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Conflicts of Technology Policy and Governance Paradigm in a Knowledge-Based Economy: A Case Analysis of the Construction of the Taiwan Biobank

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This article discusses the technology policymaking problems associated with the establishment of the Taiwan Biobank. Taiwan, as a late-coming, technology-learning country, is characterized by a hidden and delayed risk culture. In particular, by comparing biotech and industrial policies and GMO (genetically modified organism) risk governance, we can analyze the confrontation involving the state, science experts, and society, which is the result of the authoritarian regime and expert politics that have existed in Taiwan since the Cold War era. We find that none of these factors is conducive to social trust and social support, which are essential for the establishment of a genetic database. This article argues that, in different social and historical contexts, such hidden and delayed

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risk cultures may have formed in different countries that value technological R&D competition.

KEYWORDS: genetic database; Taiwan Biobank; technocracy; authoritarian tech-policy decision-making; risk governance; delayed hidden risk culture.

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Problem Identification

Since the 1990s, breakthroughs in medicine, medical treatment, and agricultural research brought about by genetic engineering have resulted in fierce global competition among technological interests. These breakthroughs have also had ecological, social, and ethical impacts, as well as giving rise to disputes about scientific safety. Also, while disputes concerning the impacts of genetically modified organisms (GMOs) are still raging, a new wave of issues concerning "big science" has arisen, including the cloning of human embryos, stem cell research, and the creation of large-scale genetic databases.[1] It seems that the impact of these disputes is no longer limited to a single region, and cannot be explained and resolved with only a single set of disciplines and values.[2] Therefore, it is essential to assess the risk governance of these new and uncertain technologies.

This article discusses the particular political and social context in which Taiwan, as a late-coming, technology-learning country, has carried out biotech policymaking and risk governance. By briefly examining the risk governance process of biotech-agriculture (GMOs), the author attempts to highlight the dilemmas that the Taiwan government has encountered while establishing its national genetic database, the Taiwan Biobank (**台灣生物資料庫**). In particular, this article points out the prob-

[1]Gary Edmond and David Mercer, "Trashing 'Junk Science'," *Stanford Technology Law Review* 3 (1998): 1-31.

[2]Jerome R. Ravetz, "What is Post-Normal Science?" *Futures* 31, no. 7 (September 1999): 647-53.

lems in terms of the authoritarian structure of technology policy and risk governance culture. Technology policymaking in Taiwan has long been a monopoly of technocrats and science experts. However, such a governance structure loses its legitimacy in the face of the challenges of globalization, resulting in a delayed and hidden risk culture. This article looks at problems of public trust and risk communication under such a special risk culture. In particular, the author focuses on disputes surrounding the Taiwan Biobank and the tension regarding risk governance between state and society.

Analytical Structure

Technology Policymaking and a New Paradigm of Risk Governance

In the era of knowledge-based economies, competition in technological research and development (R&D) and innovation are the most crucial strategies for countries attempting to compete in the global economy. All countries are drafting technology policies of various kinds to deal with the contemporary technology-oriented economic model. In addition to encouraging R&D and innovation, technology policy needs to take the market into consideration. Hence, "national innovation systems" and "national competitiveness superiority," emphasized by traditional innovation theories, are closely connected with scientific R&D, technological breakthroughs, and economic innovation. Moreover, through market orientation, technological products can be distributed throughout the world market to demonstrate their commercial superiority. Genetic medicine, genetic agriculture, and genetic pharmaceuticals (all derivatives of genetic engineering) emerged in the mid-1990s as part of the knowledge-based economy. Countries throughout the world are competing for a piece of the pie. At the same time, such a linear technological innovation ideology is controlled through technology policies formulated by expert politics. Through the cooperation of technocrats and science experts, it thus becomes possible to create niches for national competitiveness.

However, linear innovation ideology, expert politics, and authoritarian technology policymaking face great challenges.[3] The technology policymaking and risk governance models of the past are too simple, and they underestimate problems stemming from national competition strategies which over-value science, technology, and innovation. Sensitive health, ecological, ethical, and social factors are involved in the biotechnology development process, and the diversified development of the knowledge-based society, including public perception, acceptance, and trust where technological risks are concerned, and the transnational production and distribution of biotech products, all make these problems even more complicated.[4] It is from within the intertwined relationships of science, the economy, and society that blurred and highly uncertain value conflicts have emerged. Consequently, we have entered the paradigm of a world risk society and post-normal science.[5] Also, as risk threats in the modern age have far exceeded traditional regulatory and value judgment boundaries, the authoritarian and science-oriented technocracy has found itself unable to cope with highly complicated and diversified technological problems. For this reason, a new set of technology policymaking models—what may be described as a new risk governance paradigm—that includes public deliberation and democratic procedures needs to be developed.[6]

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[3]Maria Eduarda Gonçalves, "Risk and the Governance of Innovation in Europe: An Introduction," *Technological Forecasting & Social Change* 73 (January 2006): 1-12; and Gerard Delanty, "Biopolitics in the Risk Society: The Possibility of a Global Ethic of Societal Responsibility," in *Nature, Risk, and Responsibility*, ed. Patrick O'Mahony (New York: Routledge, 1999), 37-51.

[4]Michael Gibbons, "Competitiveness, Collaboration, and Globalization," in *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*, by Michael Gibbons et al. (London: Sage, 1994), 111-36.

[5]Ulrich Beck, *World Risk Society* (Cambridge: Polity, 1999); and Jerome R. Ravetz and Silvio O. Funtowicz, "Three Types of Risk Assessment and the Emergence of Post-Normal Science," in *Social Theories of Risk*, ed. Sheldon Krimsky and Dominic Golding (Westport, Conn.: Praeger, 1992), 251-74.

[6]Frank Fisher, "Technocracy and Expertise: The Basic Political Questions," in *Technocracy and the Politics of Expertise*, ed. Frank Fisher (Newbury Park, Calif.: Sage, 1990), 13-39, 179-97; Sheila Jasanoff, *The Fifth Branch: Science Advisers as Policymakers* (Cambridge, Mass.: Harvard University Press, 1990); and Herbert Gottweis, "What is Poststructuralist

The European Union's (EU) "Science and Society Action Plan"[7] affirms the operational principle of risk governance. Since risk events involve scientific uncertainty, risk assessment and risk governance are categorized as strategies for developing independent and transparent risk assessment as a scientific foundation for identifying risks. Also, risk communication and public participation should be valued as guidelines of risk governance. Risk communication refers to the open, two-way, and interactive dialogue between the public and the government when handling risk events, which also takes into account risk perception and risk acceptance. This process makes technology policy more legitimate and fosters greater public trust. There are four democratic principles underlying risk governance and risk communication. The first is accountability—the government and scientists should attach great value to social responsibility when undertaking scientific policymaking. The second is accessibility—the public should be able to gain information and participate in the technology policymaking process. The third is transparency—the policymaking process should be transparent and open to safeguard stakeholders' right to know. The fourth and final principle is participation—technology policymaking should enlist the participation of the public and social groups. Through social learning and interaction, the foundation of policymaking can be made more diversified and legitimate.[8]

The new risk governance should take into account the ethical and social values and perceptions of various professions, as well as allowing democratic deliberation. From the perspective of the risk society, disputes over policymaking and the governance process of these critical and reflexive sciences are very important.[9] Thus, while those within the scientific

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Science and Technology Policy Analysis?" in *Governing Molecules: The Discursive Politics of Genetic Engineering in Europe and the United States*, by Herbert Gottweis (London: MIT Press, 1998), 11-38.

[7]European Commission, "Science and Society Action Plan" (2002), http://europa.eu.int/comm/research/science-society/pdf/ss_ap_en.pdf.

[8]Ibid.

[9]Robert Hoppe, "Policy Analysis, Science, and Politics: From 'Speaking Truth to Power' to 'Making Sense Together'," *Science and Public Policy* 26, no. 3 (June 1999): 201-10.

community can encourage constructive criticism and reflection in order to promote openness and advancement, society at large can become more autonomous, raising criticisms and doubts about sensitive scientific procedures, thereby increasing the legitimacy of technology R&D policies through public discourse. Yet, in reality, society is trapped in a traditional technocrat-dominated policymaking process, and the relationship between science and society is characterized by tension and distrust.

However, in the development and risk governance of genetic engineering, problems have become even more serious. In recent years, challenges to state biotech development have included health and ecological threats as a result of GMO development, and privacy and working rights violations due to large-scale collection of samples of genetic material. While engaging in technological R&D innovation and competition, governments have encountered legitimacy and trust problems regarding these policies. There is a need for the public to be involved in the policymaking process where highly sensitive and controversial risks are concerned. Public risk perception and social acceptance should be valued. Governments need to adopt a new risk governance paradigm.[10]

Character of Risk Governance and Culture in Newly Industrializing Countries

Given this new global trend of risk governance, we need to consider what kinds of changes, confrontations, and meanings will arise when newly industrializing societies, particularly those still under the shadow of authoritarian rule, face these sensitive and controversial technological risks. Also of interest is what kinds of challenges these societies will encounter

[10]The Universal Declaration of the Human Genome and Human Rights, issued by UNESCO (1997), implies that there are ethical worries relating to genetic information and sample collection. Such worries are also evident in UNESCO's proposed International Declaration on Human Genetic Data (2003). This document deals with sensitive notions such as privacy, confidentiality, access, discrimination, and protection of the collection, handling, usage, and storage of human genetic information. In addition, UNESCO highlights the need for public education, consultation, and risk communication. Therefore, R&D and the development of genetic engineering need to conform to the kind of technology policymaking and risk governance which values democratic procedure and social participation. For detail see http://unesdoc.unesco.org/images/0013/001331/133171e.pdf#page=45.

in the context of an authoritarian system of expert politics and traditional top-down and expert-directed technology policymaking. What will be the impact of internal supervision by the scientific community and criticism and reflection from society at large? And what kinds of dissatisfaction will arise concerning existing policymaking to cause a risk governance paradigm shift?

Newly industrializing countries (NICs) have for the most part adopted similar technological and industrial policies. In order to develop more advanced technologies, the state undertakes forward-looking technological R&D and adopts strategic methods (such as tax breaks and fund-raising) to encourage the development of priority industries and to enhance the national technological level through transitional cooperation. The semiconductor industries in Taiwan and South Korea are good examples of this. Through learning and innovation, these two countries have already established prominent positions in the global market, and the technocrats and scientific elites who acted as major players in developmental governments have succeeded in instructing and dominating the direction of technological policy development.[11]

Yet, at the end of the 1990s, authoritarian and relatively autonomous expert politics encountered serious challenges in terms of governance transformation. The promotion of newly-developed biotech-agriculture and genetic medicine faced increasingly complex technological, ecological, health, ethical, social, and safety uncertainties and was the source of considerable technological risks and political conflicts. Under the earlier authoritarian expert governance model, governments experienced great challenges and high levels of social distrust, and this generated governance conflicts. According to Chou, Taiwan had long been accustomed to a technocratic and scientific elite dominating technology policymaking and risk regulation.[12] An ideology that combines scientific expertise and economic

[11]Linda Weiss, *The Myth of the Powerless State: Governing the Economy in the Global Era* (Cambridge: Polity).

[12]See the following works by Chou Kuei-Tien: "Zaidihua fengxian zhi shijian yu lilun quekou: chizhixing gaokeji fengxian shehui" (The gap between theory and practice in

development often results in risks being underestimated or ignored. Thus, when facing contestable risk events, the government tends to conceal and delay risk governance. In addition to crises of trust in the state's governance capability, regulatory deficiency also incites panic among the public. The system-wide gap between technology policy and society fosters a hidden and delayed risk culture.

This particular governance structure results in a tense and confrontational relationship between government and society in the face of disputable technological events. In the government, scientific elites continue to practice authoritarian expert politics, while society challenges the traditional governance model and requests a transparent, participative, and diversified communication paradigm.

Analytical Framework

Using the development model of the microchip industry as an example, this article presents the hypothesis that scientific elites face similar developmental logic in promoting new genetic technology. The initiation of three national genetic technology projects in Taiwan in 2000 is evidence that the Taiwan government still retains a dominant role in the development of new technologies. However, as both the promoter of new technologies and the regulator of disputable risk, the government faces difficult choices in trying to balance ethical concerns and technological development.

By studying the formulation of policy related to the establishment of the Taiwan Biobank, the author analyzes risk assessment problems associated with technology policymaking and discusses the problems created by

glocalizational risk: delayed high-tech risk society), *Taiwan shehui yanjiu jikan* (Taiwan: A Radical Quarterly in Social Studies), no. 45 (March 2002): 89-129; "Dudade kexue lixing yu yinmoude shehui lixing zhi duihua: zaidi gongzhong, kexue zhuanjia yu guojia de fengxian wenhua tantao" (Dialogue between monopolistic scientific rationality and tacit (submerged) social rationality: a discussion of risk culture among local public, scientists, and the state), ibid., no. 56 (December 2004): 1-63; and "Biomedtech Island Project and Risk Governance: Paradigm Conflicts within a Hidden and Delayed High-tech Risk Society," *Soziale Welt*, 2007, no. 2:123-46.

the domination of policymaking by expert politics. As genetic databases provoke sensitive legal, ethical, and social disputes, the author will interpret risk assessment criticism from within the scientific community, as well as discussing whether the closed nature of policymaking allows it to respond sufficiently to criticism from that community. The professional complexity of the Taiwan Biobank and the limited nature of the criticism and supervision it is subject to from external social movements are emphasized in the analysis. The article will also discuss how different groups were recruited to the social movement against the Biobank and how they developed media discourses to uncover the risks involved in its development. This article also throws light on the important background issue of information divulgence, which is a focus of the criticism raised by the social movement. The author also investigates what influence open supervision by the social movement will have on the ongoing Taiwan Biobank project. Overall, these analyses reveal the ambivalent attitude of the Taiwanese scientific elite toward challenges from society at large. Finally, drawing on two academic surveys, the author discusses the problem of public trust in the context of the establishment of a large-scale genetic database, and points out that relevant technology policies need to be more cautiously formulated and governed to enhance social acceptance. A regulatory culture which ignores and delays risks discourages public support for the establishment of the genetic database and the state's governance capability.

Biotech Policy and Risk Governance in Taiwan

Biotech Policy of a Delayed and Hidden High-tech Risk Society

Within the framework of Cold War politics and the division of labor, technocrats have monopolized national industrial and technological policymaking in Taiwan since the 1970s.[13] This kind of top-down policy-

[13]Peter B. Evans, *Embedded Autonomy: States and Industrial Transformation* (Princeton, N.J.: Princeton University Press, 1995).

making model still functioned effectively up until the 1990s. In the middle of that decade, the growing maturity of global economic competition and the development of biotech products encouraged the Taiwan government to increase its investments in biotechnology. Technocrats attempted to emulate the model successfully employed in the information technology industry; that is, using industrial development as a major motive.

In April 1997, the Science and Technology Advisory Group (STAG) of the Executive Yuan (**行政院科技顧問組**) held its first Strategic Review Board (SRB) meeting on biotech industry policy, with the aim of promoting national projects in genetic medicine and public health technology. In 1998, a second SRB meeting was held which modified the "Biotechnology Industry Promotion Program" (**加強生物技術產業推動方案**), and proposed that the successful experiences of the semiconductor industry be used in the biotech industry. The state was thus actively involved in the promotion of genetic medicine, the genetic modification of animals and plants, and the development of genetic pharmaceuticals. In addition, aspects of R&D, including technology innovation, strategic alliances, and industry-academy cooperation, were promoted through special technological projects run by the Ministry of Economic Affairs. These projects also helped to establish companies to nurture enterprise. Moreover, as a result of the second SRB meeting, the National Development Fund (administered by the Executive Yuan) invested NT$20 billion (approximately US$600 million) to support the development of the biotech industry in Taiwan, under the "Five-Year Project of Biotech Industry Investment" (1998-2002).

In 1995, drawing on the successful experience of the Hsinchu (**新竹**) Science Park's role in the development of the semiconductor industry, the National Science Council had announced the planned establishment of an Agricultural Biotechnology Park (located at the Southern Taiwan Science Park). This was followed in 1999 by the Biomedicine District (in Luchu Science Park **路竹科學園區**) in 1999, and the northern, central, and southern "biotech hallways" in 2001. Three major pioneering technology projects were launched in 1997, including the National Genetic

Medicine Project, the National Agricultural Biotech Project, and the National Pharmacy & Biotech Project. These projects were all based on R&D and technology transfer. In addition, in March 1998, the Ministry of Economic Affairs adopted a policy of state-owned enterprises investing in the biotech industry. The government actively encouraged the participation of privately owned businesses as well.

Such development models and technology industry projects were formulated and implemented by technocrats. As it did in the case of the microchip industry in Taiwan, the government has acted as an instructor to promote innovations in the genetic technology industry (see table 1). In addition to actively formulating national R&D projects and establishing science parks to lead the development of biotechnology and medical technology, the government has also made use of all kinds of strategies to encourage investment, recruitment, and international technical cooperation. Whether it is for the microchip 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, by a strategy of learning from industries in more advanced countries and original equipment manufacturing (OEM), the government has further encouraged innovation and development in the domestic industry. These are the major strategies of developmental governments, among which farsighted and authoritarian expert politics play a major role in promoting technological development.

Although such development-oriented policymaking remains the core of developmental government, due to the essential difference between the biotech medical industry and the microchip industry, the Taiwan government has encountered great challenges in promoting the former. In particular, since genetic engineering involves sensitive health, ecological, ethical, and social risks, a top-down, centralized, and authoritarian technocracy is suspect in terms of policymaking legitimacy. This leads to problems of social acceptance and public trust. The promotion of new technologies requires novel risk governance approaches. Yet, for a long time, the Taiwan government, accustomed as it was to authoritarian expert politics and control by technocrats and scientific elites, seemed unable to face up to this paradigm shift.

Table 1
Comparison of the Microchip Industry and Genetic Technology Industry in Taiwan

	R&D agent	Derived companies	Publicly-owned businesses encouraged to invest	Overseas elites	Foreign investment & strategic alliance	Science park	Technology projects
Microchip industry	Industrial Technology Research Institute	Institute for Information Industry, SoC Solution Foundry, Taiwan Semiconductor Manufacutring Company, Taiwan Mask Corporation, and Vanguard International Semiconductor Corporation		Recruiting	To bring in microchip technology from U.S. Radio Company of America (RCA)	Hsinchu Science Park	Technology projects budgets
Genetics & pharmaceuticals industry	National Health Research Institute, Development Center for Biotechnology, National Technological Projects for Genetic Medicine & Pharmacy (National Science Council) (not verified)			Recruiting		Northern Hsinchu Biomedicine Science Park	National Development Fund (Executive Yuan)
Biotech & pharmaceuticals	National Health Research Institute, Development Center for Biotechnology, National Technological Project on Pharmacy & Biotech (National Science Council) (can be applied by various research agents)	ScinoPharm Taiwan Ltd., United Biomedical, Inc. Asia, Formosa Biotech & Pharmacy Company, Medigen Biotechnology Corp., Harmony Biotech Corporation, and Gsharp Corporation	Taiwan Sugar Corporation, TAIYEN, Taiwan Fertilizer Co., Ltd., CPC Corporation, China Steel, and Taiwan Tobacco & Liquor Corporation	Recruiting	Foreign investment from Canadian Company – MDS Capital	Southern Hsinchu Science Park and Southern Taiwan Science Park	
Agricultural biotechnology	Development Center for Biotechnology, National Technological Project for Agricultural Biotechnology (National Science Council) (can be applied by various research agents)	Taiwan Flower Biotechnology Company, Ltd.	Taiwan Sugar Corporation, TAIYEN, Taiwan Fertilizer Co., Ltd., CPC Corporation, China Steel, and Taiwan Tobacco & Liquor Corporation	Recruiting		Southern Hsinchu Science Park and Southern Taiwan Science Park	National Development Fund (Executive Yuan)

At the end of the 1990s, the anti-GMO movement gathered momentum globally. However, Taiwan, which imports large quantities of genetically modified soybeans and corn, was not involved in that debate. The Taiwan government was itself learning and strongly promoting biotech-agriculture, and for this reason it intentionally ignored the health, ecological, and ethical implications of these technologies. According to Chou, mainstream and authoritarian positivism formed the main foundation of the risk assessment and policymaking applied by Taiwan's technocrats and scientific elites.[14] They underestimated the uncertainty surrounding the safety of GMOs and delayed risk governance. They concealed the existence of risk and delayed the introduction of GMO labeling regulation. The effect of a governance mode which favored technological R&D was a delayed and hidden risk governance culture.

In a society experiencing rapid industrialization, people become trapped in the anxiety and fear of the unknown because authoritarian experts manipulate public lack of awareness of risk and the public's inability to criticize technological risks. Chou reveals that in a hidden risk culture, the public's lack of awareness of scientific disputes directly influences public trust in the state's technocrats and scientific experts. Due to a lack of transparent, open, and participative GMO policymaking and risk governance, the public were highly anxious and requested more risk communication.[15] That is, the tension between state and society demonstrates public dissatisfaction with risk regulation.

Technocracy-Dominated Policymaking for the Taiwan Biobank

The establishment of the Taiwan Biobank presents similar problems to GMOs with regard to technology policymaking and risk governance. Since 1995, as global technological competition has grown more intense,

[14]See Chou, "Zaidihua fengxian zhi shijian yu lilun quekou"; and Chou, "Dudade kexue lixing yu yinmoude shehui lixing zhi duihua."

[15]Chou Kuei-Tien, "How is Risk Governance Possible in a Double Risk Society?" (Paper presented at the 14th SRA Europe Annual Meeting 2005: Major Risks Challenging Publics, Scientists, and Governments, Como, Italy, September 12, 2005).

the Taiwan government has greatly encouraged biotech and genetic medicine research, and in 2000 it planned, in conjunction with Academia Sinica (**中央研究院**), to establish a Taiwanese racial genetic database (the Taiwan Biobank). Through a peer review model, the technocrats relied heavily on mainstream science elite networks.[16] However, they excluded external democratic procedures and made some highly controversial scientific R&D decisions.

At a meeting of scholars from Academia Sinica in July 2000, a suggestion was made to follow the example of Iceland in establishing a "racial genetic database."[17] In March 2001, the president of Academia Sinica held a meeting to discuss the establishment of the Taiwanese Genetic Database.[18] Following this, in October 2002, Academia Sinica formally established the Taiwan Han Chinese Cell and Genome Bank project, also called the "super control genomic database."[19] This database contains 3,312 items of data, collected by random sampling through the computerized household registration system. With the encouragement of scientific elites, who exert a strong influence over Taiwan's technology policymaking decisions, the establishment of the Taiwan Biobank entered the policy formulation process. The decision to establish the Biobank was made by the Executive Yuan in February 2004.[20] Later that month, the president of the Institute of Biomedical Sciences of Academia Sinica proposed conducting a feasibility study for the project. In December of that year, the ministers without portfolio proposed the Taiwan Biomedtech Island Project, which combined genetic medicine and information industry (IT) developments and was aimed at expanding Taiwan's future gene therapy market. Then in April 2005, the Executive Yuan formally announced that NT$15 billion (ap-

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[16]Jasanoff, *The Fifth Branch*, 61-79.

[17]"Academician Meeting Passed Genetic Database Establishment," *Lianhe wanbao* (**聯合晚報**, United Evening New) (Taipei), July 4, 2000.

[18]"Preparing for Racial Genetic Database Establishment, Experts Consultation," *Zhongguo shibao* (**中國時報**, China Times) (Taipei), March 5, 2001.

[19]Chen Yuan-chong (**陳垣崇**), "Super Task, Disease Genetic Decoding Project, Everyone Together," ibid., July 27, 2003.

[20]"Tsai Ching-yan [**蔡清彥**]: Executive Yuan Promotes Taiwan Biobank," *Gongshang shibao* (**工商時報**, Commercial Times) (Taipei), February 25, 2004.

proximately US$56 million) would be invested in the Taiwan Biomedtech Island Project, which was to encompass a National Health Information Infrastructure (NHII), the Taiwan Biobank, and a clinical research system. The target was to collect 5,000 items of data for the Biobank in 2005, and a total of 200,000 items over time. So far, the process has been conducted in a very coherent and systematic way, because state scientific and technological R&D policies have been dominated by technocrats and scientific elites and no public deliberation has taken place. In fact, the technocrats have attempted to copy the distinctive developmental experiences of the IT and optoelectronics industries.

One crucial problem is that the establishment of a large-scale racial genetic database has social and ethical implications. In particular, the Taiwan Biobank involves privacy issues, such as informed consent, and also links information on the register of households with medical databases for subject tracking, thus drawing criticism and provoking challenges from the academic community and society at large.

In their capacity as the guides of Taiwan's national technology policy, Academia Sinica and the technocrat-based policymaking network did not give sufficient importance to the legal, social, and ethical risks that the policy would involve. The Taiwan Biobank project attempted to link the local household registration system and health insurance data, but it seems that there had been no prior discussion of a governance mechanism that could respond to possible risks. Beck indicates that such a policymaking model, which ignores risks, will lead to "organizational irresponsibility," resulting in laxity in managing risks.[21]

The Executive Yuan was aware of the disputes that the creation of a large-scale genetic database might encounter, and former and current government officials all stressed the importance of undertaking research into the ethical, legal, and social implications (ELSI) of the project.[22] How-

[21]Ulrich Beck, *Gegengifte - Die Organisierte Unverantwortlichkeit* (Antitoxin: organizational irresponsibility) (Frankfurt am Main: Suhrkamp, 1988), 20-25.

[22]In 2003, a minister without portofolio, Tsai Ching-yen, proposed the idea of ethical, legal, and social implication (ELSI) risk assessment for the Taiwan Biobank project.

ever, the entire policymaking and execution process was lacking in transparency, making it impossible to carry out such crucial elements as ethical and social risk governance. "Black box" policymaking gradually gave rise to disputes and concerns. Technocrats and scientific elites attempted to muddle through the project guidelines by applying the competition logic of technological R&D. At the same time, no public deliberation or consultation was carried out throughout the entire decision-making process for the Biobank (which concluded in 2005). Despite this lack of consultation, the government was keen to conduct a "pilot study."[23] The government planned to start its collection of genetic samples after Chinese New Year 2006. However, after attacks from human rights groups, this plan was quickly halted. It seemed that the government was returning to the developmental logic of "valuing technological R&D but ignoring risks." In the face of the worldwide growth of genetic R&D, the Taiwan government was engaged in a hasty attempt to take the lead in Han Chinese genetic knowledge through the creation of the Taiwan Biobank. This way of doing things diverged from the principle that the establishment of a large-scale genetic database requires a high degree of social consensus and public trust.

Reflexive Science and Social Scrutiny

From the above analysis, it can be seen that technology policymaking and implementation in Taiwan carry the marks of a strong authoritarian developmental state. First, scientific elites lay down the long-term direction for technological projects. Then, technocrats issue top-down instructions. Essentially, the development of technology policy and the discourses around it are dominated by the counseling networks of the Science and

[23]In 2005, Tsai Ching-yen's successor, Lin Fong-chin (**林逢慶**), said: "Since the Taiwan Biobank project involves ethical and social disputes on technology, more social concerns are raised. Based on the current Medical Treatment Law, the Personal Information Protection Law is going through its third reading in the Legislative Yuan. It scheduled to collect 5,000 genetic samples this year. After two years, regulations on genetic information protection will be formulated and this will hasten sample collection to 200,000 people." See "Investing 15 Trillions in Five Years," *Gongshang shibao*, April 25, 2005.

Technology Advisory Group of the Executive Yuan. However, where the Taiwan Biobank is concerned, not only did authoritarian expert politics fail to show concern for risks, but the scientific rationality-centered ideology also created problems of risk governance and trust. This metempirical scientific rationality was criticized not only in academic circles for its lack of legitimacy in terms of policymaking models and procedures, but also by social groups (particularly human rights and aboriginal groups). That is, internal academic circles and external social groups joined together to create the two dimensions of "scientific reflexivity,"[24] which highlighted the problem of the risk society in the era of the knowledge-based economy.

Internal Scientific Reflexivity:
Critics of the Black Box

From its earliest conception, the Taiwan Biobank project, due to its top-down policymaking model and lack of transparency in risk communication, suffered from a closed system of risk governance. Even though the implementing agency, the Institute of Biomedical Sciences of Academia Sinica, announced recently that it intends to follow the example of openness of the UK Biobank, a transparent and open information mechanism has yet to be established. No governance access has been granted to legal scholars, ethicists, or social scientists, giving them no opportunity to raise criticisms apart from at academic gatherings. Thus unlike the policymakers, professional but critical scholars have no channels through which they can air their criticisms. The fact that these scholars have been given few opportunities to communicate directly with policymakers only serves to perpetuate disputes. In fact, the method of undertaking supervision through academic criticism of the scientific elites for hiding and delaying ethical and social risks has become a feature of Taiwan's technology policy governance.

What is interesting is whether the level of influence this kind of academic supervision exerts on policy assessment depends on the relation-

[24]Ulrich Beck, *Risikogesellschaft: Auf dem Weg in einen andere Moderne* (Risk society: toward a new modernity) (Frankfurt am Main: Suhrkamp, 1986), 254-60.

ship between academic resource distribution and power, or on the linking and mobilization of internal supervisors and external resources. With regard to the authoritarian style of technology policymaking that is characteristic of the developmental state, this strategic mobilization is key to the influence this kind of supervision can exert. Given an abundance of academic resources and highly-esteemed scholars, a limited amount of internal supervision can be effective. Conversely, when academic resources are scarce and there is an unequal power relationship, supervisors become unwilling to voice criticisms, because their opinions are not valued.[25] As long as academic criticism is respected by external society (such as the media and social groups) and there is discourse mobilization, the legitimacy of the authoritarian and closed system of technology policymaking will be challenged, thus influencing policy assessment. Otherwise, internal academic criticism may be ignored or be instrumentally concealed.

The internal scientific reflexivity created during the establishment of the Taiwan Biobank can be categorized as the latter. This is because the internal academic risk supervisors and the scientific elites of genetic engineering belong to two different disciplines. There is disparity in terms of academic resource distribution and power, and scientific elites can exert little pressure on academic supervisors. Thus, academics have been able to voice their criticisms. However, due to the scientific complexity of the project, from the outset there has been little academic criticism, and what there was has not been highly valued. The effect of this is that, at this stage, academic supervision has had little influence on policy assessment and is ignored by mainstream technology policymakers.

Regarding the "pilot study" (the super control genomic database) for the Taiwan Biobank conducted in 2003, the following points came under

[25]Regarding research on expert disputes over GMOs, Chou indicates that due to the narrow and closed academic network, many scholars have been under pressure to propose criticisms. They have failed to confront mainstream viewpoints. Meanwhile, due to unequal academic power, many young scholars prefer to keep silent rather than propose criticisms, as they believe their criticisms will gain no respect. This is one of the causes of Taiwan's delayed and hidden risk governance culture. See Chou, "Dudade kexue lixing yu yinmoude shehui lixing zhi duihua."

fierce criticism from medical ethicists: confidentiality of sample collection and genetic data, control of access to the data, and privacy. One medical ethicist raised the following criticism:

> On April 29, 2002, the UK announced the launch of the world's biggest genetic database—the UK Biobank. It aimed to collect 500,000 samples from voluntary donors aged from 45 to 69. However, since many issues were disputed, particularly concerning confidential genomes and how pharmaceutical manufacturers would obtain information, the project has not been launched.... After observing the process of the "super control genomic database" established by Academia Sinica, it is noted that it ensures that research personnel will know only the serial numbers of donors, not their names and addresses. Such a scheme was seen to protect personal privacy. However, it was still too careless.[26]

With respect to concerns about privacy, confidentiality, discrimination, and informed consent, there must be a transparent system of public participation. However, the system of consultation based on the science elite network mentioned above does not seem to have the characteristics highlighted by UNESCO in 2003—that is, broad social participation, including experts from various disciplines, social groups, and citizen representatives. These characteristics would ensure that the views of different professional groups in different contexts can be discussed. Due to this deficiency, the establishment of the Taiwan Biobank has been seriously criticized as a "black box" operation:

> The genetic research team was aware of the problem of bio-genetic information protection. In November, the Ministry of Justice held an expert meeting. In mid-December, they sent the draft to the Executive Yuan for review. However, the lawmaking process seemed to be "black box" operation to the public. The principles of transparency and openness were not followed. No discussion or debates with grass-roots groups were held. Thus, even for future regulations, it is still doubtful whether subjects are informed and genetic information is kept confidential and managed correctly.[27]

From the time that the Taiwan Biobank was instigated in 2004, there was increasing criticism of the ethics of this pioneer genetic project and

[26]See note 19 above.
[27]Ibid.

this revealed the weakness of the supervision. Since then, academic criticism has gained the respect of social groups, and their influence on policymaking assessment has gradually increased.

First, regarding the whole process of technology policymaking, the scientific experts and technocrats who dominated policymaking seem to have been over-optimistic and to have misunderstood the experiences of foreign countries. Lacking a well-organized policymaking process, the scientific elites seemed to favor a development-first policy. They held no in-depth discussions on the activities of deCODE genetics, Inc., in Iceland, before formulating the policy. Medical law scholar Liu Hung-en (**劉宏恩**) criticized misunderstandings in the policymaking process:

> Early in July 2000, members of Academia Sinica held meetings and passed the proposal of the Institute of Biomedical Sciences. They discussed establishing a racial genetic database in Taiwan. One academician openly argued that Taiwan should refer to Icelandic experiences in establishing a civil genetic database. The Icelandic experience is adaptable to Taiwan. His proposal gained the acceptance of others. In March 2001, Lee Yuan-tseh (**李遠哲**), president of Academia Sinica, invited local and international genetic research experts to a meeting to discuss the practicability of a Taiwanese racial genetic database. The Icelandic experience was mentioned again.... The president of Academia Sinica and the director of the Institute of Biomedical Sciences indicated: "Iceland held a referendum and legislated for the collection of citizens' genetic information."... However, further research reveals that the statements of these two prestigious scholars do not coincide with the truth. First, Iceland never held a referendum regarding the establishment of a genetic database. Second, what the Icelandic parliament made laws to regulate was not a "genetic database." Therefore it is not true—that the state legislated to collect citizens' genetic samples.[28]

Liu's arguments attracted the attention of human rights groups and elicited a series of opinions from academics, indicating that supervision

[28]To allow deCODE genetics, Inc., to establish an Icelandic citizens' "medical record database," the Icelandic parliament passed a bill on health sector databases in 1998, which evoked great controversy and worldwide criticism. However, some clauses of this bill were declared unconstitutional by the Icelandic Supreme Court on November 27, 2003. Even though the Icelandic parliament passed the Act on Biobanks on May 13, 2000, it is not a law addressing large-scale genetic databases, nor do its contents authorize any single organization to establish a centralized genetic database. See Liu Hung-en, "Bingdao sheli quanmin yiliao ji jiyin ziliaoku zhi falu zhengce pingxi" (Legislative policy criticisms and analyses of Icelandic civil medical and genetic database establishment), *Taipei daxue faxue luncong* (Taipei University Law Review) (Taipei), no. 54 (June 2004): 47.

was no longer weak. Once voices from the academic community were heard in society at large, they began to have a substantial influence on policy. Thereafter, criticism focused on problems of informed consent, human rights protection, transparency, and democratic participation.

With respect to the sensitive issue of sample collection for a genetic database, it is the research team's obligation to obtain informed consent. However, the importance of this has been ignored. In one version of the consent letter, the public was offered free health checks if they participated in the Taiwan Biobank. This was heavily criticized and was subsequently scrapped as it violated the public welfare contract. Medical law scholars stated that the letter would confuse the public regarding the purpose of collecting the samples, and the risks involved. It could lead to more serious problems in the future.[29]

Sociologists criticized the project from the perspective of scientific democracy. Chou has indicated that in terms of accountability, the whole policymaking process for the Taiwan Biobank is characterized by the developmental logic of "valuing technological R&D but ignoring risks."[30] Regarding accessibility and transparency, the project employed an arbitrary scientific consultation mechanism and a non-transparent and closed platform which lacks social supervision. There was no interactive public participation. The project did attempt to encourage mainstream official scientific discourses. In 2003, the collection of blood samples encountered difficulties. The scientific elites, with a view to obtaining national technological R&D benefits, appealed to the public to join this national "super mission of genetic decoding."[31] Such a scientific rationality-based risk assessment often takes the view that once the public is educated and enlight-

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[29]Liu Hung-en, "Public Trust, Commercialization, and Benefit Sharing in Biobanking," *Taipei daxue faxue luncong*, no. 57 (December 2005): 367-68.

[30]See note 15 above.

[31]In 2003 sample collection was not proceeding as smoothly as planned in the pioneer "super control genomic database" project, causing some people to refuse to participate. The president of Academia Sinica, Lee Yuan-tseh, and the director of the Institute of Biomedical Sciences, Chen Yuan-tsong (**陳垣崇**), called on selected subjects to assist in the establishment of a genetic database by providing samples for medical research. See note 19 above.

ened, they will be more willing to accept high-tech risks. They consider public risk perception to have nothing to do with science, and public worries to be merely "emotional" and "irrational" fears. Wynne points out that mainstream and institutional scientific discourses developed by scientific elites do not take into account social rationality and usually cause public doubts.[32]

External Scientific Reflexivity: The Rise of the Social Movement

In addition to criticism from within the academic community, supervision of the risk of information divulgence was also coming from social groups. Human rights groups were concerned with the legitimacy of genetic sample collection. They built networks with aboriginal groups and undertook supervision. One question was whether collecting genetic samples from aboriginal people was a violation of their rights. This is also something that should be strictly supervised. In recent years, some serious problems concerning the divulgence of medical and personal information have attracted a lot of attention. In the case of the Taiwan Biobank, government plans to construct the database by correlating genetic information with the household register and individual medical records have raised serious social and legal controversy.

Beginning in 2000, Taiwan experienced a series of crises around the divulgence of confidential information, including cases of the police selling personal information, telecommunications companies selling customer information, schools leaking student information to insurance companies, and the divulgence of medical records.[33] There have also been many incidents of fraud and information theft. This sounded the alarm

[32]Brian Wynne, "Risk and Environment as Legitimatory Discourses of Technology: Reflexivity Inside out?" *Current Sociology* 50, no. 3 (May 2002): 459-77.

[33]See, e.g.: Taiwan Association for Human Rights, "2002-nian geren ziliao waixie anli" (2002 **年個人資料外洩案例**, Personal information divulgence cases in 2002) (December 2002), http://www.tahr.org.tw/site/PDPA/2002case.htm; ETtoday News (**東森新聞**), May 25, 2004; *Taiwan Libao* (**台灣立報**), August 28, 2004; and TTV News (**台視新聞**), March 5, 2004.

where the protection of personal information was concerned and alerted the public to issues of privacy violation and data management. In addition to coverage by the media, social groups have also been vocal in criticizing these cases. Accordingly, these problems have become the basis of scrutiny by the Taiwan Association for Human Rights (TAHR, **台灣人權促進會**) of the establishment of large-scale medical and genetic databases and personal privacy. Following the government's recent attempts to establish a citizen medical e-database and a citizen fingerprint database, the TAHR joined with gender groups, the aborigines, sex workers, homosexual groups, cultural groups, etc., to raise concerns about the protection of personal information and privacy, and to enhance awareness of social discrimination and the risk of crime. Up until 2003, these groups conducted a continuous campaign of mobilization and scrutiny.[34]

However, the sheer complexity of the Taiwan Biobank project and its lack of transparency initially hindered the social groups. Having little information about the project, they sought to attract public attention by developing a discourse through the media. In early 2006, Liu Ching-yi (**劉靜怡**), vice president of the TAHR, said:

> Academic research teams such as Academia Sinica are operating in a gray area of the law and ignoring basic human rights and research ethics. With the investment of the Department of Health, National Science Council, Executive Yuan and other departments, Academia Sinica is not establishing the Taiwan Biobank in a transparent manner.[35]

As this movement gathered momentum, the TAHR released a document entitled "Blind the Public by Providing Health Checkups: Genetic Data Theft?"[36] It launched a series of mobilization activities to link up the various social and aboriginal groups, and also combined with the media to publish discourse such as the following:

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[34]Chou, "Biomedtech Island Project and Risk Governance," 123-46.

[35]Liu Ching-yi, "Taiwan jiyin ziliaoku suowei helai?" (**台灣基因資料庫所為何來**? How come there is a Taiwan Biobank?), *Caituan faren minjian sifa gaige jijinhui* (**財團法人民間司法改革基金會**, The Judicial Reform Foundation) (Taipei), no. 60 (February 2006).

[36]See *Taiwan ribao* (**台灣日報**, Taiwan Daily), January 11, 2006.

> In recent years, some research and medical groups have blinded the public with the promise of a "health checkup." After making aborigines sign "informed consent letters," the groups collected blood samples from the aborigines. This has been going on for years and is well known by the aborigines. However, very few people know the purpose of the collection and how their samples are used. The truth is that the Taiwan Biobank was established with investment from the Department of Health, National Science Council, and the Executive Yuan. However, the project smacks of ignoring human rights and research ethics, a lack of transparency, and violating principles of personal information protection, medical treatment law, and other regulations, which may seriously encroach on the public's genetic privacy.[37]

On January 23, 2006, a mainstream Taiwan newspaper, *Zhongguo shibao* (China Times), published a news story entitled "Blood Sample Collection of 200,000 Citizens: Biobank Explores Our Privacy." This report detailed the policymaking and privacy disputes surrounding the Taiwan Biobank project and interviewed related ethicists and aboriginal groups. This began a snowball effect like the one described by Snow and Benford.[38] Meanwhile, aboriginal groups protested that, according to the Taiwan Indigenous Peoples Basic Law, governments and civil groups had to obtain the consent of aborigines before they could carry out genetic research on them.[39]

By the beginning of 2006, social groups had expressed their criticisms of the Taiwan Biobank project, but it was perhaps already too late.

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[37]Ibid.

[38]Burke E. Rochford et al., "Frame Alignment Processes, Micro-mobilization, and Movement Participation," *American Sociological Review* 51, no. 4 (August 1986): 461-81; and David A. Snow and Robert D. Benford, "Ideology, Frame Resonance, and Participant Mobilization," *International Social Movement Research* 1 (1988): 197-217.

[39]On account of the medical culture in Taiwan in the past, disputes have arisen over medical researchers' responsibility to obtain the informed consent of sample donors. In March 2001, journalist Chang Li-wen (**張瓈文**) interviewed Taiwan aborigines in Hualien (**花蓮**), and found that many of them had had blood drawn eight times within one year by different medical research agents. Most of them did this in order to get free health checkups, which involved concealing the sample donors' right to know. The media labeled these researchers as "vampires." Similarly in 2000, researchers from Harvard University had taken blood samples for genetic research from residents in rural areas of China's Anhui Province (**安徽省**) in exchange for free medical treatment. Chen Shu-zhuo (**陳叔倬**) indicated that this would provoke a backlash from the aborigines. See *Zhongguo shibao*, March 19, 2001; and Wu Si-wei (**吳思瑋**), "Yuanmin tuanti: jiyin yanjiu xu qude minzu jiti tongyi" (**原民團體: 基因研究需取得民族集體同意**, Aboriginal groups: genetic research requires collective consent of the aborigines), Central News Agency, Taipei, January 23, 2006.

Even though academic supervision continued, the lack of transparency regarding project implementation made immediate access to information impossible. Because of this, social groups requested that sample collection be suspended after Chinese New Year.[40]

The strategic discourses of social groups uncovered the "black box" operation of the Taiwan Biobank project, a mechanism which underestimates and ignores social risks. The TAHR successfully made use of the media to expose information divulgence problems, making it obvious that the state was trapped in a dilemma, where the divulgence of genetic and other information might influence public trust and public risk perception.

After a series of strategic mobilizations, the TAHR formally requested that the Taiwan Biobank research teams publish their project processes online to ensure access and transparency, in a similar way to the UK Biobank project.[41] However, the research teams refused this request, claiming that as the project was still at the formulation and review stage, it could not be publicized.[42] This sparked a confrontation between technological R&D groups and social groups. Following this, in March 2006, there was a conflict of interest in the Institutional Review Board (IRB) of Academia Sinica. Again, the TAHR cast doubt on the legitimacy of the IRB's policy decisions.[43] Due to the intensity of the disputes over human rights and social risks, the IRB decided that until doubts about human rights violations had been clarified to the public, the collection of blood samples would be suspended. However, in one media interview, the TAHR indicated that project budgets had already been prepared and that it was impossible to terminate the project.[44] Clearly, it was only through the continu-

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[40]Ibid.

[41]Lee Zong-you (**李宗佑**), "Qinfan renquan yilu weixiaochu qian, buzhun caixue, Taiwan jiyinti ziliaoku jihua hanting" (**侵犯人權疑慮未消除前，不准採血，台灣基因體資料庫計畫喊停**, Doubts on human rights violation remain, Taiwan Biobank project stuck), *Zhongguo shibao*, July 24, 2006.

[42]Academia Sinica (**中央研究院**), "Jiyin ziliaoku yu yixue lunli" (**基因資料庫與醫學倫理**, Genetic database and medical ethics), Press Release, January 27, 2007, http://www.ibms.sinica.edu.tw/biobank/press.htm.

[43]See note 35 above.

[44]See note 41 above.

ous supervision of social groups that the true nature of this contentious issue was revealed.

The activities of the various groups highlighted the conflict between science and society, and also showed that the delayed and hidden risk governance model is no longer appropriate for handling disputes over technology. Strict supervision by social groups, which represent external society, has formed a reflexive criticism of science, and these groups have been able to challenge the legitimacy of technology policymaking. Moreover, they have attempted to propose new paradigms to replace the narrow and positivistic risk governance model.

Need to Build Trust in the Taiwan Biobank

Design of the Surveys

To address disputes over the establishment of the Taiwan Biobank, the author conducted two telephone surveys, in April and November 2005, to analyze the degree of trust and the perception of risk concerning the project among the public in Taiwan.[45] The designated topics for the surveys were social acceptance and public trust in the research personnel's ability to keep subjects' genetic information confidential and public risk perception in terms of sample donation and privacy protection. The purpose of the surveys was to analyze public attitudes toward the establishment of a large-scale genetic database, and in particular the public's inclination to participate if there is a risk of information divulgence or if there is legal protection. By helping us gain an understanding of public

[45]Two national telephone surveys were conducted by the Center for Survey Research, Academia Sinica: one between April 16 and June 9, and the other between November 2 and November 16. The subjects were all Taiwan citizens aged over 18. The survey fields included the islands of Taiwan, Jinmen (**金門**), Mazu (**馬祖**), and the Pescadores (**澎湖**). Computer-Assisted Telephone Interviewing (ACTI) was utilized for data collection. The sampling method was stratified systematic sampling. A total of 854 (in April) and 924 (in November) valid samples were collected with a confidence level of 95 percent (for both April and November). The standard error was ±3.42 percent (in April) and ±3.29 percent (in November).

attitudes, the surveys show how serious information divulgence impacts project implementation. The survey was designed around six themes, including trust relationship, perception of risk of information divulgence, and public inclination to donate blood for the establishment of the Taiwan Biobank when there is legal protection for privacy.

Results of the Surveys

From survey results,[46] it was observed that 59.4 percent (59.4 percent) of the respondents did not believe that medical and research personnel would keep test records confidential. The proportion who said they would refuse to provide the 15cc sample of blood for the genetic database was 51.2 percent (46.7 percent), while only 45.1 percent (48.7 percent) would agree to provide blood. The proportion of respondents who were concerned about information divulgence for commercial purposes was 77.5 percent (this question was not included in the November 2005 survey). Even if there was legal protection against the divulgence of genetic data, 47.5 percent (37.9 percent) said they would still refuse to provide a sample, although 49.4 percent (58.8 percent) said they would agree. As many as 85.5 percent (81.9 percent) said they thought that there was a possibility that personal genetic data would be divulged even if the law declared that it should not be. In these circumstances, 66.4 percent (68.3 percent) of respondents said they would refuse to provide genetic samples, while the proportion of those who would agree to provide samples decreased to 30.9 percent (28.8 percent).

Main Finding

The results of these two surveys indicate that the Taiwan Biobank still lacks public support. Many respondents were not confident that medical and research personnel would keep their genetic data confidential, and they therefore stated they would refuse to provide samples. One reason for

[46]Values outside parentheses are from the April survey and those in parentheses are from the November survey.

this is the increasingly frequent violations of medical and ethical rules that have occurred in recent years in Taiwan. Also, there have been serious cases of divulgence of personal information, such as telephone fraud, and organized fraud gangs are rampant. For all these reasons, as many as 77.5 percent of respondents were worried about the divulgence of information for commercial purposes. Even with legal protection, 85.5 percent (81.9 percent) of respondents still thought that the divulgence of genetic data was possible. This indicates that as long as information protection mechanisms in Taiwan are incomplete, most members of the public will be distrustful and will refuse to provide genetic samples. This phenomenon is one of the challenges the Taiwan Biobank will encounter. One question in the survey asked if respondents would agree to provide a sample of blood if there were legal regulations to protect personal genetic privacy. It was observed that the proportion of respondents who were willing to provide samples in those circumstances increased to 49.4 percent (58.8 percent), which could be interpreted as indicating that the Biobank is feasible. However, if technocrats and technological R&D personnel do not face up to these problems and instead continue to operate their authoritarian scientific policies, or develop official and unilateral institutional discourses, thinking that social and ethical disputes can be resolved in this way, then they are ignoring the importance of these problems.

It can be concluded from these analyses that scientific elites are inclined to develop mainstream and official scientific discourses that emphasize safety. They regard public risk perception and public panic as being emotional and irrational, and the cure they propose for it is education. This ideology of expert politics conceals the problem of public trust and public acceptance. This constitutes a significant obstacle to creating risk governance for such a sensitive and controversial project as a large-scale genetic database.

Where the policymaking process of the Taiwan Biobank is concerned, the hidden and delayed risk governance culture is part and parcel of a system that is monopolized by technocrats. The public passively accepts that the project is risky, and seems to display a low level of trust and support. As we examine the whole social context, under the distinct,

hidden local risk governance culture, we find that society is in need of a more diversified, open, and high-quality discourse. This would ensure that new technology policymaking is achieved by means of a democratic, diversified, and bilateral risk communication process. However, the "consultation" proposed in the UK Biobank risk communication model is not fully feasible in Taiwanese society. This is because, on account of Taiwan's long tradition of expert politics, "consultation" tends to be categorized as official and institutional discourse. Also, it is impossible to broaden public debate in order to gain more social support, because public debate in Taiwan society needs to take both the structural problems of technocrat and expert politics and the long-term hidden and delayed risk culture into consideration. In conclusion, special mechanisms of public deliberation and social trust building need to be developed through a process of exchanging experiences internationally.

Discussion: Conflicts as a Sign of Paradigm Shift in Risk Governance

From an analysis of policymaking concerning such technologies as GMOs and the Taiwan Biobank, we can discern some common structural problems. With a historical background of authoritarian rule and technocratic and expert politics, the government of Taiwan has become accustomed to authoritarian and centralized decision-making and it seriously lacks the vision to deal with trans-boundary risks. These structural problems were reflected in the government's inability to carry out policy assessment and risk governance with regard to sensitive and contentious genetic technology. That is, they have ignored the assessment of social values, ethical impacts, and uncertainties regarding technological safety, public perception, and public trust.

From this analysis we can see that biotech policymakers are still applying traditional risk governance paradigms, and are inclined to make narrow scientific risk assessments. Scientific consultation-based expert politics is accustomed to treating objections to GMOs and genetic data-

bases as acceptable minor risks. These technocrats believe that complicated social and ethical problems relating to genetic information can be dealt with through institutional processes, such as amendments to the law and the establishment of related forums. Such linear policymaking models not only connect risk assessment to technology, science, and the economy, they also give higher priority to technological R&D and national economic development. In doing this, however, they seriously ignore certain social and ethical disputes and risks. In other words, for both GMOs and the Taiwan Biobank, the lack of trans-boundary risk governance damages social trust as well as causing crises in policymaking legitimacy.

Regarding the Taiwan Biobank, we can see that sections of society have been challenging the authoritarian technology policymaking and risk governance of expert politics. The results of the survey show that the public does not trust the experts to keep information confidential. The public is eager for a more transparent, diversified, and participative risk governance model. In other words, the traditional hidden and delayed risk governance model of the technocrats and scientific elites is facing a serious challenge. After a long period of debate, there are signs of a paradigm shift.

According to Chou's analyses, in recent years Taiwanese society has been experiencing paradigm conflicts concerning old and new risk governance models.[47] The old model is characterized by authority domain, knowledge instruction, information concealment, and the ignoring of social risks. The new model includes democratic procedures, information transparency, professional diversification, and the valuing of social risks. Paradigm conflict has continued for a decade, around such issues as the citizen card, the national health insurance card, the computerization of medical information, the citizen fingerprint database, and the Taiwan Biobank project. The debates surrounding these issues are essentially discourses on technological risk policymaking. However, because the traditional governance model still controls policymaking and procedures for tech-

[47]See note 34 above.

nological R&D, government and society remain in a state of tension.

Conclusion

Countries around the world are competing to develop biotech and genetic medicine. Since the research, development, and application of such technologies as GMOs and the biobank have broad and complex health, ecological, social, and ethical implications, risks with high levels of uncertainty have emerged. This article analyzes the structural problems of the technology policymaking process in Taiwan, a newly industrializing country that is trying to cope with these new trends and challenges. It also examines the risk governance paradigm conflicts between state and society. Taiwan's authoritarian power structure has allowed the scientific consultation-based technocracy to retain this centralized policymaking model ever since World War II. Expert politics are blinkered by a narrow scientific approach to risk assessment, which has evoked criticism from social, ethical, and human rights groups.

In this particular social context, and in an atmosphere of global economic competition, technocrat-dominated policymaking tends to follow the developmental ideology of "valuing technological R&D and ignoring risks." Technocrats attach no importance to trans-boundary ethical and social risks. Thus, in the policymaking process, they seriously ignore the significance of plural and multi-layer professional reviews and public deliberation. From such structurally deficient risk governance experiences, the policymaking model and culture falls into a vicious cycle of ignoring (or hiding) and delaying dealing with social and ethical risks, which are challenged by civil society. This cyclical phenomenon results in the weakening of social trust, and simultaneously endangers the legitimacy of policymaking. The special developmental circumstances of Taiwan have led the author to propose the concept of the "double risk society." That is, a society in which, under a distinct technology policymaking and risk governance model, the delayed and hidden risk governance culture has weakened the relationship among science, the state, and society. What

is paradoxical is that, due to continuous challenges from social and ethical groups asking for open, transparent, and participative policymaking and procedural democracy, the state has come under great pressure. Obviously, the pushing and pulling of the risk governance paradigm sharply reveals the contradictions involving economic benefits, technological R&D policy, and social justice, and this further exposes the problems with national risk governance capacity. Other late-coming, technology-learning countries are also likely to suffer from a similar technocrat-dominated policymaking culture.

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