# US POLICY TOWARDS RESEARCH JOINT VENTURES*

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# Non-Technical Abstract

A dramatic change has occurred in the way policy analysts and decision-makers perceive the advantages and disadvantages of inter-firm cooperation. Rather than organizational mechanisms to assist declining industries and weakened firms, inter-firm cooperative agreements are now viewed as a veritable competitive mechanism, right at the strategy core of most companies in high technology industries. A voluminous economic and business literature has supported these views.

This paper appraises the reaction of the federal government of the United States (US) to the changing attitudes internationally towards one particular type of collaboration: cooperation in research and development (R&D). The issue has attracted attention because the US has traditionally been the stalwart of competition, featuring the earliest and strongest antitrust legislation than any other country throughout the twentieth century. The paper shows the major relevant policy steps that the US government made during the past couple of decades, in a radical shift away from its earlier orientation, to accommodate and actively promote government-university-industry partnerships. This shift was initially prompted by perceptions of lagging international competitiveness of American industry. Similar concerns have also underlined the establishment of a formal science and technology policy in the European Union at the same time, very much based on the support of collaborative R&D.

It is argued that the US government has decidedly moved towards encouraging cooperation in R&D across all sectors of the economy since the early 1980s. The Republican Administration in the early 1980s set the stage for a radical shift in market environment affecting business strategy and behavior, including the undertaking of cooperative R&D, by introducing extensive changes in antitrust and intellectual property rights law and enforcement. These changes weakened competition policy and significantly strengthened IPR protection. Moreover, a series of legislative actions created the legal framework for promoting industry-university-government cooperation in science and technology and for allowing industry and universities to benefit financially from the results of research funded by the federal government The Democratic Administrations in the 1990s further built on this system, largely by pushing forward a series of Programs actively promoting government-industry-university partnerships and trying to “channel” private sector R&D activity in technological areas with potentially widespread economic returns. While many of the specific S&T programs have since been scaled down by Congress, the general policy orientation towards closer collaboration between industry, universities, and government has remained intact.

The paper is structured as follows. The first section provides an introduction to the technology policy of the United States that provides the appropriate background for our subject. The second section introduces the policies affecting R&D collaboration put in place during the past couple of decades. The third and fourth sections examine more closely the two most important policies, namely antitrust and IPR policy respectively, that have been changed to accommodate collaboration. Finally, the fifth section summarizes and concludes.

## Technical Abstract

The US government has decidedly moved towards encouraging cooperation in research and development (R&D) between firms, universities, and other research institutes since the early 1980s. The Republican Administration in the early 1980s set the stage for a radical shift in market environment affecting business strategy and behavior, including the undertaking of cooperative R&D, by introducing extensive changes in antitrust and intellectual property rights law and enforcement. These changes weakened competition policy and significantly strengthened IPR protection. Moreover, a series of legislative actions created the legal framework for promoting industry-university-government cooperation in science and technology and for allowing industry and universities to benefit financially from the results of research funded by the federal government The Democratic Administrations in the 1990s further built on this system, largely by pushing forward a series of Programs actively promoting government-industry-university partnerships and trying to "channel" private sector R&D activity in technological areas with potentially widespread economic returns. While many of the specific S&T programs have since been scaled down by Congress, the general policy orientation towards closer collaboration between industry, universities, and government has remained intact.

## 1. AN INTRODUCTION TO US TECHNOLOGY POLICY*

For much of the postwar period, the economic policy of the United States (US) had, more or less, been synonymous to macroeconomic policy. The federal government had largely shied away from industrial policy and civilian technology policy.[1] Various Presidents since Herbert Hoover in the late 1920s had expressed interest in technological advancement for economic growth and in the difficulties of industry segments – primarily small manufacturers – in producing and/or accessing new technologies. However, it was President William Clinton and Vice President Albert Gore that first issued an official document outlining an aggressive approach to technology policy for the federal government focusing directly on economic growth. Released only a few months after their arrival to the White House, this document proclaimed a radical departure from the postwar policies of the US, as is evident early on the first page:

> "American technology policy must move in a new direction to build economic strength and spur economic growth. The traditional federal role in technology development has been limited to support of basic science and mission-oriented research in the Defense Department, NASA, and other agencies. This strategy was appropriate for a previous generation but not for today's profound challenges. We cannot rely on the serendipitous application of defense technology to the private sector. We must aim directly at these new challenges and focus our efforts on the new opportunities before us, recognizing that government can play a key role in helping private firms develop and profit from innovations." (White House, 1993a, p.1).

The "old" orientation of US science and technology policy had stood on two pillars. First, a very active basic science policy, based on the consensus built around the suggestions of Vannevar Bush's report to the US President at the closing of World War II (Bush, 1945). Second, the development of advanced technology by several federal

*The STEP TO RJVs project was co-ordinated by Yannis Caloghirou, National Technical University of Athens/Laboratory of Industrial and Energy Economics. Project participants are: NTUA/LIEE (Greece), SIRN (UK), FEEM (Italy), IDATE (France), Stockholm School of Economics (Sweden), Universidad III de Madrid (Spain), PREST (U.K.).

[1] With exceptions, of course, particularly at times of widely perceived national emergencies like the response to the oil price increases in the 1970s. In addition, one must consider the policies at the state level which have often been much more microeconomic in nature and much more explicitly concerned with issues related to industry, investment, and technology (Rycroft, 1990).

agencies in pursuit of their statutory missions (Ergas, 1987). The most important of these missions has been national defense spearheaded by large R&D expenditures by the Department of Defense – until recently accounting for more than the expenses of all other government agencies combined – and extensive military procurement.

According to Branscomb (1993), since World War II, US policy had been based on the following principles:

1. Basic science is a public good. Investments in science lead to new technologies and, occasionally, new industries; however, the market fails to support basic research to the socially optimal level. Recognizing the importance of basic science the government entered into a "social contract" with scientists, accepting to support scientific research at a much grander scale than ever before while permitting the direction and quality of this research to be determined on the basis of scientific meritocracy (peer review).
2. Federal agencies must aggressively pursue the development of new technology for specific "missions" in activities with extensive public good characteristics, including national defense, nuclear energy, space exploration, and public health.
3. The federal government must refrain from "picking winners" through R&D investments directed to technologies for commercial exploitation and specific firms. It is the private sector's responsibility to try to benefit from government-supported science (and education) and from mission technology spin-offs.
4. A further role of the federal government is to create the appropriate regulatory environment to enable efficient markets and to occasionally steer private sector investment in desired directions (e.g., toward environmentally benign technologies). Science and technology can be used to support the struggle against communism.

This was essentially a supply-side approach. The mechanism through which government investments in R&D would assist industrial innovation was that of a "linear" ("pipeline") model according to which scientific discoveries (and mission technology spin-offs) inevitably lead to new commercial technologies. The selection of technologies for development and the timing of commercial innovation is left entirely to market forces.

In contrast, the "new" policy orientation of the early 1990s has had the following objectives:

- "Strengthening America's industrial competitiveness and creating jobs;
- Creating a business environment where technical innovation can flourish and where investment is attracted to new ideas;
- Ensuring the coordinated management of technology all across the government;
- Forging a closer working partnership among industry, federal and state governments, workers, and universities;
- Redirecting the focus of national efforts toward technologies crucial to today's businesses and a growing economy, such as information and communication, flexible manufacturing, and environmental technologies; and,
- Reaffirming our commitment to basic science, the foundation on which all technical progress is ultimately built." (White House, 1993a, p.1).

Several of these objectives pointed at a radical shift in the traditional policies of the US federal government. Particularly striking were objectives one, three, and five calling for an aggressive federal technology policy to improve the international economic competitiveness of the country, to coordinate management across agencies, and to aim for technologies explicitly for economic growth (Vonortas, 1995). Objectives two and four also called for an enhanced government role in creating the necessary infrastructure and social capital to attract and efficiently utilize private investment in areas of technology of strategic economic importance. Objective six simply continued earlier policies. With the possible exception of the third, all above objectives remain on the agenda of the Administration.

The basic principles of the new US S&T policy orientation in the 1990s have been succinctly characterized by Branscomb (1993) to be the following:

1. The government must partly shift its priorities from large government missions toward assisting the technological prowess and international competitiveness of the private sector. National defense cannot anymore be driving technologies in many cutting-edge fields. Government agencies are encouraged to buy off-the-shelf, state-of-the-art technologies from the private sector. Agencies with significant S&T budgets should try to develop, to the extent possible, dual-use technologies.

2. The government must try to balance the supply and demand sides of its technology policy. That is, in addition to the creation of new technologies, significant weight must be placed on technology dissemination. The government must pay attention to the ability of firms to locate, access, adapt, and use new technologies.
3. State governments must increase their role in the national technology policy. At a minimum, they must be prepared to assist smaller firms, attract capital, and diffusing innovation-related knowledge (e.g., manufacturing extension services).
4. An increased dialogue with industry is necessary to assist the government in making decisions with respect to civilian technologies. Specific technology policy goals can be frequently pursued through public/private cooperative R&D undertakings.
5. A more relaxed antitrust environment allows firms to enter multiple strategic alliances to allay the pressures from increased international competition and to assist them in responding to the demands of rapidly changing technologies. Multi-firm research joint ventures for precompetitive and infrastructural R&D must be favored.
6. An increasingly stringent enforcement of intellectual property rights by the court system promotes the creation and rapid commercialization of new technological knowledge for the competitiveness of American industry. Intellectual property matters can be linked with the efforts of the US Trade Representative office to ensure a "level playing field" for American companies in foreign markets.
7. The system of national laboratories should increase their interaction with the private sector in order to expedite the transfer of innovation-related knowledge and facilitate large-scale, heavy facility-dependent R&D.
8. The research universities must also interact more with the private sector. This will both create an alternative source of funds for the universities and will speed up the commercialization of good science to benefit industry.
9. Large science projects should be increasingly funded and undertaken cooperatively with other countries.

Almost all policy principles listed above are more or less related directly to cooperative R&D. It is reflected in the large number of programs that were set in place during 1993-1994 to implement the new policy principles and the existing initiatives relating to

civilian technologies that were given a significant boost. Well known examples of new or enhanced programs include the Advanced Technology Program (ATP), the Technology Reinvestment Program (TRP), the Environmental Technology Initiative (ETI), the Manufacturing Extension Partnership (MEP), the Partnership for a New Generation of Vehicles (PNGV), and the Small Business Innovation and Research (SBIR) program. Information technologies, advanced manufacturing technologies, and environmental technologies were considered areas of strategic importance, needy of government intervention due to significant infrastructure requirements and frequent market failure. The National Information Infrastructure (NII) initiative was put in place. The Defense Advanced Research Projects Agency (DARPA) was renamed the Advanced Research Projects Agency (ARPA) and focused on dual use technologies. Government laboratories (many of them part of the Department of Energy's research system) were strongly induced to set up Cooperative R&D Agreements (CRADAs) with industry. Manufacturing R&D was promoted through collaborative agreements in the private sector, made possible by an increasingly relaxed antitrust regulatory system.

## 2. AN INTRODUCTION TO POLICIES FOR RESEARCH JOINT VENTURES

The first Clinton Administration arrived with a grand vision that turned technology policy into a front-runner (White House, 1993b). Although it set out to implement a serious policy shift, however, neither the justifications of this shift nor the specific instruments to achieving the main policy objectives were entirely new. The "new" policy orientation reflected issues and solutions debated for years in the United States.[2] President Jimmy Carter's science advisor had considered several similar ideas in the late 1970s. The science advisor to President George Bush (Clinton's predecessor) was also more sympathetic to an active government role in civilian technology policy.[3]

[2] A significant number of high-visibility reports were produced in the late 1980s and early 1990s stressing the need for radical policy change. See various reports by committees organized under the aegis of the National Academy of Sciences, National Academy of Engineering, and the Institute of Medicine – for instance, Committee on Science, Engineering and Public Policy (1992, 1993); and Committee on Technology Policy Options in a Global Economy (1993). See also National Science Board (1992), Council on Competitiveness (1991), and Competitiveness Policy Council (1993).

[3] During the tenure of President Bush, an Industrial Technology Division was established in the Office of Science and Technology Policy (OSTP) of the White House. In addition, the dormant Federal

One such recommendation was that a more balanced supply-side/demand-side technology policy is much more appropriate today for the US today than, say, twenty years ago. The obvious justification relates to the change in society's perception of high technology (Branscomb and Florida, 1998). The traditional perception of high tech – still reflected in our indicators – has been research-intensive manufacturing industries, like computers and aircraft. The penetration of technologies like information technology, biotechnology, and advanced materials throughout the economy has, however, changed the basic meaning of high tech. Rather than referring to the output of R&D-intensive industries, high tech now refers to a style of work applicable to just about every business. We can have high tech steel production and low tech steel production; high tech machine tools and low tech machine tools; high tech banking services and low tech banking services; high tech entertainment services and low tech entertainment services; and so forth.

This change is said to have revolutionized the features of a successful technology policy. Distributed knowledge, skill, entrepreneurship, together with new forms of collaboration between firms, universities and the government, can now result in more effective products and services. Importantly for both firm and worker income, they can result in significantly differentiated products and services. In other words, technology policy must be more user-centered and demand-based than ever before.

The S&T policy community in the US had observed such changes since the late 1970s, slowly but steadily moving towards a position of extensive S&T policy modifications. The arguments often drew strength from the signs of declining American competitiveness in vital industries such as consumer electronics, cars, machine tools, and computers from the mid-1970s to the mid-1990s. The signs were strong enough to even move the Reagan Administration, in principle hostile to anything that can be labeled microeconomic

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Coordinating Council for Science, Engineering and Technology (FCCSET) was revived and given authority to identify program areas of interest across all major S&T agencies. However, the effort to back up the identified "critical technologies" of high performance computing and communication,

management. At least two major steps were taken during its time. One was the discontinuation of the long-term policies of the United States related to competition and intellectual property rights. Another was the initiation of an extensive public debate on economic competitiveness, exemplified by the setup of the President's Commission on Industrial Competitiveness and its report in the mid-1980s (PCIC, 1985).

The activities around the first step culminated in two concrete actions. First, there was a radical change in the philosophy of antitrust (competition) regulations, starting with the new "Merger Guidelines" issued by the Antitrust Division of the Department of Justice and the Federal Trade Commission in 1982.[4] Second was the creation of the 11th Circuit Court in the District of Columbia, the first Court dedicated to the adjudication of issues related to intellectual property, also in 1982. Essentially, the long-term US policy was being reversed from strict enforcement of antimonopoly regulations (based on a "per se" approach) and fairly lax enforcement of intellectual property rights laws to more relaxed enforcement of antimonopoly regulations (based on a "rule of reason" approach) and much stricter enforcement of intellectual property rights laws (Vonortas, 1997a).

These actions were in line with the Administration's philosophy that, besides the big "missions" like national defense, the role of the government is limited to the general economic and regulatory environment in which businesses operate. Three successive Republican Administrations in the 1980s became increasingly convinced that the world had changed for American business and that this necessitated policy changes. They were willing to take the initiative to help strengthen what the S&T policy community was claiming to be the foundation of the competitiveness of American business: its ability to create and deploy technological innovations. Often nudged by the Democratic Party-dominated Congress, these Administrations were willing to push for the aforementioned changes in antitrust and intellectual property rights policies, introduce a R&E tax credit, maintain the government's support of basic research, and go along with supporting R&D in small businesses through the SBIR program (requiring all agencies with R&D budget

biotechnology, advanced materials, and advanced manufacturing with real budgets did not get very far. An OSTP document of the time entitled "US Technology Policy" did not have much success either.

[4] Subsequent versions of these guidelines have followed in the same direction. See next Section.

to allocate part of it to small businesses). They were, however, much less willing to offer direct assistance to civilian technology development that many S&T experts had hoped.

The public debate on competitiveness culminated in the passing of the Omnibus Trade and Competitiveness Act in 1988 by the American Congress. This was an important piece of legislation which the Bush Administration was basically forced to accept. Among many other provisions, it radically changed the nature of a little known agency known as the National Bureau of Standards (NBS). It renamed NBS into National Institute of Standards and Technology (NIST) and transformed it into a much more formidable agency enveloping, in addition to its long-standing laboratories for industrial standards, the newly established Advanced Technology Program, Manufacturing Extension Program, and Baldridge Quality Award.

The Clinton Administration reinforced the policies of its predecessors and added some new, more interventionist policy instruments. It also added a new strong vision of a more balanced supply-side/demand-side technology-cum-innovation policy. Overall, tt gave a strong signal to American industry of a government seriously concerned with technology for economic growth.

## 3. COMPETITION POLICY REGARDING COLLABORATION IN R&D[5]

*The National Cooperative Research Act*

Since its foundation around the turn of the century, US antitrust policy has been primarily concerned with the preservation of competition in industry.[6] Antitrust law has been utilized frequently to fend off damaging cartels, domineering mergers, and various forms of restraints to free market operations raised by dominant firms such as vertical market

[5] This Section draws extensively on Vonortas (1997a), chapter 4.

[6] The Sherman Act of 1890 was the first federal antitrust law in the U.S. and is generally accepted as setting in place the foundations of U.S. antitrust policy. (By the time the Sherman Act was passed, twelve states had passed their own antitrust laws.) The major follow-up legislation establishing merger control provisions were the Clayton Act of 1914, the Celler-Kefauver Act of 1950, and the Hart-Scott-Rodino Premerger Notification Act of 1976. See Scherer (1994) for an overview.

foreclosure and other vertical restraints. Inter-firm cooperative agreements (officially defined as joint ventures) have traditionally been treated as partial mergers, that is, an intermediate stage between arm's length market transactions and mergers.

In the 1970s and early 1980s, horizontal mergers with substantial market share came close to being ruled outright (per se) illegal, the only exception being cases where one of the firms was on the brink of failure. The hostility extended to horizontal joint ventures – i.e., joint ventures among competitors – with substantial market share, including joint ventures focusing on R&D. The prevalent view was that research joint ventures might easily facilitate collaboration among member firms in activities beyond those covered by the explicit agreement (Mason, 1946). To the extent they did, they were raising unwanted barriers for others and were thus undesirable.

The first set of Merger Guidelines of 1968 on which this restrictive view of JVs was built were, however, extensively revised in the early 1980s. A new set of Merger Guidelines were issued by the Antitrust Division of the Department of Justice and the Federal Trade Commission in 1982, which were subsequently revised again in 1984. The new Guidelines introduced significant changes in the interpretation of the law and they were used by the Reagan Administration to develop new concepts and policies. These changes reflected a build-up of "anti-structural" views since the 1970s that rendered doubtful the mainstream consensus stressing that *market structure* is a significant indicator of the degree of *market power*. The anti-structural views, instead, were based on beliefs that any type of market structure allows significant variability in firm behavior and that the *entry potential* in a market is more important as a predictor of firm behavior than internal market conditions, even when there is high market dominance (Mueller, 1993).

The Horizontal Merger Guidelines were revised once more in 1992 without, however, reversing the course set during the 1980s. According to this set of Guidelines, "market share and market concentration data provide only the starting point in analyzing the competitive effects of mergers." (quoted by Ordover and Willig, 1993, p. 144). Instead of being automatically challenged, a merger lying outside the "concentration safe region"

would be placed under scrutiny to determine whether anticompetitive effects are likely involving a comprehensive examination of the specific market circumstances.[7] Specific market conditions need to be related to one of the anticompetitive effects of concern identified in the Guidelines, and explicitly assessed. The most recent amendment of the Horizontal Merger Guidelines in 1997 remained on the same course.

The Merger Guidelines outline the two Agencies' approach to horizontal mergers and acquisitions, and certain competitor collaborations. More importantly, however, the Merger Guidelines have provided the necessary background for seriously questioning the adequacy of the traditional economic reasoning over whether, why, and when inter-firm collaboration promotes or inhibits competition on the basis of static welfare arguments. Concern over the long-term viability and expansion of American high technology industries during the last couple of decades dictated the introduction of dynamic considerations of market evolution, in addition to the preservation of maximum possible competition, in shaping antitrust policy. Suddenly, organizational forms other than the stand-alone business firm were being contemplated as potentially effective for promoting industrial competitiveness and growth. Inter-firm cooperation, a typical loser in the earlier system of antitrust regulations (largely based on static economic arguments), has been a major beneficiary of such developments. Per se rules of the anticompetitive effects of many forms of cooperative agreements have been replaced by a "rule-of-reason" standard, emphasizing judgment on the merits and drawbacks of individual agreements on the basis of overall economic reasonableness. Dynamic factors (creating competitive advantage) have joined static ones (degree of existing competition) in determining what is good and what is bad.

At the time of this writing, the Federal Trade Commission and the US Department of Justice were issuing a draft of a new set of "Antitrust Guidelines for Collaborations among Competitors" (October 1, 1999). These Guidelines, specific for horizontal cooperative agreements, come as a supplement to the Horizontal Merger Guidelines and

[7] The expression "concentration safe region" denotes the borders of acceptable market competition. A merger that falls within this region is not contestable. Another falling outside it, contestable per se with the old rules, may not be contestable under the rule-of-reason.

are intended to give guidelines to business people in a ear when "…the increasing varieties and use of competitor collaborations have yielded requests for improved clarity regarding their treatment under the antitrust laws". With few exceptions, the rule-of-reason approach is adopted. The mildness of this set of Guidelines is evident right from p. 1 where it is declared that "[S]uch collaborations often are not only benign but procompetitive. Indeed, in the last two decades, the federal antitrust agencies have brought relatively few civil cases against competitor collaborations". Although Congress has protected certain kinds of cooperation from antitrust liability (see below), it is considered that relatively few collaborations have actually sought protection. The Guidelines for Collaborations cover production collaborations, marketing collaborations, buying collaborations, and R&D collaborations.

Cooperation in R&D has played a leading role in shaping the argumentation for more lenient antitrust legislation for inter-firm cooperation during this time period. RJVs have, thus, featured prominently on the antitrust policy agenda. By evoking the dynamic efficiencies in technological change, economists proposed in the early 1980s that cooperation in R&D could, in fact, enhance the participants' competitive advantage. Calls for a more accommodative treatment of RJVs quickly proliferated.

Policy makers responded in 1984 with the enactment of the National Cooperative Research Act (NCRA), intended to sanction inter-firm cooperation in research of generic interest. The rationale for allowing collaboration in the "earlier" (precompetitive) stages of R&D relied on traditional arguments emphasizing the insufficient incentives of individual firms to undertake basic and pre-competitive research at socially optimal levels due to: difficulties in appropriating the output of such research; difficulties in exchanging generic knowledge through the market while assuring a fair rate of return for the investor; the existence of economies of scope in generic research that no single firm can capture adequately; high levels of uncertainty for the final result. "Downstream" activities, on the other hand, including product/process development, production and marketing were considered to fall squarely in the domain of private firm operations. Such activities continued to be deemed inappropriate for collaboration.

NCRA required RJVs to be registered with the US Attorney General (Department of Justice) and the Federal Trade Commission in return of preferential antitrust treatment. Even if challenged and convicted in court for limiting competition, a registered RJV would be only liable for the actual damages determined by the court instead of treble damages as the law allows in such cases. Registration of RJVs under the provisions of NCRA started on January 1, 1985.

*Extension: The National Cooperative Research and Production Act*

NCRA's limited reach to pre-competitive research was subsequently challenged in favor of widespread modifications to its provisions in order to include downstream activities such as product development, prototyping and production (e.g., US Senate, 1991). Criticism of the NCRA essentially came from two sides, both claiming to perceive some kind of a problem for American firms in commercializing innovations and keeping up with frequent product/process improvements. The driving argument of the first group – the "traditionalists" – was that firm incentives to collaborate in pre-competitive research (which the NCRA tried to promote) were being hampered by subsequent restrictions concerning the collective exploitation of the results of this research. Theoretical analysis showed, for example, that the anticipation of head-on competition in development and production between potential co-venturers lowers their ex ante incentive to cooperate in research because they expect the surplus to flow to consumers (Katz and Ordover, 1990). It was thus argued that "...to the extent that unbridled downstream competition dissipates rents from successful R&D efforts, it may be necessary to allow RJV participants some restraints on ex post competition." (Ordover and Baumol, 1988, p.30). Such restraints could boost incentives for more research upstream and speed the transfer of innovations to the market.

While traditionalist claims may indeed be true, the analysis they have depended on is far from conclusive. The arguments depended extensively on theoretical models where R&D leads to innovations in the absence of any direct reference to how new technologies

materialize in different industries and how the process of technological advance affects the incentives for and the outcomes of collaborating. There was little or no reference to the technological conditions under which a possible extension of NCRA's provisions might work and when they might not. The actual process of technological advance was essentially dismissed as an argument.

The concern of the second group of proponents of extending NCRA – the "nontraditionalists" – was exactly the dismissal of the process of technological innovation from the economic arguments that supported the original NCRA. Being the product of a basically linear model of innovation, they argued, the NCRA was an ineffective policy tool. By differentiating between various types of research for which cooperation is or is not permissible, the NCRA implicitly contended that there is a clear demarcation between basic and pre-competitive research on one hand and development research on the other, and that the former precedes the latter. Instead, Jorde and Teece (1990) solicited an alternative model (the simultaneous model of technological innovation) to refuse the existence of any clear distinction between pre-competitive research, development research, and production activities in terms of when each activity occurs and how information flows between activities. "[T]he simultaneous model of innovation," they wrote, "recognizes the existence of tight linkages and feedback mechanisms which must operate quickly and efficiently, including links between firms, within firms, and sometimes between firms and other organizations like universities." (Jorde and Teece, 1990, p.77). Under those circumstances, vertical as well as horizontal linkages assume important roles in leveraging the in-house technical capabilities of a firm.[8]

The opposition to broadening the coverage of NCRA basically concentrated on fears that antitrust policy was becoming too relaxed, thus, endangering further loss of the country's international competitiveness by allowing extensive restrictions to competition. It was argued that existing merger guidelines were already very lenient for joint activities

[8] Such views permeate the contemporary applied literature on inter-firm strategic alliances. See, e.g., Culpan (1993), Gomez-Casseres (1996), Gulati (1998), Teece (1992).

involving firms with considerable combined market share (Harris and Mowery, 1990). There were also fears that increasing cooperation and concentration of market power would adversely affect smaller firms.[9] The proposed extensions were said to increase the chances for collusion while ignoring the real weakness of American firms which is their slow adoption of new technologies developed internally or externally (Rosenberg and Steinmueller, 1988).

Ultimately, favor went with the proponents of change; the challenge was sustained. Amendments to the NCRA were turned into public law known as the National Cooperative Research and Production Act (NCRPA) in 1993. The prerequisites for collaboration in production were determined to be that, first, the joint venture participants had also cooperated earlier in R&D and, second, they would not exclude independent activities in the same field.

Seven hundred and forty six RJVs, with several thousands of business participants have registered under the provisions of the NCRA and the NCRPA during the first 14 years (1985-1998). The response to the legislation is considered low, given the fact that inter-firm strategic technical alliances have exploded at the same time. What's more, an increasing rate of registrations until 1995 has turned into a rapidly decreasing rate during the past three years.[10] Recent studies have shown that the registered RJVs have tended to focus on high technology areas, led by information technology and followed by new materials technologies and, in some distance, biotechnology (Vonortas, 1997a, 1997b).

[9] See, for example, the testimony of Michael Porter (US Senate, 1991).

[10] The decrease in registration may be partly related to the aforementioned "Antritrust Guidelines for Collaborations among Competitors". While a draft of this document was released only in October 1999, the tolerance of the Department of Justice and the Federal Trade Commission for inter-firm collaboration has become increasingly evident during the past few years. It should be mentioned that this new (draft) Guidelines also define "safety zones" guaranteeing the absence of government interference. The Agencies declare to abstain from challenging any kind of collaboration among competitors when the market shares of the collaboration and its participants collectively account for up to 20% of each relevant market in which competition may be affected. Specifically for RJVs, the Agencies declare to abstain from challenging "a competitor collaboration on the basis of effects on competition in an innovation market where three or more independently controlled research efforts in addition to those of the collaboration possess the required specialized assets or characteristics and the incentive to engage in R&D that is a close substitute for the R&D activity of the collaboration."

## 4. INTELLECTUAL PROPERTY PROTECTION

The United States intellectual property protection system is arguably one of the oldest and the most well developed in the world (Wallerstein et al. 1993). This system has been greatly reinforced since the early 1980s, starting with the creation of the 11th Circuit Court of Appeals specializing on intellectual property rights issues in the District of Columbia in 1982. [11] Intellectual property law does not single out RJVs in any way from other stand-alone organizations that legally protect their intellectual property or try to access the intellectual property of someone else.

It is contract law where one should look for evidence of special arrangements in the case of RJVs in order to protect both the intellectual property of individual members as well as the intellectual property that is created by the RJV. There are no generally applicable rules governing the sharing of intellectual property among the members of a joint venture or among the joint venture and third parties. Contracts pertaining to intellectual property in RJVs are built on the basis of prior case experience. Even government programs that subsidize RJVs, while usually strongly suggesting the use of appropriate legal protection of the resulting intellectual property, leave it to the RJV participants to determine exactly how.

For our purpose, it is interesting to briefly examine the intersection of antitrust (competition) law and intellectual property protection. Similarly to any other organization that acquires, creates, uses, and diffuses intellectual property, RJVs are considered benign, procompetitive, and welfare-enhancing but also potentially able to use intellectual property as a means to acquire market power. The US Department of Justice and the Federal Trade Commission have, in fact, released a set of "Antitrust Guidelines for the Licensing of Intellectual Property" (April 6, 1995). These Guidelines state the Agencies' antitrust enforcement policy with respect to the licensing of intellectual

[11] Studies show that, up to 1982, about one third of all legal claims against patent infringement were successful in court. This share has increased to about three quarters since 1982.

property protected by patent, copyright, and trade secret law, and of know-how.[12] The release was in recognition that intellectual property laws and antitrust laws share the goal of promoting innovation and enhancing consumer welfare.

The Intellectual Property Guidelines do not single out RJVs for special treatment in any way. In addition, the Guidelines indicate that the two Agencies apply the same general antitrust principles to conduct involving intellectual property that they apply to conduct involving any other form of tangible or intangible property. While it is recognized that intellectual property has certain special characteristics, it is also considered that these can be sufficiently taken into account by standard antitrust analysis. Activities that allow intellectual property to be combined more efficiently with other complementary factors of production, including contacts, selling of intellectual property, and joint ventures are generally considered pro-competitive. Licensing, cross-licensing, or other means of transferring intellectual property are typically thought to confer pro-competitive benefits and be welfare-enhancing by allowing access.

Nonetheless antitrust concerns might arise, as for example in the case where an arrangement effectively merges the R&D activities of two or more of only a few entities that could plausibly engage in R&D in the relevant field, thus, harming competition for development of new goods and services (a plausible scenario in an RJV). Three kinds of markets might be adversely affected by intellectual property licensing restraints and are examined by the Agencies: (a) (extant) goods markets, related to the licensed intellectual property; (b) technology markets, consisting of the intellectual property that is licensed (when rights to the intellectual property are marketed separately from the products in which they are used); and (c) innovation markets, consisting of the R&D directed to particular new or improved goods or processes, and the close substitutes for that R&D. In the vast majority of intellectual property cases, restraints are evaluated under the rule of reason. This involves an inquiry into whether the restraint is likely to have anticompetitive effects and, if so, whether the restraint is reasonably necessary to achieve

[12] The term “licensing” is used generically for technology transfer; it incorporates licensing, cross-licensing and other means of transferring of intellectual property.

procompetitive benefits that outweigh those anticompetitive effects. Application of the rule of reason generally requires a comprehensive inquiry into market conditions.

No such inquiry is initiated for intellectual property arrangement restraints that affect product, technology, and innovation markets falling within the antitrust "safety zones" defined by the Guidelines. Absent extraordinary circumstances, the antitrust authorities will abstain from challenging a restraint if (1) the restraint is not facially anticompetitive and (2) the licensor and the licensees collectively account for no more than 20% of the relevant goods market significantly affected by the restraint. Also, absent extraordinary circumstances, the authorities will abstain from challenging a restraint that may affect competition in a technology market if (1) the restraint is not facially anticompetitive and (2) there are four or more independently controlled technologies in addition to the technologies controlled by the parties in the IP arrangement that may be substitutable for the exchanged technology at a comparable cost to the user. Finally, absent extraordinary circumstances, the authorities will abstain from challenging a restraint that may affect competition in an innovation market if (1) the restraint is not facially anticompetitive and (2) four or more independently controlled entities in addition to the parties in the IP arrangement possess the required specialized assets or characteristics and the incentive to engage in R&D that is a close substitute of the R&D activities of the parties in the IP agreement.

## 5. CONCLUDING REMARKS

A dramatic change has occurred in the way policy analysts and decision-makers in capitalist economies perceive the advantages and disadvantages of inter-firm cooperation. Rather than organizational mechanisms to assist declining industries and weakened firms, inter-firm cooperative agreements are now viewed as veritable competitive mechanisms, right at the strategy core of most companies in high technology industries. A voluminous economic and business literature has shown that large numbers of firms regularly use strategic technical alliances to access, create, and diffuse technological knowledge. Research joint ventures – being just one kind of strategic technical alliances – now

feature prominently on the policy agenda of every developed country government.

The US government has decidedly followed this trend since the early 1980s. While there have been serious disagreements between the two major political parties during this time period concerning the appropriate role of the government in providing incentives to the private sector to cooperate in R&D, few in either camp seem to doubt the value of RJVs.

Abiding with the doctrine on non-market interference, the Republican Administrations of the 1980s set the stage for a radical shift in market environment affecting business strategy and behavior, including the undertaking of R&D, by introducing extensive changes in antitrust and intellectual property rights law and enforcement. On one hand, a series of annotated Merger Guidelines issued by the Department of Justice and the Federal Trade Commission have promoted a new attitude towards "partial mergers" (joint ventures). The competitive effects of joint ventures is now judged on a "rule-of-reason" basis, requiring that the possible anticompetitive effects are juxtaposed to their potential for current and future (dynamic) procompetitive and consumer welfare-enhancing effects. Starting in the early 1980s, this shift opened the door for the National Cooperative Research Act of 1984 to offer antitrust protection to RJVs undertaking research of generic interest, a clear signal that cooperative research was now becoming a desirable activity. Its follow-up, the National Cooperative Research and Production Act of 1993, extended protection to any type of inter-firm collaboration as long as it is based on cooperative R&D.

On the other hand, the establishment of a new Circuit Court for IPR matters that took a much stricter approach to infringement gave a clear signal that private intellectual property is a very valuable resource, much recognized by society and well protected in court. This gave additional incentives for collaboration by allaying the fears of prospective RJV partners regarding involuntary loss of own knowledge to other RJV members and by better enabling the RJV and its partners to better exploit the returns from R&D collaboration. In addition, a series of legislative actions in the past twenty years have created the legal framework for promoting industry-university-government

cooperation in science and technology and for allowing industry and universities to benefit financially from the results of the research undertaken with or for the government (excepting national defense items). Instrumental pieces of this legislation that paved the road in the 1980s for the greater government-industry partnership in the 1990s have been the Stevenson-Wydler Technology Innovation Act (1980), the Bayh-Dole University and Small Business Act (1980), the Small Business Innovation Development Act (1982), the Federal Technology Transfer Act (1986), and the National Competitiveness Technology Transfer Act (1989). The National Cooperative Research Act (1984) and the National Cooperative research and Production Act (1993) should be added to this list too.

The Democratic Administrations that took office early in the 1990s built on this system. In addition to reinforcing the legal environment favoring the establishment of RJVs, they pushed forward a series of Programs actively promoting collaboration in R&D through subsidies or other incentives. The objective was now to use government resources to "channel" private sector R&D activity in certain technological areas with significant potential for widespread economic returns. Government resources were limited; RJVs were used as a mechanism to leverage these resources with the resources of industry. The Advanced Technology Program (ATP), the Technology Reinvestment Program (TRP), and the Partnership for a New Generation of Vehicles (PNGV) are only few, well-known examples of such efforts. Cooperative R&D Agreements (CRADAs) involving government laboratories and industry also expanded rapidly.

Unfortunately for the Administration, an extensively renewed 104$^{th}$ Congress in 1994 quickly got busy unraveling its technology policy objectives and strongly pushed in reverse. The 105$^{th}$ Congress, sworn in office in 1996, continued in the same direction as has, more or less, also been the case with the 106$^{th}$ Congress starting in 1998. The extended set of programs that were pushed forward in the first 4-year term of the Clinton Administration did not survive intact. Some were eliminated (e.g., TRP), others were weakened or neutralized (e.g., ATP), and still others lost their direction under a weakened Administration and became ineffective, even non-operational (e.g., PNGV). The blow was severe and, together with the continuing conservatism of the legislature concerning

the appropriate role of the government in science and technology (US Congress, 1998), it seems to have curtailed the enthusiasm of the Administration for active technology-cum-innovation policy.

Even so, the general policy orientation towards legislative leniency regarding inter-firm collaboration and a strong partnership between industry, universities, and government has remained intact. Government policy has largely adapted to and, even more, has acquired a clear supporting attitude towards the continuing drive of the private sector to engage in complex webs of strategic technology alliances.

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