FOREWORD

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This is a timely symposium. Renewed attention to the dynamics of patent licensing in the theoretical literature coincides these days with acute interest in doctrines and case outcomes in various licensing-intensive industries. Mobile phone components are the best example, as many of the papers in this volume attest. Of course, one reason people care about patent rights—the main reason, for most business people—is that in some industries large sums of money change hands because of patents. For scholars, though, the flow of money is of interest not just for its own sake, but also for what it tells us about patterns of research, invention, and innovation.

Looking broadly, the question for mobile phone technology is how this industry organizes production, and how that organization affects the "rate and direction" of technical change.[1] Mobile phones are a good case study; they are made up of dozens of sophisticated components, some of which are made in-house by phone makers (or "handset manufacturers"), but many of the components are sourced from independent specialist firms. Each component is covered by numerous patents, as befits sophisticated technologies such as microprocessors, sound and video chips, data compression software, antennas, and even specialized glass that includes sensitive touchscreen capabilities. According to one branch of theory, this is a recipe for disaster: a multitude of independent, autonomous right holders all of whom must cooperate with a central firm if a state-of-the-art product is to hit the market. Too many independent patents, too many independent firms, creates a transaction cost nightmare.[2]

And yet: as the saying goes, it works in practice, though maybe not so well in theory.[3] The question for the patent system, and for patent scholars, is why. Why does it work when it is not supposed to, at least in some accounts?

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1. The reference is to the classic book edited by Professor Richard R. Nelson of Columbia University, The Rate and Direction of Inventive Activity (1962).

2. *See generally* Mark A. Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991 (2007).

3. *See, e.g.*, Alexander Galetovic, Stephen Haber & Lew Zaretski, *An Estimate of the Average Cumulative Royalty Yield in the World Mobile Phone Industry: Theory, Measurement and Results*,

One part of the answer comes from new developments in patent theory. The economic study of patents has undergone a gradual but thorough change over the past twenty-five years. As late as the 1990s, most economists understood patents as state-backed monopolies. Theoretical studies mostly featured a tradeoff model: losses from monopoly pricing were balanced against the societal benefits of new technologies.[4] The lure of monopoly power called forth inventive effort, but the benefits of new inventions came at the expense of above marginal-cost pricing.

Call this the Incentive/Tradeoff (I/T) theory.[5] I/T theory deals in highly aggregated terms: the costs and benefits of patents are modeled and discussed at the society-wide level. The total value of all new inventions called forth by patents is weighed against the total cost of supra-marginal pricing across all markets in an economy.

Roughly twenty-five years ago something new began to take shape in economic writing on patents. The same trends that swept through economics as a whole, where classical microeconomics was being modified by a newfound interest in the various structural elements that together determine aggregate economic activity (firms, transactions, property rights, and other "institutions"), also visited the literature on patent economics. I/T theory was refined by inquiries into two new topics: (1) how patents affect the *locus* of inventive activity and not just its aggregate level, and (2) transactional solutions to problems of dispersed patent ownership. One frequent finding in these newer studies is that patents (and IP rights generally) promote firm specialization, and in this way patents affect not just aggregate incentives but industry structure as well. For this reason, we might call the new approach the Specialization/Industry Structure (S/IS) Theory.

The basic insight from this literature is that IP rights can and do affect the location of firm boundaries.[6] The key to this new understanding of IP is to see

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42 TELECOMM. POL'Y 263, 271–72 (2018); Alexander Galetovic, Stephen Haber & Ross Levine, *An Empirical Examination of Patent Holdup*, 11 J. COMP. L. & ECON. 549, 564–69 (2015).

4. *See, e.g.*, WILLIAM D. NORDHAUS, INVENTION, GROWTH, AND WELFARE: A THEORETICAL TREATMENT OF TECHNOLOGICAL CHANGE 76 (1969) (using tradeoff model to assess optimal patent length).

5. *See* Robert P. Merges, *Economics of Intellectual Property Law*, *in* 2 THE OXFORD HANDBOOK OF LAW AND ECONOMICS: PRIVATE AND COMMERCIAL LAW 200, 207 (Francesco Parisi ed., 2017) (reviewing the Incentive/Tradeoff Model and its role in patent scholarship).

6. *See generally* David J. Teece, *Profiting from Technological Innovation: Implications for Integration, Collaboration, Licensing and Public Policy*, 15 RSCH. POL'Y 285 (1986) (an early contribution). *See also* Robert P. Merges, *A Comparative Look at Intellectual Property Rights and the Software Industry*, *in* THE INTERNATIONAL COMPUTER SOFTWARE INDUSTRY: A COMPARATIVE STUDY OF INDUSTRY EVOLUTION AND STRUCTURE 272, 282 (David C. Mowery ed., 1996)

it not primarily as something that affects overall incentive levels, but instead as an instrument that affects transactions and, hence, the organization of production. Advocates of this view see IP as a way for small, specialized firms to protect against opportunism when contracting with larger firms. IP makes it easier for specialized firms to sell technology and know-how via arm's-length contracts, which permits specialized producers to exist as independent firms. IP rights can then be said to affect industry structure: without these rights, specialized knowledge subject to opportunistic copying would have to be produced within large, vertically integrated firms. This in turn would mean a loss of the "high powered incentives" (to use Oliver Williamson's term)[7] available to independent firms who sell their output via contracts. The upshot is that IP at the margin may enable more small and independent firms to remain viable even in industries where multicomponent products are assembled and sold by large, vertically integrated firms.[8]

And so contemporary theory gives us some insights into why dis-aggregated production works in the mobile phone industry. Specialist component suppliers are an effective way to encourage technological advances. In some industries, the combination of specialization and eventual integration (in the making of handsets, for example) has proven to be effective.[9]

But of course, as this branch of theory emphasizes, product integration works only if the components can be effectively integrated. In physical products, the solution is modularity: plug-in components, made with standard interfaces, that work in an integrated product regardless of which manufacturers makes and sells the components. For intangible inputs—product designs, blueprints, and manufacturing techniques, etc.—integration

("The Japanese software industry teaches some valuable lessons about the role of property rights in overcoming transaction costs. Without the security of a property right granted by the government, software suppliers in Japan would be loath to leave the protective contractual sphere they shared with their captive customer/patrons ["keiretsu"]. But with such a right, enforceable outside the context of an individual contract (that is, a right that is "good against the world"), these firms are free to sell to other customers."); Robert P. Merges, *A Transactional View of Property Rights*, 20 BERKELEY TECH. L.J. 1477, 1485 (2005). *See generally* JONATHAN M. BARNETT, INNOVATORS, FIRMS, AND MARKETS: THE ORGANIZATIONAL LOGIC OF INTELLECTUAL PROPERTY (2021) (discussing an excellent overview of the literature that has developed around these ideas, with many important and original contributions of its own).

7. *See* OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM: FIRMS, MARKETS, RELATIONAL CONTRACTING 141–44 (2007).

8. *See* Ashish Arora & Robert P. Merges, *Specialized Supply Firms, Property Rights and Firm Boundaries*, 13 INDUS. & CORP. CHANGE 451, 451 (2004).

9. *See, e.g.,* Keith Mallinson, *Don't Fix What Isn't Broken: The Extraordinary Record of Innovation and Success in the Cellular Industry under Existing Licensing Practices,* 23 GEORGE MASON L. REV. 967, 1000 (2016).

works differently. It involves a market exchange that provides payment for the intangible, and this in turn often involves patent protection. Which means that legal institutions are an important part of the market-making mechanism for components of this type. (I don't mean to suggest that physical products do not involve patent-related issues; they do, just of a slightly different flavor. "Exhaustion" of patent rights, for example, is an issue that often accompanies transactions over physical components.)

The legal system is charged with granting the rights that help to structure this market. And at the enforcement stage, the legal system mediates conflicts between right owners and those who use (or are at least accused of using) technologies covered by those rights. The intangible nature of the assets; the high economic value of many of the technologies involved; and the relevance of legal craft and strategy—these combine to create special conditions for market-making.

At a high level of abstraction, in the mobile phone industry the market for intangible inputs is serviceable if far from perfect. One helpful feature is that, for some patented inputs, mobile phones are designed and sold before the market-making process is complete. In many cases, these steps happen before the market-making process even begins. By necessity and convention, handset makers negotiate licenses for some technologies up front (ex ante), but for others they wait to hear from claimants holding patents that were not cleared in advance.[10] Patent courts thus facilitate ex post market-making in two ways: first, by sorting out which of the supposed inputs added any value (i.e., are covered by valid patents); and second, by determining whether any accused handset makers reaped any of that value (i.e., infringed a valid patent). Only after these initial determinations do courts get to the important issue of putting a monetary value on the handset maker's use of the patented technology (i.e., damages). These damages set the market price between the parties to the dispute, and also provide indirect guidance for future conflicts and deals between component suppliers and handset makers.

Industry-wide engineering organizations debate and adopt technical standards to insure product modularity. This is an important practice that encourages component interoperability and price-based competition among component makers. To prevent patent-related opportunism in standard-setting, standards groups routinely require participants to make a general promise that patent coverage (and resultant potential profit) will not be used to extort unfair royalties from those who adopt the standard. Unlike a patent

10. Robert P. Merges, *After the Trolls: Patent Litigation as* Ex Post *Market-Making*, 54 AKRON L. REV. 555, 559–71 (2020).

pool, these binding pledges do not set a precise price on patented technologies that are incorporated into standards.[11] Instead, these pledges merely defer negotiations over royalties, with a promise to be "reasonable" should the issue later arise. This general commitment only "kicks the can down the road," but that is valuable in itself. It takes patents (and in some measure self-interest) off the table, leaving only technical issues to be resolved.

Of course, down at the granular level, participants in this ecosystem take the big picture as a given. They are too busy fighting to maximize their own profit to care much about overall efficiency, or the way their industry is structured. Business and legal strategies are intertwined, and each legal tactic that contributes to their strategy is deployed for maximum leverage. Patent owners seek as much of the surplus from a multi-component product as they can; at the limit, their strategy may approach a true holdup (though empirically the precise conditions for technical holdup are rare). On the other side, handset makers and other technology "implementers" work hard to invalidate patents asserted against them. They fight over patent claim language to escape infringement liability. They drive damages down and resist injunctions. They stretch out their defenses, often in coordinated campaigns in different jurisdictions. At the limit they "hold out": they enjoy the free, uncompensated use of technological inputs for as long as their legal machinations enable them to.[12]

Because the legal system so thoroughly mediates the market for technologies, it must be sensitive to potential abuses growing out of legal tactics. Judges, regulators, even Congress on occasion must root out and put a stop to clever tactics that tilt the bargaining table too steeply in one direction or another. Whenever and wherever possible, the legal system should work to identify and reward real inventions, valuable innovations. It should seek not to reward novel use of tactics, loophole-seeking strategies, and all the other efforts to turn the legal process to private advantage. The integrity of the market for patented, intangible inputs depends on this. The Articles give a good cross-section of the nature of that market today and some of the challenges faced by those charged with keeping it true to its primary function.

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11. *Cf.* Kristen J. Osenga, *Ignorance over Innovation: Why Misunderstanding Standard Setting Organizations Will Hinder Technological Progress*, 56 U. LOUISVILLE L. REV. 159 (2018) (distinguishing standard development organizations and patent pools given their different legal and market functions).

12. *See generally* Richard A. Epstein & Kayvan B. Noroozi, *Why Incentives for "Patent Holdout" Threaten to Dismantle FRAND, and Why It Matters*, 32 BERKELEY TECH. L. J. 1381 (2017); Bowman Heiden & Nicolas Petit, *Patent Trespass and the Royalty Gap: Exploring the Nature and Impact of Patent Holdout*, 34 SANTA CLARA HIGH TECH. L.J. 179 (2017).