The Defense of Intellectual Property Rights in the Global Information Order

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Introduction

A key feature of contemporary competition over digital technologies is increasing demand for intellectual property protection on the part of those claiming ownership to that property (National Research Council 1993). Rising costs of research and development (R&D) combined with wide availability of inexpensive copying, storage, and transmission are driving this demand (Mowery ed. 1996, p.305). Since the lion's share of intellectual property in the global system is owned by private multinational corporations (MNCs), the MNCs predictably have aligned themselves with the governments of powerful nation-states, like the United States, that are the home of influential owners of intellectual property. In the United States, this includes, among others, the entertainment industry, chemical and pharmaceutical firms, computer and integrated circuit manufacturers, and software companies.

Unscrupulous individuals or firms can quickly and cheaply copy movies or computer software programs costing millions of dollars to develop with fairly rudimentary equipment. The evidence of this can be seen on many street corners in Asia, where pirated copies of Microsoft Windows programs on compact discs can often be purchased for the equivalent of a few dollars. Programs can also be "reverse engineered" in more subtle and sometimes illegal ways by the process of "decompilation."[1] The possibility of decompilation has its roots in the unusual characteristics of software technology, as Joel West points out:

[1]If engineering is the process of turning a product design into an actual product, then reverse engineering means taking the actual product and deducing from it as much as possible about the original design. In software development, the most significant (and controversial) form of reverse engineering is decompilation—the systematic disassembly and adaptation of computer programs.

An unusual quality of software is that its plan is endogenous and complete. The translation from source code to binary software (compilation) is entirely automatic, by means of the computer… A second software characteristic is that plans can be deduced from the original machine—i.e., a source code can be decompiled from the binary software. (West 1995, p.1124)

This process of translation via decompilation is still difficult and lacks some of the information that makes the original source code so valuable. As West explains, however, the technical tools for decompiling programs have gotten progressively better over time because they are an essential part of maintaining one's competitiveness in the industry.

Software, like recorded music, films, and videos, is highly vulnerable to infringement of intellectual property rights.[2] It is no surprise then that software firms want more secure mechanisms to protect their intellectual property. They must do this in order to recoup substantial investments in R&D. Even after they have done this, they want to protect their intellectual property to assure an adequate return on investment to their shareholders. Recent evidence shows that information technology firms are seeking greater intellectual property protection through legal mechanisms, such as patents and copyrights. Similarly, the number of patent and copyright infringement lawsuits is increasing. These current trends have raised the salience of intellectual property laws and their enforcement in the eyes of national governments (Clapes 1993; Moore 1997).

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[2]Semiconductor chips pose similar problems with respect to existing forms of intellectual property protection. As in computer software development, designing new chips and preparing masks for chip

International disputes over intellectual property rights can be understood from the perspective of relational power – the power of actor A over actor B (and vice versa). Thus, for example, when the United States attempts to coerce or at least influence the People's Republic of China to adopt and enforce strict intellectual property laws, we are in the realm of relational power. The source of potential relational power in this relationship is that U.S. firms possess intellectual property that is desired in the P.R.C. but are not willing to provide access to it without adequate compensation. The P.R.C. government wants access to these technologies for its citizens but many of them do not want to pay the demanded price and the government is at least ambivalent about enforcing intellectual property laws. In addition, the U.S. government may withhold other things that China wants, like MFN status, as part of its campaign to change Chinese practices in this area. This puts the dispute into the realm of "linkage politics," where progress on one issue depends on concessions made in another area.

Beyond this relational aspect of intellectual property disputes is a deeper question of structural power. Nation-states compete not just over relational power but also over *structural power* – or *meta-power* as Stephen Krasner calls it. According to Krasner, "relational power behavior refers to efforts to maximize values within a given set of institutional structures; meta-power behavior refers to efforts to change the institutions themselves…[and]…the ability to change the rules of the game." (Krasner 1985, p.14) International regimes for intellectual property protection are not a *given* but rather must be periodically redefined by actors themselves, while interpreting their material interests and circumstances. Susan Sell, for example, stresses the role of ideas – in relation to

manufacturing is expensive, but copying chip designs and reproducing chip masks is relatively simple and inexpensive.

power – in defining or redefining material interests within intellectual property regimes (Sell 1998).

In the similar vein, Joseph Nye's concept of *soft power* provides a useful conceptual framework [Nye, 1990]. Soft power is the ability to achieve desired outcomes in international affairs through *attraction* rather than *coercion*. It works by convincing others to follow, or getting them to agree to, norms and institutions that produce a desired behavior. Soft power can rest on the appeal of ideas or the ability to set the agenda in ways that shape the preferences of others. In the same context, Susan Strange argues that, "technological changes do not necessarily change power structures. They do so only if accompanied by changes in the basic belief systems which underpin or support the political and economic arrangements acceptable to society" (Strange 1988, p.123).

If we rely on the above views, international regimes for protecting intellectual property rights, such as the WTO/GATT agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs), may conceal a lot more than they reveal. Hamilton (1997), for example, argues that:

> …far from being limited to trade relations, correcting the international balance of trade, or lowering customs trade barriers, TRIPs attempts to remake international copyright law in the image of Western copyright law … TRIPs imposes a Western intellectual property system across the board – which is to say that it imposes presuppositions about human value, effort, and reward. ... A people must value individual achievement and believe in the appropriateness of change and originality if it is going to concede to and adopt a Western-style intellectual property regime. Indeed, there is an

> intimate link between respect for individual human rights and respect for a copyright system that values and promotes individual human creative achievement. (Hamilton 1997, pp.243-45)

In this respect, arguments over international regimes of intellectual property protection are really over structural, not relational, power. They often have a strong ideational and persuasive element to them, because one way to exercise structural power is to control the framing of key issues by getting others to adopt a particular set of ideas.

Wintelism in the United States

The sophisticated management of “intellectual property” was the second essential—but somewhat environmental—ingredient in the success of Wintelism in the United States. According to Borrus and Zysman (1997), *Wintelism* started off as a way to link “the names of the two most evident major victors of the new standards competition: Microsoft Windows the software operating system and Intel microprocessors.” [Borrus and Zysman 1997, p.141] According to Borrus and Zysman, Wintelism has come to symbolize something much bigger than that:

Wintelism is the code word … to reflect the shift in competition away from final assembly and vertical control of markets by final assemblers. Competition in the Wintelist era … is a struggle over setting and evolving de facto product market standards, with market power lodged anywhere in the value chain, including product architectures, components, and software. [Borrus and Zysman 1997, p.162]

Following the example of Borrus and Zysman, we define Wintelism to be the structural dominance of components providers, like Intel and Microsoft, over assemblers, like IBM and Dell, which is exercised by applying strategies for controlling architectural standards in a horizontally segmented industry structure.

While the diffusion of technical standards was part of the “offensive” dimension of Wintelism, the protection of intellectual property was a key part of its “defensive” dimension. Indeed, a fine balance between liberal dissemination of open architecture and stringent protection of intellectual property rights emerged as a central issue for Intel and Microsoft, even in the early days of their ascent to market hegemony.

To protect their interests, Intel and Microsoft were active in policing infringements and taking legal action in their home markets. Inter-firm-level lawsuits against alleged cases of intellectual property infringement have played an important role in protecting the intellectual property of Wintel. Examples include computer-related infringement lawsuits, such as NEC vs. Intel, Intel vs. AMD, Intel vs. Cyrix and Microsoft vs. *Shuuwa*. (Clapes 1993) In this process, Intel and Microsoft owe much of their financial success to their vigorous defense of intellectual property rights.

After the introduction of 386 chips, which Intel decided to keep proprietary, Intel prosecuted any firm that violated its intellectual property rights. In keeping with this decision, it filed suit against NEC in 1982, claiming that NEC had violated Intel’s copyright on the micro-code for its 8088 and 8086 microprocessors. The U.S. courts ruled in favor of Intel. The ruling meant that the micro-code for the next generations of Intel microprocessors was copyrightable and therefore firms to which Intel had licensed earlier versions of its microprocessors could not build later generations of its microprocessors without acquiring a new license. Fighting NEC in court sent a message to the microchip community that Intel would use legal means to protect its intellectual property.

Intel made this threat more credible when it filed and subsequently won a copyright infringement suit against AMD, which had cloned the 386 and 486. Intel has also taken legal action against Cyrix, another clone-maker, for infringement of Intel's 486 copyright. In another case, Intel challenged SGS Thomson for infringement of an Intel patent for its 80387 math coprocessor. Despite several setbacks, Intel's legal strategy appears to have discouraged the type of cloning that was closer to outright copying rather than the cloning that depends on successful reverse engineering. In July 1993, for example, after over ten years of using Intel microcode for its microprocessors, AMD finally declared "independence" by introducing a 486-compatible chip that, according to AMD, is not based on Intel microcode (Afuah 1995, pp.12-15).

Microsoft has also tried to fend off copying by taking legal actions against copyright infringement. In 1987, for example, Microsoft claimed that *Shuuwa*, a Japanese firm that marketed computer publications, infringed Microsoft's copyright of a BASIC interpreter by printing a reverse assembled or decompiled listing of the interpreter (Clapes 1993, ch.11). "Because the BASIC interpreter can be considered part of the computer's operating system, the case raises issues concerning the copyrightability and scope of protection in operating systems software as well as the relationship between the source (assembly language) and object code representations of the program" (Karjala 1988, pp.172-3). Some legal experts argued that, "reverse engineering might be inhibited if the Copyright Law were literally interpreted" (Haynes 1995, pp.263-4). To competitors of Microsoft, the BASIC case meant that reverse engineering of such programs for any purpose, including research, might be prohibited by law or at least substantially impeded.

Intel and Microsoft lobbied U.S. legislators to enact copyright-related laws and persuaded U.S. government officials to pressure foreign governments for stronger enforcement of existing intellectual property laws. Intel, for example, realized, as early as 1979 when U.S. law did not provide any way of protecting the intellectual effort that went into designing chip masks, that the company would in future need a stronger form of protection for its intellectual property. According to Tim Jackson (1997), Andy Grove, the CEO of Intel, raised the issue of protecting Intel's efforts in chip designs:

"I've got an idea," said Grove. "I think there should be copyright protection for masks… [Intel]… have patents on the circuits, but they're all cross-licensed to everyone else. That's fine, but so much time and effort goes into the layout of these chips, and the photolithography is getting better and better… We're going to have a situation where someone knocks off a chip by peeling off layer after layer and photographing it." (Jackson 1997, pp.268-9)

Intel tried to secure its intellectual property by legal means, and its efforts eventually resulted in the passage of the Semiconductor Chip Protection Act (SCPA) in 1984, as described below.

Successful efforts of intellectual property ultimately require a commitment on the part of national governments to enact strong copyright and patent laws and to develop credible enforcement procedures. Intellectual property protection has primarily been a matter of national (territorial) jurisdiction in the sense that “each national government determines the scope of protection and rights subject only to bilateral and multilateral agreements” (Hansen 1997, pp.265-6). Here, we should note that the U.S. government has played an important—albeit “indirect”—role in securing adequate intellectual property protection for American companies by advocating a strong international regime for protecting intellectual property rights, especially at the international level.

The U.S. government has taken a trade-oriented approach to international intellectual property issues. Intellectual property protection became a major trade issue in the Uruguay Round of the multilateral trade negotiations of the GATT—later the World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPs) (Ryan 1998). However, because of the vagueness of both domestic and international intellectual property regimes, many bilateral disputes over intellectual property have occurred in recent years. For this reason, the U.S. government has concluded a number of bilateral reciprocity agreements with other countries that protect software programming and chip mask works on substantially the same basis as in U.S. domestic law (Leaffer 1991; West 1995).

In the semiconductor industry, for example, the U.S, Department of Commerce (DOC) used the SCPA of 1984 to extend reciprocal protection of semiconductor mask works to foreign companies in nations that agree to protect U.S. chip designs. Laura Tyson explains:

> In the semiconductor industry, as in other high-technology industries, bilateral deals are necessary to secure adequate intellectual property protection for American producers because binding international rules have

> not yet been developed. Often threats of restrictions on access to the U.S. market have resulted in improved intellectual property protection for American producers. (Tyson 1992, p.258)

In this context, early in the so-called MOSS (market-oriented, sector-specific) talks, the Japanese agreed to adopt 10-year protection of original chip design, in conformity with American practice. Furthermore, the U.S. Department of Commerce has succeeded in fashioning similar bilateral agreements with 18 other nations since 1984. However, because of their essentially unilateral nature and the claims of target governments that the U.S. is violating their sovereign right to decide for themselves what intellectual property laws to enact and enforce, such U.S. initiatives lead inevitably to clashes between systems—"system friction," as Sylvia Ostry calls it (Ostry 1996; Bergsten and Noland 1993).

The U.S. Regime of Intellectual Property Protection

The U.S. government has also played an important role in protecting intellectual property rights of Wintelist firms especially at the international level. Intellectual property has been seen as a key asset for modern corporations with very important ramifications for industrial strategy. As Robert Merges holds:

> Intellectual property determines the degree of legal shelter an incumbent can count on. Strong protection, like a brick wall, protects such an incumbent from the winds whipped up by potential entrants, while weak protection is

> more like a tent—it helps but cannot be relied on when the winds get too strong. (Merges 1996, p.285)

The U.S. government has long recognized the importance of protecting intellectual property in industry as a way of encouraging technological innovation. The legal development of computer program-related intellectual property laws suggests that the United States has established intellectual property protection regimes for computer hardware as well as software.

For computer software programs, the National Commission on New Technological Uses of Copyrighted Works (CONTU), for example, which Congress established in 1974 to investigate whether copyright protection was available for computer software programs, concluded that copyright protection extends beyond the literal source code of a computer program. The CONTU report resulted in passage of the 1980 Computer Software Copyright Act (Haynes 1995, p.254; Samuelson 1993, p.289).

Regarding the protection of intellectual property in semiconductors, Congress created new safeguards for chip-related intellectual property, the model of which can be found in the Semiconductor Chip Protection Act (SCPA) of 1984. This SCPA provides a *sui generis* approach to chip protection and extends coverage to a major new technology vitally important to the U.S. economy. The SCPA also provides an innovative statutory solution to the problem and contains procedures to encourage protection in foreign countries through bilateral negotiations (Leaffer 1991, p.290).

Since these intellectual property laws provide the creator of an original work with exclusive rights, the intellectual property owner can enjoy a virtual monopoly on his work's circulation through the market by fully exploiting the related law's potential. Intellectual property rights reward innovation and encourage research by allowing the owner to reap the benefits of his labor and creativity, but possibly at the expense of creating the potential for persisting monopolies in major technology markets.

Strong intellectual property protection is often in tension with antitrust policies (Gordon 1996, pp.171-3). While there is some overlap in the goals of intellectual property and antitrust laws – for example, to promote consumer welfare by assuring that innovations are introduced to the marketplace by potential competitors to market leaders -- the granting of a temporary monopoly on a work or an invention by patents and copyrights can be antithetical to the antitrust concept of open and fair competition, especially if the behavior of intellectual property owners is not properly monitored by authorities. Antitrust laws operate on the assumption that imperfectly competitive markets may not create as many incentives as competitive markets for innovations on the part of competing firms. Thus, the monopoly power inherent in the intellectual property laws is sometimes difficult to reconcile with a policy of disallowing market dominance. In short, there is a subtle tension, which is often a source of legal disputes, between protecting intellectual property to reward innovation and maintaining competition in markets where innovation occurs.

To summarize, we call attention to antitrust enforcement and intellectual property protection, rather than the conventional category of industrial policy, as one of the policy areas most relevant to the creation and preservation of Wintelism. In the U.S. personal computer industry, we are observing this shift toward governmental policies with less intervention and more regulatory tendencies. Here, the relationships between government and other economic actors— which one of us has called state-societal arrangements elsewhere — are obviously more decentralized in the United States than in some East Asian and West European economies. In fact, regulatory governmental policies—a decentralized form of state governance—have played an active role in encouraging horizontal value-chain specialization and contributed to the establishment of an internationally competitive computer industry. This observation about the effects of decentralized U.S. government policy is consistent with our argument in other works that decentralized governance structures fit the personal computer industry better than centralized structures.

Japan

U.S.-Japan Intellectual Property Disputes

By the late 1990s, all of the major Japanese PC platforms was based on Intel microprocessors, even there once had been a possibility that the Japanese firms could challenge Intel's leadership. Japan's weakness in the global microprocessor market was the result not only of their firms' technological inability to design and fabricate internationally competitive microprocessors, but also of strategic constraints imposed on those firms by a vigorous defense of the intellectual property rights held by U.S. firms..

It was in November 1971 that Intel announced the world's first microprocessor, the 4004, a 4-bit microprocessor. Five months later, in April 1972, NEC produced Japan's first domestically made microprocessor, the 4-bit µPD700. The µPD700 was Intel-compatible, indicating that NEC, with its ever stronger competence in semiconductors, was following Intel closely (Fransman 1995, p.169, p.173).

In the following year, NEC produced an 8-bit microprocessor similar to Intel's 8080. NEC also developed a Zilog 80 (Z80) compatible chip for their 8-bit personal computer models. The Z80 chip was upward compatible with Intel's 8080, and was widely used in 8-bit personal computers in the early 1980s. For the PC-8001, NEC's early 8-bit computer, the company used Intel 8080- or Z80-compatible microprocessors (Interview with a Japanese researcher).

NEC's 16-bit microprocessor, µPD-8086, was also Intel 8086 compatible (Fransman 1995, p.173). For 16-bit computers, some firms used NEC's µPD-8086 as alternatives to Intel's 8086 microprocessoor, which was already becoming the standard for 16-bit PC-compatible computers. Some computer assembles, however, incorporated the less expensive Intel 8088 also employed in the original IBM PC (Kobayashi et al 1983). By 1977, when sales of PCs were growing fast, NEC decided to use Intel as a second source for its microprocessors (Kobayashi 1989, p.80). In this context, NEC used Intel 8086 or 8086-compatible chips for its first 16-bit PC, the PC-9801, in 1982.

Although NEC used Intel chips in its early PC-98 series, it also developed its own version of microprocessors, the V-series, by the mid-1980s. Koji Kobayashi, who became NEC's CEO in 1976, explained the birth of the V-series thusly:

> …as NEC's competitiveness increased and we [Intel and NEC] began to compete with each other in the marketplace, the alliance [of second sourcing] became difficult to sustain. I therefore handed down the decision that at an early stage we would switch to a proprietary line, and I directed … to move ahead with the project. That was how work began on NEC's original microcomputer line, the V (for victory) series. (Kobayashi 1989, p.80)

When NEC introduced the V-series microprocessors, it made sure they were compatible with the Intel-8086; for example, NEC's V30 chip was Intel 8086/80186 compatible (Yanagawa 1995). However, "in subsequent releases, NEC tried to plant its own architectural stake with a series of chips that were functionally excellent but internationally incompatible with the x86 standard" (Ferguson and Morris 1994, p.147). Along with the V-series microprocessors, which gradually became incompatible with Intel chips, NEC has also used Intel chips.

NEC's decision on the V-series—and its gradual incompatibility—had significant effects, not only on the future evolution of NEC's microprocessors, but also on the company's presence in global microprocessor markets. As Kobayashi implies, the reason NEC made this critical decision was because of the difficulty of remaining Intel-compatible without infringing Intel's proprietary rights. Indeed, Intel brought a protracted lawsuit against NEC, alleging infringement of its microprocessor design (Fransman 1995, p.173).

In 1982, Intel filed a suit against NEC claiming that NEC had violated the copyright on microcode[3] for its 8088 and 8086 microprocessors (Karjala 1990). When the trial opened in 1984, NEC attempted to defend itself by claiming two major points: that microcode was not entitled to copyright at all; and that even if it were, the microcode for its V-series of microprocessors had not in been copied from Intel's microcode (Jackson 1997, p.271). The U.S. court's final decision in 1989 was a kind of compromise between these two claims.

On one hand, NEC proved that there was no alternative source of supply for 8086 microcode from elsewhere than Intel. The U.S. court ruled that NEC had the right to continue selling its V-series processors without paying a penny in royalties to Intel. With this decision, it appeared that NEC, no longer blocked by legal challenges from Intel, could have overwhelmed the U.S. microprocessor industry. NEC was not the only likely challenger; Fujitsu, Hitachi, and Toshiba all had experience as second-source producers of earlier Intel or Motorola microprocessors.

On the other hand, however, the U.S. court ruled that Intel's microcode for its 8086 and 8088 are copyrightable under U.S. laws.[4] By concluding that microcode could be copyrighted, the ruling meant that Intel had won a prize of great value. The microcode for the next generations of Intel microprocessors was copyrightable and therefore the firms to which Intel had licensed earlier versions of its microprocessors could not build

[3]This is software on the chip itself that helps it execute instructions from a computer's instruction set. It is imbedded in the microprocessor's hardware, one of a hundred or so miniature programs stored on the chip itself and used by the processor to interpret complex instructions and break them down into much simpler steps.

[4]Until then, it was not clear if microcode was copyrightable or not. Software was copyrightable but hardware was not. And since microcode is somewhere in the middle of the two, it was for the court to decide.

later generations of its microprocessors without new licenses. Fighting NEC successfully in court sent a message to the microchip community that Intel would use legal means to protect its intellectual property. Intel made this threat even more credible when it filed a lawsuit against AMD in the early 1990s, claiming that AMD had violated the copyright for its 386 microcode (Afuah 1995, pp.12-15).

NEC's V-series chips never caught on with PC assemblers and buyers outside of Japan, and by 1993 the company had stopped using them even in its own computers. NEC then shifted to a RISC (reduced-instruction-set computing)[5] strategy with its VR-series based on designs by a U.S. company, MIPS. However, NEC's PC division continued to use Intel chips for the PC-98, and the VR series was relegated to specialized markets such as workstations and microcontrollers (Takezaki 1997). As a group, moreover, the Japanese companies failed to make even a dent in the mainstream PC microprocessor market. By the mid-1990s, most Japanese PCs carried the "Intel Inside" label, a symbol of Japan's continuing dependence on Intel's microprocessor standards (Dedrick and Kraemer 1998, pp.89-90).

The Japanese firms were not successful in competing with Intel. The latter was able to squeeze more performance out of the x86 architecture than many had expected. Within ten years of the U.S. court's ruling, the microcode in Intel's 8088 and 8086 chips was no longer of much commercial value. Not only were both chips outdated, and selling as commodity products for razor-thin margins, but Intel had kept writing new and more

[5]RISC microprocessors used for workstations are in contrast to the CISC (complex-instruction-set computing) microprocessors used for PCs. Intel x86 microprocessors are the typical examples of CISC processors. The established CISC architectures were developed during the late 1970s, when software developers used assembly language in programming and often included special instructions (which are rarely if ever used by compilers) to assist these programmers. RISC microprocessors, however, were designed for programmers using high-level languages and compilers, and their instruction sets are tailored to work efficiently with compilers. For more details of RISC processors, see Khazam and Mowery (1996).

complex microcode every time it developed a new product. These later sets of microcode would be more difficult to reverse engineer than the 8086 (Dedrick and Kraemer 1998, pp.89-90).

By the early 1990s, the Japanese firms were no longer able to license next-generation microprocessors from Intel. Intel made a decision to jettison all its second source producers after the introduction of the 386 chip. Therefore, in the early 1990s, when the 386 started to become accepted in the Japanese PC business, Intel was the exclusive supplier. Fujitsu was unable to enter the U.S. market for 32-bit microprocessors because Intel prohibited second-sourcing of those microprocessors.[6]

As discussed above, Sakamura's TRON project had incentives from the monopolistic activities of Intel (and Motorola), which had cut off licensing of their new, advanced 32-bit microprocessor designs to Japanese manufacturers.

Trade, antitrust, and intellectual property disputes between the U.S. and Japan were working, as a "circumstantial factor," to open up the Japanese market to U.S. semiconductor manufacturers and to prevent Japan from launching protectionist actions. Examples include 1) the negotiation of the Semiconductor Trade Agreement (STA) in 1986, 2) trade and antitrust disputes over the Japanese BTRON program in 1989, and 3) intellectual property disputes in 1983-85.

Trade disputes in semiconductors between the U.S. and Japanese industries came to a head in June 1985, when the Semiconductor Industry Association, the U.S. industry's trade association, filed a Section 301 petition against unfair Japanese trading practices. Shortly thereafter, the office of the U.S. Trade Representative (USTR) filed an

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[6] Fujitsu stayed in the microprocessor business by becoming a major producer of Sun SPARC processors for the workstation market.

antidumping complaint against Japanese DRAM manufacturers, and a wider complaint under section 301 of the U.S. trade law for unfair trade in semiconductors (Hart 1989; Bergsten and Noland 1993).

The conflict resulted in the Semiconductor Trade Agreement of September 1986. This accord had two main goals: 1) to prevent Japanese enterprises from dumping semiconductors in the U.S. and other markets, and 2) to force Japan to open its domestic market by setting a 20 percent minimum market share for semiconductor imports.[7] This study is more concerned with the second goal. As a result of the agreement, the Japanese government encouraged Japanese producers and consumers of semiconductors to purchase more foreign semiconductors, and they established a marketing organization in Japan to help foreign producers increase their sales in Japan. Moreover, the Japanese government agreed to ensure full and equitable access for foreign firms to patents generated by government-sponsored R&D projects (Bergsten and Noland 1993, pp.129-30).

The STA clearly played a role in opening up the Japanese market to U.S. semiconductor companies. The question that arises here is *how much* of the increased semiconductor sales of U.S. firms in Japan after 1986 can be ascribed to the STA. The available data indicate that total semiconductor sales by North American firms[8] grew more than twice as fast as the market in the wake of the STA, from $1.2 billion in 1987 to more than $2.8 billion in 1991. Sales of MOS (metal oxide silicon) microcomponents—

[7]The STA included a secret side letter in which the Japanese side said they "understood, welcomed and would make efforts to assist the U.S. companies in reaching their goal of a 20 percent market share within five years" (Jackson 1997, p.243).

[8]The original data source does not separate U.S. from North American sales. Canadian sales are presumably negligible.

which include both microprocessors and microcontrollers—by North American firms grew more than three times from $238 million in 1987 to $815 million in 1991 (Bergsten and Noland 1993, p.137).

Likewise, it is difficult to say how much Intel gained and how much of its increased microprocessor sales in Japan were due to the STA. However, according to William O. Howe, President of Intel Japan, the STA had real impacts on Intel's microprocessor business in Japan:

> If it weren't for the STA, I don't think Intel Japan would have had nearly as good as chance to become successful. The STA was certainly not the only thing that helped our success in Japan, but … that provided the entry ticket to that Olympics [competition in the Japanese market] for foreign companies such as Intel. It gave us a chance to participate. We were like new countries that suddenly had been given their own flags and allowed to compete. Of course, you couldn't win without training and the ability to compete with the best, but we were never worried on that score. What we wanted was the chance to compete. (Howe, 1995, p.20)

As outlined above, TRON was deliberately aimed at creating something new, something Japanese, that would erode Intel's and Microsoft's dominance over the global PC market. Leaders of the TRON project understood, for example, that as long as the U.S. companies maintained a leading position in the microprocessor market, they would attempt to protect the proprietary interests of their microprocessor producers, as seen in Intel's cutting licensing of the 386 chip. Thus, many Japanese companies saw TRON as an opportunity to loosen the American stranglehold on crucial computer technologies, and MITI also embraced the TRON concept as a way to reduce Japan's dependence on U.S. software and associated microprocessors.

TRON heightened U.S. concern about technological competitiveness. The U.S. computer companies did not want to follow in the path of American makers of DRAM by losing market share and eventually abandoning the field to Japanese manufacturers. Americans wanted to ensure that U.S. microprocessor and software makers were not challenged in direct competition by consortia of large Japanese companies set up to eventually gain market share (Petersen 1994, pp.913-4). In fact, "no major American semiconductor companies are making TRON chips; nearly all their Japanese rivals are" (*Wall Street Journal*, Jun.2, 1989). Thus, the success of TRON would have had the effect of shutting out U.S. makers from the new TRON PC market (*Wall Street Journal*, November 8, 1988).

Despite TRON's ostensibly private roots, therefore, U.S. government and corporate officials were suspicious of the subtle, tight relationship between Japanese government and industry, especially in BTRON. For example, the USTR's annual report on foreign trade barriers in 1990 expressed its concern about possibly discriminatory school computer procurement, which would favor BTRON computers:

The United States is concerned about the potential for Japanese government intervention to support the recently introduced TRON. … Although some U.S. companies are members of the TRON association, no U.S. manufacturer is in a position to sell TRON-based PCs or telecommunications equipment. With Japanese government support, however, several Japanese companies have pursued development of such products. Thus specification of TRON capabilities can give Japanese manufacturers a significant competitive advantage. (USTR Annual Report on Foreign Trade Barriers 1990)

In this context, as part of the Super 301 law, the USTR *listed* TRON as a trade barrier to international trade. (Petersen 1994, pp.914-6) At a later time, TRON might be *cited* as a priority practice under Super 301, which could lead to serious penalties under the law. The above USTR report in 1990 also noted that "the United States will closely monitor the procurement of (BTRON) personal computers for Japanese schools."

When the Japanese government withdrew BTRON, MITI officials and Ken Sakamura, the architect of TRON, argued that USTR's pressure on MITI frustrated BTRON. As Callon (1995) and Anchordoguy (2000) have argued, it is controversial whether the U.S. pressure on BTRON worked or how effective it was. Callon says that "the United States' sudden objection rescued the Japanese government from a bad situation, and that compliance with the U.S. request was a face-saving way out" (Callon 1995, pp.53-54). Anchordoguy also argues, "this appears to be a case of Japan using *gaiatsu* (foreign pressure) as an excuse for rejecting a proposal computer experts knew would lead Japan down a path of yet another unusual standard" (Anchordoguy 2000, p.399). We agree with their points that U.S.-Japan disputes were not the major factor that frustrated BTRON. However, U.S. bilateral pressure, even if not a major factor, was at least one of the causes of BTRON's failure.

The third example of inter-governmental disputes, in which U.S. bilateral pressure played a role in providing U.S. Wintelist companies with a favorable environment, was over intellectual property rights. The inter-governmental intellectual property dispute between the two countries was a critical indicator of increasing U.S.-Japanese technological rivalry in the information industries.[9] U.S. bilateral pressure on intellectual property protection in Japan was linked to more general complaints about trade barriers in Japan.

For example, a major goal of the MOSS (market-oriented, sector-specific) talks in electronics, which began in the mid-1980s, was adequate protection of semiconductor chip design, and copyright protection for computer software created and produced in the U.S. In the absence of such protection, many U.S. semiconductor companies had seen their intellectual property rights in proprietary chip design dissipated by their Japanese competitors; and many U.S. software companies faced similar prospects (Prestowitz 1988; Tyson 1992). Early in the MOSS negotiations, MITI gave up its attempts to revise Japanese copyright laws and adopted instead a 10-year protection of original chip designs and 50-year protection of software copyrights without compulsory licensing in conformity with American practices.

In 1983, MITI introduced plans for the Program Rights Law that would control legal protection of software without using copyright law. MITI's proposal provided 15-year protection for software programs, as compared to 50-year protection under the Berne Copyright Convention, and 75-year protection under U.S. copyright law. Moreover, its most controversial provision provided for compulsory licensing of software when "it is necessary for public interest or when it is not properly worked"—referring to software

[9]From the neo-institutional perspective, intellectual property disputes between the U.S. and Japan have also arisen from systemic differences in the two countries' intellectual property regimes. For example, in the copyright area, the U.S. government pressured the Japanese to adjust their copyright laws to resemble more closely those in the U.S.

that was written outside Japan but not freely licensed within the country (West 1995, pp.1134-5). MITI's proposal was in line with the interests of the large, export-oriented manufacturers of electronics equipment who were skilled in using the Japanese system of intellectual property protection as a competitive weapon (Borrus 1990, p.261).

The United States objected to the MITI proposal because MITI's Program Rights Law proposed protection for only 15 years and provided for the possibility of compulsory licensing. In particular, U.S. firms viewed compulsory licensing as an effort by the Japanese to appropriate the valuable products of the U.S. software industry without adequate compensation. The United States feared that Japan was adopting a scheme of lesser protection for the purpose of pirating U.S. software, the last bastion of American technological supremacy (Samuelson 1993, p.313; Karjala 1990, pp.283-4). In fact, since the IBM Industrial Spy Incident,[10] the U.S. government had been pressuring Japan to provide clear legal protection to software. The U.S. government wanted software included in Japanese copyright law just as it was in the United States.

In the face of international pressure and threatened U.S. sanctions, MITI dropped its plan in March 1985. Instead, the Agency for Cultural Affairs (ACA) within Japan's Ministry of Education (MOE) proposed a plan more favorable to the interests of Japanese and foreign software authors by amending copyright law to protect software for 50 years and without compulsory licensing, and original chip design for 10 years (West 1995, pp.1134-5). At a time of extreme bilateral trade tensions, exacerbated by a low yen, MITI could not get away with such an obvious attempt to subvert the interests of U.S. companies. As a result, Japanese practice was harmonized to U.S. standards, eliminating

[10]In 1985, IBM accused Fujitsu of infringing the agreement. The American Arbitration Association arranged a settlement in which Fujitsu paid IBM a penalty of some $400 million.

a serious structural impediment to competition between the two nations (Tyson 1992, p.59).

Japanese Regimes of Intellectual Property Protection

Japan has weak regimes for protecting intellectual property rights. During the catch-up period, these weak regimes were justified as helping Japanese firms compete with foreign competitors. They undoubtedly contributed to Japan's success in reverse engineering a wide range of technologies developed by U.S. companies (Doi 1980, 1986; Karjala 1990). Other examples of a "developmental tendency" in Japanese intellectual property regimes could be found in MITI's attempts to alter copyright law; twice, in 1984 and again in 1993. MITI attempted to alter Japan's copyright laws to give domestic firms advantages, but was not successful largely due to strong pressure from U.S. firms and the U.S. government.

In 1983, as part of its plans for the Program Rights Law, MITI proposed 15-year protection for software programs, as compared to 50-year protection under the Berne Convention and 75-year protection under U.S. copyright law. MITI's proposed law was aimed at helping Japanese firms cheaply copy foreign software programs. In other words, MITI attempted to change copyright law to favor the interests of the large, export-oriented companies, including major customers for computer software systems as well as manufacturers of electronics equipment who depended on the availability of software or on the "reusability" of existing programs. Obviously, this was an attempt to undermine U.S. firms' intellectual property rights in order to nurture the Japanese domestic industry.

In 1993, many of the same issues reappeared when the Japanese government reexamined copyright law. Japan's Agency for Cultural Affairs (ACA) announced that it would set up a council to study possible revisions in Japan's copyright law that would legally permit reverse engineering of software programs. The revision might allow Japanese competitors to legally glean the key technological secrets of successful products through a process known as "decompilation." It was widely believed in Japan that legalizing decompilation would help Japanese firms to catch up in a technologically important industry with high spillover potential (West 1995, p.1118-9).

Paradoxically, this proposed revision of copyright laws contradicted MITI's policy of favoring open standards and not opposing foreign firms' entrance to the Japanese market. It seems that MITI intended to adopt open standards in the computer and software industry in order to solve the problems associated with "standards fragmentation," but still wanted to nurture the industry by allowing large computer companies to benefit from weak intellectual property protection as a means of catching up with U.S. competitors. In this sense, the weak regimes reflected the significant political influence of large computer firms in Japan .

Japan's lack of strong intellectual property protection was likely to damage innovative small companies by making it difficult for them to earn a decent return on their investment in product development. The long-term growth and success of computer architecture and software technology depended on strong intellectual property rights enforcement. In the United States, greater protection for software developers tended to favor the growth of a domestic packaged software industry. Weak protection of intellectual property rights benefited large mainframe makers at the cost of hampering the emergence of innovative small firms (Ruping 1997, 1998).

Japan's weak intellectual property regime, which served Japan well in catching up with the West in manufacturing industries, may have outlived its usefulness. In recent years, there have been some reforms. For example, "trade secret protection was formalized in 1990, copyright service marks were introduced in April 1992, and new rules have strengthened property rights in sound recordings. A proposal has been endorsed by the Japan Patent Office to create a global arbitration panel under the auspices of the World Intellectual Property Organization" (Bergsten and Noland 1993, p.82). According to Dedrick and Kraemer, "protection of intellectual property has actually improved in recent years, with software piracy rates dropping from 66 percent in 1994 to 41 percent in 1996, possibly reflecting a change in attitudes toward [intellectual property rights] on the part of government and industry" (Dedrick and Kraemer 1998, p.110).

Despite gradual changes in protecting intellectual property rights, Japan is still slow to adopt strong intellectual property regimes. Japan's unique social ethos toward technological knowledge and illegal copying underlies this slowness. Japan's system of intellectual property protection remains significantly different from that of other industrialized countries such as the United States. This difference has been a major issue of U.S.-Japan trade talks, like the Structural Impediment Initiative (SII) negotiations, causing general "system friction" (Ostry 1996).

These differences can be traced at least in part to Japan's interpretation of the contribution of social value accorded to imitation vis-à-vis innovation. Japan's system of intellectual property protection favors technological diffusion or "creative imitation" in the same way that it rewards creativity in innovation. Significantly, “the user who improves (in terms of functionality, cost, or quality), adapts, or otherwise takes creative advantage of a less restricted flow of technological ideas is seen as creating as much as or more social value than the originators of technology” (Borrus 1990, p.262).

In a similar vein, Japan’s cultural uniqueness in intellectual property regimes can also be traced to social attitudes toward intellectual property as “intangible” assets. Indeed, until recently, intellectual property has been considered a common good to be shared and used rather than as a right exclusively possessed by the creator (Feigenbaum 1995). For example, there has been a strong feeling in the Japanese government against allocating money for purchasing software programs. Software is treated as an intangible product which is not real and thus should be free; illegal copying is not restricted, but encouraged in an institutionalized pattern. Edward Feigenbaum reported:

> The Ministry of Finance (MOF) does not budget for government agencies to buy software. They only budget for computer hardware… they scrape together some miscellaneous budget to buy a single piece of software and then make a large number of copies . . . a piece of software sold to a business is on average copied four to five times. Sold to the government, on average it’s copied ten times. (Feigenbaum 1995, p.221)

Under these circumstances, even if the laws regulating illegal copying may be satisfactory in Japan, governmental enforcement of those laws is less than satisfactory. The developmental mentality of the Japanese government has made it strongly disinclined to harmonize its intellectual property regimes with those prevailing in the

United States and Western Europe, despite the fact that weak IPR regimes have hampered its efforts to catch up in the computer and software industries.

Western Europe

Contemporary U.S.-European relations in intellectual property rights need to be understood in light of the history of competition between the two regions in high technology industries. In the 1960s, for example, the Europeans were concerned about the dominance of US firms like IBM. A key document of the time was Jacques Servan-Schreiber's book, *Le defi americain* (The American Challenge) that stressed the inability of European firms to compete with giant U.S. multinationals like IBM. In the late 1960s, European government funded crash programs to catch up. Each country selected one or two firms – "national champions" – to participate in these programs. By the late 1970s, when the failure of these efforts became fully evident, a crisis mood developed that was supportive of more drastic measures.

By the early 1980s, there was growing political support for Europe-level responses to US dominance. Within the bureaucracy of the EEC, the European Strategic Program for Research and Development in Information Technologies (ESPRIT) was created to administer funding of new information technology research programs. A similar program called RACE was developed for telecommunications. A government-industry consortium to develop next-generation random access memories called the Megaproject was initiated in 1985.[11] EUREKA was launched that same year as a

[11] Kenneth Flamm, *Targeting the Computer: Government Support and International Competition* (Washington, D.C.: Brookings, 1987), pp. 153-168; see also, Tom Forester, *High-Tech Society* (Cambridge, Mass.: MIT Press, 1990), pp. 283-289.

civilian-oriented answer to America's Strategic Defense Initiative (SDI). More importantly, in a series of antitrust cases, the European Community authorities signaled their intent to look the other way if European firms merged to form large trans-European competitors to the giant U.S. firms like IBM and AT&T.

By the early 1990s it was clear that the era of European R&D consortia and mergers again had not permitted Europe to catch up with the United States, or for that matter even Japan, in information technologies. The main competition was no longer IBM but the Wintel coalition: Microsoft and Intel. The competition was no longer over mainframe computers but over PCs and networks. So a new philosophy went into effect, especially after the publication of the Bangemann Report in 1994.[12] The focus in this report was on creating a societal basis for innovation in information technology by fostering an "information society." Information society refers to the general receptiveness of the public to the integration of information technologies into their daily lives. A European information society was to be built through a combination of education, training, and industry promotion measures (and not just industrial policies). The move to an information society would require breaking up monopolies in telecommunications services and moving toward higher levels of competition in information technology markets generally. It would require deregulation of overregulated industries and removing other forms of impediments to the operation of market forces. About intellectual property, the authors of the report said: "Intellectual property protection must rise to the new challenges of globalization and multimedia, and must continue to have a high priority at both European and international levels."

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[12] *Europe and the Global Information Society: A Report to the European* Council. Accessed at http://www.rostock.igd.fhg.de:10555/WISE/globals/ecinfo/general_information/bangemann.html.

For these reasons, the distance between U.S. and European approaches to intellectual property became less than the distance between U.S. and Japanese practices. Nevertheless, there were still important differences that produced some friction in relations between the two regions.

European Regimes of Intellectual Property Protection

European regimes for intellectual property protection include both national and EU-level regimes. There are still considerable differences in national IPR regimes within Europe. A large part of the internal EU debate on intellectual property concerns whether or not it is desirable to reduce national differences in IPRs within the EU. Those who favor complete harmonization emphasize the possibility that differences in IPRs across EU members may hurt the effort to create a unified market. One concrete manifestation of this is the high cost of obtaining an EU patent (relative to that in the US or Japan), due to the fact that all EU patents must be translated into all the languages of EU member states. A recent proposal put forward by the European Commission is to reduce the costs of EU patents by replacing this system with a much less expensive one.

In addition, Europeans are concerned than the US government has allowed the issuing of copyrights and patents for software to become automatic, so that anything that takes the form of computer software is copyrightable or patentable even if it does not contain anything truly innovative or inventive.[13] Thus, EU authorities are trying to make

[13] See, for example, Robert Hart, Peter Holmes, and John Reid, *The Economic Impact of Patentability of Computer Programs*. Study Contract ETD/99/B5-3000/E/106. London: Intellectual Property Institute, 1999.

sure that their harmonization efforts do not lose sight of the original intent of IPR laws – i.e., to foster creativity and innovation.

The EU experienced a lot of changes in IPRs, especially in the 1990s. In 1991, The Computer Programs Directive established a basis for legal protection of computer programs, while at the same time setting up new rules determining when it was legal or illegal to decompile programs.[14] One principle that caused some controversy with U.S. firms was the asserted right of EU software firms to decompile programs for the purpose of obtaining information about interfaces so that they could build interoperable software or equipment. In essence, what was in conflict was the U.S. view that sharing of interface information should be handled privately via alliances among firms rather than mandated by governments. The European view, however, was that European firms had been denied access to important information about interfaces in the past and that their only guarantee of access was to force U.S. firms to allow European firms to decompile programs, but only when this was necessary for the latter to compete with the former (a strange and unstable solution to the problem of European backwardness).

The Rental Right Directive of November 19, 1992, established rules for permitting or restricting rentals or loans of various forms of intellectual property (videotaped movies, for example).[15] It gave an "exclusive right to authorize or prohibit rental and lending" to the author of a published work, the performer of a recorded performance, the producer of recorded music, or the producer of a film.

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[14] Council Directive 91/250/EEC of May 1991 on the legal protection of computer programs. Accessed at http://europa.eu.int/eur-lex/en/lif/dat/1991/en_391L0250.html.

[15] Council Directive 92/100/EEC of 19 November 1992 on rental right and lending right and on certain rights related to copyright in the field of intellectual property. Accessed at http://europa.eu.int/eur-lex/en/lif/dat/1992/en_392L0100.html.

In European copyright laws, authors were given more extensive rights than authors in the United States. These included the right to prevent changes in works even after ownership of the copyright passed from the author to another person or corporation. In the United States, the owner of the copyright could set the rules for the use of copyrighted material during the term of the copyright even if the owner was not the author.

The Satellite and Cable Directive of 1993 established further rules regarding IPR so as to permit the development of cable, satellite, and other pay TV services in Europe. This Directive was written as part of a larger effort to accommodate the interests of European broadcasters, who had felt excluded from the European debates over high definition television. European elites supported these moves because they saw political advantages to having greater variety of programming choices for European consumers; a more Europe-oriented mass media would be an excellent underpinning for creating an information society.

In the late 1990s there were a variety of initiatives in Europe to protect intellectual property rights in connection with databases, e-commerce, and web-delivered mass media. There was a lot of discussion about removing or at least harmonizing policies connected with protecting individual privacy in databases so that database-driven services can begin to grow as fast as they do elsewhere. These initiatives were still mostly in the deliberative stage; but the general direction of policy making was fairly clear: Europe was moving toward a more deregulated, decentralized, and market-oriented approach to fostering information technology and part of this overall strategy was to adopt intellectual property guarantees similar to those already existing in the U.S.

U.S.-Europe Intellectual Property Disputes

In the 1960s there were a number of U.S.-European disputes connected with intellectual property that came out of the U.S.-European rivalry in computers. After the conclusion of the U.S. Department of Justice's inquiry regarding IBM's antitrust violations, the European Commission proceeded with its own antitrust actions. European computer firms enlisted the help of the EEC in forcing IBM to reveal key information about interfaces so that they could continue to build "plug compatible" equipment. European firms benefited from the unbundling of hardware and software that was part of IBM's settlement of its antitrust suit, but European software firms did not grow as fast as U.S. software firms because they focused too much on customized software and not enough on standardized or packaged software.

In the late 1970s, there was some friction between the Europeans and the United States over European computer network standardization efforts like Open Systems Interconnection (OSI). The Europeans tried to take advantage of the divisions between the mainframe giants and the minicomputer and workstation companies over the openness of computer networks to argue for their particular flavor of integrated services digital networks (ISDN) – but they eventually went along with global standards for computer networks such as TCP/IP and ATM when it became clear that the market would not support Europe-only network standards.

While some European standards initiatives succeeded – I am thinking primarily of the case of 2^{nd} generation GSM cellular telephones – by the early 1980s and with the publication of the Bangemann report, Europeans had accepted the idea of trying to influence but ultimately conforming to global standards so long as they had access to the necessary information about interfaces and interoperability that would allow them to compete in markets for equipment and software.

This is not to say that Europe was immune from the complaints by the U.S. government and U.S. companies about lax enforcement of intellectual property laws. On the contrary, the end of the Cold War and the expansion of the European Union resulted in a number of new disputes directed at potential members like the Czech Republic. Even long-time EU members like Greece were taken to task for lax enforcement of copyrights in the area of TV programs and films. Italy has been criticized for not being in compliance with its obligations under the TRIPs protocols of the WTO.[16] The French government, in efforts to protect the French film industry, has taken a protectionist line with respect to the Hollywood film industry without necessarily questioning its intellectual property rights. This stance actually delayed the conclusion of the Uruguay Round in 1994. Hollywood films and TV shows and U.S. rock music remained very popular in Europe, a sign that some European elites were in a different place than that occupied by European mass publics, but many Europeans held on to the belief that they needed to discriminate between European and non-European firms and could not support "national treatment" for foreign MNCs. This belief helped to torpedo the negotiations for the Multilateral Agreement on Investments (MAI) in 1998 and has delayed progress in liberalizing services trade in other forums.

[16] "IIPA Lauds USTR's Continuing Pressure on Countries to Improve Copyright Protection and Enforcement through the Special 301 and TRIPs Processes," press release, International Intellectual Property Alliance, Washington, D.C., May 1, 2000. Accessed at http://www.iipa.com.

Conclusion

The bilateral intellectual property disputes between the United States, Japan, and Western Europe have continued to create friction in relations among the major industrialized nations despite the fact that there has been convergence in perspectives about the overall value of protecting intellectual property. The gap between the U.S. and Japan is broader than the gap between the U.S. and Western Europe; but in both cases, a considerable gap remains. The primary source of the U.S.-Japanese gap is the continued developmentalist (catch-up), pro-manufacturing mentality of the Japanese government and its main clients and a deeply rooted belief that tangible goods are more important than intangibles like software. The primary source of U.S.-European differences is the view of many Europeans that Europe cannot afford to strictly enforce intellectual property rights until it reaches a state of full competitiveness with the U.S. in software and other IP-dependent industries (such as films and TV programs). However, European developmentalists and protectionists are increasingly outweighed by those who want to promote innovation in software, multimedia, and web-related activities by closing the remaining loopholes in European intellectual property regimes and more strictly enforcing them. Still, the Europeans worry that the U.S. government has gone too far in protecting intellectual property that is not truly innovative, especially in the area of software.

In conclusion, one should see the disputes among major industrial regions in this area as part of the larger process of debating the pace of globalization and liberalization of world markets. It is clearly also part of global adjustment to the growing importance of knowledge management in the so-called “new economy.” It is also a reflection of a new way of playing the old game of nation-state competition. Has competition over intellectual property become more important than competition over other forms of property in the international system? The trend seems to be in this direction.

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