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To Whom It May Concern:

I have been asked to review the materials on intellectual property and innovation prepared by the Project on Intergenerational Equity at the Center for Intergenerational Studies of the Institute of Economic Research of Hitotsubashi University.

Over the past few years, there is increasing recognition that organizational economics—which incorporates elements of industrial organization, corporate finance, labor economics, and other fields—has emerged as a distinct area of economics. Within this nascent field, the organizational economics of technological innovation is seen as a particularly promising area. There are two rationales behind this consensus.

First, great uncertainty, severe informational asymmetries, and very intangible assets typically characterize settings where technological innovation is being pursued. As a result, contracting and incentive problems are particularly severe here. These considerations make the study of the way in which innovation is organized and financed, and the contracting challenges that emerge in these settings, a particularly rich "laboratory" for understanding these more general problems.

Second, there has an increasing interest in studying these questions because of events in the real world. The past two decades have seen an explosion of new organizational forms in high-technology industries, from complex webs of strategic alliances (involving large and small companies and academic bodies) to publicly traded R&D financing organizations to corporate venture capital affiliates. Corporations are increasingly relying on these alternative arrangements to finance innovation instead of the traditional centralized R&D laboratory. Despite the importance of technological innovation in contributing to economic growth, we know very little about the nature and consequences of these novel structures.

One of the most vexing problems in the organizational economics of innovation has been how to reward innovations: in particular, how to create incentives for both initial pioneers and succeeding generations of researchers or firms to invent. If patent awards to the initial innovators are too strong or too broad, subsequent innovators will have little incentive to invent. Indeed, the past two decades have seen an explosion of patent awards across a wide variety of technologies, and a dramatic increase in the volume of patent litigation between rivals. Numerous commentators have suggested that the proliferation and strengthening of these awards has socially

detrimental consequences: overlapping intellectual property rights make it expensive for final good producers to commercialize innovative products and difficult for subsequent inventors to move the technological frontier forward.[1]

Patent pools, which can be defined as formal or informal organizations where owners of intellectual property share patent rights with each other and third parties, have been proposed[2] as a way in which firms can address this "patent thicket" problem. Indeed, patent pools are already an economically significant institution: a recent estimate[3] suggests that sales in 2001 of devices based in whole or in part on pooled patents were at least $100 billion. Were these suggestions to be adopted, their role might approach that seen in the early days of 20th century, when many (if not most) important manufacturing industries had a patent pooling arrangement.

While the patent pools have been well established in basic manufacturing and electronic industries, they have also been increasingly seen as a potential solution for prevalent patent licensing issues in biotechnology-related fields.[4] Indeed, in the past few years, the biomedical research community has expressed a keen interest in the development of patent pools for biomarkers for cancer, patents relative to HIV/AIDS and SARS, as well as for biotechnologies applied to agriculture and animal cloning. Similarly, the Organization for Economic Cooperation and Development has highlighted the development of biomedical patent pools as an area for future research.

Public policy in the United States and many other economies toward patent pools gradually shifted from an extreme laissez-faire approach in the early 20th century to an outright hostility in the middle of the century. Only in the late 1990s have pools been examined in a more favorable light by regulators. While patent pools are no longer frowned upon by competition authorities and treated as a collusive agreement among potential competitors, they still raise a number of concerns that optimally should be addressed in order to build a stronger support in their favor and to secure their adoption in the future.

The work of Reiko Aoki and co-authors has been exploring these important and exciting issues in a series of novel and exciting papers. I will briefly discuss two of these:

- In "Differentiated Standards and Patent Pools," Aoki (and her co-author Aaron Schiff) examine the relationship between patent pools and standards. (This paper is now forthcoming in the *Journal of Industrial Economics*). Many of the modern patent pools have formed around a technological standard, such as that around the MPEG file compression technology. But much of the literature has considered pools in a vacuum, without exploring the interaction between pools and standards. The authors explore these important dynamics. While

[1] Gallini [2002] and Jaffe and Lerner [2004] review this literature.

[2] E.g., by Merges [1999], Priest [1977], Shapiro [2001], and the U.S. Patent and Trademark Office (Clark, *et al.* [2001])

[3] Clarkson [2003].

[4] See, for instance, Delmer, et al. [2003], Ebersole, et al. [2005], Van Overwalte, et al. [2006], and Verbeure, et al. [2006]).

definitive conclusions regarding social welfare are hard to glean—for instance, it is hard to glean whether policies that increase the compatibility between standards are socially beneficial or detrimental—the issues explored here are undoubtedly important and neglected one.

- Another tough but important question is examined in Aoki and Schiff's "Collective Rights Organizations and Upstream R&D Investment." Much of the literature on patent pools has concentrated on its "downstream" impact: that is, the incentives of firms to contribute patents to the pool and the subsequent consequences for profitability. A much tougher issue is that of the "upstream" consequences—whether the potential of forming a pool will lead to more or less innovation in the first place, and whether this increase (or decrease) in discoveries is socially desirable. They show that the answer to these tough questions are a function of the distribution of the ability to innovate across firms (for instance, does not firm account for the bulk of the innovations in a sector?) and the royalty sharing rules that the pool choose to adopt.

I hope these comments are of use. Please do not hesitate to contact me if you have any follow-up questions.

Best wishes,

Josh Lerner