed from a position of strength in the coercive sense to a catalyst which continuously guided industrial, economic and technological policy and promoted investment, upgrade and innovation in business (Weiss, 1998; Amsden and Chu, 2003).

The core of developmental state theory is that the state limits development and deprives society of its resources through authoritative manipulation of technological, industrial and economic policies. Also, the state attempts to win legitimacy of its dominion through economic achievement. That is, an elite-dominated technocracy model with strong economic development drive became ingrained in these later newly industrial societies. However, similar to South Korea, Taiwan experienced rapid democratization from the end of the 1980s; then in the 1990s, the state was confronted with a need to transform as it faced the impact of globalization. Society's desire for democracy and industry's desire for structural transformation challenged the state's authoritative dominion. Research from the 1990s onwards continues to examine whether such historical factors will result in the downfall of developmental states.

The end of the 20th century saw the rapid progress of new technologies result in a crisis of a magnitude not seen since the Industrial Revolution Era. Although development of these new technologies brought much convenience and efficiency to our lives, they have also brought uncertainty in terms of safety. They also challenge human health, economy, ethics and society. Moreover, due

to globalization, the problem is not limited to any single region. For example, medical, health, ecological, social and ethical problems directly caused by genetic engineering, nanotechnology and information technology become not only trans-boundary but also globalized risks spreading through global networks.

These developments require a revolution in risk governance for all nations. To better govern these trans-boundary risks and risks resulting from state-dominated technological industries, social communication and democratic participation in decision-making process are important to win social trust and to strengthen the state's legitimacy. So, too, are active intervention and coordination of governments of countries in the world important to form a cross-national governance mechanism. As risk governance paradigm received more attention from countries throughout the world (European Commission, 2002; Renn, 2005), the cry to "bring the state back in" rang out. The paradox of the simultaneous desire for a more democratic government and a government willing to take a strong role in global risk issues is worth examining. There are two structural issues: first is the transformation of authoritative expert politics, including challenges encountered as technocrats combine expertise to carry out technological decision-making, and second is society's ability to supervise, reflect and criticize within a historical context.

Reinvention of the Developmental State

Despite both South Korea and Taiwan experiencing democratization and entering global economic competition, research such as Minns' on the relative waning of autonomy (Minns, 2001) has been skeptical that the role of developmental state is on the out since the end of 1980s. Yet, much of the research conducted in this field indicate that the developmental states which still exist in nations such as South Korea and Taiwan are facing transformation problems. For instance, case studies of state-supported IT, LCD, semiconductor and dynamic RAM industry (Bae and Lim, 2001; Kim, 2003; Wang, 2007; Wang, 2008), coordinated research of government-business relations (Cherry, 2005), research on "politics of neo-liberalism special economic zones" (Park, 2005), and the South Korean government's strategy research after the Asian financial crisis (Kim and Kim, 2005) all point to the fact that the state is still actively involved in technological and industrial policies in developmental states such as Taiwan and South Korea. However, experiencing restrictions of capital flow regulation and the expansion of industry and *Chaebols*, the state gradually

adjusts its role from an active intervener to a catalytic one which plans technological and industrial policy separately, and guides society towards economic transformation by pursuing technological development (Wang, 2007). In other words, within the framework of fierce global economic competition and knowledge, the role of developmental state is reinvented.

However, this research focuses on changes in the state's role in terms of economic and industrial policies. Even recent studies on the transformative capacities of the developmental state are limited to economic ambit (Weiss, 1998). While encountering globalized cross-boundary risks, we need to deliberate on the notion of "bringing the state back in" to effect cross-national cooperative risk governance. Hence, the state's transformative capacities are no longer limited to economic governance but have a broader meaning. However, we need to consider the paradoxical contradiction of the traditional role of the developmental state confronted by these new changes.

Comparison of GMO and Genetic Medicine Research in Taiwan and South Korea

Within the context of transformation for these developmental states facing new and globalized risks, this paper is concerned with the attempt to probe into the question of how Taiwan and South Korea deal with and govern newly emerging technological risks, beginning with a comparison of similarities and differences in the way that these two countries' risk cultures have transformed the technological aspect of society. On the one hand, we will point out that both Taiwan and South Korea altered their regulations in order to promote policies supporting the development of biotechnology industry and will discuss how the governments of these newly industrialized countries were expected to govern the potential globalized risk related to the development of genetic engineering in the context of such developments. On the other hand, we will also probe into how Taiwan and South Korea responded to these globalized risks under their differing governance structures. We will focus on the case studies of GMO, Taiwan Biobank and the Fake of stem cell research by analyzing the development patterns of technological risk disputes within these two societies first, by pointing out the hidden or awakening response to technological risk disputes revealed by these two societies and, finally, by discussing the similarities and differences between the risk culture of these two countries. On Taiwan, this paper will analyze Taiwan society's awakening to technological risks from the hidden culture as was evident in their response to GMO risks to the gradual transformation of an open dispute over the issue of the Taiwan Biobank and open criticism of the government's governance structure for handling

technological risks. Conversely, on South Korea, this paper will point out that both South Korea's government and South Korean society demonstrated cautious treatment of the risks related to GMO, with the public revealing a high level of awareness of the issue. Stem cell research, on the other hand, garnered the opposite response.

On the basis of this comparison, why the risk disputes in these two countries have developed so differently will be discussed in this paper. Moreover, under the context of differences in the governance of these two nations and the technocratic policies and civil societies' ability to oversee such risks, we will continue to point out the similarities and differences that they have produced. At the same time, the author will reflect on the transformation and challenges facing the states and societies of East Asia from this perspective as they deal with the realities of globalized risk threats, especially societies with a background of bearing the deceit of the once authoritarian dominance of technocrats. And in these places, we will point out that the key to transforming societies' consciousness of, and response to, technological risk is the growth and development of the countries' civil society.

Globalized Risks: GMO Risks

GMO is considered a typical globalized risk threat similar to the greenhouse effect noted in the 1970s and to the mad cow disease discovered in the beginning of the 1990s. Genetically modified animals and plants may impact global ecology. Technological uncertainty brings with it the contested issue of social accountability. Debates and regulations on GMO all focus on the unpredictability, uncontrollability and unrecoverability of health, safety and spreading ecological pollution.

Globalized Risks: Biobank

In 1998, deCODE genetics tried to establish a national health database in Iceland. The project failed but raised considerable dispute. Subsequently, looking at the technological interest this kind of database would bring, other countries began to invest in large-scale genetic database establishments, including the Estonia Gene Bank (2000), the Singapore Tissue Network (2002) and the UK Biobank (2002) (Liu, 2004). Taiwan and Japan are also planning to invest in this field. Because the establishment of a biobank involves factors such as medical market acquisition, technological R&D and large-scale genetic database, the process should be governed within the larger framework of global competition.

Starting from the breakthrough success of the cloned sheep Dolly in 1997, the human genomics draft in 2000, and the development of large-scale human biological sample collection, a set of value standards have gradually developed for R&D and the application of human genetic data (Petersen, 2005). UNESCO's *The Universal Declaration on the Human Genome and Human Rights* (1997) highlighted potential ethical concerns with respect to sample collection and information preservation development of genetic database globally.[1] Such ethical worries were shown more concretely in the *International Declaration on Human Genetic Data* issued by UNESCO (2003), which stated that the value-related considerations of privacy, confidentiality, and access to information and discrimination in the process of collection, handling, utilization, and preservation of samples are special issues for human genetic data. In addition, the possibility of exploitation by transnational corporations or research sectors in developing countries should also be taken into consideration.

It is evident that because establishment of and collection of data for large-scale genetic database involve sensitive social and ethical concerns for individuals, families and ethnic groups, it is therefore logical that genetic research must be regulated within a global framework rather than a national or localized one. Due to the fact that genetic data is being collected, stored and managed by computers, it is even more likely that it will be divulged, duplicated, modified or even transmitted across national boundaries, thereby causing global risks of information divulgence and illegal transmission.

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[1] In particular, the importance of genetic privacy and genetic-based social discrimination (Rothstein, 2005; Noble, 2006; Tavani, 2004), genetic database research and the ethics of commercial application (Rothstein, 2002; Terry and Terry, 2006), genetic research responsibility and social participation (Malinowski, 2005; Racine, 2003), global crises caused by the divulgence of genetic information (Knoppers, 2005) and the ethical problems posed by the release of personal medical records and genetic information (Regidor, 2004) have been raised. These problems are reflected in WHO and EU risk governance structure as well. Based on the principle of human generality, a WHO report, *Genetic Databases: Assessing the Benefits and the Impact on Human & Patient Rights*, and the Council of Europe's *Convention on Human Rights and Biomedicine* coincidentally place importance on the impact and doubts that may be caused by large-scale bio-sample collection from the viewpoint of privacy, confidentiality, rights of access and control, and freedom from discrimination. Also, they point out the problems of social and ethical uncertainties on a global level. More concretely, in terms of global cooperation, genetic data collection may be connected to household registration systems and health records. These two documents also clearly point out the potential for global ethical and social uncertainties (Chou, 2005).

Ignorance of Risk Society and Regulatory Science

Although scientific knowledge is the motive and base of social development in modern society, it simultaneously causes unintended globalized consequences such as ecological, health and ethical risks brought on by GMO and stem cell research. One major reason risk stems from this is the fact that people use limited knowledge to explain unknown areas, creating a great risk from ignorance, or unawareness (*Nicht-Wissen*) (Beck, 1986; 1999).

A constitution of unawareness can be viewed from the aspects of state, civil society, media and the public. In particular, while the state controls decision-making on crucial risk policies or its vast expert systems dominate definition and interpretation of risks, its governance strategy affects society's ability to control risks. For convenience in regulation and governing, state technocrats usually ignore uncertainty of risks and, instead, directly propose pragmatic knowledge as the basis of regulation. Technocrats are fully confident in scientific safety inspection and they consider tracing the only effective tool for governing uncertain risks. Moreover, they firmly believe that risk regulations must be neutral and objective (Jasanoff, 1990). Even so, such a limited regulatory culture which actually ignores scientific uncertainty usually underestimates risk complexity, thus developing into concealment, ignorance and exposure to risk threats, which eventually resulting in high public dissatisfaction and distrust in government risk governance. For the developmental state, the problems of authoritative advocacy in science and expert politics-dominated decision-making can no more be ignored.

The state either actively intervenes in technological and industrial policies or transforms into one which plans and catalyzes technological and economic competition. As the state faces challenges of these globalized risks, its role becomes paradoxical. When these countries transform from non-democratic states into newly industrializing democratic nations, we need to deliberate the role of civil society and the media in supervising the state. One possible means may be that society and the media can only be involved in a limited capacity in the framework of the authoritative developmental state, and thus, they become delayed and ignorant actors. Another possible way may be that civil society gradually awakens, then transforms into effective actors who supervise government risk decision-making. No matter which, state, civil society and the media's actions constitute public risk perception and public trust. These give us pause to reflect on what kind of system risks may occur for newly industrializing countries such as Taiwan and South Korea with the involvement of

developmental state while its governance remains effective, (OECD, 2003).

Developmental States and High-Tech Policies: Taiwan: Biotech

Within the framework of global cold war politics and international division of labor, technocrats in Taiwan controlled national industrial and technological development in authoritative dominion from the 1970s (Evans, 1995). In the 1990s, the technocrats' top-to-bottom technology-oriented policy for decision-making was still effective. Against this background, in light of globalized economic competition and the gradual maturation of biotechnological products from the mid-1990s onwards, the Taiwanese government sped up investment in biotechnology. Taiwanese technocrats also attempted to replicate successful experiences of the IC industry's investment — revealing industry development to be the major motive for policy-making.

In April 1997, the Science and Technology Advisory Group of Executive Yuan (STAG) held the 1st Strategic Review Board (SRB) Meeting on biotech industrial policy, with the aim of promoting national genetic medicine and public health technological projects. In 1998, the 2nd SRB Meeting was held. It modified the "Biotech Industry Promotion Strengthening Project" and proposed transplanting successful experiences of the semi-conductor industry to the biotech industry. The state was actively involved in the promotion of genetic medicine, genetic modification of animals and plants, and genetic pharmaceuticals. It had a whole plan: *headstream* (*basic research*), including Academia Sinica,[2] National Science Council and departments in universities; midstream (*applied research and technological R&D*), government-supported research institutions; downstream (*commercialization and application*), including private and national enterprises (Chou, 2000). In addition, research and development, including technology innovation, strategic alliances and industry-academy cooperation were promoted by special technological projects of the Ministry of Economic Affairs. They also helped to establish derived companies to nurture enterprises (Cheng, 1997).[3] Based on a resolution of the 2nd SRB Meeting, moreover, the National Development Fund (Executive Yuan) invested 20 billion NTD (approx. US$600 million) to provide assistance to

[2] According to the minutes of a 1994 academic meeting of Academia Sinica, a resolution was made to set up a Biotech Promotion Committee, a Biotech Medicine Committee and an Agricultural committee; and a Biotech R&C Center and Technology Transfer Center were planned.

[3] According to Executive Yuan's statistics, the government invested 1.25 billion NTD on average from 1993 to 1997 in biotech R&D yearly. In 1997, it was 1.4 billion NTD. In 1998, it was 2.9 billion NTD. The budget increased year by year (Su, 1997)

national biotech industrial development in accordance with the "Five Year Project of Biotech Industry Investment" (1998-2002).[4]

At the same time, the National Science Council planned to establish the Agricultural Biotechnology Park (in Southern Taiwan Science Park) in 1995, and then the Biomedicine District (in Luchu Science Park) in 1999 and Northern, Central and Southern Biotech Hallways in 2001 following the successful experience of Hsinchu Science Park's semi-conductor industry development. Also, starting in 1997, three major pioneer technological projects were launched, including the National Genetic Medicine project, the National Agricultural Biotech project and the National Pharmacy & Biotech project. These projects were all initiatives based on R&D and technological transfer. In addition, the Ministry of Economic Affairs promulgated in March 1998 the policy of state-owned enterprises investing in the biotech industry. State-owned enterprises such as Chinese Petroleum Corporation, Taiwan Sugar Corporation, TAIYEN, Taiwan Fertilizer Co., Ltd. and Taiwan Tobacco & Liquor Corporation all devoted resources to applied research and commercialization development. The government actively encouraged the participation of privately owned businesses as well.

Such development models and technological industrial projects were formulated and implemented by technocrats. In both cases, the government acted as instructor to promote new technologies. Besides actively formulating national technological R&D projects and science parks to lead the development of biotechnology and medicine technology, the government also made use of various strategies to encourage investment, human resource recruitment and international technical cooperation. Whether for the IC industry in the 1970s or the biotech and medicine industries in the 1990s, the government has played a major role as a promoter and demiurge. Also, through strategies of tracing and learning from technological industries in more advanced countries and OEM manufacturing, the government further innovated and developed national technological industry. These are the major strategies of developmental governments, of which foresighted and authoritative expert politics become the

[4] Since 1999, the Taiwanese government invested 220 million NTD in Genovate Biotech Company Ltd., 8.4 million NTD in Harmony Biotech Corporation, 100 million NTD in Taiwan Flower Biotechnology Company Co., Ltd., 168 million NTD in ScinoPharm Taiwan Ltd. and 700 million NTD in United Biomedical, Inc. (Lee, 1999). Among these, several were formed as a strategic alliance to attract foreign investment and technology. ScinoPharm Taiwan Ltd. was established based on 2.7 billion NTD of capital in 1997; US technology shares account for 15%, mainly for producing material for medicine. US United Biomedical, Inc. was established in 1998. United Biomedical, Inc., Taiwan, was established based on 3.5 billion NTD of capital in 1998, whereas technology shares account for 60% (Jiang, 1998).

major actor in promoting technological development.

Because the biotech industry has great development potential, it has high additional value and knowledge-oriented industry which the Taiwanese government emphasized. Following the announcement of Executive Yuan's Six Year National Development Project in 2003, the biotech industry was listed as key in the "Two Trillion Double Stars" project. To initiate Taiwan's biotech-industry development, speed up biotech R&D and enhance international competition, Executive Yuan passed the fourth amendment of the Biotech Industry Promotion Strengthening Project in March 2003. After this project was commenced in 1995, interest in investment from private enterprises had obviously increased, and yearly investment increased from 12.1 billion to 20.3 billion NTD. The number of biotech and medical companies established increased from three in 1997 to 150 in 2003. In addition, many other software and hardware facilities appeared, such as the Center for Drug Evaluation, hence providing equipment for internationally-recognized clinical animal experiments, building a clinical experiment center and initial factories which conform to cGMP. These all provide essential facilities for Taiwan's medical development. As part of promoting biotech parks, Nankang Biotech Incubation Center, Hsinchu Biotech Park and Pingtung Agricultural Biotechnology Park were established. To promote biotech-industrial development in Taiwan, the Biotech Industry Promotion Strengthening Project set a target of "achieving 18 successful investment cases before 2010." Executing key points included: 1) continuation of increasing R&D budgets, emphasizing technology development, research and clinical experiment, and enhancing introduction of technology and international cooperation projects; 2) increased onus to complete related regulations, such as those regarding new biotech medicine, animal and plant transplants, and development of new Chinese herbal medicine; 3) resolution of the need for initial stage capital for R&D commercialization by actively growing a "biotech entrepreneurial seed fund." It was hoped that through market forces and capital strategy, skills and technology can be integrated quicker, making Taiwan the R&D, production and operation center of biotech industry in Pacific Asia. Promotion of this project can build sound foundation and investment environment, leading to vigorous development of Taiwan's biotech industry (Science and Technology Advisory Group, 2008).

Developmental States and High-Tech Policies: Korean Biotech Industry

The South Korean government has systematically cultivated national technological industry and centralized investments for R&D resources. In 1989, it stressed the "Five Year Advanced Industry Development Project," promoting scientific research of seven high technologies including microelectronics, new materials, biotech engineering and optical fiber (Shen, 2006). In 1991, the Korean government proposed the ten-year HAN Project (G-7 Project), which aimed to catch up to the scientific and technological development of G7 countries in the 21st century. The seventeen new key technological R&D items include nine new basic technologies such as new nuclear reverberatory, new materials, new energy and environmental protection as well as eight applied technologies such as nano-semiconductor, broadband network, AI computing and liquid crystal TV. In addition, the five-year "Basic Plan for Scientific Technology" of 2001 invested in six national strategic technologies collectively known as 6T such as IT, biotechnology (BT), nanotechnology (NT), space technology (ST), environment technology (ET) and culture technology (CT) in order to promote technological R&D internationalization (Shen, 2006; Eom, 2006). Also, in 2004, the Korean government launched a technological development project called "Ten Next Generation Tech Projects".

At present, the focus of industrial development in Korea remains on 6T and Ten Next Generation Tech Projects. In 2005, the budget for the Ten Next Generation Tech Projects was 397.7 billion Won, up by 7.0% from 2004, accounting for 5.1% of the total national R&D investment (refer to Table 2). Following this figure are the amounts each department allocated for the Ten Next Generation Tech Projects: Ministry of Science and Technology — 10 billion Won, Industrial Resource Department — 1,136.2 billion Won and

Table 1. Budget Profile of Ten Next Generation Tech Projects (2003~2005)

Category	Budget for 2003	Budget for 2004	Budget for 2005
Government R&D investment (A)	65,154	70,827	77,996
Ten Next Generation Tech Projects (B)	3,058	3,717	3,977
(B/A, %)	(4.7)	(5.2)	(5.1)

Source: Eom (2006: 26).
(Unit: 100 million Won, %)

Table 2. 6T Budget Profile (2003~2005)

Category	2003		2004		2005*	
	Budget	Percentage	Budget	Percentage	Budget	Percentage
Government R&D budget	55,768		60,995		67,368	
6T	16,782	30.1	25,239	41.4	27,646	41.0
Information Technology (IT)	5,015	9.0	6,474	10.6	7,425	11.0
Biotechnology (BT)	4,964	8.9	7,651	12.5	8,037	11.9
Nanotechnology (NT)	1,992	3.6	2,988	4.9	3,351	5.0
Environment Technology (ET)	2,718	4.9	5,111	8.4	5,918	8.8
Space Technology (ST)	1,844	3.3	2,487	4.1	2,445	3.6
Cultural Technology (CT)	249	0.4	528	0.9	469	0.7

* estimated.
Source: Eom (2006: 28).

National Intelligence Service — 215.5 billion Won. The combined budget for 6T, was 2.764 trillion Won in 2005, up by 9.5% from 2004 (refer to Table 2).

From the 1980s, South Korea already had invested heavily in biotechnology. According to statistics, biotech expenditure was US$98.3 million in 1991. By 1994, it had already risen to US$247 million, a yearly increase of 36%. In addition, the percentage of biotech R&D investment accounted for in the total R&D expenditure increased from 1.7% to 3.3%. Biotech research personnel increased from 2,169 in 1991 to 3,354 in 1994, a yearly growth rate of 15% (Hsu, 2005). In 1999, biotech R&D budget accounted for 3% of the total budget for technological development, of which private investment and government investment accounted for 50%, respectively. Of the government budget, 5% was from the Ministry of Science and Technology (MOST) (*MD News*, 2007).

Both the Taiwanese and South Korean governments have actively supported and planned for their biotech industries, indicating that the developmental state still exerts great influence in guiding technological policy decision-making. However, what we need to further analyze is how the state responds to genetic engineering risks, what kind of regulatory culture forms and what kind of risk culture and problems may result.

The Structure of Ignorance in GMO Risks

The State's Laissez-Faire Risk Governance

Department of Health (DOH) of Taiwan had started to regulate GMO in April 1999, but the policy itself was not yet active.[5] Until the end of 1999, DOH collected regulatory materials from around the world and drew up related drafts about safe experimental procedures and assessment. Simultaneously, DOH responded to doubts in the media about GMO disputes and announced that Taiwan "will formulate related regulations next year."[6] Unlike neighboring countries such as Japan and South Korea, Taiwanese society had not yet launched any local risk movements until the middle of 2000, and was thus unable to supervise and exert pressure on the government.

How contradictory was the Taiwanese government's attitude. Neighboring countries such as Japan, South Korea and Hong Kong all adopted stricter regulatory measures for scientific, health and safety disputes related to GMO; whilst Taiwan's DOH's risk governance mechanism was delayed and oblivious of risks, lacking open information and communication to let local consumers understand more about imported genetically modified foods and related processed foods.[7] Such delays and concealment of risk information damaged society's perception of technological risk.

October 2000 was the second time the Environmental Quality Protection Foundation, a social movement group, launched an anti-GM food demonstration. They lobbied legislators for action. Then, on November 8th, DOH set up the Genetically Modified Food website to promote risk communication.

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[5] On April 16, 1999, DOH held "Genetic Engineering Management Coordination Meeting." The National Science Council, Environmental Protection Administration and Council of Agriculture carried out integrated GM food management for headstream, middle stream and downstream levels. Refer to DOH website: http://www.doh.gov.tw/cht2006/index_populace.aspx.

[6] Refer to reports of *The China Times*. Its analysis points out that Taiwan's accession to WTO was the result of US containment. It also indicated that the public generally pay little attention to and raise few disputes regarding GM foods. It also showed the Taiwanese government did not consider following the EU to regulate GM food labeling (Hong, 1999).

[7] DOH delayed drafting GM regulations for a long time. It also undertook no related food inspections and made no announcements to the public. In fact, as much as 30 to 40 billion NTD of US imported grain was involved, of which soybean accounted for 5 million tons and half was genetically modified. Of the 2 million tons of imported corn, 30% was genetically modified (Wei, 2005).

Regulatory Science and Culture

Taiwan's government did not follow the revolving door policy. In related speeches and meetings in January, February and April 2000, DOH invited six representatives from Wyeth and Monsanto to talk about risk governance and the current state of regulations in the US, EU and Japan.[8] In fact, 70% of the world's GMOs are planted in the US. Taiwan imports the most grains from the US. Not to mention that Monsanto is the most disputed body for risk movements in the world (Oliver, 2000: 226).

Furthermore, the processes of safety assessment and regulation policy formulation were not open. DOH usually invites representatives from the industry, government and academic fields that have close interests in R&D, but the representatives were selected this time seemingly against the principle of democracy. Even when DOH invited experts, social groups, government and business representatives to hold a conference on "Genetically Modified Food Labeling" in September and October 2000, this conference was more like propaganda and did not clearly carry out substantial discussions about the principles of democracy, risk communication, safety assessment and labeling management.

DOH's confusion about the standpoint of R&D and safety regulations is shown by its public announcements asserting that GM food safety is beyond doubt;[9] this *laissez-faire* risk governance attitude originated from the technocrats' belief in giving priority to expert politics. Also, it deemed that technological risks of GMOs should be evaluated through positivistic scientific risk assessment, excluding technological uncertainties. It deemed that science has nothing to do with the social and ethical uncertainties stemming from GMO risks. DOH stressed that it needed not only to "educate" the public but also to enlighten the public's ignorance (Wynne and Dressel, 2001). On different occasions, DOH officials openly announced that GMOs are free from safety and health doubts. And they claimed that consumers should avoid unwarranted fear. These actions concealed the existence of risk.

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[8] As a department that represents the state in DOH's three related speeches, it invited only representatives from a controversial cross-national company which produces GM foods to "explain" EU and Japan's labeling management, which was considered counter to the international revolving door principle, and was suspicious of yielding to US pressure. Refer to DOH website.

[9] Refer to DOH website.

Lack of Pressure on Risk Politics

Official positivistic regulatory scientific attitudes and the delayed development of social movements on the other hand, resulted in the delayed and hidden risk system of local society. This particular local social context lessened the degree of public concern and pressure regarding risk management.

In contrast to South Korea and Japan, Taiwan's public risk sensitivity and political actions toward GMOs were not constructed. First, consumers were quite apathetic to the Starlink GM corn issue. From September 2000, the media continued to report that Starlink GM foods cause health risks such as allergies, and that 44 people showed allergic reactions which caused vomiting. Japan and South Korea made official and social protests to the US; the government and civil societies demanded that the US reclaim thousands of tons of corn (Lu, 2000b; Wu, 2000a) However, no public discussion was made by Taiwanese citizens. No group or organization exerted political pressure on its government to request the US to recall its GM products.

During the same period, in November 2000, DOH announced it would postpone the date for compulsory labeling of GM food; it would come into effect in 2004. DOH also adopted the loosest definition of GMO foods, determining foods with 5% GMO composition or less to be non-GMO. This standard overthrows its previous attitude to strict and quick labeling,[10] which was quite different from that of Japan and South Korea. However, DOH's risk decision-making still attracted little public attention and no public reply or protests.[11]

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[10] In the very beginning, the vice director of DOH had openly announced that Taiwan would introduce compulsory labeling from the beginning of 2000 (*Minshenbao*, 2000). Previously, DOH had announced the compositions of GM foods. Then, in October, DOH openly announced that from 2001 they would apply a mixed guideline which combines compulsory labeling and voluntary labeling (Refer to Wu, 2000b; *Taiwan Times*, 2000; Du, 2000). In the beginning of November, the director of the Food Sanitation Bureau, DOH indicated that he would take industries' responses into consideration (industries preferred a preparation period of three years to five years to implement compulsory GM food labeling). Then, in the following year, DOH changed the policy to voluntary labeling. DOH planned to apply compulsory labeling for soybean and corn just two years later in 2002. However, information released to the media on November 30th indicated the date on regulating GM food labeling was postponed for two to four years, and the threshold for food to be declared genetically modified was the loosest at 5%. DOH experienced "no" pressure from consumers in this policy's decision-making (Li, 2000)

[11] With no political pressure, DOH was free of public pressure. On February 23, 2001, DOH voluntarily announced a lax and delayed labeling management policy, which still prompted no discussion from the public, social movement groups or the media.

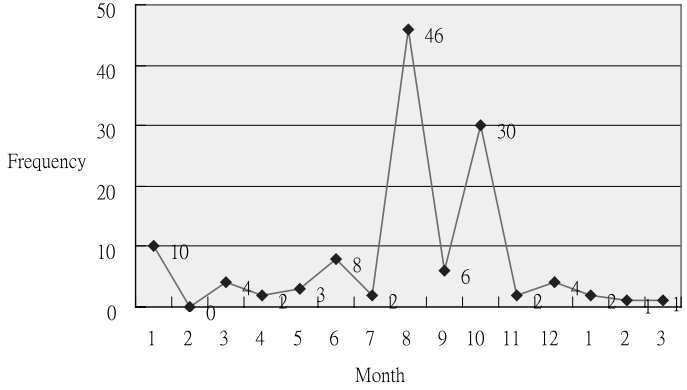

Figure 1. Analysis Reports of GM Food Issues (January 2000 — March 1, 2001)
Source: Chou (2002).

Lack of Risk Communication in Media

The development of the media's discourse on risks has encountered some changes along with mobilization strategy of social movement groups. However, fundamentally speaking, the Taiwanese media provides little GMO risk information, and thus are unable to provide a public arena for discussions and criticism. In August 2000, the Environmental Quality Protection Foundation concluded that Taiwanese-produced beans were composed of 100% genetically modified material, raising consumers' consciousness.[12] At the end of October, the Environmental Quality Protection Foundation announced a list of GMO-containing products;[13] this caused much discussion in the media. Figure 1 shows how reports of GM foods steeply increased in August 2000. In October 2000, GM food issues attracted much attention as well. These results reveal that the actions and discourse strategies of social movement groups became the

[12] On the afternoon of August 27, 2000, evening newspapers *Zili Evening* (Cao, 2000), *China Times Evening* (Cao, 2000) and *United Evening* (Hong, 2000). All reported this news with remarkable photos. They included the Environmental Quality Protection Foundation's discourses on risks. On the next day, several daily newspapers such as *China Times* (Lu, 2000a) and *United Daily* (Li, 2000) all had distinct reports.

[13] The Environmental Quality Protection Foundation re-released the list of foods which contain GM material. From discussions on television and related forums, the Environmental Quality Protection Foundation highlighted the risks of imported fast foods such as MacDonald's and local foods such as instant noodles, showing the great influence these can have on public perception. Refer to the Environmental Quality Protection Foundation's website: http://www.envi.org.tw/EN_index.htm

focus of risk perception.

The problem is that social movements received heavy media coverage as the observation period was extended from August to October 2000, but for other months, average media coverage was low. This kind of phenomenon can be initially explained as social movement groups not strategically continuing media discourse to magnify its influence. But more importantly is the media's lack of interest in reporting GMO-related news (Gamson, 1988; Snow et al., 1986), perpetuating hidden and delayed risks in local society. With media agencies unaware and lacking mobilization to propose public discourse, society itself is left unaware and uninformed.

Social movement groups have criticized Taiwanese media's lack of ability to actively track the development of international risk movements or investigate the local situation. Short-sighted newsgathering means that issues in the spotlight change frequently.

"From over ten years' interaction with environmental protection journalists, it is observed that the real high quality ones will not stay on the same position but have a high turnover rate. Also, Taiwan lacks critical media. The media itself lacks autonomy to discuss GMO" (interview with a representative of Homemaker's Union and Foundation).

Delayed Risk Movement in Civil Society

From absence to the initial stage of local risk movement observation, one clear factor influences whether Taiwan's social movement groups are involved in GMO criticism or not. Due to the uncertainty and complexity of scientific disputes, knowledge and consensus on risks available to social movements are often delayed.

Concerns over genetically modified animals and plants are not only related to food safety but also ecology, health and the rights of consumers with smaller budgets. It is a whole new technological risk. For some local social movement groups, other interests (for example, many social movement groups are highly involved in debates on the Fourth Nuclear Plant) have meant that GMO risks have not attracted their attention. Representatives of the Awakening Foundation indicated that they value human rights and gender perception, and had no special interest in GM foods. When contacted, the representative of the Taiwan Environmental Protection Union said some members had concerns about GMO issues, but their concerns did not transform into internal discussions or action plans. Green Consumers' Foundation indicated that they currently have

no related action plans.[14]

The Consumers' Foundation, in spite of being influenced by Consumer International's anti-GMO standpoint, found the complexity and uncertainty of genetically modified technology greatly influenced their desire to get involved.

> "I think it is because of the novelty of GMOs. First, starting in Europe three or four years ago, GMO risks are a problem resulting from novel technologies. Second, due to the complexity of scientific disputes related to this issue, the Consumers' Foundation faces the problem of a lack of rationality and objectivity. Accordingly, we know that a thing has its cause" (interview with Consumers' Foundation).

With limited cognition, the Environmental Quality Protection Foundation previously decided not to engage in anti-GMO movements. Even when the Environmental Quality Protection Foundation learned about the strategy of anti-GMO movements around the world from Greenpeace in 1998 and 1999, they still had insufficient information. Meanwhile, public mobilization was delayed because the whole of society was unfamiliar with, and unaware of, these high-tech issues. It was not until August and October 2000 when the Environmental Quality Protection Foundation discovered MacDonald's imported potato chips were mixed with genetically modified products that the Foundation was led to hold temporary anti-GMO protests. However, their activities were not ongoing, and so local risk movements disappeared from the scene.

The Homemaker's Union and Foundation (Homemaker's Union) prolonged their deliberations. Through internal education, they gradually came to know the essence and structure of GMO risk problems. In interviews, representatives of Homemaker's Union stressed that the technological risks of GMO are not easy to understand and they needed to understand the issue before taking action.

> Interviewer: So, you first contacted Japanese groups in 1997. Through this network, you obtained information. Then you used this information for internal activities, such as conferences and speeches, but you didn't turn it into a consumer movement.
>
> Interviewee: No. One crucial thing is that this topic itself is not easy to

[14] From telephone contacts with these three groups, only abovementioned opinions were collected; no further interviews were made.

> clarify. Also, public perception of related risks is not clear yet. Speaking of the process of information delivery, there is a gap between Taiwanese and foreign countries' cognition. … First, our members have to learn where the main risks are. But it's not easy to learn. Information in foreign newspapers and on the Internet is not easy to translate and interpret. All these things cannot be fully understood in short time (representative of Homemaker's Union).

The Homemaker's Union was the first organization in Taiwan to include GMO issues in its interests. However, they included this topic in the internal network of "collective buying movement."[15] From the second half of 1999, the Homemaker's Union started to promote anti-GMO activities through small-scale speeches and internal publications. The role of the Homemaker's Union transformed from one of information collection and translation into one constructing the basis of risk actions. Firstly, they need to understand GMO risk issues and develop related information for debate and movement.

In fact, the complexity of high-tech risks requires a learning process by social movement groups. Only through this step can social movement groups gain the ability to research and consolidate social action. Different movement groups often have difficulty reaching consensus on high-tech risks.[16] So far, continuing unawareness of the major causes of delayed social risks has left Taiwan absent in the international arena of GMO risk discussions.

Unknown Public Perception of GMO

Owing to the delay of national risk governance, the sluggishness of social movement motivation and limited local risk information, structural gaps in public risk perception have formed. These gaps include information and

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[15] Collective buying is a focus of social movements in recent years, promoting organic food with pesticide- and chemical-free production process. It promotes the concept of healthy consumption. The Homemaker's Union considered the problem of GMO risks a "new technological crisis of food" and opposed it. The Homemaker's Union has 4,000 members. Since 2000, its publication, *Homemaker's Union — Green Assertion*, has continued to cover the anti-GMO movements around the world. It also translates related information from its sister organizations in Japan. On November 11, 2000, the Homemaker's Union discussed anti-GMO movements as the subject of the "International Conference of Asian Sister Organizations," inviting Japanese and Korean groups to exchange their opinions. Refer to *Homemaker's Union — Green Assertion*, May, June, July, September and November of 2000.

[16] This problem exists not only in the Consumers' Foundation but also in the Homemaker's Union.

knowledge, which are embedded in risk perception gaps within the social system as a whole. From the results of three current nation-wide telephone surveys on GMO risk perception and risk communication issues,[17] only respondents who had heard of GMOs continued to be interviewed. Only 49.1% of the respondents (836) in 2003 and 56.5% (888) in 2004 had heard of GMOs. And 50.9% of the respondents (866) in 2003 and 43.5% (684) in 2004 had never heard of GMOs, even though GM foods had already been imported into Taiwan for more than three years at the time. This clearly reveals the public's unawareness of high-tech risks.

When further questioned about the origin of information, most people (85.8%) answered that media reports were the major source of information. However, according to the author's previous research and continued observation, the media in Taiwan only prominently discussed GMO risks principally in August and late October 2000. There were only two anti-GMO movements launched by the Environmental Quality Protection Foundation in 2000. After these, follow-up media discourses were scarce because social movement groups seldom paid attention to the discussions on this issue. The Taiwanese public has long lacked risk information access and knowledge from the media, creating information and knowledge gaps (Chou, 2002).

Next, we further compared GMO risks and benefits. It seemed the public had enhanced recognition of high-tech products such as GMOs. For instance, in 2004, 69.7% of the respondents were concerned about the potential ecological threats, and 68.7% cared about health problems. Rather than identifying the risk threat, over half of the respondents (55.2%) recognized one advantage of GMOs as reduction in pesticide use. Conversely, 27.8% of the respondents still didn't think such benefits justified GMOs.

We asked whether the public trusted the discourse of science experts who stated that GMO products were safe. The survey results showed that 35.6% of the respondents unwaveringly believed GMO products are safe. On the other hand, 52.3% of the respondents did not believe this and were suspicious about scientific controllability.

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[17] The national telephone survey was conducted from 2004 to 2005 by the Center for Survey Research, Academia Sinica. Subjects included citizens over 18 years old. Survey areas included the national territory of the Republic of China. Computer-Assisted Telephone Interviewing (CATI) was utilized for data collection. The sampling method was stratified systematic sampling. Results of the three telephone surveys (March 29 — April 7, 2004, April 18 — June 9, 2005, November 2 — 16, 2005) are as follows: confidence interval 95%; valid samples collected 888, 854 and 924; sampling error ±3.36%, ±3.42% and ±3.29%; completion rate 15.39%, 12.37% and 14.80%; rejection rate 29.87%, 43.00% and 35.59%.

From this data, we see about 67.2% of the respondents did not support the production, research and development of GMOs. Even though GMO products are cheaper in price, 90.8% of the respondents still refused to buy them due to health concerns.

The respondents were questioned about what information they have received from the DOH. The results reveal that 82.7% (2003) of the respondents thought the DOH had failed to inform the public about the compulsory labeling policy of GMOs. Also, 80.6% (2003) of the respondents said that the DOH did not regularly announce related GMO information through the media.

Due to the lack of active risk communication of two-way social learning, nearly two-thirds of the respondents stated that the DOH's GMO decision-making process should be more transparent. In such delayed and hidden risks, structures and social developmental contexts, the public's trust of high-tech products has been decreasing. Trust is the basis of a modern society. These surveys showed 73.2% (2003) and 63.3% (2004) of the public in Taiwan distrusted the DOH's statement that GMOs are completely safe for human health.

More than half (54.3% of 2003 and 51.2% of 2004) of the public did not trust the DOH's ability to manage potential risks of GMOs. Furthermore, up to 74.6% (2003) of the respondents did not believe that manufacturers would follow compulsory labeling regulations.

Formation of knowledge and information gap on technological risks is chronically embedded in a social system that has been dominated by monopolistic technocracy and expert politics. Along with the lack of dissenting voices from the scientific community, lack of supervision by social movement groups and lack of pressure applied to technocrats by those involved in risk politics have caused *laissez-faire* governance and delayed supervision. At the same time, the public is unaware and worried about GMO risks, further increasing distrust in the state's risk governance ability.

Public Awareness of GMO in Korea

GMO risk disputes have attracted much attention in South Korea due to protests and the mobilization of social movement groups. In November 1998, the Korean National Commission for UNESCO nominated Soongsil University to convene a citizen conference regarding GMOs. This conference inaugurated ethical and social risk communication for discussing GMO-related topics such as human health, ecological uncertainty, ethical problems stemming from

humans changing nature and religious acceptance of GMOs (Korean National Commission for UNESCO, 1998). This contrasted with Taiwan's delayed and hidden attitudes toward GMO risks and resulted in different public risk perception and trust in the government and scientists.

Although Korean consumers fully believe in the advantages that biotech will bring, they still doubt the safety of GM foods. Just like other consumer organizations, the South Korean government shows a high level of concern about the safety of GM foods. Based on this, the National Assembly of Korea formulated the Biotechnology Support Act in 1999 to support biotech product development and industrialized production. Also, Korea Food and Drug Administration (KFDA) established a set of safety assessment guidelines for GM foods in order to control the safety of GM foods and related addictives. KFDA mailed a survey questionnaire to respondents from January 18th to the 31st in 1999. 33.1% of 1,400 people completed the questionnaire. Survey results show that 98.7% of the respondents were familiar with GM foods. Male respondents knew more information related to GM foods, particularly those over 40. Respondents working in the food industry possessed the least knowledge on GM foods. Most (90%) of the respondents indicated that biotechnology is necessary for food production, and additionally, agricultural product development should be the priority of biotechnology. 81% of the respondents showed concerns about the potential risks of GM foods, particularly toxicity. Female respondents (92.5%) were more worried about the safety of GM foods than male respondents (77.1%). Only 23.5% of the respondents said they will buy GM foods, no matter what (Kim et al., 1999).

From April 10th to May 9th in 2003, Korean Biosafety Clearing House (KBCH) authorized Gallup Korea to carry out a national face-to-face survey of citizens aged from 20 to 59. 96% of the respondents considered that GM foods should be labeled. And 52% of the respondents had already found GM foods in supermarkets. However, only 24% said they trust biotech companies while 29% said they believe the government to be trustworthy and make decisions that are advantageous to society and provide effective information on the origin of GM foods. However, 72% (83% for environmentalists) of the respondents believe that scientists (environmentalists) are trustworthy, make decisions advantageous to society and provide effective information on the origin of GM foods. 60% of the respondents also believe that the media is trustworthy, makes decisions advantageous to society and provides effective information on the origin of GM foods (Govindasamy et al., 2004).

Transformation from Ignorance to Awareness of Risks: Taiwan Biobank

Big Science of State

The technological policy-making problems related to the establishment of the Taiwan Biobank thus must be considered within the historical context of an autocratic government. Similar to the background on the GMO issues, in light of global technological competition, the Taiwanese government has greatly encouraged biotech and genetic medicine research since 1995 and planned to establish a Taiwanese racial genetic database (Taiwan Biobank) in 2000. Through the model of expert review (Jasanoff, 1990), technocrats relied greatly on mainstream scientific elite networks. Their oligarchic ally excluded external social democratic procedures and highly disputable scientific R&D decision-making, and technological projects were undertaken. In particular, the managers who directed this racial genetic database project were genetic medical scientists from Academia Sinica. At a meeting of Academia Sinica in July 2000, a suggestion was made to follow the example of Iceland in establishing a "racial genetic database" (Yang, 2000).

In March 2001, the president of Academia Sinica launched a meeting to discuss the establishment of the Taiwanese Genetic Database (Zhang, 2001). Based on this concept, in October 2002, Academia Sinica formally established the Taiwan Han Chinese Cell and Genome Bank project, also called the "super control genomic database" (Chen, 2003). This database includes 3,312 data collected by random sampling through the computerized household registration system. With the encouragement of the scientific elite who possess influence over Taiwan's technological policy-making decisions, the establishment of the Taiwan Biobank entered the policy formulating process. In February 2004, Executive Yuan decided to establish the Taiwan Biobank (Xie, 2004; Chao and He, 2004; Zhong, 2004). Then, in the same month, the president of the Institute of Biomedical Sciences proposed conducting a feasibility assessment of the Taiwan Biobank (Chen, 2004). In December 2004, Ministers without Portfolio proposed the Taiwan Biomedtech Island Project, which combined genetic medical and IT developments and aimed to expand Taiwan's future genetic therapy market (Hsieh, 2004). Then, in April 2005, Executive Yuan formally announced investing 15 billion NTD (approximately US$456) to establish the Taiwan Biomedtech Island Project, which included three categories: the National Health Information Foundation (NHIF), the Taiwan Biobank and a clinical research system. Taiwan Biobank aimed to collect 5,000 data in 2005, eventually collecting 200,000 data over time (Wei, 2005;

Commercial Times, 2005). So far, the process has been very coherent and systematic because technocrats and the scientific elite have dominated national scientific and technological R&D policies without public deliberation. In fact, just like the developmental models of IT and the optoelectronic industries, technocrats attempted to copy such distinct developmental experiences.

One crucial problem with this is that the establishment of large-scale racial genetic databases involves social and ethical uncertainties. In particular, the establishment of the Taiwan Biobank involves data linkage to the household registration system and medical databases. Also, researchers in the future may use these databases as subjects of medical or pharmaceutical research. Such schemes have given rise to criticism and challenges from the academic community and civil society.

Awareness of Civil Society and the Academic Circle

Meanwhile, as scientific development is embedded in social contexts (Gibbons, Nowotny and Scott, 2001), the Taiwan Biobank implementation faces the hidden problem of medical culture. Second, medical and personal information divulgence has become more serious in recent years, and this has become a problem in the establishment of large-scale genetic databases. Lastly, along with these problems, the government is intentionally ignoring the data linkage problems (among personal medical and household registration systems), which may generate serious attacks from social movement groups.

From 2000, furthermore, incidents of information divulgence have been occurring in an endless stream, including police selling personal information,telecommunication companies selling customer information (*ETtoday News*, 2004), schools carelessly providing student information to insurance companies and medical record divulgence due to misconduct. Then, incidents of fraud and information theft have broken out time after time, and these have sounded an alarm about personal information protection. Under such social contexts, privacy violation and data management became topics on which the public started to pay attention. In addition to continued coverage by the media, social movement groups also made noise about these issues and criticized these cases. Accordingly, these problems become the basis of the Taiwan Association for Human Rights' long-term scrutiny of large-scale medical and genetic database establishment and personal privacy. Following the government's recent attempts to establish a citizen medical e-database, a citizen fingerprint database and the Taiwan Biobank, the Taiwan Association for Human Rights continuously carried out various kinds of social actions from the

viewpoint of personal information, privacy protection, social discrimination and crime risk in order to connect the voices of gender groups, various indigenous groups, sex workers, gay groups, cultural groups and so on. This mobilization and scrutiny from these groups continued until 2003 (Chou, 2005).

In particular, the establishment of the Taiwan Biobank gained high attention from Taiwan's human rights groups and some scholars under the social background of serious procedural errors during the establishment of the genetic database, authoritative policy-making culture and personal medical information divulgence. In the beginning of 2006, Liu, Ching-yi, Vice President of the Taiwan Association for Human Rights, announced her criticisms in mainstream media. This was the first time the technological policy-making and ethical review problems of the Taiwan Biobank project had been publicly denounced.

Risk Communication of Media

At the same time, the Taiwan Association of Human Rights released a declaration, *Blind the Public by Providing Health Checkups. Genetic Data Stealing?* (Taiwan Association of Human Rights, 2006), and launched a series of mobilizations to connect voices from different social movement groups and indigenous ethnic groups. On the 23rd of January, 2006, one of Taiwan's mainstream newspapers, *the China Times*, issued a news story entitled "Blood Draw Collection of 200,000 Citizens. Biobank Explores Our Privacy" (*China Times*, 2006). This news reported the policy-making and privacy disputes of the Taiwan Biobank project in detail and interviewed related ethical scholars and aboriginal groups. As seen in the issue on development described in Snow's analysis of social mobilization (Snow et al.,1986; Snow and Benford, 1988), a snowball effect started. Aboriginal groups announced their declaration that based on *Taiwan Indigenous Peoples Basic Law*, the groups' consent must be obtained when governments or civil groups carry out genetic research of aborigines (Wu, 2006).

Public Perception: Is Trust Still There?

In April and November 2005, the author conducted two telephone surveys analyzing Taiwanese people's trust and risk perception on large-scale genetic database establishment. The results provided in-depth analysis. 59.4% (59.4%) of the respondents did not believe that medical and research personnel would

keep testing records confidential. 51.2% (46.7%) of the respondents refused to provide 15cc of blood for genetic database establishment. On the contrary, only 45.1% (48.7%) agreed to provide blood. 77.5% of the respondents (this question was not included in the November 2005 survey) worried about information divulgence for commercial purposes. With legal protection against genetic data divulgence, 47.5% (37.9%) of the respondents still refused to provide 15cc of blood; however, 49.4% (58.8%) agreed to. In another question, 85.5% (81.9%) of the respondents still thought there was a possibility that personal genetic data may still be divulged despite legal regulations declaring that genetic data should not be divulged. Under this condition, 66.4% (68.3%) of the respondents refused to provide genetic samples, while those who agreed to provide them decreased to 30.9% (28.8%).

Concerning the results of these two surveys, the establishment of the Taiwan Biobank still needs to strive for social support. Because there were still many respondents who were not confident that medical and research personnel would keep their genetic data confidential, they refused to provide samples. One reason was because medical and ethical violations have occurred more and more frequently in recent years in Taiwan. Meanwhile, issues on personal information divulgence have also been quite serious, as is the case for telephone fraud and the rampant emergence of organized fraud gangs. For all these reasons, as many as 77.5% of the respondents worried about information divulgence for commercial purposes. Despite being under legal protection, 85.5% (81.9%) of the respondents still thought that there was the possibility of divulgence of genetic data. These conditions revealed that as long as information protection mechanisms are not perfectly built, most of the public will remain distrustful and will refuse to provide genetic samples. This phenomenon shows that the Taiwan Biobank establishment will encounter certain challenges. In addition, one question in the survey asked if respondents would agree to provide 15 cc of blood if there were legal regulations to protect personal genetic privacy. It was observed that the rate of respondents who were willing to provide samples increased to 49.4% (58.8%), which could be interpreted that the establishment of the Biobank may be feasible. However, if technocrats and technological R&D personnel do not face the root of these problems or develop official and unilateral institutional discourses, instead choosing to continue manipulating their authoritative scientific policy-making by thinking social and ethical disputes can be resolved, then they are ignoring the importance of these problems.

In terms of the whole policy-making process and current development of the Taiwan Biobank, the hidden and delayed risk governance culture is still

embedded in the technocrat-monopolized system. The public has continued to passively accept disputes resulting from risks despite the fact that the survey revealed a low level of trust and support amongst the public. As we review the complete social contexts under the distinct and hidden local risk governance culture, we find that society is in need of more diversified, open and high-quality deliberation.

Stem Cell Research in Korea and Public Support

It is unknown if there is a similar decision-making model and risk governance culture in South Korea; however, after the scandal of Dr. Hwang, Woo-suk's breach of research ethics and fraudulent report of a scientific breakthrough in stem cell research in November 2005, the rate of those supporting stem cell research in the public sector increased more than before (Cho, 2006). Meanwhile, fuelled by nationalism, there were nearly one hundred Korean women volunteering to donate their eggs to Dr. Hwang's research team, regardless of global criticism (Couzin, Normile and Vogel, 2006).

According to a public opinion survey done by a South Korean scholar Cho (2006) following the outbreak of the Hwang, Woo-suk stem cell research scandal, it was observed that 64.2% of the respondents in July 2005 supported stem cell research for strengthening national competitiveness. And contrary to expectations, the rate of support for stem cell research among the public actually increased to 87% in February 2006 following the scandal, revealing a high level of national competitiveness within South Korean society (Cho, 2006). This phenomenon also revealed that South Korean society still held an optimistic attitude towards genetic engineering. However, it also shows that South Korean society, like Taiwanese society, still lacks the ability for self-reflection and social criticism.

We see similar dilemmas in Taiwan due to risk governance paradigm shifts. What is similar about the situations in these two countries is that they both face the pressure of fierce global technological R&D and economic competition while also having enjoyed the fruits of successful technological and economic development over the past decades. Together, in the new wave of global competition, they all face challenges in terms of risk governance paradigms regarding these new technologies. In analyzing risk issues in Taiwan, whether for disputes on GMO or the Biomedtech Island Project, it is evident that decision-making models on special technological policies within a hidden and delayed high-tech risk society have been formed.

Discussion and Conclusion

From their common experiences of democratization and globalization in the mid-1990s to initial research on the GMO and genetic medicine issues in Taiwan and South Korea, we can see that technocrats still closely control decision-making of technological and industrial policies. In particular, we see that the role of the developmental state never fades in terms of economic and technological fields through analysis of strategic investment, R&D construction and incentives for biotech and bio-medicine. However, both state and society encounter interconnected biotech risks and problems. In addition, there remain other problems such as governance capacity of a state in transformation, a civil society in transformation, and problems of public risk perception and public trust.

With its strong potential for economic development, technocrats applied expert politics based on scientific positivistic evidence regarding cases of GMO risks in Taiwan in early 2000. Technocrats ignored and concealed technological risks involving serious scientific, ethical and social disputes, even delaying risk governance. Due to the long-term authoritative scientific and positivistic risk governance model, scientific uncertainty, and the involvement of complicated knowledge, social movement groups remained ignorant of risks; therefore, they were delayed in mobilizing protests and unable to attract public attention. The phenomenon of structural delay and hidden risks is reflected in public dissatisfaction with state governance and public awareness of GMO risks.

On the other hand, active social movements and media reports prompted the state to be more proactive in risk regulation in South Korea (the South Korean government commenced regulating GMOs, brought in compulsory labeling and convened a citizen conference in 2001). The result of this is the Korean public who is familiar with GMOs and related threats. Despite critical public viewpoints, distrust of state risk governance and the scientific discourse of experts, no delayed and hidden risk culture developed. Therefore, the role of the developmental state can be seen as working at the opposite extremes within these two countries.

As for disputes on genetic medicine, developmental states such as Taiwan and South Korea still show a strong standpoint in terms of involvement in technological and industrial R&D and development. However, unlike the stem cell scandal of Dr. Hwang, Woo-suk in 2005, social movement groups and citizens in Taiwan were aware of the risks associated with the Taiwan Biobank. They strongly criticized the government's technological policy and forced

technocrats to change their governance model.

In comparing these two cases, we see that the government, civil society and the public are currently undergoing transformation in newly industrializing countries. Proponents of "bringing the state back in" seek to reinstate the government's ability for governance and solving problems related to social injustice caused by globalization (Jessop, 2002). This research shows that the state's role thus becomes contradictory when governing trans-boundary risks if the state is still blinded by a narrow and positivistic regulatory science which prioritizes economic and industrial development.

On the other hand, transformation of a civil society's ability to criticize and reflect in newly industrializing countries also has its special and historical limitations. Like other nations, newly industrializing countries shoulder risk threats and pressure over technological competition when facing fierce global technological competition. However, in the short and accelerated process of industrial development, it becomes more difficult to raise stable and continuous criticism from society due to different interests in different risk issues. In other words, these historical and structural factors cause society to form a delayed and hidden risk culture in response to technological risks, which accordingly lacks power to supervise and criticize the government's lax risk regulations.

With regards to the ideal cosmopolitan type of governance strategy (Beck and Sznaider, 2006), difficulties and transformation of states and societies stem from different historical contexts. The case studies of these two East Asian newly industrializing countries show that the economic-oriented developmental state model needs be adjusted. We also need to reconsider the role of the state, the regulatory culture of technocrats, and the risk governance capacity of the state. However, such reflection may apply differently to different countries. Similarly, cosmopolitan risk governance should be based on the involvement of civil society and connection to different social and historical contexts in order to stimulate transformation.

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