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U.S. Trade Policy and the Japanese Patent System

by

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Introduction

Background on the U.S. Trade Policy Debate over the Japanese Patent System

In June, 1988 and February, 1989, the Senate Subcommittee on Foreign Commerce and Tourism held hearings to investigate charges by U.S. businesses that the Japanese patent system constitutes a nontariff trade barrier. The hearings took place in an atmosphere of concern over high-profile cases involving alleged attempts by Japanese firms to use the Japanese patent system to capture core technologies from their American rivals, concern over the high volume of Japanese firms' patents in the U.S. relative to the volume of U.S. firms' patents in Japan, and a 1987 ITC report suggesting that the U.S. annually loses \$1.8 billion in domestic sales and \$6.2 billion in exports as the result of overseas patent infringement.^[1] U.S. corporations, trade associations, and government officials testified that Japanese patent law and procedures force American firms to cross-license their technology to Japanese rivals, and specifically argued that the Japanese patent system does not contain sufficient safeguards to prevent "patent flooding," the practice of filing large numbers of patents with narrow claims and utility models to "surround" a rival's basic patent on a core technology.^[2]

In the wake of these hearings, the U.S. General Accounting Office (GAO) undertook a survey of U.S. firms with experience patenting in Japan to determine

their level of satisfaction with the Japanese patent system. 39% of respondents expressed dissatisfaction with their experience filing patents in Japan, while only 13% expressed dissatisfaction with their patent experience in the U.S. 65% of U.S. firms patenting in Japan indicated that the length of time to obtain a patent, the "cost of obtaining a patent", the "scope of claims granted", or the "ability to obtain patents for pioneering inventions" presented "a great or very great problem to their firm." 12% of the firms told GAO that patent flooding was a "great" or "very great" problem. Several firms reported to GAO that the Japanese practice of "laying open" patents for public examination during the examination process, combined with long delays prior to the actual commencement of examination (on average, approximately three years) allows competitors to "produce around their products," and U.S. and Japanese patent attorneys reported that the Japanese practice of pre-grant opposition allows firms to "target" those applications filed by competitors that have "high technological and commercial value."³¹

The Senate hearings, and subsequent government and press reports, identified several cases in which Japanese firms appeared to have engaged in "patent flooding," coercive cross-licensing, or multiple opposition to delay a rival's patent, including the following:

- Fusion Systems Corporation, a U.S. firm manufacturing high-energy lamps, contends that Mitsubishi Electric Company (Melco) attempted to surround its invention by filing patents that "copied elements directly" from Fusion's invention, patents that copied public-domain literature, and patents that "were only thinly different from Fusion's patented technology." Melco reportedly pushed for a royalty-free cross-licensing agreement that "will give it undisputed access to Fusion's technology."
- A U.S. firm reported to GAO that a Japanese competitor had surrounded its patents for a "breakthrough synthetic fiber" with 150 patents on incremental improvements to the U.S. company's invention, and that the Japanese firm subsequently tried to pressure the U.S. firm into cross-licensing its "core" technology.
- A U.S. firm reported to GAO that its patent application for an advanced materials technology met with 17 oppositions that made no references to the "prior art" embodied in existing patents. The U.S. firm alleged that it had obtained evidence that Japanese rivals prepared their oppositions collusively.
- A U.S. firm reported to GAO that one of its applications was held up in the Japanese pre-grant opposition process for 11 years. This effectively destroyed the utility of the patent, since the Japanese patent system measures a patent's term from the date of filing.
- According to an article in the *Nihon Keizai Shimbun*, the Sumitomo corporation filed over 2000 patent applications in the field of superconductivity with the explicit goal of surrounding basic patents on this technology owned by U.S. firms.
- Recently, an application by Genentech, a U.S. biotechnology firm, met with at least 28 oppositions. According to the U.S. Patent and Trademark Office (PTO), the pre-grant opposition system, and the Japan Patent Office (JPO) practice of

considering oppositions serially, rather than simultaneously, unreasonably delayed the grant of the Genentech patent.^[4]

Government Response to Allegations by U.S. Firms

In response to these kinds of complaints, U.S. executive branch officials have strongly and publicly criticized the Japanese patent system. In 1989, Senator John D. Rockefeller (D-WV) introduced legislation to authorize retaliatory trade actions against Japan on the grounds that its patent practices "effectively deny adequate and effective patent protection to United States nationals because of unreasonable delays in granting or enforcing patents or unnecessarily narrow interpretations of patent claims."^[5] In the same year, the Office of the U.S. Trade Representative (USTR) placed Japan on its "special 301 watch list of countries from which the United States seeks stronger intellectual property protection;" Japan remains on the "watch list."^[6] In 1990, former PTO commissioner Donald Quigg was reported as stating that "Japan's patent law appears to be administered in a way that makes it a formidable but subtle trade barrier," and in 1993, PTO Commissioner Bruce Lehman told a seminar audience that "the problems faced by U.S. inventors in Japan are symptoms of a `disease' which is `insidious and parasitic.'" ^[7] The Japan Patent Association (JPA), a Japanese government-sponsored organization, has responded sharply to U.S. concerns, particularly as expressed in GAO's 1993 report. JPA accused GAO of presenting "unsubstantiated anecdotes" in its findings, and of giving "unwarranted visibility" to U.S. firms that "nurse a grudge" over problems attributable to their own inexpert utilization of the Japanese patent system.^[8] JPA argued that Japan has taken adequate statutory and regulatory steps to mitigate the concerns of foreign applicants, and that Japanese patenters have considerable legitimate concerns with U.S. patent law and practice.^[9]

Bilateral Efforts to Reduce Trade Friction Through Patent Harmonization

In 1994, the U.S. and Japan agreed to major revisions of their patent systems, partly in response to the TRIPS ("trade-related aspects of intellectual property rights") component of the Uruguay Round GATT agreement, and partly in the context of the "Framework" round of U.S.-Japan trade negotiations. Although not intended as final patent harmonization agreements, GATT-TRIPS and Framework have made considerable headway in reducing bilateral tension over intellectual property.^[10]

Under GATT-TRIPS, the U.S. agreed to change its patent term from 17 years, measured from the date of grant, to 20 years, measured from the date of filing, as in Japan. The U.S. also agreed to eliminate a practice that gave preference to U.S. inventors in patent interference cases.^[11] Japan, in turn, agreed to allow broader discovery procedures in patent infringement cases, and agreed to a provisional application system that effectively extends its "grace period" for inventors who divulge proprietary information prior to filing a patent application.^[12] Both countries agreed to highly detailed enforcement provisions

that require fast proceedings and "prompt and effective" preliminary injunctions in patent infringement cases, and that ban the import of infringing goods.^[13] Under the Framework agreement, Japan agreed to restrict JPO's ability to grant compulsory licenses, to eliminate multiple pre-grant oppositions in favor of a single post-grant opposition proceeding, to introduce a system of accelerated examination for foreign filers that requires examination within 36 months, to permit foreign patenters to submit applications in English, and to give foreigners the opportunity to make translation corrections before and after a patent is granted. In return for these concessions, the U.S. reasserted its willingness to change its patent term under GATT, and further agreed to adopt a system for disclosing, or "laying open" the content of patent applications, to allow greater third-party participation in reexamination, and to restrict PTO's ability to grant compulsory licenses.^[14]

The Framework agreement was initially hailed in the press as a policy coup by the current administration, for two reasons. First, the Japanese concessions are more numerous and broader in scope than the U.S. concessions.^[15] Second, the adoption by the U.S. of a new basis for measuring patent terms, and the adoption of a "laying open" system, have strong domestic support. These measures will serve to eliminate so-called "submarine patents," will allow inventors to avoid filing duplicative applications, and will allow U.S. firms to monitor foreign applications filed with the Patent and Trademark Office. 20 of the top 25 U.S. exporters support the Framework agreement, and these firms represent a wide variety of technology sectors.^[16]

The GATT-TRIPS and Framework agreements can be expected to considerably improve the patenting environment for Americans doing business in Japan, particularly by eliminating pre-grant opposition. U.S. observers have noted that Japan has made a good-faith effort to fully honor its responsibilities under these agreements.^[17] Considering that global patent harmonization negotiations under the auspices of the World Intellectual Property Organization (WIPO) have broken down, GATT-TRIPS and Framework provide the closest available substitute for U.S. businesses seeking a simpler and more unified international patent environment. Nevertheless, several criticisms have been leveled against the political advisability of the agreements, and their potential for differential effects on firms of different sizes and in different industries. These criticisms are responsible for current efforts in Congress to neutralize certain provisions of the GATT-TRIPS and Framework agreements, in particular the provision to peg U.S. patent terms from the date of filing.^[18]

Pitfalls of Patent Harmonization for U.S. Industry

Framework is undergoing a concerted attack from a coalition of independent inventors who characterize the agreement as a "giveaway."^[19] Critics of the provisions adopted by the U.S. suggest that "laying open" would provide no real informational advantage for industries patenting in this country, and may simply add procedural complexity to a

patent system which, on the whole, has performed reasonably well.^[20] In addition, because small firms are more sensitive than large firms to infringement and "copycat" R&D, and possess smaller and less diverse patent portfolios than large firms, the possible advantages for small firms of "laying open" patent applications may be offset by the increased risk of infringement.^[21] Patenters in relatively new technology areas, such as biotechnology, also feel that as the U.S. moves to a patent term measured from the date of filing, delays in examination will limit the effective tenure of their patent protection. This is because examination in new technology areas takes considerably longer at PTO than examination of patent applications for traditional industrial technologies.^[22] Critics of the provisions adopted by Japan note that "all the Japanese offered...is faster patent reviews--a goal they have espoused for years."^[23] According to this view, the backlog at JPO is so structurally and politically entrenched that nothing short of a major overhaul of the patent system will mitigate it. Another frequent criticism is that the Framework agreement does not address the narrow interpretation of patent scope by Japanese examiners, which PTO continues to view as a major problem. One additional criticism of the provisions adopted by Japan has not yet received extensive attention. There is no provision to eliminate the JPO practice of deferred examination, which creates a Japanese equivalent of the "submarine patent" problem.^[24]

Statement of Purpose

These criticisms deserve serious consideration, to the extent that they do not simply reflect the interests of groups that benefited from prior imperfections of the U.S. patent system.^[25] Nonetheless, they fail to address a more fundamental political and economic question: namely, the degree to which Japanese attitudes about the proper goals of a patent system have converged with those of the United States. The objective of this paper is to discuss unique political and economic functions of intellectual property in Japan that may be unfamiliar to American readers, and to suggest some surprising historical similarities between U.S. and Japanese patent policies. By giving the reader a sense of the practical limitations of patent harmonization, I hope to stimulate more informed--and less acrimonious--discussion of U.S. and Japanese patent policy, and to help businesses design effective intellectual property strategies for the Japanese market.

I aim to fulfill this objective in three ways. The first is to fill the gaps in the current literature by comprehensively reporting on those aspects of the Japanese patent system--its legal basis, its governance, and its use by Japanese competitors--that continue to present problems for American firms patenting in Japan. The second is to introduce microeconomic theories of patenting, the emergent literature on national innovation systems, and a detailed explanation of Japanese attitudes toward technology to the policy debate over the Japanese patent system. The third is to discuss new Japanese-language sources on technology management, technology trade, and career patterns in the Japanese patent system. Many of these sources are not yet available in English to U.S. patent practitioners and policymakers.

Research Outline

Section 1 analyzes the historical role of patenting in Japanese industrial policy, and assesses charges that the Japanese patent system is subject to interference or guidance from trade and industrial policy officials. In the introduction to Section 1, I demonstrate that at least until the late 1960s or early 1970s, Japanese government and industry regarded patent licensing as one component of a broad strategy to import, indigenize and diffuse foreign technology, although this "developmental" approach to technology policy has often come under attack in Japanese official circles for both budgetary and ideological reasons.

I next address the thornier question of whether a developmental logic continues to inform the general goals of the Japanese patent system, and whether there is any merit to current allegations by American firms that the patent system has been manipulated to their disadvantage. In the first section, Regime Characteristics, I argue that the Japanese patent code is essentially "neutral," but that prior to 1994 it did not actively discourage patent strategies that could be used to facilitate technology importation. The conclusion to this section suggests that developmental goals may continue to provide normative support for certain unusual provisions that remain in Japanese patent law and doctrine. In the next section, Industrial Policy and Industry Influence in the Japanese Patent System, I turn to the administration of the patent system by the Japan Patent Office (JPO). I address three aspects of the Japanese patent examining process that are frequently cited as problematic by American firms: the slow pace of examination, the treatment of prior art by patent examiners, and the patent opposition process. I conclude that there is no firm consensus among U.S. companies and government agencies as to the source of these problems, which are alternatively attributed to government policy preferences, resource availability, client behavior, or procedural differences between U.S. and Japanese administrative practice. Despite the absence of conclusive evidence to the contrary, there is a lingering suspicion in the U.S. that the Japanese patent system is subject to administrative interference from industrial policy agencies. I therefore construct a concrete test of politicization in the Japanese patent system by examining the career patterns of current and former JPO officials. I find that a significant number of senior patent officials began their careers at the Ministry of International Trade and Industry (MITI), that many of these officials initially specialized in trade policy, industrial policy, and foreign technology assessment, and that former MITI officials are disproportionately represented in divisions responsible for examining heavily-imported technologies (such as computer technology). I also find a high incidence of former MITI officials, and former executives from trade-intensive Japanese companies, entering senior management posts at government-sponsored intellectual property associations. These findings are subject to two conflicting interpretations. On the one hand, these career patterns may indicate clear lines of client influence on the

administration of the Japanese patent system, and the "revolving door" between government, industry, and intellectual property associations may indicate a coordinated strategy to confer competitive advantage on Japanese high-technology firms. On the other hand, the placement of Ministry-level officials in JPO management positions may simply reflect good public-sector management practices, while the "revolving door" in the Japanese intellectual property community simply represents an administrative style that is designed to foster the efficient provision of government services. Although I favor the second explanation, I concede that ambiguity over the intention behind these staffing patterns should cause concern in the U.S. intellectual property community. The final part of this section, Economic and Comparative Perspectives on the Japanese Patent System, represents a step back from the trade debate and a critical appraisal of its underlying assumptions. I introduce arguments from microeconomic theory which suggest that every patent system is designed with a mind to legitimate tradeoffs between affording protection to first inventors and providing incentives to subsequent innovators, and that formal patent systems are not necessarily the best means for firms to protect their intellectual property. I suggest that if the debate over intellectual property protection is reframed as a debate over maximizing economic efficiency, social welfare, or national security, a "developmental" or "incrementalist" patent system may have distinct advantages over a "protection"-oriented system. I conclude by showing that the U.S. is not unaware of these advantages, and that the U.S. government to some degree views the patent system as an instrument of "industrial policy." In light of this conclusion, I believe that a more circumspect approach to allegations of impropriety in the Japanese patent system is warranted.

In section 2, I analyze the Japanese patent system as a forum of private competition between U.S. and Japanese firms. Specifically, I show how Japanese private-sector management practices, corporate structures, manufacturing specialties, and attitudes about technology inform the way that Japanese firms utilize the patent system as a competitive tool.

The first part of Section 2, Micro-Institutional Factors: Technology Management in the Firm, examines the relationship between Japanese staffing and budgeting practices and patent strategy. I argue that the relatively low hire rate for basic science graduates in Japan, the continuing prevalence of lifetime employment and seniority-based advancement in the Japanese firm, and the Japanese practice of maintaining large, stable R&D budgets contribute to a distinct corporate intellectual property strategy. The key components of this strategy are a defensive, or "portfolio" approach to patenting; the extensive use of patents for "secondary" purposes, such as credentialing, market signaling, and blocking litigation; and a "volume filing" strategy, which requires firms to float large numbers of patent applications with narrow claims. Although these components have been identified in detail by previous authors, my suggestion of a link between patent strategy and the Japanese R&D personnel system represents a new approach.

The second part of Section 2, Meso-Institutional Factors: The Japanese Industrial Order, represents the first comprehensive attempt to demonstrate a link between Japanese industrial organization and Japanese private-sector patent strategy. First, I argue that the value of each individual patent is relatively unimportant in Japan's *keiretsu* financing system. This may make defensive patent strategies and secondary uses of the patent system more feasible for Japanese firms than for their American rivals.

Second, I suggest that *keiretsu* groups confer size advantages on relatively small Japanese manufacturing firms, improving their ability to monitor against infringement and to carry out successful patent intelligence activities. I suggest that *keiretsu* affiliates have a weaker incentive than their American rivals to favor a strong intellectual property environment, since *keiretsu* structures may endow affiliated firms with the ability to internalize external economies, reduce the contracting costs associated with innovation, secure first-mover advantages, increase the frequency of product cycles, avoid diminishing returns to innovation, and generate innovation as a byproduct of volume manufacturing.

Third, I argue that Japanese industry associations have historically played an active role in supplying affordable imported technology to client firms. As long as there is a strong market for licensed technology in Japan, industry associations will serve as efficient suppliers. The relative weakness of American industry associations, by contrast, may make U.S. firms less enthusiastic than their Japanese rivals about the benefits of freely shared technology.

In past decades, the developmental technology management strategy adopted by the Japanese private sector in response to the challenge of the West was at least partially responsible for certain practices identified as problematic by American firms, such as "patent flooding." Whether U.S. firms continue to have difficulties with the Japanese patent system may therefore depend on the degree to which the Japanese economy has shifted toward an independent technological profile, in which indigenous basic research has supplanted commercial development of imported technology. The final part of Section 2, Macro-Institutional Factors: National Development and Developmental Ideology, is an attempt to gauge the degree to which the Japanese private sector has converged with that of the United States in its technology trade profile and in its attitudes toward technology.

Japan is clearly a first-world technology developer, and tends to side with the United States and the European Community against less-developed regions in international intellectual property negotiations.^[26] Nonetheless, I find that there is no clear consensus on whether Japan has a high-value added, high-technology production profile comparable to that of the United States. Some economists believe that the gradual liberalization of the Japanese economy since the 1960s, combined with the two oil shocks of the 1970s, forced a fundamental shift in private-sector research priorities. Other economists are less optimistic. They point to persistent disincentives for basic research in the Japanese firm and the Japanese university, and to a dangerous "hollowing out" of private-sector

research capacity since the bursting of the bubble economy. Technology trade data appears to support the second view.

I conclude the section with an analysis of the historical origins of Japanese attitudes toward intellectual property. Certain of the attitudes commonly regarded as "developmental," and as reactions to the challenge of the West, may in fact precede Japan's opening to the West, while others may have more to do with popular attitudes toward national security than with the requirements of Japan's technology trade profile. Even if the Japanese and American private sectors achieve essentially identical economic structures, they may retain significantly different historical attitudes about the nature of intellectual property.

1. Industrial Policy in the Japanese Patent System

Introduction

The Historical Role of Patent Licensing in Japanese Industrial Development

It is widely recognized that from the 1880s through the 1960s, the Japanese government used its own patent system--and that of the United States--to diffuse foreign technology among domestic firms. Although the current structure of the Japanese patent system is virtually identical to that of most other world patent systems, this was not always the case. Japan did not accede to the Madrid agreement prohibiting the copying of patented goods until 1953, and the patent system did not contain serious safeguards against patent infringement until 1960. Preliminary remedies for infringement against pending applications were not adopted until 1970. Food, chemicals, and pharmaceuticals remained unpatentable until 1975, and multiple claims were not allowed in a single application until 1987.^[27] The Japanese government ensured the domestic availability of low-cost licenses on foreign technology in the 1950s and 1960s by restricting competitive bidding by Japanese technology purchasers, negotiating directly with potential licensors on behalf of industry, and granting domestic producers a 10-15% tax credit for payments on foreign licenses. In addition, forced mergers, tariffs, quotas, registration requirements, customs procedures, and restrictions on foreign direct investment were used to encourage foreign firms to export patent licenses to Japan in lieu of actual goods, and the Ministry of International Trade and Industry (MITI) and Nippon Telephone & Telegraph (NTT) are alleged to have exercised influence over the patent system to help domestic firms in the semiconductor and fiber optics fields capture new technology from their American rivals in the 1960s and 1970s.^[28] The result, according to the president of the American Chamber of Commerce-Japan, was "the largest `white sale' on technology in history."^[29]

The Role of Developmental Ideology in Japanese Technology Policy

The historical use of the Japanese patent system to import foreign technology and diffuse it to domestic firms may be viewed in the context of a consistent set of government attitudes about the role of foreign technology in national development and national security. Richard Samuels has characterized these attitudes as a "technonational ideology," whose explicit goals are "the struggle for independence and autonomy through indigenization of technology (*kokusanka*); the national commitment to diffuse this knowledge throughout the economy (*hakyuu*); and the national, regional, local, and sectoral effort to nurture and sustain Japanese enterprises to which technological knowledge can be diffused (*ikusei*)."^[30] Samuels argues that this set of attitudes, which has provided a consistent ideological framework for broad industrial policy initiatives in the pre-war and postwar periods, is a response to Japan's historical late developer status. It encourages the belief in Japanese official circles that inventions must primarily be viewed as welfare-enhancing externalities, or "quasi-public goods," rather than competitive products with discrete ownership rights.^[31]

The technonational ideology identified by Samuels has never been shared by all branches of the Japanese government, and since the 1880s, there has been an ongoing history of conflict between various government agencies and the Diet over the ideological validity and efficacy of developmental industrial policy strategies. Although the developmental, protectionist trade theories of Henry Charles Carey and Friedrich List gained currency in Japan in the 1870s and 1880s, some of the most prominent Meiji oligarchs, such as Tsuda Mamichi and Nishi Amane, had studied economics in the Netherlands and were proponents of radical *laissez-faire* liberalism.^[32] Matsukata Masayoshi, Japan's first Minister of Finance, was a strident advocate of classical economic theory who engineered a massive sell-off of government-owned enterprises to the private sector in the 1880s. Classical economic theory and an anti-expansionary view of fiscal policy continued to serve as a significant counterpoint to developmental ideology in official circles throughout the 20th Century: the Japan Development Bank unsuccessfully opposed MITI infrastructural development initiatives in the 1950s on the basis of the classical Ricardian theory of comparative advantage, and the Ministry of Finance (MOF) was consistently suspicious of the budgetary merits of MITI and NTT joint technology development programs in the 1970s and 1980s.^[33] Specifically, in regard to intellectual property protection, Japan's suspension of its patent system from 1873 until 1885 has been characterized by one economist as a reaction to the "great patent debate" in Europe, a well-organized resistance by liberal trade theorists against the inefficiency and perceived corruption of national patent monopolies.^[34] Nonetheless, Samuels is probably correct in identifying a developmental, technonational ideology as a dominant strain in official economic thought from the Meiji period onward, despite the existence of an officially valid counter-ideology. As Samuels has shown, the components of technonational ideology, *kokusanka*, *hakyuu*, and *ikusei*, have remained consistent over the past century,

in one guise or another. Bureaucrats in MITI and other technology agencies have generally won policy debates over the validity of this ideology, and have had the institutional capacity to transform their vision into reality. In addition, politicians of Japan's dominant Liberal Democratic Party (LDP) have had little incentive to stand in the way of developmental industrial policy.^[35]

Michael Borrus and others have argued that the Japanese patent system was one mechanism in a broad-based, developmental strategy of economic growth, and as such, it clearly served "political" goals.^[36] The current English-language literature on the Japanese patent system has done an adequate job of identifying past instances of political uses of the patent system, although it has failed to adequately characterize these uses as a response to the historical and ideological trends identified by Samuels. The current literature has also failed to confront the issue of whether the administration of the Japanese patent system is currently subject to a "developmental logic."

This section is an analysis of "political" criticisms of the Japanese patent system. After reviewing evidence that the regime characteristics of the Japanese patent system continue to foster the developmental goals of technology importation, indigenization, and diffusion, I will confront lines of criticism that focus on the administration of the patent system itself. I will conclude this section with a brief discussion of industrial policy coordination within the U.S. patent system, drawing parallels with the Japanese case.

Regime Characteristics

Statutory Provisions of the Japanese Patent Code

Many recent criticisms of the Japanese patent system make direct reference to its statutory foundations, rather than to its administration by JPO or its strategic use by Japanese firms. This section provides an overview of post-1975 statutory characteristics of the Japanese patent regime which continue to favor the importation, indigenization, and diffusion of foreign technology.

One could point to section 1 of the Japanese patent code, which states that the purpose of the patent system is "to encourage inventions by promoting their protection and utilization *so as to contribute to the development of industry*," as indicative of an industrial bias in the patent law itself.^[37] GAO, in its 1993 report, indicated that the patent experts it interviewed subscribe to the view that Japanese patent law is biased in favor of industrial development, and against the individual inventor: "patent experts contend that the Japanese patent system seeks to promote technology development by disseminating technology, rather than rewarding inventors with exclusive rights," and statutory provisions for "laying open" patents, allowing deferred examination and pre-grant opposition, and allowing compulsory cross-licensing in the event of an improvement patent are said to "foster this goal."^[38] U.S. criticisms of the Japanese patent law over the past eight years have concentrated most strongly on the following provisions:

(1) The requirement for "laying open" patent applications 18 months after filing; i.e., publishing them during the examination process. (section 65bis of the patent code). (Still in the Japanese patent code, and adopted by the U.S. under GATT-TRIPS).

(2) The applicant's ability to defer the examination of his or her patent application for up to seven years (section 48ter). (Still in the Japanese patent code).

(3) The short and restricted pre-filing "grace period" for publishing information about inventions (section 30). (Expanded under GATT-TRIPS to U.S. standard).

(4) The requirement for publishing an application after it is examined, so that interested parties may file pre-grant oppositions against the application (sections 51-52). (Abolished under GATT in favor of a post-grant opposition system).

(5) The requirement for compulsory cross-licensing of patents that are improved upon by new patents. (Restricted under Framework).

(6) The alleged absence of a legal doctrine for identifying and punishing fraudulent patent filing practices. (Not addressed by GATT or Framework).

In addition, there has been some criticism of the existence of a utility model system parallel to the patent system (which is said to burden patent examiners with an unreasonably high workload and facilitate "patent flooding"), the lack of strong legal provisions for damages and royalties for patent infringement, and the inability of inventors to patent inventions determined by JPO to contravene "public order, morality, or public health" (section 32 of the patent code).^[39]

U.S. Allegations Concerning Statutory Provisions

The U.S. International Trade Administration (ITA) argued in 1988 that the practice of laying open patent applications "opens the door for imitation and harassment," because Japanese firms use open applications as the basis for patent oppositions or derivative R&D that may result in coercive cross-licensing agreements.^[40] PTO argued in 1989 testimony that the practice of deferring patent examination for up to seven years, which was instituted to reduce the backlog of unexamined patent applications at JPO, is undesirable. Because the status of unexamined applications and the technology embodied in them are unknown to the public, they present "possible pitfalls" for U.S. firms doing business in Japan.^[41] A recent internal paper by a PTO official similarly argues that deferred examination "causes uncertainties for both Japanese and American businesses" with regard to what technologies may be used without infringing.^[42] 52% of U.S. firms surveyed by GAO said that a two-year cap on deferred examination would improve their patent experiences in Japan.^[43] In the sense that filing a patent represents a contract between the inventor and the patent office, PTO's objection to the deferred examination system is that it places an ex-post contracting cost on filing patents at JPO, because competitors can opportunistically and unexpectedly surround new inventions with previously "dead" patent applications. This risk of ex-post opportunism encourages U.S. filers to "contract" with their competitors directly, through the medium of licensing agreements.

A secondary objection has been made by the Pacific Industrial Property Association, which claims that the deferred examination system actually increases the backlog faced by examiners rather than reducing it.^[44] The logic behind this argument is that deferred examination encourages firms to file patents in areas that are not commercially viable at the time of patenting, but that may become viable within the time limit for deferral.

Prior to the GATT-TRIPS agreement, Japan's "grace period" for divulging technology prior to patenting was criticized as being too short: six months in Japan, as opposed to one year in the United States. 49% of U.S. firms surveyed by GAO indicated that extending the grace period to one year would improve their patent experiences in Japan.^[45]

Pre-grant opposition has received more criticism from U.S. officials and patent experts than any other provision in Japan's patent code, and the U.S. attempted to convince Japan to eliminate this provision in the Structural Impediments Initiative (SII) talks, in conferences to formulate a draft patent harmonization treaty under the auspices of the World Intellectual Property Association (WIPO), in meetings of the U.S.-Japan Trade Committee, and finally, with success, in the 1994 "Framework" round of bilateral trade negotiations.^[46] Pre-grant opposition was a lengthy and expensive process requiring multiple submissions and responses, and it has been argued that it constituted a *de facto* system of mandatory licensing.^[47] According to patent attorneys interviewed by GAO, pre-grant opposition caused "protracted delays" in patent examination. Because applicants usually restricted or dropped their claims in response to opposition, it also served "to narrow the scope of the claims in a patent application beyond JPO's own examination process." The attorneys also told GAO that the number of oppositions filed by Japanese firms was "related to the importance of the technology in question and the level of maturity of Japanese industry in that field," rather than being solely related to the soundness or unsoundness of the patent application.^[48]

The requirement for pre-grant opposition, it could be argued, created both an incentive and a means (1.) for firms to delay the issuance of their rivals' patents, making infringement more feasible; (2.) for firms to narrow the scope of rivals' patents, making it more feasible to "share" the commercial benefits of rivals' technology by filing similar patents; and (3.) for firms to engage in "patent flooding" with the goal of securing cross-licensing agreements. In a broader sense, it could be argued that the narrow patent scope resulting from the pre-grant opposition process was technologically "incrementalist," as it distributed the opportunity to patent minor inventions to a large number of inventors while limiting the incentive for individual inventors and highly innovative firms to patent "pioneer" technologies.

There was an additional, indirect criticism of the pre-grant opposition process. Section 52(4) of the Japanese patent code states that if a party commercially exploits an invention for which his or her patent application is subsequently invalidated, or if the scope of his or her patent is subsequently narrowed to

exclude the invention being exploited, he or she must retroactively indemnify damages to parties (i.e., business rivals) adversely affected by the working of the invention by the inventing party. It has been argued that the indemnification provision weakened the inventor's incentive to work an invention in the face of pre-grant opposition.^[49]

Under certain circumstances, when a new invention improved on a prior invention, compulsory cross-licensing could occur. Commissioner Quigg has stated that compulsory licensing was by no means automatic in Japan, and was used only infrequently, but that the threat of it "encourages the first patentee to voluntarily license his patent."^[50]

Finally, it has been argued that the Japanese patent code does not require sufficient disclosure of prior art by patentees, resulting in "fraudulent" patents (patents based on direct copying rather than an "inventive step").^[51] It has further been argued that Japanese patent system lacks a legal doctrine to designate the failure to disclose prior art as a fraudulent practice. Maureen R. Smith, Deputy Assistant Secretary of Commerce for Japan, ITA, testified to the Senate that the lack of penalties in the Japanese patent system for failure to disclose prior art, when combined with Japanese firms' practice of filing earlier and in greater volume than their American counterparts, has resulted in a system that has "difficulty distinguishing between innovation and invention."^[52] Joseph A. Massey, Assistant U.S. Trade Representative for Japan and China, argued at the same hearing that there is a "widespread lack of concern" among Japanese businesses over the failure to disclose prior art, noting that Japanese patent application forms do not include a warning against filing fraudulently.^[53]

Allegedly, the weak standard for disclosure of prior art encourages Japanese firms to claim minor improvements of rivals' products and processes as genuine, patentable inventions. This, in turn, deprives their rivals of the royalties to which they are entitled.

Viewing the Japanese Patent Code From the Perspective of Developmental Strategy

All criticisms of these statutory provisions implicitly suggest that the Japanese patent system encourages importation, indigenization, and diffusion of foreign technology. One could argue that the disclosure provided by "laying open," the delays caused by pre-grant opposition, and the uncertainty caused by the indemnification requirement encouraged infringement as a low-cost technology importation strategy. The ability of Japanese firms to indigenize foreign technology, or produce domestic analogues to foreign inventions on the basis of incremental improvement, may have been supported by Japan's weaker requirements for prior art disclosure, and by the "narrowing" effect of pre-grant opposition. Finally, the provisions for "laying open," deferred patent examination, pre-grant opposition, and mandatory cross-licensing apparently encouraged domestic diffusion of foreign technology through low-cost licensing. Pre-grant opposition may have also encouraged diffusion by narrowing patent scope, giving Japanese firms the opportunity to "pool" or "rotate" opportunities to

innovate. The fact that some of these provisions, such as pre-grant opposition, were not eliminated until 1994, while others, such as deferred examination, remain in place, suggests that the technonational ideology identified by Samuels may continue to provide normative support for maintaining the regime characteristics of the Japanese patent system.

Industrial Policy and Industry Influence in the Japanese Patent System

There is historical evidence that the Japan Patent Office played a role in technology importation and development policy prior to the 1980s, and some American researchers, such as Michael Borrus, have alleged that JPO was amenable to direct interference from other government agencies, such as MITI (its parent ministry) in pursuit of this policy. In this section, I will assess the validity of evidence suggesting that administrative interference in the Japanese patent system continues today, with the goal of distributing proprietary information as a public good to Japanese industry as a whole, or as a private good to industries whose continued success is viewed as vital to national development strategies. In particular, I will critically examine recent allegations that the backlog of unexamined patents at JPO represents a strategy to induce low-cost cross-licensing agreements, that Japanese patent examiners de-emphasize prior art to encourage "copycat" patent applications, and that MITI uses the patent opposition process to target key foreign technologies for appropriation by domestic firms.

Is the Pace of Patent Examination in Japan Driven by Resource Availability, Government Strategy, or the User Community?

The most frequently cited criticism of the Japanese patent examination process is its slow pace, and the significant backlog of unexamined patent applications at JPO. Patent examination takes, on average, 19 months at PTO, and 37 to 84 months at JPO. In certain new, active technology areas, pendency can last as long as 120 months at JPO, as opposed to 25 months at PTO.^[54] Alfred Michaelson, the General Patent Counsel of Corning Glass Works, has testified that this creates uncertainty, which induces inventors to engage in cross-licensing agreements to avoid infringement and interference claims.^[55]

The backlog partly results from provisions of the patent code, but also serves as a justification for maintaining certain controversial provisions of the code. The option of deferred examination, for instance, generates much of this backlog, but deferred examination would become unnecessary if the backlog were reduced. The single greatest cause of delay is the inadequate level of staff at the patent office, rather than any statutory provision or examining practice. The ratio of patent applications to patent examiners is significantly higher in JPO than in PTO. In 1991, JPO had only 955 examiners to handle 369,396 new patent applications, while PTO had 1,890 examiners to review 178,083 new applications. There is also a sizable backlog at JPO of unexamined patents filed in previous years. A PTO official interviewed by the author in 1994 stated that the staffing level in JPO is "way off" in terms of dealing with a backlog that has gone "out of

control." In a 1996 follow-up interview, the same official stated that Japan has adopted procedures for accelerated examination of foreign patent applications. She noted, however, that staffing at JPO remains low, and that Japan needs to add additional examiners as a preface to additional bilateral discussions of patent practice.^[56]

JPO contends that it cannot effect significant staffing increases due to civil service regulations limiting the number of patent examiners, instituted as part of an administrative reform movement begun during the Nakasone administration. JPO examiners also feel that any unusual delays experienced by U.S. firms are due to the firms' noncompliance with Japanese legal requirements for patent specifications, translation errors by U.S. firms, and the unusually long time it takes for foreign firms to respond adequately to Japanese examiners' office actions.^[57]

Can this backlog be viewed as a policy outcome, deliberately generated by JPO or MITI? The U.S. Patent and Trademark Office does not accept the argument that low staffing levels in JPO are solely the result of administrative reform pressures. U.S. patent officials have testified that JPO's understaffing is "arbitrary" and "a matter of political will," and that JPO could seek a legislative or regulatory remedy "if they really wanted to deal with the problem."^[58]

It is, however, a far step from suggesting a "political will" behind the understaffing at JPO, to arguing that it represents a deliberate strategy to encourage infringement or low-cost licensing. When pressed to explain whether understaffing serves concrete policy goals, U.S. officials have given contradictory responses. They appear to suspect that there is a policy agenda behind the delays, but are either too uncertain, or too concerned about offending their Japanese counterparts, to do more than hint at the possibility. When asked by Senator Rockefeller whether the "hand of MITI" was responsible for understaffing at JPO, PTO Assistant Commissioner Michael Kirk's response was, "I do not believe that I could say that it is or is not part of a grand strategy on the part of the government."^[59] A similar assessment was provided by Donald Quigg, who testified that JPO is not "deliberately inefficient" and was established "strictly to process patents," but that "there is some evidence" that JPO may be responsive to MITI goals.^[60] USTR and ITA officials testified in the 1988 Rockefeller hearing that the cross-licensing of patents is a national policy goal of the Japanese government, and ITA went so far as to allege that "the patent system...is not unlike the MITI system...it has the implementation of the law and the regulations accomplished through an alliance of bureaucrats and clients." They also noted, however, that they view the Japanese patent system as nondiscriminatory, and that the problems it presents to foreign filers are "structural" in nature.^[61]

Certain U.S. businesses are far less reticent about characterizing delays at the patent office as a deliberate government attempt to induce cross-licensing agreements, but it should be borne in mind that these firms have engaged in bitter patent disputes with Japanese rivals that may color their analysis and the

presentation of their cases. Fusion Systems Corporation, for example, as a result of its long-running feud with Melco, alleges that "MITI has a notorious policy of providing an inadequate number of patent examiners," and Allied-Signal contends that the Japanese government targeted its amorphous metal product, "Metglas," as a "critical technology," and purposely delayed Allied's patent applications by reassigning examiners.^[62] GAO's 1993 report subsequently introduced some anecdotal evidence supporting Fusion's and Allied-Signal's claims that foreign patenters are singled out: 22% of the U.S. firms surveyed by GAO reported feeling that they "had been treated differently by JPO than Japanese applicants," and one patent counsel reported that applications his firm co-owns with a Japanese partner received more expedient examination than applications owned solely by the American firm.^[63]

In spite of this evidence, it would be a mistake to say that there is a consensus among U.S. firms and patent experts that patent examination is delayed to serve policy goals. The Assistant General Counsel for Intellectual Property of Bell Laboratories, A. E. Hirsch, accepted JPO's justification for delays in patent examination, noting that JPO is "going against the tide" of government-wide administrative reform when it chooses to hire additional examiners.^[64]

Regardless of whether the backlog at JPO is planned or unplanned, it undoubtedly creates a great deal of inconvenience and uncertainty for Japanese and American filers. Whatever its advantages or drawbacks from a trade or industrial policy perspective, one result of the understaffing at JPO is to simply cause frustration among patenters, which may make them think twice about using the Japanese patent system to disclose and protect their innovations.

Is the Japan Patent Office Amenable to "Fraudulent" Practices?

A second criticism of JPO procedure is that Japanese patent examiners place less of an emphasis than their American counterparts on requiring filers to disclose prior art. This is somewhat different from the allegation that the Japanese Patent Code does not contain sufficient antifraud provisions. Rather, it is a two-part assertion: first, that patent examiners, by de-emphasizing the disclosure of prior art, open the door for companies to surround their rivals' filings with fraudulent filings, and second, as Donald Spero of Fusion Systems has argued, that JPO examiners "either cannot, or will not," properly enforce antifraud provisions in the patent code to punish the filers of fraudulent patent applications.^[65] The economist Janusz Ordover has characterized the lack of emphasis on prior art as a JPO policy. He feels that the de-emphasis of prior art makes the role of the Japanese patent examiner less important than the role of an American patent examiner, and believes that this may be one reason why the "number of applications per examiner is so much higher in Japan," resulting in JPO's backlog of unexamined applications.^[66] If one is inclined to believe that JPO is attempting to carry out an industrial policy goal of technology diffusion, then the de-emphasis of prior art and the backlog of patents at JPO appear to be mutually reinforcing strategies. De-emphasis of prior art opens the door to "patent

flooding," which exacerbates the backlog of unexamined patents, fostering an atmosphere of uncertainty that is favorable to low-cost licensing.

There appears to be some disagreement among U.S. officials over the argument that the Japanese patent system fails to treat nondisclosure of prior art as a fraudulent practice. While USTR and ITA endorsed this argument during the 1988 Rockefeller hearing, PTO testified that it had no intention of asking for greater disclosure of prior art in the Japanese patent system. More recently, a PTO official interviewed by the author reported that claims of JPO's failure to prevent patent fraud should be viewed with some skepticism, and emphasized that JPO is fair within the boundaries of its structural restraints.^[67]

There are several possible reasons why U.S. government agencies appear to disagree on this issue. First, USTR and ITA have an industry constituency, while PTO does not. Second, as James Q. Wilson has noted, each federal agency has its own professional culture.^[68] ITA and USTR officials, as trade specialists, may regard patent law and procedures primarily as industrial policy tools. This is certainly not true of the patent specialists employed by PTO, whose spokesperson informed the author that "the patent system isn't viewed as an economic policy tool."^[69] Finally, it may be that one or more of these three agencies has relatively little policymaking authority over patent-related trade issues. In that case, there may be no real policy disagreement, and Japanese officials would, from their interaction with U.S. counterparts, understand which U.S. government position carries the most policy weight (probably that of PTO, which is the lead U.S. agency in international patent negotiations).

Allegations of MITI Interference in the Patent Opposition Process

Some private-sector sources believe that MITI actively utilizes the opposition system to "target" promising foreign technologies for expropriation. For example, the petroleum firm BP America has asserted that if an application covers a basic invention that is considered commercially valuable, or if it "falls into an area of technology targeted by MITI," there will be a "surprisingly large number of oppositions," collusively prepared by Japanese rivals. BP contends that MITI has either encouraged or directly organized collusive, multiple opposition to U.S. patents in the pre-grant opposition process.^[70] BP's charge is suggestive in light of the testimony of several U.S. patent attorneys, who told GAO that "it is particularly difficult to obtain patents on broad, commercially valuable technologies in Japan or those that involve important new technologies." One electronics firm, for example, told GAO that it did not begin to have problems with the Japanese patent system until its product set industry standards in the United States.^[71]

How Valid Are Allegations of Administrative Interference?

We have seen that there is considerable suspicion that delays in patent examination, the de-emphasis of prior art by Japanese patent examiners, and the ability of Japanese firms to use opposition to challenge American patent applications in new technology areas may be the result of administrative interference in the patent system. How much credence should we give to these

allegations? If Fusion and Allied-Signal are correct, and MITI can manipulate the Japanese patent system to effect delays, then a whole series of questions present themselves which no party in the debate has adequately addressed. For instance, what mechanism could MITI use to exercise influence over career examiners in JPO? Could this influence only occur under exceptional circumstances, or is it consistently applied as an industrial policy strategy? If it constitutes an industrial policy strategy, to what extent is it endorsed by Diet members with oversight authority over the patent system, and by the staff of the Japan Patent Office itself? And finally, is this alleged industrial policy strategy only used against applications submitted by foreign inventors, making it a clear-cut trade barrier, or are targeted delays also used to insure the industry-wide diffusion of domestically-generated strategic technologies?

As I have shown, there is no consensus among U.S. government officials and private-sector patent practitioners on the extent to which the Japanese patent system is subject to politicization, and the evidence of politicization is highly anecdotal. It is therefore necessary to develop a concrete test to investigate possible avenues of policy influence.

Career Patterns of Senior Patent Officials: Evidence of *Shukko* and *Amakudari*

Michael Borrus has noted that JPO commissioners rotate into their positions from other branches of MITI, and has suggested that some policy coordination occurs between JPO, the Administrative Vice Minister of MITI, and the Directors General for Information Industries and International Trade Policy.^[72] Similarly, the Commissioner of PTO, in his 1988 Senate testimony, suggested that the rotation of MITI bureaucrats into JPO may represent an avenue of "industrial policy planning."^[73] In light of these clues, and the fact that post-retirement placement of senior career bureaucrats (*amakudari*) and interdepartmental rotations (*shukko*) are widely used as policy coordination mechanisms by the Japanese government, I believe that an analysis of the career patterns of Japanese patent officials may provide clues to the degree of "industrial policy bias" at JPO.

Research into the career patterns of rank-and-file examiners is not conclusive, but it suggests that *shukko* and *amakudari* are infrequent below the level of senior management. Patent examiners do sell their skills in the private labor market after retirement, but their ability to secure employment apparently has more to do with the state of the economy than with imperatives of industrial policy coordination.

According to a current PTO examiner who previously worked in a Japanese law firm, Japanese examiners enter their positions through a high-level civil service examination, after specializing in a science or engineering field. They generally do not change jobs for their entire career, and retire in their 60s (a relatively late age in Japan for civil servants who hope to transition into other positions after retirement).^[74] Takeuchi Sumio, a Japanese patent attorney, has informed the author that examiners are automatically qualified for patent practice after seven years of service; and that consequently, they usually go into private practice after retirement, "either solo or with other patent firms."^[75] Data collected by the

Library of Congress-Japan Documentation Center, however, suggest that this post-retirement employment may only be the norm in periods of unusually strong inter-firm labor market activity. A report prepared by the Center in response to a reference inquiry by the author notes that "during the bubble economy period in Japan a considerable number of examiners transferred from JPO to private firms...or private patent offices; however, in these five or six years since the bubble collapsed the number of such examiners has declined."^[76]

The late retirement age of Japanese patent examiners, the fact that they generally do not rotate into other government positions, and the difficulty they apparently face when seeking alternative employment during periods of economic downturn, may suggest that *shukko* and *amakudari* by patent examiners are not used as an element of industrial policy guidance, although more research on this question is clearly warranted.

A study of the career patterns of senior officials at the Japan Patent Office, based on 1989, 1991, and 1994 Japanese government personnel directories, yields more striking results.^[77] As of 1994, 40 senior positions at JPO, or 25.3% of the total, are filled by former MITI officials, while 112 of the remaining 118 senior positions, or 70.9% of the total, are filled by individuals who were initially hired by JPO.^[78] Former MITI officials are not distributed evenly throughout the agency's administrative and examining departments. Approximately half (5/9) of the senior executives in the General Administration Department, including the Commissioner, are former MITI officials, and former MITI officials fill almost all (7/9) of the senior positions in the 5th Examination Department, which is responsible for computers, telecommunications, consumer electronics, circuitry, and electric power generation technology.^[79] In contrast, only 7 of the 40 senior positions in JPO's other four examination departments, or 17.5%, are filled by former MITI officials, with no more than three in each department. Examples of the technology fields covered by these four departments include chemicals, transportation machinery, factory machinery, metals, and agriculture. Even when a relatively small number of former MITI officials serve in an examination department, however, there may be a pattern to their placement. Former MITI employees fill only two of the nine senior positions in the 4th Examination Department, but they are responsible for directing the only two divisions that examine polymer technology. Divisions that examine other chemical technologies are all run by individuals who began their careers at the patent office. Finally, the number of former MITI officials serving as senior executives in the Department of Appeals is numerically large (20), but small as a percentage of that department's total number of senior executives (20.8%).

If we look at the career patterns of former MITI officials serving as senior patent officials, we find that a number of them have a career background in trade, industrial policy, and foreign technology assessment. Former MITI position titles include Director of Economic Affairs, International Trade Policy Bureau; Chief, Industrial Location Policy; Chief, Industrial Redisposition; Chief Examiner, Industrial Policy Bureau; and Chief of International Resources, Agency of Natural

Resources and Energy. In addition, the current Director-General of the 1st Examination Department previously served as Councilor to a department of the Cabinet Legislative Bureau, a principal forum for interaction between senior bureaucrats and Japan's ruling party.^[80] A cursory study of the career backgrounds of former senior patent officials has yielded similar results. One former JPO Commissioner previously served as the Assistant Director of MITI's International Trade Policy Bureau, while another previously served at the Japan Defense Agency as Director of Matériel. Other former senior officials at the Japan Patent Office have served as senior planning and guidance officials at MITI's Small and Medium Enterprise Agency, which is responsible for regional technology development initiatives.^[81]

Two Explanations for the Staffing Patterns Observed at the Patent Office

If MITI were to use the patent system to confer advantage upon favored firms and industries, then one could plausibly argue that senior MITI officials with a strong background in trade, industrial policy, and technology assessment would have to be placed in senior positions at the patent office to provide a tacit link between MITI planners and the Japan Patent Office, and between the Japan Patent Office and client industries. The preponderance of former MITI officials in the 5th Examination Department is especially suggestive in this respect, considering MITI's long-standing efforts to improve the competitive position of the Japanese computer industry. The Japanese government has actively nurtured the domestic computer industry since the late 1950s, because of the strong market position of foreign manufacturers, a perception that other governments use defense spending to confer market advantage on their computer industries, and structural characteristics of the industry that discourage private investment (high entry barriers, poor short-term returns, and frequent shifts in market structure). The primary instruments of industrial policy through the 1970s included joint research in MITI-sponsored Engineering Research Associations (ERAs), tax credits, price controls, licensing assistance, demand stimulation initiatives, and attempts by MITI to limit the market to six primary manufacturers.^[82] Government interest in the industry remains strong because of concerns over the viability of more resource-dependent industries, because of the unwillingness of foreign firms to license technology to their Japanese counterparts without restrictive side agreements, and because of the increasingly basic nature of computer engineering research. Current MITI-sponsored computer projects tend to be entirely government-funded, and are complemented by an array of projects sponsored by off-budget government organizations such as the Key Technology Promotion Center.^[83]

If MITI decides to utilize the patent system to confer advantage upon domestic computer manufacturers at the expense of foreign patent applicants, it may have the incentive, and probably has the capacity, to do so. However, we should be circumspect in assessing these findings, as there is a more plausible alternative explanation for the staffing pattern we observe at the Japan Patent Office. The alternative explanation hinges on three factors: prestige, expertise, and control.

First, the career background of senior patent officials may simply reflect the prestige of trade and industrial policy positions within the Ministry. A mid-level managerial position in trade policy, for example, may be followed as a matter of course by a senior appointment in any number of MITI bureaus, one of which happens to be the Japan Patent Office. Second, the placement of former MITI officials into positions of responsibility at the Japan Patent Office may simply reflect their professional expertise. The high proportion of former MITI officials in the 5th Examination Department may, therefore, be explained by the high volume of business undertaken by the Department, which necessitates managerial expertise best supplied by highly competent officials who have served at the Ministry level.^[84] Finally, Japan has a parliamentary, rather than a presidential system of government, and each ministry generally has only one political appointee (the parliamentary vice-minister). MITI officials may serve the same function at the Japan Patent Office that political appointees ideally serve in a typical U.S. government agency: ensuring agency accountability and performance.

Corporatism in the Japanese Intellectual Property System

Another possible route for industrial policy coordination and industry influence in the Japanese intellectual property system is through the Japan's large network of governmental and quasi-governmental intellectual property associations. In general, Japanese government-sponsored foundations, or *seifu kankei hoojin* are closely tied to "parent" ministries, and are often used to coordinate policy between ministries and the industries they regulate. In addition, *hoojin* are sometimes used to move major governmental functions off-budget, and are known to have informal policy and program mandates that exceed their official mandates.

According to reports by the Japan Information Access Project and by a researcher at Germany's Max-Planck-Institut, as well as a study by a Japanese labor federation (*Seirooren*), there are at least thirteen government-sponsored patent associations in Japan. All of these organizations are sponsored by MITI. Of these, at least two, the Japan Patent Information Organization (JAPIO) and the Japan Institute of Invention and Innovation (*Hatsumei Kyookai*, or JIII) are *seifu kankei hoojin*. Another of these organizations, the Patent Attorneys Association (JPAA, or *Benrishi Kai*), is jointly supervised by MITI and JPO, and membership in it is mandatory for patent attorneys. A third, the Japanese Group of AIPPI (*Association Internationale pour la Protection de la Propriete Industrielle*) was established jointly by the Foreign Ministry, JPO, and the Federation of Economic Organizations (*Keidanren*), Japan's peak industry association. Finally, the Institute of Intellectual Property (IIP), which was established by MITI in 1989, functions under the Industrial Policy Bureau.^[85] These organizations carry out activities that one would expect to see in a nonprofit industry association or private consulting firm in the United States, such as sponsoring awards and industrial expositions (JIII), conducting patent searches and providing advice to client firms (JIII, JPAA), sponsoring educational

and library services (JIII, JPA), assisting firms with licensing (JIII, AIPPI-Japan), conducting comparative studies of national patent systems (JPA), gathering business intelligence (IIP, JAPATIC, JPAA, Science and Technology Information Foundation), and lobbying on behalf of the Japanese intellectual property community (IIP, JPA, JPAA). They also, however, carry out quasi-governmental regulatory and administrative functions, such as dispute resolution (JIII), regulation of professional standards (JPAA), guidance and oversight of government policy (JPA, JPAA), publication of court records (JPA), publication of patent applications for examination and opposition (JAPIO, JIII), and regional economic development (JPAA, JIII).^[86]

Several of these organizations possess a mandate to provide Japanese firms with foreign market intelligence, have the capacity to alert Japanese firms of opportunities to file oppositions against foreign patenters, and have the ability to alert MITI of unusual foreign technology developments. One of the roles of IIP is to "gather foreign patent information," and it announced its intent in 1992 to distribute information on U.S. and European patents to Japanese firms, free of charge, with the assistance of the Japan External Trade Organization (JETRO).^[87] The Science and Technology Information Foundation "collects and disseminates information on technologies for which foreign companies have applied for patents in Japan," and publishes special "flash bulletins" on applications of interest.^[88] JAPATIC was established jointly by government and industry to "collect information on industrial property rights from Japanese and foreign sources" for clients, including "surveillance of the status of examination progress."^[89] JAPIO and JIII, as the official publishers of pending applications in the Japanese patent system, have access to foreign patent information that would be of interest to Japanese industry.

Career paths in government-sponsored intellectual property organizations provide strong evidence of policy coordination between MITI, JPO, Japan's dominant Liberal Democratic Party, and Japan's most patent-intensive industries. Looking at 1992 data on the career paths of Japan Patent Information Organization (JAPIO) executives, we see several items of interest. First, all of JAPIO's senior executives entered their positions through *amakudari*. Second, while seven of JAPIO's junior managers entered their positions through *amakudari* or *shukko* from the Japan Patent Office, the senior executives in policy positions come from much broader career backgrounds, having served at various times as senior officials at MITI's International Trade Administration Bureau and Small and Medium Enterprise Agency, at the Economic Planning Agency, at JIII, on the Commerce and Industry Committee of the Lower House of the Diet, in JPO divisions responsible for strategic industries (e.g., semiconductors), and in electronics and aluminum manufacturing corporations.^[90] The careers of two of these individuals merit special attention. The Vice President of JAPIO previously served as the Commissioner of the Japan Patent Office, and then as the Vice Chairman of MITI's Small and Medium Enterprise Agency. JAPIO's Chairman previously served as the Bureau Chief of

MITI's International Trade Administration Bureau, and then as the president of a major electronics firm (Matsushita Electric Industrial Corporation).^[91]

A similar pattern can be observed in other government-sponsored intellectual property organizations. Former chairmen of NKK, Fuji Film, Toyota Motors, and TEPCO have served as the chairmen of JPA and JIII, while former senior officials at Matsushita and Sony have served as acting presidents at JIII.^[92] Former MITI and Japan Patent Office officials have served in senior positions at IIP, senior JPA and JPAA officials participate on MITI's Industrial Policy Council, and JPA is represented on Keidanren's Committee on Industrial Technology.^[93]

Of course, this staffing pattern does not, in itself, suggest any more policy coordination than we see in the U.S. patent system, which features career patterns that appear quite similar. For instance, former U.S. Patent Commissioner Gerald Mossinghoff, who spearheaded President Reagan's campaign to strengthen the U.S. patent system, is now the president of the Pharmaceutical Research and Manufacturers of America (PHRMA), which exercises influence over the patent policy of the Department of Health and Human Services.^[94] Prior to his appointment to PTO, Mossinghoff was a senior official at NASA, one of the leading U.S. industrial policy agencies in the aerospace sector.

What is striking in the Japanese case, however, is not simply that there is a "revolving door" between the private and public sectors of the intellectual property community, but that the revolving door operates among a strikingly large network of organizations, many of which are under government supervision, have quasi-governmental authority, and are staffed by professional trade officials as well as intellectual property practitioners.

Additional research must be conducted on Japanese government-sponsored intellectual property organizations, however, before we can reach any firm conclusions about their role in the patent system. Pharr and Badaracco (1986), among others, have suggested that Japan favors a corporatist pattern of regulation, which involves frequent direct negotiations between a relatively stable set of government agencies and interest intermediaries, as well as a formal delegation of quasi-governmental powers to interest groups. In addition, Morris-Suzuki (1994) notes that Japanese government technology policy has historically involved "creating nodes" in the scientific and engineering research community through which "knowledge of new techniques could flow to many parts of the industrial system," and formally establishing public corporations to serve as intermediaries between the private and public "nodes" of innovation.^[95]

The functions and staffing priorities of Japanese government-sponsored patent organizations may, therefore, simply reflect a general administrative style, under which professional networks and avenues of influence are less opaque and more formally institutionalized than in the United States, but functionally similar. Additional evidence is needed to show that government-sponsored intellectual property organizations actually participate in the administration of the patent examination process, and the mode of participation must be properly defined.^[96]

Economic and Comparative Perspectives on the Japanese Patent System

U.S. participants in the discussion of the Japanese patent system tend to assume that a patent system promoting a political goal of diffusion also fails to promote invention, and that the use of patenting to fulfill industrial policy goals is somehow unique to Japan. As I will demonstrate in this section, there is considerable economic evidence that some of the practices identified by U.S. firms and policymakers as disincentives for invention in the Japanese patent system may, in fact, be necessary to encourage invention, and to promote goals of national welfare. U.S. government agencies recognize this, and have also engaged in "industrial policy" initiatives to carry out similar practices, although they do so in a different political forum.

The Economic Advantages of Narrow Patent Scope

A number of economists and legal scholars have argued that a narrow construction of patent scope is crucial for promoting invention in cumulative and basic science industries, and that incremental innovation and technology diffusion are socially desirable goals for a patent system. On the basis of these views, it can be plausibly argued that some of the Japanese industrial policy strategies that cause considerable problems for U.S. firms patenting in Japan also bring the Japanese patent system closer to the ideal of economic efficiency. It is not surprising, then, that U.S. firms and policymakers involved in the debate over the Japanese patent system have made little reference to the theoretical economic literature on patenting.

Robert Merges has argued that in "cumulative" technology sectors (e.g., computer engineering and aeronautical engineering), where incremental advances push forward the technological level of advanced systems, overly-broad patent scope can lead to inter-firm "stalemates" that make it prohibitively expensive for firms to innovate or even to manufacture their patented products. Similarly, broad patents in "science-based" industries, such as biotechnology, may stifle the invention of new methods for producing "purified natural products."^[97] In economic sectors characterized by cumulative innovation and basic sciences-driven research, therefore, narrow patent scope decisions may be preferable.

Peter Grindley of the Law and Economic Consulting Group has noted that U.S. firms in the semiconductor industry engage in extensive inter-firm cross-licensing agreements after their patents are granted, to avoid the sorts of stalemates identified by Merges.^[98] The objection of U.S. firms to narrow patent scope decisions by Japanese patent officials may, therefore, have less to do with differences in the ultimate scope of patent rights conferred by each country's patent system, than with the forum in which patent scope is determined.

The Problem of Double Marginalization

Suzanne Scotchmer has argued that every patent system is characterized by trade-offs between invention and diffusion. First inventors only have an incentive to invent if they receive some of the social surplus generated by subsequent

innovators, but this incentive is only socially justified if subsequent inventors are left enough profit from second-generation products to warrant developing them. Broad patent rights of the sort championed by U.S. opponents of the Japanese patent system are therefore problematic, because they place first inventors in an excessively strong bargaining position vis-à-vis subsequent innovators, hindering socially useful innovation in cumulative technology fields.^[99] Joan Robinson has succinctly pinned down this problem as an inevitable tradeoff between current and future benefits, arguing that "the justification of the patent system is that by slowing down the diffusion of technical progress it ensures that there will be more progress to diffuse...since it is rooted in a contradiction, there can be no such thing as an ideally beneficial patent system."^[100]

The Tradeoff Between Intellectual Property Protection and Socially Useful Investment

In a broader sense, there is also a tradeoff between the research generated by strong patent rights, and other types of socially necessary investment, such as investment in capital goods. Fritz Machlup has consequently argued that "the decision to increase inventive activities is fully rational only when it looks likely that productivity can be raised faster and promoted more securely by more new technical knowledge than by more education and more capital equipment." Even if economists bracket investment in R&D together with investment in education as "investment in knowledge," Machlup argues, it may still carry a lower marginal utility than investment in capital or in consumer goods.^[101] Machlup's analysis suggests that overly strong patent protection may bear a social cost in the form of reduced productivity.

Arguments for the Irrelevance of a Strong Patent System

Some economists have argued that low appropriability intellectual property regimes are not inherently harmful to invention in the private sector. Firms assume low appropriability as a necessary condition of operating in research-intensive sectors, and adjust their business practices accordingly. Richard Nelson has argued, on the basis of a survey of 127 U.S. industries, that firms regard first mover advantage, learning curve economies, and sales and service efforts as more important means of assuring appropriability to innovation than either "patents for protection" or "patents for royalties." Among the survey respondents stating that patent systems generally fail to provide good basic protection for innovation were the U.S. semiconductor, telecommunications, computer, and aircraft industries.^[102] If Nelson's survey still provides an accurate picture of the role of intellectual property in corporate strategy, then there is obviously nothing sinister in the Japanese view that patents should primarily serve secondary roles such as market signaling, credentialing, and diffusing knowledge into the public domain.

Finally, certain industries have built-in characteristics that make their products difficult to infringe upon or reverse-engineer, even under a low-appropriability patent regime such as Japan's. In biotechnology, for example, the highly specialized nature of each firm's product line lowers the cost of monitoring

infringement, and regulatory requirements make incremental innovation relatively costly.^[103]

Macroindustrial Policy in the U.S. Patent System

A recent Office of Naval Research report notes that the outcome of the Honeywell v. Minolta infringement case, which granted an extremely broad range of equivalents to a U.S. firm's camera design, is held up by Japanese commentators as an example of U.S. industrial policy in action, and according to Saxonhouse, the outcome of the 1980 Diamond v. Chakrabarty case, which opened the door for strong patent rights in the biotechnology field, convinced Japan's *Keidanren* that the U.S. government had designated biotechnology as a "strategic industry," and was "weaving about it a new and unprecedented network of protective patents."^[104] More generally, the ONR report suggests that there is a "widely held view" in Japan that "during the Reagan administration, strengthening and protecting intellectual property rights was emphasized, instead of strengthening manufacturing, as a way to compensate for the decline in production capacity and to reap profits, and this became a national policy of the U.S."^[105] Although the allegation that the Reagan administration strengthened the U.S. intellectual property system as a purely compensatory measure is open to debate, it is undisputed that the administration set out to strengthen the patent system, and that it did so largely through judicial means: by establishing the U.S. Court of Appeals for the Federal Circuit (CAFC) in 1982 to adjudicate patent cases on appeal.^[106] According to Stanley Besen and Leo Raskind, the CAFC has acted to strengthen the patentability of mathematical algorithms embodied in software.^[107] The establishment of the CAFC, therefore, can be viewed as a judicial instrument of industrial policy that has acted, in practice, to strengthen intellectual property rights in an industry in which U.S. manufacturers have a competitive advantage.^[108]

Microindustrial Policy in the U.S. Patent System

Although the general trend in the U.S. has been toward stronger intellectual property protection, the U.S. government has been cognizant of the fact that broad patent protection may be economically inefficient or socially undesirable in individual cases, and has acted when necessary to curb patent scope, encourage licensing and diffusion, and, arguably, promote industry concentration and international competitiveness among U.S. high technology industries. Rather than being carried out by an industrial policy agency such as Japan's MITI, U.S. "selective" industrial policy initiatives in intellectual property are carried out in the spheres of defense and health policy, and through the discretion of the court system.^[109]

U.S. law allows a five year patent extension for pharmaceutical products. However, because overprotection of pharmaceuticals could hinder the policy goal of ensuring low-cost access to medicine, the U.S. also guarantees market entry for generic drug manufacturers, and caps the price that can be charged for pharmaceuticals jointly developed by the government and industry.^[110] When patent "stalemates" have occurred in strategic industries in the United States,

government agencies whose primary authority lies outside of the patent sphere have used their procurement procedures to impose cross-licensing agreements on rival patent holders. Prior to the Second World War, for example, the War Department imposed mandatory cross-licensing arrangements on the U.S. aircraft and radio industries, and after the war, the Defense Department used its multiple-source procurement process to impose cross-licensing arrangements on the semiconductor, integrated circuit, and computer industries.^[111] The case of DOD's alleged infringement of British hovercraft patents, noted by Thorson and Fortnort (1995), suggests a continuing imperative to selectively bypass strong intellectual property protection when necessary to meet national security goals.^[112]

It should also be noted that patent scope decisions generated by administrative opposition procedures in Japan are not guaranteed to be narrower than patent scope decisions generated by litigation in the United States. Although the recent trend in the U.S. courts has been to award broad patent scope to inventors, there are actually two competing precedents that U.S. courts must choose from as they see fit. On the one hand, court decisions following the "doctrines of disclosure and enablement" (e.g., *O'Reilly v. Morse*) hold that the inventor must disclose "the full range of variants implicitly encompassed within the claims," and that patent scope must consequently be narrow. On the other hand, courts may choose to grant patent protection to a broad "principle" (e.g., *Gillette v. Clarke*).^[113] In addition, there is a "doctrine of reverse equivalents" in U.S. legal precedent, which allows literal infringement in some cases (e.g., *SRI v. Matsushita*) if the infringing invention is deemed sufficiently "novel" and "useful."^[114]

My conclusions may, unfortunately, serve to further complicate the debate over politicization in the Japanese patent system, because they suggest that all real-world patent systems must, to some extent, be amenable to political interference in the service of promoting the goals of economically efficient innovation, national security, and national welfare. The real issue for policymakers is to determine where to draw the line between "acceptable" and "unacceptable" levels of interference in the patent system, on the assumption that a certain degree of interference is inevitable. Where this line will be drawn will depend on how broadly national security and national welfare goals are officially construed. It will also depend on the type of forum--administrative or judicial--that dominates the national regulatory environment.

2. Historical Antecedents and Industry Preferences

Introduction

Although we can draw a boundary between a country's formal intellectual property system and other elements of its innovation system for purposes of simplification, it is important to understand that an intellectual property "system" is actually a complex equilibrium of laws, administrative routines, firm-level practices, industry-level market arrangements, and national-level assumptions concerning the role of technology in society. The formal elements of the system represent an ongoing response to the structural requirements of the private sector, just as private-sector patent practices represent a response to system characteristics.

Unfortunately, reports on the trade policy disagreements between the U.S. and Japan over intellectual property often concentrate on the will and capacity of the Japanese government to influence the patent system without adequately accounting for the incentives of Japanese firms to maintain or discard their patenting practices. To the extent that the Japanese private sector continues to favor an ambiguous and diffusion-oriented intellectual property system, it will get one, regardless of any efforts to the contrary by U.S. and Japanese policymakers. Durney (1990) has argued that American businesses and policymakers cannot realistically expect patent law harmonization to do more than bring about a certain degree of administrative uniformity between the U.S. and Japanese patent systems, as "significant differences between the business and legal conditions that make up the 'patent environment' in Japan and the United States" continue to encourage American firms to rely on "offensive" patent strategies and Japanese firms to rely on "defensive" patent strategies.^[115] Durney's conclusion seems justified when one considers that 1975 and 1988 Japanese laws allowing multiple claims have not appreciably changed the Japanese private-sector practice of filing single-claim applications, and that complaints of "overfiling" have continued in spite of JPO's use of administrative guidance and threats of patent quotas to try to reduce the level of filing to a manageable level.^[116]

It is important, therefore, to address the structural and historical incentives for Japanese firms to maintain a patent environment characterized by volume filing, patent flooding, defensive "portfolio" strategies, and the use of patents for blocking, credentialing, and market signaling. Drawing from Lynn, Reddy, and Aram's "innovation community" methodology for studying national innovation systems, which distinguishes between the different roles played by "substructure" organizations (the firm, laboratory, or factory) and "superstructure" organizations (professional societies and trade associations), this section separately analyzes the micro-institutional, meso-institutional, and macro-institutional elements of the private-sector patenting environment in Japan.^[117] In my analysis, micro-institutional elements include firm-level activities, such as personnel and budgeting practices. Meso-institutional elements are characteristics of the Japanese industrial order, such as the activities of business groups and industry associations. Finally, I designate national comparative advantage, and national-level attitudes, or ideologies, concerning the role of technology in society as macro-institutional elements. This three-tiered approach, I feel, allows for the most nuanced and comprehensive

discussion of "extrasystemic" factors affecting the Japanese patenting environment.

Micro-Institutional Factors: Technology Management in the Firm

R&D Personnel Management

Several firm-level Japanese technology management strategies may account for the evidence that Japanese firms frequently infringe upon foreign patents, favor narrow patent claims, engage in "patent flooding," and take a "defensive" approach to patenting. First, there is a well-known engineering bias in Japanese firms' hiring practices. Wakasugi Ryuhei, a retired MITI official, notes that "the alumni of engineering departments engaging in engineering-oriented R&D find employment in large numbers, while the number of graduates of natural sciences departments finding employment in firms is relatively small, even though these individuals bear the burden of conducting a significant proportion of basic R&D."^[118] While the U.S. and Japan graduated approximately the same number of engineers in 1994, the number of U.S. natural science graduates (105,000) was more than four times the number of Japanese natural science graduates (25,000).^[119] Wakasugi argues that the result of this phenomenon is that the R&D personnel system is geared toward technology importation and incremental innovation, and "specialized toward applied research."^[120] This may bias Japanese firms in favor of market-oriented patents with narrow claims. Second, lifetime employment in the Japanese firm may encourage volume-oriented patent strategies, encourage infringement, and discourage private-sector support of broad protections for "pioneer" inventions. Michael Helfand suggests that the large number of narrow patents filed by Japanese researchers can be partially explained by the "credentialing" role of patents as a performance indicator in the Japanese firm. Stanley Cole, former Vice President of Patents for Varian Associates agrees, noting that patents are used for "honoring and reward for someone who contributes" to the corporation, and play a role similar to bonuses in American firms.^[121] James Lincoln, who has recently conducted field research at Toyota and Hitachi, has documented the use of patenting as a group performance indicator for competing research groups within a firm. Lincoln believes that use of patents for "credentialing" is a function of lifetime employment and seniority-based advancement in the Japanese firm.^[122]

R&D Budgeting

As a number of authors have noted, Japanese high technology firms have consistently large R&D budgets, representing a higher percentage of sales than in equivalent U.S. firms. The size of Japanese R&D budgets is, in part, due to the lifetime employment system, which allows wages to be viewed as a fixed cost for accounting purposes.^[123]

Large, predictable R&D budgets have a direct effect on patent strategy, by making a "defensive," or "portfolio" strategy of patenting both desirable and

feasible. Japanese firms view the use of patents as defensive: firms primarily use patents to negotiate low-royalty cross-licensing agreements, and to "defend market share and preserve profit margins," rather than to secure royalties. Because the defensive approach to patenting requires each firm to build a large portfolio of patents to use as bargaining chips, "royalty-free access" to technology does not become a disincentive to invention.^[124]

This strategy, which requires a large research budget, has several implications for the functioning of the patent system. First, the defensive strategy reduces the demand for patent litigation. Infringement actions are "stalemated" by large patent portfolios, and cross-licensing agreements provide insurance against surprise lawsuits.^[125] Second, the defensive strategy encourages patent flooding, which adds to the backlog at the Japan Patent Office and which, as we have seen, can be used to facilitate infringement and coercive cross-licensing agreements. Finally, a defensive patent strategy encourages firms to view patents principally as market signaling mechanisms. Firms use their patent applications to attract potential business partners, and to warn competitors of what they are working on so as to avoid mutually costly infringement actions.^[126]

The use of patent applications for market signaling has three implications for the operation of the patent system. First, because intellectual property protection is not the primary goal of filing patent applications, there is not significant demand for a faster patent system.^[127] Second, defensive strategies encourage Japanese firms to favor the practice of "laying open" patent applications eighteen months after filing, because it allows them to disclose the technology embodied in their patent applications in an orderly and predictable manner. Third, Japanese firms do not object to the practice of deferred examination, because applications that purely serve a signaling role can be left unexamined after the "laying open" period.^[128]

As we have seen, Japanese personnel practices and R&D budgeting practices at the level of the firm provide incentives for filing patent applications in volume. These firm-level incentives are doubtless reinforced by incentives stemming from the patent system itself. According to Irving Kayton, in every first-to-file patent system, whether in Europe or Asia, the incentive to file early produces a professional cadre of economically-trained, rather than legally-trained patent practitioners. Their goal is not to write robust patent applications, but to get applications to the patent office as early as possible. Kayton concludes that all first-to-file systems "demand" patent flooding as a "proper and effective" use of the system, and that consequently, the practices of patent flooding and filing insufficiently robust applications cannot be eliminated in Japan.^[129]

Meso-Institutional Factors: the Japanese Industrial Order

Keiretsu Financing

Carl Kester, among others, has demonstrated the importance in Japan of the *keiretsu*, a quasi-market corporate governance structure, as a mechanism for

establishing close ties between firms and financial institutions, and for preventing hostile takeovers. *Keiretsu* firms are closely linked to industrial banks, which provide credit financing by "borrowing short and lending long." To protect their risk, the industrial banks serve on the boards of affiliated manufacturing firms, and serve a major brokerage role during bankruptcies and similar crises. Because equity is not the primary source of investment within the *keiretsu*, the role of equity is to foster coordinated management rather than to externally monitor managerial performance. Firms cross-hold shares to improve long-term cooperation, banks hold shares in firms to guarantee the security of loans, and board members tend to be "inside men" rather than unaffiliated investors.^[130] The Japanese reliance on bank loans, rather than stock issues or venture capital, as primary instruments of industrial investment provides a buffer for the firm-level practices identified above, such as lifetime employment. It may also provide a strong incentive to adopt a "portfolio" approach to patenting, in which individual patents are traded away in exchange for favorable business agreements. By contrast, for U.S. high technology firms relying heavily on equity markets, each patent assumes crucial importance. The National Research Council noted in a 1991 report that U.S. firms depend on successful patents to attract equity investments; in turn, equity investments generate new patents, by giving biotechnology firms staying power during the product approval process, and by giving them the resources to attract top-quality researchers.^[131] For the American biotech sector, then, patenting and equity financing are linked in either a vicious cycle or a virtuous cycle, and each individual patent is relatively important to the survival of the firm.

Transaction Cost Advantages of *Keiretsu* Organization

One popular argument in the patent debate is that innovative firms in the U.S. tend to be small venture-capitalized startups, while innovative Japanese firms tend to be multidivisional and vertically-integrated. During the 1988 Rockefeller hearing, ITA and USTR argued that differences in the organizational structure of Japanese and American firms effectively rendered the Japanese patent system discriminatory. According to ITA, the Japanese patent system "sets up a balance which tips in favor of the large, well-financed organizations, which can afford to invest in a patent portfolio, typical of Japanese integrated industrial inventors, and penalizes the small, entrepreneurial organization which is the typical source of innovation in the U.S." Similarly, USTR argued that the cost of the multiple opposition system may render the Japanese patent system "intolerable" for small firms.^[132] Michael Helfand has stated that in order to "surround" the technology of a competitor in the Japanese patent system, a firm "must have the resources to monitor competitors' patent filings." Similarly, "the victim" will be more susceptible if it is unable to monitor patent filings to see if its technology is being taken.^[133]

PTO reported in 1990 that it can be costly for an American firm to adopt a Japanese-style, "aggressive" approach to patent filing, unless the firm retains a patent department or law firm to file a large number of applications in Japan.

This does not bode well for small American firms, since according to GAO, most U.S. firms patenting through *bennrishi* (Japanese patent agents) or maintaining their own patent offices in Japan are large (1991 sales over \$1 billion) while most U.S. firms patenting in Japan through U.S. law firms are small (1991 sales under \$1 billion).^[134]

The "size matters" argument has been backed up by a great deal of anecdotal evidence. Michael Whitener, for example, has quoted one U.S. firm as attributing its success in the Japanese patent system solely to its size.^[135] In addition, the greatest complaints aired during the 1988 and 1989 Rockefeller hearings came from small American firms, while large American firms reported few problems with the Japanese patent system. Alan Lourie of the SmithKline Beecham corporation, a major pharmaceutical manufacturer, testified at the 1988 Rockefeller hearing that the pharmaceutical industry is not adversely affected by pendency problems in the Japanese patent system, because the development of drugs is such a lengthy process.^[136] At the same hearing, the corporate patent counsel of Ciba-Geigy corporation, another major pharmaceutical manufacturer, testified that his firm had "fared quite well" in the Japanese patent system in terms of patent solicitation, enforcement, and litigation.^[137] Pharmaceutical firms tend to be very large, and have the resources to use a low-appropriability patent regime in much the same manner as it is used by their Japanese rivals: for example, they can afford to hold large patent portfolios, file in volume, maintain offices in Japan, wait out long periods of pendency, and treat their patents as expendable "cards" with which to make deals with rivals for favorable licenses. In fact, pharmaceutical firms that survive the lengthy drug approval process in the United States probably have an in-built capability to withstand long patent pendency periods, a capability which other U.S. high-technology industries may not share.

Although arguments related to firm size are appealing, they are somewhat simplistic. As Eleanor Westney has indicated, the most innovative Japanese firms are, in fact, relatively small by U.S. standards. She notes that in 1990, the only Japanese corporation with more than 100,000 employees was a public utility. Among major private corporations, Fujitsu had 49,625 employees, Matsushita had 42,510, Sanyo had 34,405, and Sharp had 19,547. These employment figures are quite small when compared with those of equivalent firms in the United States.^[138] Westney argues, however, that these firms can behave like much larger firms, because of shared personnel, shared expertise, and lines of managerial control between parent firms and suppliers, regional sales and distribution companies, and subsidiaries in related industries. In other words, *keiretsu* structures and supplier networks confer large-firm advantage. Goto Akira has described this phenomenon in terms of transaction cost economics, noting that "from the standpoint of the firm, by forming or joining a group, it can economize on the transaction costs it would have incurred if the transaction had been done through the market, and at the same time, it can avoid the scale

diseconomies or control loss which would have occurred if it had expanded internally and performed that transaction within the firm."^[139]

The transaction cost approach has crucial implications for the patent performance of *keiretsu* affiliates. First, if *keiretsu* enable affiliates to internalize the external economies, or "spillovers," associated with innovation, and to market finished products without resorting to a great deal of external contracting, affiliates will have less need for a strong patent system than small, unaffiliated firms that are constrained to produce more easily imitable intermediate goods. Second, by mitigating the organizational costs associated with vertical integration, *keiretsu* may help affiliates to achieve first mover advantage, reducing the allure of restrictive patents as a primary source of monopoly quasi-rents. Third, by reducing the contracting costs associated with innovation, *keiretsu* may allow affiliates to take a "volume" approach to patenting, which would reduce the relative value of royalties from each patent as a source of return to R&D investment.

Advantages Accruing to the *Keiretsu* From Market Share Maximization

John Zysman and Laura Tyson argue that the "market logic" of the Japanese economy encourages manufacturing firms to engage in a "market share maximizing" (MSM) strategy.^[140] A market share maximizing strategy has two components. First, a firm with a large and growing market share can benefit from learning-curve economies. By producing in volume, the firm accrues expertise that allows the firm to shift to a lower short-term total cost curve and a downward-sloping long-term total cost curve. A firm playing this "volume game" will be able to avoid diminishing returns, and to defend and capture market share by reducing costs and by introducing new product innovations with great cyclical frequency. Second, a firm using an MSM strategy must minimize costs to capture market share, which requires significant innovation in manufacturing processes. These process innovations, referred to collectively as a "flexible production strategy," allow firms to introduce a variety of specialized product innovations for different market segments. One aspect of the flexible production strategy is a "networked" pattern of innovation, in which small subcontractors innovate to "adjust to changes in the market demands of the large parent firm" within the *keiretsu* structure.^[141]

The purpose of Tyson and Zysman's discussion of technological innovation in Japan is to emphasize the fact that a successful MSM strategy requires cheap, imported technology and protectionist trade strategies. For our purposes, however, it is more important to note three other implications of their study. First, an MSM strategy relying on flexible production may generate a greater volume of innovation, at a lower cost, and embodied in a greater variety of products, than a profit-maximizing strategy relying on more traditional production techniques. Second, *keiretsu* affiliates may be better equipped to survive in a low-appropriability patent regime, because innovation is generated as a byproduct of volume production. Third, as a system of competitive outsourcing in which parent firms enjoy disproportionate market power, the

keiretsu structure may reduce the cost of technology development for parent firms, and consequently diminish the need for the patent system as a principal means of ensuring returns to R&D.

Ambiguities in the Role of the *Keiretsu*

At this stage, I feel that it is important to make two general points about the role of *keiretsu* in Japan's technology management system. First, not all sectors of the Japanese economy are dominated by *keiretsu*, and there is considerable evidence that the balance of market power between *keiretsu* parent firms and their suppliers varies considerably by industry and by region. David Friedman's analysis of the machine tool industry in central Nagano Prefecture, and Richard Samuels' study of the aircraft industry in Kagamigahara, suggest that there are unique social and market conditions in certain regions of Japan that allow suppliers to control the terms of their contracts with parent companies to a far greater degree than in, for example, the Japanese auto industry. In both regional cases, suppliers have succeeded in securing credit financing outside of *keiretsu* networks, and have successfully used collective action to capture market power from parent firms.^[142] Friedman's and Samuels' findings imply that any future analysis of the effects of *keiretsu* financing and contracting on firm-level patent strategies in Japan should seek data from a variety of industries and regions, because there are different kinds of *keiretsu* in different industries and regions. The second point is that there is no clear consensus among scholars on the general efficacy of *keiretsu* financing and organization at promoting innovation in Japanese firms. Leonard Lynn notes that, surprisingly, no studies have ever been conducted comparing technology management processes within *keiretsu* networks to technology management processes outside *keiretsu*. There is currently an active debate among economists on the issue of whether *keiretsu* promote innovation, or whether they "undercut the effectiveness of *keiretsu* members in developing technology" by reducing parallel sources of innovation.^[143] This debate cannot simply be resolved with better data collection techniques. As in the case of the current debate over the efficacy of research joint ventures and consortia, it is fundamentally a ideological debate between institutional and neo-classical economists, who hold opposing views on the ability of quasi-monopolistic organizations to promote innovation. With these two caveats in mind, my analysis suggests that *keiretsu* financing and organization effectively shield firm-level patent practices from budgetary uncertainty and reduce the relative cost of generating each patent in the Japanese firm. This, in turn, partly accounts for some Japanese firms' capacity to use "portfolio" and "patent flooding" strategies, and their incentive to value the patent system largely for its "secondary" functions--credentialing, signaling, and blocking.

Industry Associations

Japan's strong industry associations comprise a second meso-level element of the Japanese economy with a significant impact on the patent environment. Industry associations have historically helped Japanese firms to share licenses on

patents acquired from abroad. This low-cost technology-sharing strategy has prevented licensors from appropriating the higher rents that would accrue if individual Japanese firms were to compete over foreign licenses, or if Japanese firms were to negotiate parallel contracts for licenses. In addition, technology-sharing by industry association members has served as an important corollary to government technology importation strategies. Industry associations played a key role, for instance, in diffusing LD converter and continuous casting technology throughout the Japanese steel industry in the late 1950s and early 1960s, after MITI used its "bloc introduction" licensing policy to buy the patent rights for these technologies at an extremely favorable price.^[144] More recently, industry associations have played a critical role in diffusing intellectual property generated by government-sponsored consortia. Japan's aircraft industry association (SJAC) was a major participant in a recent MITI and MPT-sponsored consortium known as the Frontier Aircraft Research Corporation (FARC), whose stated goal was to generate process patents on advanced turboprop technology and license them at low cost to the Japanese aircraft, automobile, steel, electronics, and materials industries.^[145] Even if U.S. firms are invited to participate in similar consortia, it is likely that the weakness of industry associations in the U.S. will seriously hinder the willingness of participating American firms to license patents generated by consortia to nonparticipating American rivals. As Lynn, Reddy, and Aram argue, Japanese industry associations, such as the Japan Iron and Steel Federation, are more closely linked to the government than their American counterparts, have larger staffs, have a "more explicit mandate to collect technical information," and work more closely with firms and government to "effectively disseminate technology."^[146] Japan's strong industry associations clearly have an incentive to support low-cost, diffusion oriented patent licensing strategies, and have the capacity to fulfill this incentive.

Macro-Institutional Factors: National Development and Developmental Ideology

The Importance of Comparative Advantage

There is a widespread view in Japan that the establishment of a diffusion-oriented patent system was necessary to help Japan overcome its historical "latecomer" status, and to meet the challenge of Western competition. As noted by Helfand (1991), "Faced with historical pressures from larger Western powers, the Japanese came to believe it necessary that their legal system promote the survival of the Japanese nation and society, as a whole. Thus, the goal of the patent system became to share scientific and technical information (and) to teach about new innovations, so as to promote the development of Japanese industry...Japan probably could not 'afford' a system that promotes protection of individual rights over sharing."^[147] Although Helfand characterizes this view of the patent system as a "cultural imperative of industrial advancement," it can be

more precisely, and less mechanistically, identified as a shared consensus within the private and public sectors on the need for effective industrial development strategies.^[148] Wakasugi Ryuhei similarly argues that Japan's past technological backwardness had a significant effect on Japanese firms' technology management practices and attitudes toward intellectual property. Wakasugi believes that the dependence of the Japanese firm on imported technology resulted in a view that imitation could be used "to adapt to customer needs in the product market, or as a means of effecting a realization of efficient production process methods."^[149] Wakasugi argues that the pre-1975 patent system, in which "material patents" were not recognized, served to "accelerate" the tendency of Japanese firms to favor incremental, or cumulative, innovation (*tsuiteki na koofu*). Nonetheless, he argues that this tendency would have existed even in the absence of weak patent rights, because incentives for technology importation will naturally weaken incentives for basic R&D investment and put a premium on market-oriented development.^[150]

As these quotes suggest, Japan's status as a late developer strongly encouraged Japanese firms to adopt a technology management strategy emphasizing importation and commercialization of foreign technology, competition on the basis of incremental differentiation rather than product uniqueness, and use of technology to generate externalities for production processes. Many of the Japanese firm-level practices that are problematic for Americans patenting in Japan can be attributed to the attitudes identified by Helfand and Wakasugi. "Secondary" patent strategies, such as the defensive accumulation of large patent portfolios, may be especially common in Japan because inventions are valued instrumentally rather than inherently. "Patent flooding" to capture rivals' new technologies, and multiple oppositions to narrow patent claims also make sense in the context of private-sector attitudes favoring ambiguous intellectual property rights and market-oriented, incremental innovation. Finally, according to GAO, "patent protection is most important for industries with products that are easy to duplicate, have long product life cycles, and have high front end research and development costs...patents are most important for chemical, pharmaceutical, and biotechnology products and generally not as important for primary metals, electrical equipment, and automobiles, rubber, and textiles."^[151] Since the U.S. has a comparative advantage in the patent-sensitive high-technology fields identified by GAO, U.S. firms may experience disproportionate problems in a patent environment geared toward a lower-value added, lower-technology production profile. Thorson and Fortnort (1995) argue, in fact, that Japan's comparative advantage in mechanical engineering and electronics, rather than basic sciences, demands a collusive, defensive approach to patenting which is unfamiliar to U.S. patenters.^[152]

Whether U.S. firms continue to have difficulties with the Japanese patent system may therefore depend on the degree to which the Japanese economy shifts toward a more basic research-driven profile, and on the degree to which indigenous research supplants commercial development of imported technology.

Although certain Japanese industries have clearly reached the cutting edge of basic research, aggregate data on the technological level of the Japanese economy could support opposite conclusions.

Japan: Typical First-World Inventor or Technological Superpower?

On the one hand, Japan's export/import ratio for technology has risen from .13 in 1971 to .54 in 1993, while that of the U.S. has dropped from 10.56 to 4.21 over the same period.^[153] Starting in 1972, Japan's receipt of royalties for new technology contracts began to exceed its payment of royalties.^[154] Odagiri and Goto (1993) attribute the general narrowing of Japan's technology trade gap, and the increasing intensity of Japanese patenting practices, to a fundamental shift in the Japanese economy toward an "energy-saving, technology-intensive, and high value-added" industrial structure. They argue that this shift began in the 1960s, when trade liberalization, capital liberalization, and a general reduction of industrial policy guidance resulted in a massive increase in private-sector R&D spending, and that the intensification of private-sector R&D was further boosted by the oil shocks of the 1970s, which crippled traditional resource-intensive heavy industries.^[155] If this trend is continuing today, it may explain recent reports that Japanese high-technology firms are shifting toward an American-style basic research-oriented patent strategy, with the encouragement of the Japan Patent Office. A 1992 study by the Office of Naval Research (ONR) suggests that JPO is shifting away from an "implementation-example centered" examination doctrine, which favors incremental innovation, and toward an examination doctrine more favorable to basic invention. ONR suggests that at least two major Japanese electronics firms, Hitachi and Sanyo, have shifted toward an American-style "offensive" patent strategy.^[156] Similarly, a survey by the Nomura Research Institute has found that Japanese firms are increasingly adopting an American-style "proactive" intellectual property strategy.^[157] Other researchers present a less optimistic picture. Wakasugi believes that recent increases in private-sector research funding have benefitted "goal-oriented" basic research (*mokuteki-kihonkenkyuu*), but have not necessarily resulted in a shift in emphasis toward genuinely prospective basic research.^[158] Westney (1994) concurs, arguing on the basis of OECD data that there has been no aggregate shift in Japanese corporate R&D funding away from developmental research and toward basic research. Westney attributes this trend to the continued weakness of Japanese university science and engineering departments, and to the highly "isomorphic" pattern of wage structures and competencies within Japanese research establishments.^[159] Westney also believes that the Japanese R&D budgeting system has proven to be fragile in the face of economic crises, and that the negative growth of Japanese industrial R&D expenditures since the collapse of the "bubble economy" may result in a significant hollowing out of competencies.^[160]

If we look at technology trade data, we see that Japan continues to be a net technology importer, even though it has somewhat narrowed the gap with the United States over the past 20 years. The Japanese industries that shifted from a

deficit to a surplus of technology royalties during the 1970s were principally traditional heavy industries, such as shipbuilding.^[161] Most importantly, virtually all of Japan's imported technology (99.58%, worth [[yen]]361.43 billion) originated in North America and Europe in 1993, but only 49.08% of Japan's technology exports (worth [[yen]]196.48 billion) were purchased by North American and European customers that year. The remaining share of Japanese technology exports in 1993 were sold to less-developed regions (mainland Asia, South America, Africa, and Oceania).^[162] If we look at technology trade by industry, we see that only three Japanese industries (transportation equipment, fabricated metal products, and pulp and paper products) currently enjoy a technology trade surplus with North America. One Japanese industry, electrical machinery, has a technology trade deficit with North America of over [[yen]]100 billion; two other Japanese industries, precision instruments and general machinery, each have a technology trade deficit of at least [[yen]]10 billion with North America.^[163] If these data indicate continuing backwardness in certain industries, then Japanese firms in these industries may be slow to give up "latecomer" patent practices, such as patent flooding, that facilitate licensing and importation.

History and Ideology

To simply characterize the private sector's acceptance of a low appropriability patent system as a response to Japan's late developer status and industrial structure does not paint a complete picture of private-sector attitudes toward intellectual property. There is strong evidence that this acceptance is reinforced by postwar public attitudes toward national security, and by a historical legacy of attitudes stemming from Japan's agrarian past.

Richard Samuels argues that Japanese government initiatives to import, indigenize, and diffuse technology are widely supported in the private sector as a national security response to Western economic challenges. In this sense, the private sector and public sector can be said to share a technonational ideology in which technology diffusion plays a more important role than proprietary rights. This view toward technology is enhanced by Japan's postwar "Peace Constitution" and public concerns over militarism, which necessitate a broad conceptualization of national security in terms of "decisions about general industrial structure, technology transfer, and economic growth" rather than in terms of arms production and security posture.^[164]

There is also some evidence that Japanese attitudes toward invention, which are frequently explained as responses to the economic challenge of the West, actually preceded Japan's opening to the West. According to Thomas Smith, uneven and regionally distinct patterns of agricultural commercialization in the Tokugawa period (1600-1868) created a stream of local technological adaptations that could be successfully reapplied elsewhere, and a new class of commercial farmers emerged from the upper peasantry, eager for knowledge about these new techniques. Their needs were met by a group of merchant scholars referred to as the "technologists," who published widely-read, extremely

detailed manuals on agricultural and commercial methods. These scholars characterized invention as a process of incremental improvement and "microadaptation to local conditions" rather than a process of inventive breakthrough, and emphasized to their readers that the primary benefit of innovation is a long-term accumulation of "small increases in output or savings in cost."^[165] Motivated by the Confucian value that knowledge is a public good, the technologists believed that their primary goal was to "diffuse existing techniques" for the benefit of society as a whole.^[166]

Smith does not explicitly argue that these attitudes toward innovation and intellectual property jumped the gap between Japan's revolution in agricultural technology and the later industrial revolution of the 1880s. He does note, however, that the technologists' almanacs continued to be widely read and applied well after the Meiji Restoration, and that their attitudes were representative of the "large class of commercial farmers and rural merchants and manufacturers" that emerged in the late Tokugawa period and subsequently formed the nucleus of Meiji Japan's new industrial bourgeoisie.^[167]

3. Conclusion

This study of the Japanese patent system leaves us with several empirical and normative conclusions, as well as some intriguing puzzles for future researchers.

Empirically, my research indicates that the Japanese intellectual property system is characterized by a dense, formal, and highly corporatistic network of government agencies, quasi-governmental trade associations, and private sector high-technology firms. This network undoubtedly serves as a conduit for technology information and as a mechanism for policy consultation. Placement of senior trade and industrial policy officials from MITI in the interstices of this network may also serve as a mechanism of political control, although this interpretation cannot be regarded as conclusive. The key questions raised by this finding are whether this network confers trade advantages on Japanese firms, and whether the U.S. intellectual property system is characterized by a functionally similar "revolving door."

My research also empirically demonstrates that every formal patent system will inevitably interact with broader and less mutable elements of a country's economy, such as its firm-level technology management system, the structure of its industrial order, and its technology trade profile. This implies that any administrative conveniences occasioned by the GATT-TRIPS and Framework agreements will not necessarily make the Japanese patent environment more like that of the United States: Japanese and American firms will continue to approach intellectual property with different assumptions and strategies, as long as significant differences remain in the two countries' national innovation systems and managerial assumptions.

Normatively, my research indicates that a diffusion-oriented patent system is not inherently worse than a protection-oriented patent system at encouraging

innovation. Every patent system faces tradeoffs between encouraging discrete invention and encouraging cumulative innovation, between cultivating basic research and building engineering capacity, between maximizing the rights of the inventor and maximizing the rights of the consumer, and between providing market advantages to industry and providing society with efficient systems of national welfare and national defense. To put it bluntly, even if one maintains that the net benefit to society of maintaining a patent system exceeds the net loss, one must still concede that every real-world patent system will reward certain industries and punish others. Researchers should scrutinize whether industrial policy uses of the U.S. and Japanese patent systems are legitimate expressions of national interest or efforts to benefit favored clients.

As we have seen, even when trade and industrial policy officials act in the interest of higher goals, the most important real-world result of their actions is to restructure the balance of competitive advantages between commercial actors. In this sense the case of international patent harmonization is a useful example of the contradictions inherent in constructing any supranational institution, a process which always involves tradeoffs between the representation of foreign and domestic interests, and between the ability to maintain distinct national styles of administration and the imperative to conform to international rules and norms.

I believe that the most important conclusions of this paper are those that suggest more questions than they answer. Substantively, there are differences between the U.S. and Japanese patent systems that have potentially serious international consequences. As I have demonstrated, the Japanese patent system clearly confers different advantages and liabilities on firms according to their size, product mix, technology management strategy, and managerial structure. It is far too simplistic, however, to make an unqualified argument that only large firms can succeed in the Japanese patent system, or that engineering firms will always succeed in the Japanese patent system while basic science firms fail. The actual situation is far more complex, and this paper represents an initial glimpse at some of the key issues facing any researcher who hopes to map out the role of intellectual property in the Japanese industrial system in order to recommend competitive solutions to U.S. firms.

On the issue of firm size, for example, we see that U.S. firms generally report success in the Japanese patent system if they are large enough to hold sizable patent portfolios, to file in volume, to maintain offices in Japan, to wait out long periods of pendency in the patent examination process, and to treat patents as expendable "cards" for sealing licensing deals and for "trumping" lawsuits. Thorson and Fortnort (1995) have demonstrated that two large American firms, IBM and General Electric, actively and successfully utilize Japanese-style strategies when patenting in Japan. GAO (1993) has found that U.S. firms report increased success in the Japanese patent system after acquiring Japanese subsidiaries, establishing Japanese patent divisions, or building Japan-based manufacturing facilities, activities which only relatively large and wealthy firms

can undertake. Finally, as we have seen from the Rockefeller Committee testimony of the 1980s, large Western pharmaceutical firms report a comfortable level of success in the Japanese patent system, in spite of the unusually difficult appropriability problems associated with pharmaceutical research.

Are we, then, to write off the small entrepreneurial American firm, which allegedly possesses insufficient resources to carry out a full-scale "defensive" patent strategy in Japan? Our examination of the advantages accruing to relatively small Japanese firms from *keiretsu* financing and organization suggests that small U.S. firms may benefit from adopting collusive strategies in low-appropriability patent systems. Few such strategies appear to be available in Japan, however. Small U.S. firms hoping to tap into the dense network of Japanese trade associations and intellectual property associations will inevitably develop suspicions about the role of these organizations in Japanese industrial policy planning. Japan's *keiretsu* are fairly averse to relationships with independent foreign concerns: as a rule, the "big six" *keiretsu* do not make purchases from foreign suppliers in which they hold less than 50% stake, and none of the "big six" makes more than 10% of its purchases from unaffiliated foreign firms.^[168] If small U.S. exporters "piggyback" on the Japanese operations of larger U.S. concerns, they may find themselves losing the organizational flexibility and proximity to market incentives that drives their innovational advantages.

The ultimate key to success for small American exporters, then, may be a shift of the Japanese patent system itself toward a more protective model, in response to the demands of an emergent Japanese high-technology client base. As I have demonstrated, however, considerable controversy surrounds the issues of Japan's technology trade profile and Japanese private-sector attitudes toward technology.

This example suffices to demonstrate the complexity of isolating any individual element of the Japanese intellectual property system for analysis. Discussions about the role of firm size in Japanese patent strategy, for example, cannot exclude questions about Japanese industrial organization, national comparative advantage, national innovation systems, and historical attitudes concerning the role of technology in society.

I have one final caution for the readers of this report. Debates over the differential competitive effects of patent regimes and over the advisability of patent harmonization are unresolvable insofar as they are framed as debates over "fairness." Whether it is "fair" for the Japanese patent system to be more suitable for Japanese clients than for a certain proportion of its American clients, and whether it is "fair" for the U.S. to continue to demand a "first to invent" patent system in the face of widespread foreign opposition, are issues that may well attract great journalistic interest. Nevertheless, fairness is by its very nature a floating standard, and debates on the present subject matter that are structured in terms of fairness may foster unconstructive animosity rather than practical understanding. I would like to suggest instead that researchers

concentrate on two more tangible concepts, adaptability and transparency. We should ask how each country's intellectual property owners can take specific steps to make themselves more adaptable when entering different regulatory environments. On the assumption that these environments can never be completely "harmonized," we must also propose ways to make their rules of operation more transparent and comprehensible to outsiders, and less likely to foster the suspicion of favoritism.

Appendix 1: Selected Career Paths of Recent Japan Patent Office (JPO) Officials. [\[169\]](#)

Director of Economic Affairs, International Trade Policy Bureau, MITI Regional Office
Director, Consumer Goods Industries Bureau, MITI Commissioner, Japan Patent Office.
Assistant Director, International Trade Policy Bureau, MITI Commissioner, Japan Patent Office.

Director, Matériel Bureau, Japan Defense Agency Commissioner, Japan Patent Office. [\[170\]](#)

Chief for Redisposition of Industry, Industrial Location and Environmental Protection Bureau, MITI Chief, Industrial Location Policy, Industrial Location and Environmental Protection Bureau Director-General, General Administration Department, Japan Patent Office.

Representative for the Industrial Location and Environmental Protection Bureau, Deliberative Assembly of the Minister's Secretariat, MITI Director-General, General Administration Department, Japan Patent Office.

Representative for the Consumer Goods Industry Bureau, Deliberative Assembly of the Minister's Secretariat, MITI Director-General, General Administration Department, Japan Patent Office.

Industry Examiner, London Center, Japan Trade Promotion Society Chief of International Resources, Director-General's Secretariat, Agency of Natural Resources and Energy, MITI Chief Examiner, Industrial Policy Bureau, MITI Division Director for General Administration, General Administration Department, Japan Patent Office.

Chief of Planning, Small and Medium Enterprise Agency, MITI Division Director for General Administration, General Administration Department, Japan Patent Office.

Section Chief for Management, Japan Defense Agency Division Director for General Administration, General Administration Department, Japan Patent Office.
Director, Secretarial Division, General Administration Department, Japan Patent Office
Section Chief, Guidance Department, Small and Medium Enterprise Agency, MITI.

Director of General Affairs, Tokyo Regional Bureau, MITI Director-General, 1st Examination Department, Japan Patent Office. [\[171\]](#)

MITI (position unspecified) Councilor, 4th Department of the Cabinet Legislative Bureau Chief of Operations, Agency of Natural Resources and Energy, MITI Director-General, 1st Examination Department, Japan Patent Office.

MITI (position unspecified) Director, Production Machinery Division, 3rd Examination Department, Japan Patent Office Director, Patent Information Management Department, Japan Patent Office Director-General, 3rd Examination Department.

MITI (position unspecified) Senior General Examiner, 5th Examination Department, Japan Patent Office Director, Electronic Circuit Division, 5th Examination Department Director-General, 5th Examination Department.

In addition, 20 of the 96 senior appeal examiners at the Japan Patent Office in 1994 began their careers with MITI. Available career information indicates that four worked for the 5th Examination Department, four worked for the 2nd Examination Department, two worked for the 4th Examination Department, one worked for a technology consortium, and one worked for the Tokyo District Court after serving with MITI, and prior to their appointment as senior appeal examiners. [\[172\]](#)

Appendix 2: Career Paths of Senior Executives at Japanese Government-Sponsored Patent Organizations. [\[173\]](#)

Commissioner, Japan Patent Office Vice Chairman, Small and Medium Enterprise Agency, MITI Governor, Credit Guaranty Finance Corporation, Small and Medium Enterprise Agency, MITI Chairman, JAPATIC Vice President, JAPATIC Vice President, JAPIO.

Chief for Promotion, International Trade Administration Bureau, MITI Bureau Chief, International Trade Administration Bureau, MITI Managing Director, Matsushita Electric Industrial Corp. President, Matsushita Electronic Industrial Corp. Chairman, JAPIO.

Councilor, Secretariat of the Economic Planning Agency General Managing Director, Japan-Amazon Aluminum Corp. Chief Investigator, Commerce and Industry Committee, Lower House of the Diet Special Director, Japan Institute of Invention and Innovation Managing Director, JAPIO.

Director-General, Department of Appeals, Japan Patent Office Divisional Director, 5th Examination Department, Japan Patent Office President, Training Center, Japan Institute of Invention and Innovation Managing Director, JAPIO.

Executive Office Director, Japan Institute of Invention and Innovation Director, Japan Institute of Invention and Innovation Standing Director, JAPIO.

Divisional Director, 4th Examination Department, Japan Patent Office Standing Director, JAPIO.

Director of Systems, JAPIO Director, Semiconductor and Electric Appliances Parts Division, 5th Examination Department, Japan Patent Office.

Deputy Director, JIII Research Center Head of Appeals Examiner Group, Japan Patent Office.

Chairman, NKK Chairman, Japan Patent Association; also Vice Chairman, Industrial Property Cooperation Center and Member, MITI Industrial Property Council.

Chairman, Fuji Film Chairman, Japan Patent Association. [\[174\]](#)

Chairman, Tokyo Electric Power Corp. Chairman, Institute of Intellectual Property.

Chief of Intellectual Property Policy, Japan Patent Office Member, Enforcement Committee, Institute of Intellectual Property (announced but unconfirmed appointment).

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(Some of these interviews were formal; others were informal telephone conversations.)

Note on Translation:

Following standard practice, long vowel sounds in Japanese are rendered with a double vowel, except in the case of proper nouns and names for which an alternative romanization is standard (e.g., "Tokyo" instead of "Tookyoo," "Goto Akira" instead of "Gotoo Akira").

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Professors of Business Administration, U.C. Berkeley; Richard Steinberg, Professor of Law, Berkeley Roundtable on the International Economy; Yuriko Inoue, Professor of Law, Institute for Advanced Studies of Business Law, University of Tsukuba; Rose Marie Ham and Tetsuo Wada, Graduate Students, Haas School of Business, U.C. Berkeley; Benedicte Callan, Graduate Student, U.C. Berkeley Department of Political Science; Stanley Cole, Sumio Takeuchi and Robert Jacobson, Patent Attorneys; and Peter Grindley of the Law and Economic Consulting Group.

Footnotes

¹More than 22% of U.S. patents are granted to Japanese inventors. Japanese inventors received 21,029 U.S. patents in 1991, more than double the number granted to Germany, the foreign country with the next highest number of U.S. patent grants. Although U.S. patenting in Japan increased in absolute terms between 1971 and 1993 (by 37.4%), a large increase in patenting by Japanese filers resulted in a significant drop in the share of Japanese patents going to U.S. inventors during this period (from 11.5% to 4.6%). Refer to GAO (1994), P.444, Kagaku-Gijitsu Cho (1995), PTO (1992).

²The alleged object of "patent flooding" is two-fold: to encourage cross-licensing agreements, and to prevent rivals from commercializing basic R&D.

³PP.27-28, 31-33, GAO (1993).

⁴Boland interview (1994), PP.31-33, GAO (1993), PP.42-43, Helfand (1991), and Statement of Maureen R. Smith, Deputy Assistant Secretary of Commerce for Japan, ITA, in S. Hrg. 100-874 (1988), P.17.

⁵P.45, S. Hrg. 101-19 (1989), and Whitener (1990).

⁶P. 160, USTR (1994), and Whitener (1990).

⁷P.12, GAO (1993), and P. 559, BNA (1993).

⁸PP.36-39, Japan Information Access Project (1993).

⁹PP.37-49, Japan Information Access Project (1993). JPA offered the following as some of the major problems with the U.S. patent system: statutory discrimination against foreign applicants under the U.S. "1st to invent" system; complicated, expensive, and time-consuming interference procedures that discriminate against small firms and encourage fraudulent claims; lack of disclosure; lack of clear standards for prior art and for "judgment on non-obviousness;" unclear standards of patentability for algorithms; inconsistent quality of examination; and a patent litigation environment characterized by inconsistent rulings on the "doctrine of equivalents," unclear standards of "willful infringement," a "wide margin of estimated damages," and burdensome discovery requirements.

¹⁰ GATT-TRIPS was signed into law in December, 1994. The Commissioners of PTO and JPO signed a statement of understanding on the Framework accords in January, 1994. As of mid-August, 1996, however, Framework provisions are still

pending Congressional approval (as H.R.3460 and S.1961). Boland interview (1996).

The goal of GATT-TRIPS is to establish "minimum substantive standards for protection of intellectual property rights, measures for the effective enforcement of these rights both internally and at the border, and a dispute settlement mechanism to ensure that participants fulfill their obligations." Statement of Michael K. Kirk, Assistant Commissioner of Patents and Trademarks for External Affairs, in S. Hrg. 101-9 (1989), P.19. A more comprehensive multilateral harmonization agreement under the auspices of the World Intellectual Property Organization (WIPO) has been under intermittent negotiation for years. Although the U.S. recently negotiated with WIPO over technical issues of patent practice, more substantive negotiations have stalled. Boland interview (1996). The GATT agreement has resulted in jurisdictional disputes between WIPO and the newly-created World Trade Organization (WTO), which has a committee to oversee trade-related aspects of intellectual property.

¹¹Under this practice, known as the "Hilmer doctrine," a patent filed overseas could not be used to defeat a patent filed in the U.S. on issues of novelty, unless the overseas patent was also filed in the U.S. prior to the filing date of the rival patent. Statement of Michael K. Kirk, in S. Hrg. 101-9 (1989), P.9.

¹²GAO (1993), and PP.238, Van Horn (1995). A "grace period" is deemed essential by academia, because it protects the intellectual property rights of inventors who choose to publish research results prior to patenting.

¹³P. 96, GAO (1994), and Kirk presentation (1995).

¹⁴Framework agreement (1994). Also refer to Carey (1994), Cooper (1994), and Riordan (1994).

¹⁵Certain U.S. concessions were *pro forma*. The U.S. PTO had already decided to unilaterally implement a system for "laying open" patent applications. In addition, the provision restricting PTO's ability to issue compulsory licenses has no substantive effect, since PTO was already restricted in this respect. Kirk presentation (1995).

¹⁶Submarine patents are applications that remain hidden from the public until they are approved by PTO, sometimes decades after they are introduced. "Submarine patents" present a degree of uncertainty to domestic and foreign filers similar to that posed to U.S. firms by backlogs and deferred examination in the Japanese patent system. A company may hold a U.S. patent filing or a patent grant representing a significant amount of investment capital, only to see it challenged when a "submarine patent" unexpectedly surfaces. The most notorious "submarine patent" was the application to patent the basic microprocessor. When the patent was finally awarded in 1990, nearly 20 years after the date of filing, several rival inventors had to scramble for licensing agreements to avoid infringement actions. Boland interview (1996), Carey (1994), Cooper (1994), Kantor (1994), and Riordan (1994).

¹⁷Kirk presentation (1995).

¹⁸P. 2, IPO (1995).

¹⁹Boland interview (1996).

²⁰Statement of A. E. Hirsch, in S. Hrg. 101-9 (1989), P.48.

²¹Cooper (1994).

²²Cole interview (1995).

²³Carey (1994).

²⁴As of 1991, only 47% of applications filed in 1985, and 3.8% of applications filed in the previous 18 months "had been the subject of a request for examination." P.292, Thorson and Fortnort (1995, Part II). This leaves a substantial pool of unexamined applications which could "surface" in response to rival patent applications and new market trends.

²⁵Michael K. Kirk, now Executive Director of the American Intellectual Property Law Association (AIPLA), has suggested that some of the opposition to revisions of the U.S. patent system may come from organized lobbies representing professional submarine patenters. Kirk presentation (1995).

²⁶Choy (1989).

²⁷277PP. VI:1-19 to VI:1-22, Amemiya (1992), and P.464, Rahn (1983).

²⁸P.267, 269, 271-2, Borrus (1990).

²⁹P.265, Borrus (1990), Goto and Wakasugi (1992), Jordan presentation (1995), and Odagiri and Goto (1988).

³⁰PP. IX-X, Samuels (1994).

³¹PP. 31, 43-49, Samuels (1994).

³²PP.49-62, Morris-Suzuki (1989).

³³PP. 57-58, Morris-Suzuki (1989), P. 42, Levy and Samuels (1989), PP. 34-35, Freeman (1987), and P. 65, Tyson and Zysman (1989). Morris-Suzuki cites Smith's Political Change and Industrial Development in Japan: Government Enterprise 1868-1880. Stanford: Stanford University Press, 1955.

³⁴PP.4-5, Machlup (1958). Rahn (1983) holds a different view of the dissolution of the Japanese patent system during this period. He characterizes the initial establishment of the Japanese patent system in 1871 as an instance of over-enthusiastic Meiji-period institution building. Although the idea of patenting was accepted in government, the establishment of a working patent system had to wait until the public was familiar with the concept of intellectual property, and until sufficient Japanese officials were qualified to examine patents.

³⁵MITI industrial policy has had a generally beneficial effect on large firms, which comprise an important second-tier constituency for the LDP. (The LDP's primary constituents are farmers and small and medium-sized enterprises, particularly in the retail, banking, and construction sectors). MITI's success at setting a consistent industrial policy agenda also makes sense in microeconomic terms. As public choice theorists argue, vote-maximizing legislators have little economic incentive to develop expertise in policy areas with "public goods" characteristics, such as macro-industrial policy. Informational asymmetries and principal-agent problems can therefore develop between LDP legislators and MITI bureaucrats, shielding industrial policy initiatives from legislative control.

³⁶P.264, Borrus (1990).

³⁷Emphasis added.

³⁸P.18, GAO (1993).

³⁹See JPO (1988 and 1994) for the full text of these statutory provisions and a detailed summary of their content. Note: another past criticism of Japanese patent law, that it does not allow foreign applicants to designate a native-language patent filing as the "filing of reference," has been negated by the Japanese government's recent decision to accept first-language filings starting in 1995.

⁴⁰Statement of Maureen R. Smith, in S. Hrg. 100-874 (1988), P.17. To the extent that this criticism is valid, it may now apply to the United States as well.

⁴¹Statement of Michael K. Kirk, in S. Hrg. 101-9 (1989), P.37.

⁴²Zalik (1990). This point was recently reiterated in a published piece by Thorson and Fortnort (1995, Part II).

⁴³P.75, GAO (1993).

⁴⁴Statement of A. E. Hirsch, Pacific Industrial Property Association, in S. Hrg. 101-9 (1989), P.54.

⁴⁵P.75, GAO (1993).

⁴⁶Zalik (1990).

⁴⁷ibid.

⁴⁸P.47, GAO (1993).

⁴⁹Helfand (1991).

Zalik (1990).

⁵⁰Statement of Donald J. Quigg, Commissioner, PTO, in S. Hrg. 100-874 (1988).

⁵¹"Prior art" refers to similar, earlier inventions in a given field. A patent applicant must demonstrate that his or her invention required an "inventive step," distinguishing it from all "prior art" in the field. Failure to adequately document prior art and to demonstrate the inventive step can be taken as evidence that the patent application may be a fraudulent attempt to benefit from another inventor's product or process.

⁵²Statement of Maureen R. Smith, in S. Hrg. 100-874 (1988), P.13.

⁵³Statement of Joseph A. Massey, in S. Hrg. 100-874 (1988), P.27.

⁵⁴P.44, GAO (1993), and P.292, Thorson and Fortnort (1995, Part II).

⁵⁵Testimony of Alfred L. Michaelson, General Patent Counsel, Corning Glass Works, in S. Hrg. 100-874 (1988), P.54.

⁵⁶P.45, GAO (1993), and Boland interviews (1994, 1996).

⁵⁷Boland interview (1994), Whitener (1990), and P.294, Thorson and Fortnort (1995, Part II).

⁵⁸Statement of Michael K. Kirk, in S. Hrg. 101-9 (1989), P.36, Statement of Donald J. Quigg, in S. Hrg. 100-874 (1988), P.7, and Boland interview (1994).

⁵⁹Statement of Michael K. Kirk, in S. Hrg. 101-9 (1989), PP.37-38.

⁶⁰Statement of Donald J. Quigg, in S. Hrg. 100-874 (1988), P.12, PP.30-31.

⁶¹Statements of Maureen R. Smith and Joseph A. Massey, in S. Hrg. 100-874 (1988), PP.33-38. ITA's contradictory testimony did not go unnoticed by the

international patent community, and was publicized by Guntram Rahn of Germany's Max-Planck-Institut. P.152, Rahn (1988).

⁶²P.24, Helfand(1991), and PP.30-31, GAO (1993). When Allied filed a 301 complaint with USTR in 1990, the Japanese government "agreed to protect Allied-Signal's manufacturing rights until 1997," and to procure a "specified amount" of Metglas. This settlement is intriguing. Was the Japanese government's willingness to settle an admission of guilt, or simply an attempt to minimize trade friction on a high-profile issue?

⁶³PP.35-37, GAO (1993).

⁶⁴Statement of A. E. Hirsch, in S. Hrg. 101-9 (1989), P.47.

⁶⁵Statement of Donald M. Spero, President Fusion Systems Corp., in S. Hrg. 100-874 (1988), P.42.

⁶⁶P.46, Ordover (1991).

⁶⁷Boland interview (1994).

⁶⁸PP.379-382, Wilson (1989).

⁶⁹Zalik interview (1994).

⁷⁰Statement of Larry W. Evans, Director, Patent and License Division, BP America, in S. Hrg. 100-874 (1988), PP.60-61.

⁷¹PP.30-31, GAO (1993).

⁷²PP. 267, Borrus (1990).

⁷³Statement of Donald J. Quigg, in S. Hrg. 100-874 (1988), P.31.

⁷⁴Mason interview (1995).

⁷⁵Takeuchi (1995).

⁷⁶Kato (1995).

⁷⁷PP.485-492, Seikai/Kanchoo Jinjiroku (1993), PP.681-704, Seikan Yooran (1989), and PP.829-862, Seikan Yooran (1991).

⁷⁸The other 6 senior executives began their careers with the Ministry of Education (3), Ministry of Justice (1), Ministry of Agriculture, Forestry, and Fisheries (1), and the predecessor agency of the Ministry of Posts and Telecommunications (1).

⁷⁹The senior positions held by former MITI officials in the 5th Examination Department are Director-General; Director, Data Processing Division; Director, Information Storage Division; Director, Electric Communication Division; Director, Electronic Image Devices and Electronic Appliances Parts Division; Director, Electric Application Division; and Director, Electronic Circuit Division.

⁸⁰Refer to appendix 1, this paper.

⁸¹PP.694-700, Seikan Yooran (1989), and PP.856-861, Seikan Yooran (1991). A search for data on the general career paths of Patent Commissioners yielded contradictory results. The Japan Documentation Center, U.S. Library of Congress has informed the author that JPO Commissioners return to MITI after their 2-3 year rotation, and take senior positions at the level of bureau director or higher. In contrast, Takeuchi Sumio, a Japanese patent attorney has told the author that Commissioners "very seldom" return to MITI, because they are locked out of senior positions at MITI by the seniority advancement of their colleagues.

Consequently, they "usually retire and (are) employed by big business or by a government related foundation."

⁸²PP.33-37, 42-45, Anchooguy (1994), PP.212-219, Imai (1988), PP.61-73, Samuels and Levy (1989), and PP.189-200, Wakasugi and Goto (1988).

⁸³PP.210-219, Morris-Suzuki (1994), and PP.61-68, Samuels and Levy (1989).

⁸⁴The high volume of business undertaken by the 5th Examination Department can be seen from a list of Japan's top five applicants, all of which are electronics and computer firms: NEC (#1), Matsushita Electric Industrial Corp. (#2), Toshiba (#3), Mitsubishi Electric (#4), and Fujitsu (#5). Note 67, P.293, Thorson and Fortnort (1995, Part II).

⁸⁵PP.67-74, 93-95, Japan Information Access Project (1993), P.10, JPO (1988), PP.196, 230, Seirooren (1992), and PP.470-474, Rahn (1983). Other government-sponsored organizations include the Japan Design Protection Corporation, the Industrial Property Cooperation Center (IPCC), the Japan Foods Patent Center (JFPC), JAPATIC, the Japan Industrial Technology Association (JITA), the Japan Technology Transfer Association (JTTAS), and the Science and Technology Information Foundation.

⁸⁶id.

⁸⁷PP.73-74, Japan Information Access Project (1993).

⁸⁸PP.93-95, Japan Information Access Project (1993).

⁸⁹P.471, Rahn (1983).

⁹⁰PP. 196, 230, Seirooren (1992).

⁹¹P. 196, Seirooren (1992). Also refer to appendix 2, this paper.

⁹²PP.67-74, 93-95, Japan Information Access Project (1993), and PP.470-471, Rahn (1983). Also refer to appendix 2, this paper.

⁹³PP.67-74, Japan Information Access Project (1993). Also refer to appendix 2, this paper.

⁹⁴The most patent intensive U.S. industry is petroleum / natural resource extraction. Refer to PTO (1992).

In April, 1995, PHRMA carried out a successful lobbying campaign to increase the price of pharmaceuticals jointly invented by the government and private-sector firms.

⁹⁵PP.182-202, Morris-Suzuki (1994).

⁹⁶Professor Gregory Noble of Australian National University suggests that a mode of administrative guidance may either involve providing higher-level and more prestigious positions to officials who adopt a "party line" in carrying out their duties, or it may involve designating certain administrative bodies with the authority to "signal" general policy goals to other administrative bodies. On the issue of industry influence in regulatory decisionmaking, see, generally, Quirk, Paul J., Industry Influence in Federal Regulatory Agencies (Princeton University Press, 1981).

⁹⁷PP.31-80, Merges and Nelson (1990). By contrast, the authors argue that broad patent protection is both necessary and acceptable in the pharmaceutical industry, which is characterized by "well-defined and bounded" inventions, high R&D- and commercialization-related uncertainty, and ease of product replication.

⁹⁸Grindley interview (1995).

⁹⁹Scotchmer (1991). Because excessively narrow patent protection will also place subsequent innovators in an excessively strong bargaining position vis-à-vis first inventors, there is a nearly intractable problem of "double marginalization" in any patent licensing agreement. The only solution to this problem, Scotchmer argues, is a collusive arrangement between first inventors and subsequent innovators to share costs and profits, effectively bypassing the patent system entirely.

¹⁰⁰From Robinson, The Accumulation of Capital (1956), P.87. Cited in Machlup (1958), P.40.

¹⁰¹PP.47-49, Machlup (1958).

¹⁰²PP. 14-20, Nelson (1990). First mover advantages accrue from the expense of detecting and duplicating a competitor's product, and the credentialing, or "natural trademarking" of a first mover's goods. They can be significant in conditions of imperfect competition, or when R&D outlays for a product are relatively low. Refer to P.69, Machlup (1958).

¹⁰³Callan interview (1995).

¹⁰⁴PP. 3-7, Kahaner (1992), and PP.97-101, Saxonhouse (1986).

¹⁰⁵P. 3, Kahaner (1992).

¹⁰⁶According to an Examiner in Chief of the Board of Patent Appeals and Interferences interviewed by the author in 1994, the PTO was put on the "front burner" during the Reagan administration because of a boom in the computer, data processing, and biotechnology industries. The administration believed that strong patent system was necessary for a "high technology economy;" consequently, PTO was automated and moved off-budget with the establishment of a user-fee funding system. It is widely acknowledged that the CAFC was established in this atmosphere of an overall strengthening of U.S. intellectual property regimes.

¹⁰⁷Besen and Raskind (1991).

¹⁰⁸Whether stronger patent rights in software will strengthen the U.S. software industry, or whether they will actually weaken it, is still a matter of debate. Refer to Kahin (1990).

¹⁰⁹In a colorful explanation of the public policy rationale for selectively restricting broad patent protection, Fritz Machlup argued that "the socially most important inventions, say, of drugs or vaccines for the cure or prevention of cancer, would not be allowed to be exploited with the same monopolistic restrictions that are freely tolerated in the exploitation of patents on hair curlers, bottle caps, or television screens." P.54, Machlup (1958).

¹¹⁰Besen and Raskind (1991).

¹¹¹PP.31-72, Merges and Nelson (1990).

¹¹²PP.310-311, Thorson and Fortnort (1995, Part II).

¹¹³PP.6-31, Merges and Nelson (1990).

¹¹⁴PP.6-31, Merges and Nelson (1990).

¹¹⁵Durney (1990).

¹¹⁶PP.486-489, Rahn (1983), and Whitener (1990).

¹¹⁷P. 14, Lynn, Reddy, and Aram (1994). In these scholars' formulation, the function of superstructural organizations is to provide public goods to an "innovation community," mediate inter-firm collective action problems, regulate market entry, and help firms to link "diverse bodies of knowledge, competencies, and techniques" in the service of integrative innovation.

¹¹⁸P. 189, Wakasugi (1989). All quotes from this source are translated from Japanese by the author.

¹¹⁹P. 24, Farrell (1994).

¹²⁰PP. 189-193, Wakasugi (1989).

¹²¹Cole interview (1995), and Helfand (1991).

¹²²Lincoln interview (1995).

¹²³Okimoto and Nishi (1994).

¹²⁴Henty (1991).

¹²⁵P. 48, GAO (1993), Henty (1991), and P. 45, Helfand (1991). Helfand quotes Carl Silverman, International Patent Counsel of the Intel Corporation, as stating that Japanese firms prefer cross-licensing because they "want to feel comfortable that they won't face someone popping up at some time after they're doing business to say they're infringing."

¹²⁶PP. 13-16, Helfand (1991).

¹²⁷Durney (1990).

¹²⁸PP. 13-16, Helfand (1991). In a similar manner, generic technology is disclosed by U.S. firms to help them "stake their claims" on customers. The Japanese practice differs because it involves the disclosure of proprietary rather than generic technology. Refer to PP. 14-20, Nelson (1990).

¹²⁹Statement of Irving Kayton, in S. Hrg. 100-874 (1988), PP. 74-75.

¹³⁰Kester (1991). For a more nuanced discussion of why credit-based financial systems and cartelistic industrial structures emerge in late-developing countries, refer to PP.12-15 and 21, Gerschenkron (1962), and PP.60-67, Zysman (1983).

¹³¹PP. 6, 9, 24, NRC (1991).

¹³²Statements of Maureen R. Smith and Joseph A. Massey, in S. Hrg. 100-874 (1988), PP.15-27.

¹³³PP.30-45, Helfand (1991).

¹³⁴Zalik (1990), and P. 53, GAO (1993). A "benrishi" is a Japanese patent agent without attorney status. Patent agents are far more numerous than attorneys in patent practice.

¹³⁵Whitener (1990).

¹³⁶Statement of Alan Lourie, in S. Hrg. 100-874 (1988), PP. 71-82.

¹³⁷Statement of Karl F. Jorda, in S. Hrg. 100-874 (1988), P. 74.

¹³⁸Westney presentation (1995).

¹³⁹Quoted in Freeman (1987), PP. 52-53. For a more complete discussion of the market and organizational transaction costs associated with firm size, refer to PP. 36-46, Teece (1989). Teece's study does not specifically discuss large-scale quasi-market entities, such as *keiretsu*, but it does discuss the adaptive role of smaller hybrid entities, such as research joint ventures.

¹⁴⁰PP.80-90, Tyson and Zysman (1989), and Class notes, Political Science 201A, University of California, Berkeley. October 18 and 25, 1994: Lecture by Professor John Zysman.

¹⁴¹ibid.

¹⁴²Friedman (1988), and PP. 301-318, Samuels (1994).

¹⁴³P. 165, Lynn (1994a).

¹⁴⁴PP. 72-78, Samuels (1994).

¹⁴⁵PP. 279-286, Samuels (1994).

¹⁴⁶P. 9, Lynn, Reddy, and Aram (1994).

¹⁴⁷P. 12, Helfand (1991).

¹⁴⁸P. 47, Helfand (1991).

¹⁴⁹P. 192, Wakasugi (1989).

¹⁵⁰PP. 194-195, Wakasugi (1989). The term "material patent," or "substantive patent," (*busshitsu-tokkyo*) does not have a common equivalent in the English-language patent literature. My reading of Amemiya (1992) suggests that the term refers to a patent protecting embodiments beyond the "indispensable matter" of the claim.

¹⁵¹PP. 12-13, GAO (1993).

¹⁵²PP.217-218, Thorson and Fortnort (1995, Part I). Thorson and Fortnort argue that the low market concentration in engineering industries, combined with the cumulative nature of innovation in these industries, increases the risk of patentability and patent infringement suits and "stalemates" efforts to secure strong, exclusive patent rights. Firms in these industries may be relatively willing to accept a collusive solution to patent stalemates because they are less subject to appropriability problems than firms in basic science industries.

¹⁵³PP. 436-437, Kagaku-Gijitsu Cho (1995).

¹⁵⁴P.466, Rahn (1983).

¹⁵⁵PP.87-89, 104-105, Odagiri and Goto (1993).

¹⁵⁶PP.6-8, Kahaner (1992).

¹⁵⁷Murakami and Nakata (1994).

¹⁵⁸P.194, Wakasugi (1989).

¹⁵⁹PP.159-161, 167-168, Westney (1994).

¹⁶⁰Japanese industrial R&D grew by 12.6% in 1990. It grew by only 5.1% in 1991, however, and actually dropped by 1.9% in 1992. This has disrupted hiring, since during the peak years of the "bubble economy," new hires of scientific and engineering graduates accounted for up to 4% of the total employment level in certain corporations (e.g., Sony). Westney presentation handouts (1995).

¹⁶¹P.466, Rahn (1983).

¹⁶²PP.440-441, Kagaku-Gijitsu Cho (1995).

¹⁶³PP.442-443, Kagaku-Gijitsu Cho (1995). Other Japanese industries that have a technology trade deficit with North America include the food, textile, printing and publishing, chemical, petroleum and coal, plastic goods, rubber goods, ceramics, iron and steel, and nonferrous metal industries.

¹⁶⁴P. 54-57, Samuels (1994).

¹⁶⁵PP. 174-187, Smith (1988).

¹⁶⁶PP. 183-190, Smith (1988).

¹⁶⁷PP. 196-197, Smith (1988).

¹⁶⁸P.84, Nanto (1995).

¹⁶⁹From PP.485-492, Seikai/Kanchoo Jinjiroku (1993), PP.681-704, Seikan Yooran (1989), and PP.829-862, Seikan Yooran (1991). Please note that I have directly translated those titles and names of offices that do not appear on official JPO and MITI organizational flowcharts in my possession. There may, therefore, be some discrepancies between my translation and official Japanese government translations of titles and names of offices.

¹⁷⁰According to Professor Gregory Noble of Australian National University, senior JDA positions in matériel are routinely filled by MITI officials. We cannot, therefore, assume that former JDA officials serving with the patent office are Defense Agency careerists.

¹⁷¹The 1st Department is responsible for application and registration, formality examinations, industrial designs, and trademarks. The 2nd Department is responsible for civil engineering and construction, business machinery, agricultural and marine products, applied physics and optics, and business machinery. It is also responsible for general coordination, examination policy, and examination standards. The 3rd Department is responsible for textiles, transportation equipment, factory machinery, and home machinery (such as air conditioning). The 4th Department is responsible for chemicals, machine tools, polymers, metals, textiles, food products, and medical technology. The 5th Department is responsible for electric power equipment, telecommunications equipment, computers and computer peripherals, consumer electronics, appliance parts, circuits, and data processing equipment. Responsibility for semiconductors was shifted from the 5th Department to the 4th Department between 1988 and 1994. During the same period, the examining divisions responsible for automatic control machinery, motive machinery, measurement, applied physics, inorganic chemistry, and chemical engineering appear to have been streamlined and restructured. Refer to P. 5, JPO (1988 and 1994).

¹⁷²PP.488-492, Seikai/Kanchoo Jinjiroku (1993), and PP.700-704, Seikan Yooran (1989).

¹⁷³From PP.67-74, Japan Information Access Project (1993), PP.701-702, Seikan Yooran (1989), and P.196, Seirooren (1992).

¹⁷⁴the Japan Patent Association's Director and Executive Director also serve on the MITI Industrial Property Council, and the Executive Director belongs to the Council's Patent Harmonization Treaty Committee. PP.67-68, Japan Information Access Project (1993).