

The New Patent Intermediaries: Platforms, Defensive Aggregators, and Super-Aggregators

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Some assets are traded in liquid markets, at transparent prices, with the help of many thriving intermediaries: houses and apartments, stocks and other financial products, books, DVDs, electronics, and all sorts of collectibles. Intellectual property in general and patents in particular—the focus of this paper—are not among those assets (Gans and Stern 2010). The patent market consists mainly of bilateral transactions, either sales or cross-licenses, between large companies. Such deals are privately negotiated and might involve hundreds or thousands of patents. For example, in June 2011, a consortium of Apple, Microsoft, Sony, and several other large tech companies outbid Google to buy Nortel's 6,000 patents and patent applications for \$4.5 billion. Google responded first by buying over 1,000 patents from IBM for an undisclosed price, and then by acquiring Motorola Mobile and its more than 17,000 patents for \$12.5 billion. In April 2012, Microsoft bought 925 patents from AOL for \$1.1 billion, then sold a portion of that portfolio to Facebook for \$550 million. And in September 2012, Samsung lost a \$1 billion judgment to Apple and faced a potential injunction from a federal judge in a jury trial over patent infringement. The very real threat of adverse jury rulings or injunctions, which might lead to partial or total shutdown of existing businesses, have led to extremely high willingness-to-pay for some intellectual property.

Outside of these bilateral deals, patent buyers and sellers frequently have a hard time finding each other. There is no eBay, Amazon, New York Stock Exchange, or Kelley's Blue Book equivalent for patents, and when buyers and sellers do find

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each other, they usually negotiate under enormous uncertainty: prices of similar patents vary widely from transaction to transaction and the terms of the transactions (including prices) are often secret and confidential.

Inefficient and illiquid markets, such as the one for patents, generally create profit opportunities for intermediaries. In this paper, we begin with an overview of the problems that arise in patent markets, and how traditional institutions like patent brokers, patent pools, and standard-setting organizations have sought to address them. But during the last decade, a variety of novel patent intermediaries has emerged. We will discuss how several online platforms have started services for buying and selling patents but have failed to gain meaningful traction. However, new intermediaries that we call defensive patent aggregators and super-aggregators have become quite influential and controversial in the technology industries they touch. In particular, the rising prominence of a new and powerful patent aggregator called Intellectual Ventures has sparked heated debates about the economic role played by intermediaries in the patent market and their effects on innovation.¹

One might expect that new intermediaries and competition between them could lead to increased market efficiency. Sometimes, however, intermediaries are able to exploit market inefficiencies without contributing much social value or, worse, they might even exacerbate existing market failures. The goal of this paper is to shed light on the role and efficiency tradeoffs of these new patent intermediaries. In the conclusion, we offer a provisional assessment of how the new patent intermediary institutions affect economic welfare.

Patent Market Failures and Traditional Patent Intermediaries

Why is the market for patents so illiquid and inefficient? While the root causes are well-known to economists and are a subset of market failures that arise in many markets for ideas, it is useful to summarize them briefly here, highlighting the issues most relevant for patent intermediaries. Gans and Stern (2010) offer a review of market failures in the market for ideas, many of which apply to patents.

First, patents are much more difficult to value than most other goods. This problem arises not simply because patents are intangible assets: after all, intangibles such as brand equity are routinely valued. What sets patents apart is that every patent

¹ Because our notion of a patent intermediary is an organization (firm or not-for-profit entity) that *directly* facilitates the sale or licensing of patents from owners-creators to users, we will not discuss here the patent rating, valuation, and search services that aim to create liquidity indirectly by providing useful patent information. An example of such a service is ArticleOne Partners (<http://www.articleonepartners.com/>). In addition, we focus specifically on patent intermediaries as opposed to other forms of intellectual property and more general notions of markets for technology (Arora, Fosfuri, and Gambardella 2001) and for ideas (Gans and Stern 2010). Thus, our study does not cover firms like InnoCentive and NineSigma, which connect companies with individuals or institutions that can create pre-patent solutions to science or technology problems.

is by definition unique: they lack “comparables,” which are used in many markets to estimate a given asset’s value. More importantly, patent value in many modern technologies is subject to strong complementarities and portfolio effects (Gans and Stern 2010; Parchomovsky and Wagner 2005). The issue of complementarities arises because in industries like semiconductors and smart phones, products are covered by dozens or even hundreds of interdependent patents. As a result, the value of *individual* patents is heavily discounted. Potential buyers or licensees may not place much value on a given patent sold by itself unless it complements a portfolio that they already own. This greatly reduces the number of buyers and the potential for liquidity. Portfolio effects create asymmetries between large operating firms on one side and individual inventors and small companies on the other side (Jaffe and Lerner 2004). There is a lower probability for smaller inventors to monetize their patents because they lack a large portfolio and because their owners typically have limited financial resources and legal expertise, which severely undermines their ability to bargain effectively. A well-known example (and the subject of the 2008 movie *Flash of Genius*) is that of engineer Robert Kearns, who in 1964 applied for a patent for an intermittent windshield wiper system for automobiles. Manufacturers refused Kearns’s requests to sign licensing agreements and began producing cars featuring the wiper system in 1969. Kearns spent decades battling in court for infringement. He eventually earned \$30 million in settlements from Ford and Chrysler but, in the process, lost his job, divorced, and suffered multiple nervous breakdowns (Schudel 2005).

Second, both sides of the patent market face high search costs. For patent owners, it is prohibitively costly to find all current users (actual infringers) and all *potential* applications of their patents. For potential patent buyers or users, it is very costly to find all prior art and patents that “read on” (that is, that might cover the technology within) their products, especially when these products are complex and rely on fast-changing technologies. Indeed, although patent offices around the world as well as private databases provide comprehensive and searchable lists of all patents issued, patent applicants typically seek to disclose only the minimum necessary to obtain the patent, and use language that is oftentimes broad and opaque. This makes it very difficult to figure out their relationship with other patents and prior art, particularly with millions of patents in circulation. To illustrate, consider Apple’s “bounce-back” utility patent, which was highly publicized during the recent *Apple vs. Samsung* trial settled in August 2012 before a California jury (Gallagher 2012). This patent essentially covers a method for allowing users to scroll beyond the edge of an image, webpage, or list and have it bounce back onto the screen. Despite the highly intuitive nature of this functionality, it is quite hard to identify its scope and the way it is meant to be implemented from the language used in the actual patent.²

² The patent number is 7469381, and its detailed description is available from the US Patent Office at <http://patft.uspto.gov/netacgi/nph-Parser?Sect2=PTO1&Sect2=HITOFF&p=1&u=/netahtml/PTO/search-bool.html&r=1&f=G&l=50&d=PALL&RefSrch=yes&Query=PN/7469381>.

Third, patent transactions always happen in the shadow of litigation, which exacerbates valuation problems and creates large transaction costs. Litigation often implies that patents are best viewed as “probabilistic property rights” or “lottery tickets” (Lemley and Shapiro 2005): few patents are litigated, but of those that are, approximately half end up being invalidated. Given this risk, many patent owners and users prefer to settle out of court for amounts that have more to do with their opportunity costs of going to trial and their attitude towards risk than with the “true” economic value of their patents. Is the plaintiff a small company or individual with limited resources who prefers to settle for a small amount rather than face the possibility of years of litigation? What about a competitor who can be countersued and brought to accept a cross-licensing agreement? Or what about a “nonpracticing entity” against which injunctions that they cannot produce the product will not work—because the entity doesn’t produce in the first place. Furthermore, some courts have a reputation for bias in favor of small players and against large companies, which makes them attractive patent litigation forums for small players and nonpracticing entities. For example, the Eastern District of Texas received 25 percent of all US patent infringement cases during 2011 and found in favor of patent owners almost 75 percent of the time (Decker 2012). The prospect of choosing a favorable court setting increases the amount of (inefficient) litigation.

The complexity that arises when valuation is intertwined with litigation has been heightened by the emergence of the US International Trade Commission (ITC) as a new forum for patent battles. The ITC is an independent federal agency with powers to do investigations and fact-finding on international trade issues, including import subsidies, dumping cases, and also issues of whether an imported product infringes on existing intellectual property. The ITC typically decides much faster than federal courts: often 12–15 months vs. several years in federal courts (Analysis Group, n.d.; Fisher 2006). It also offers the possibility of relatively quick injunctive relief against defendants: it can require that the offending imports be halted, which can be even more effective in extracting monetary settlements. Qualcomm, for example, was forced to negotiate an \$891 million settlement with Broadcom in 2009, after losing a case at the ITC and facing an import ban (Crothers 2009). Thus, the ITC has significantly increased the costs of exposure to potential patent infringement lawsuits for firms in traded goods industries such as semiconductors, smartphones, and computers.

These patent market failures are most problematic for individual inventors or small companies, who represent the majority of patent owners. One study, compiling data from a variety of public sources, found that inventors and small businesses contribute 60 percent of all patents in the United States, but only extract 1 percent of total licensing revenues. The remaining 99 percent of licensing revenue goes to large companies (Hagiu, Yoffie, and Wagonfeld 2011, exhibit 11). Of course, it is not shocking that large companies may tend to focus on higher-value patents, but the disjunction is nonetheless striking.

One possible mechanism for small patent owners to address the problems of getting paid for their ideas would be to incorporate them in start-ups and seek either to compete with incumbent companies or to cooperate with them by licensing or

being acquired (Gans, Hsu, and Stern 2002). In this way, investors, particularly venture capitalists, could mitigate some of these market failures. But many patents are not worth incorporating in a start-up, especially if they are not part of broader portfolios. Furthermore, great inventors are not necessarily great entrepreneurs (Wasserman 2012). In fact, it is arguably more efficient for inventors to specialize in invention rather than to pursue commercialization, a point argued by Lamoreaux and Sokoloff (2003) in the context of late nineteenth century United States and probably equally valid today.

With so many difficulties facing inventors trying to monetize their discoveries, an obvious answer is to create intermediaries that facilitate the sale of patents to users (mainly operating companies), thereby maintaining appropriate incentives for innovation. In the next section, we discuss the three main traditional patent intermediaries studied in the existing economics literature: patent brokers/agents, patent pools, and standard-setting organizations. These traditional patent intermediaries have been around for a long time, but each faces certain limitations which prevent them from solving many of the patent market's problems.

Three Traditional Patent Intermediaries

Patent brokers help patent owners sell or license their technologies in exchange for a fee contingent on successful transfer. Their activity helps reduce search and transaction costs by investing in specific knowledge and connections on both sides of the market. Brokers often facilitate not just the sale or licensing of patents, but broader technology transfers, which include patents and know-how. They also offer consulting services helping patent owners market and sell their assets. There are a large number of patent brokers, which tend to be small companies with fewer than 10 employees. Some examples include Thinkfire (<http://www.thinkfire.com/>), IPValue (<http://www.ipvalue.com/>), Pluritas (<http://www.pluritas.com/>), and Competitive Technologies (<http://www.competitivetech.net/>).

Such patent brokers have existed since at least the nineteenth century: for example, Lamoreaux and Sokoloff (2003) document the positive effect of brokers on the US market for patented technology between 1870 and 1920. These brokers were typically patent agents or lawyers who matched inventors looking to sell new technologies with investors or buyers eager to commercialize them. At that time, however, there were few products encompassing hundreds of patented technologies like today: thus, the portfolio effects problem was less prevalent, and patents with fuzzy and overlapping boundaries were relatively rare. The job of modern patent brokers is much harder than those of a century ago. Unlike other markets for assets like stocks or real estate, the existence of many brokers in the patent market does not create sufficient liquidity on its own. Indeed, patent brokers are small in scale and tend to focus on facilitating high-end licensing transactions that carry large price tags. Their fees are above 10 percent of the value of the transaction and sometimes reach 20–30 percent (Young 2008), a level high enough to suggest that inefficiencies prevail in the patent market.

Patent pools are formal or informal organizations in which for-profit firms come together to license patents to each other or to third parties (Lerner, Strojwas, and Tirole 2007; Shapiro 2001). Some common examples of patent pools include the historical example of the patent pool for sewing machines (see for example Lampe and Moser 2010), along with more recent technology patent pools such as Bluetooth and MPEG-4. Bluetooth is a technology standard for exchanging data over short distances; the corresponding pool brought together patents from 12 companies including Ericsson, IBM, Intel, Motorola, Nokia, and Toshiba (Layne-Farrar and Lerner 2011). MPEG-4 is a method for compressing audio-visual data; this pool contained 29 companies, including Apple, AT&T, Canon, France Telecom, Fujitsu, Hitachi, Microsoft, RealNetworks, and Sharp (Layne-Farrar and Lerner 2011). Patent pools emerged to solve the “multiple marginalization” problem—also known as “royalty-stacking”—which arises when multiple parties hold market power in a chain of production. If all parties attempt to exercise their market power to the fullest, the resulting prices will typically be above the level that would be set by a single party with market power—and the joint profits and social welfare will be lower than in the case of a single party with market power.

While patent pools can create social value by reducing royalty stacking, it is not clear how well they address the traditional problems of patent markets. First, if patents included in a pool are substitutes rather than complements, the pool may turn out to have anticompetitive effects in the form of higher prices: the pool facilitates price collusion at the expense of price competition (Shapiro 2001; Lerner and Tirole 2004). Second, patent pools can create barriers to entry and innovation, favoring large companies with sizable patent portfolios who are members of the patent pool and discriminating against small companies or individual inventors who find it hard to negotiate their way into the pool. Third, the applicability of patent pools is limited to a small number of markets, where the essential intellectual property to producing a specific product or service is more or less evenly distributed among several large, identifiable players.

Similarly, standard-setting organizations have made it possible for participants in industries where there is an important need for interoperability between many components to come together and voluntarily produce consensus technical standards. Standard-setting organizations create economic value by enabling coordination on (Simcoe 2012) and certification of (Chiao, Lerner, and Tirole 2007; Lerner and Tirole 2006) technical standards. When these organizations endorse a specific technological standard, participants in the relevant industries typically adopt that standard and agree to cross-license or to pay the required royalties to the standard owner(s). The technological standard usually consists of many patents, owned by a patent pool, or on rare occasions by one company or institution. The process of choosing and certifying standards, however, is often subject to conflicts of interest due to interference by large producers (Schmalensee 2009). Furthermore, the scope of standard-setting organizations is limited to a small number of industries and technologies relative to the size of the broad patent market.

Thus, while brokers, patent pools, and standard-setting organizations have a role in bridging some of the gaps in the patent market, their effects are limited, and they have not managed to help small inventors get paid for their ideas. Indeed, small patent owners generally do not participate in pools or standard-setting organizations, and most small patent owners are not worth the time of professional brokers.

Exploiting Market Failures: Nonpracticing Entities

The general lack of depth in patent markets has created a particularly favorable environment for the so-called “nonpracticing entities,” which have become the most controversial patent intermediaries. In essence, nonpracticing entities act as arbitrageurs, first acquiring patents, typically from individual inventors or small companies, and then seeking licensing revenues from operating companies through litigation or the threat of litigation. These entities do not innovate themselves, nor do they produce output. In 2001, nonpracticing entities brought 144 lawsuits targeting over 578 operating companies; by 2011, the numbers had increased to 1,211 lawsuits targeting 5,031 operating companies respectively (according to PatentFreedom research at <https://www.patentfreedom.com/research-lot.html>).

Two main factors account for the explosion in activity of nonpracticing entities. First, the Internet has greatly reduced transaction costs for inventors to find intermediaries to whom they can sell their patents (Spulber 2011). Although nonpracticing entities appeared in the second half of the 1990s, the way they found undervalued intellectual property assets at that time was largely serendipitous—for example, through personal connections to inventors or sales of distressed assets containing obscure patents. Today, with a quick Internet search, any inventor can locate nonpracticing entities directly or contact brokers who can help one do so (Lohr 2009).

Second, the value and prominence of patents have increased along with the revenues and profits associated with intellectual-property-intensive businesses. This growth was fueled in large part by the explosion of the information and communication technology sectors in areas like software, semiconductors, and mobile communications. Not coincidentally, most of the activity of the nonpracticing entities is concentrated in those sectors. These industries produce complex products and services, which involve many interrelated processes and components. For example, manufacturing an integrated circuit requires hundreds of steps, with literally billions of transistors and thousands of complex algorithms. Consequently, the potential for newly issued patents to have “fuzzy boundaries” (in the sense of Besen and Meurer 2008) and to overlap with prior art is very high in these sectors. Furthermore, no firm—even the industry’s largest ones—has more than 30 percent of the patents that cover semiconductor design and manufacturing. This fragmented ownership of the relevant intellectual property exacerbates the uncertainty regarding the merits of the many patents involved.

Contrast this situation with the pharmaceutical industry, where patents also play a crucial role, but the boundaries of intellectual property are much more clearly defined. Patent claims on new molecules are easily distinguishable from other patented molecules. Not surprisingly then, nonpracticing entities and other patent merchants have been largely absent from the pharmaceutical sector. In contrast, different patents on smartphone user interfaces oftentimes contain closely related claims. For example, the difference between a horizontal and a vertical swiping mechanism for unlocking a touchscreen smartphone leaves lots of room for interpretation. How a jury might construe these claims create big opportunities for nonpracticing entities.

The arbitrage opportunities available to nonpracticing entities are sizable. As of 2010, the median price paid by nonpracticing entities for a patent was approximately \$100,000 and the mean was \$400,000 (according to PatentFreedom website, accessed December 2010). On the other side of the market, most patent settlements range between \$50,000 and a few million dollars (Sharma and Clark 2008). In a few notable cases, however, nonpracticing entities have managed to extract hundreds of millions of dollars. The best-known example is a 2006 settlement in which Research in Motion (maker of the Blackberry smartphones) agreed to pay \$612.5 million to NTP, a Virginia-based nonpracticing entity, which had sued Research in Motion for infringing on eight wireless email patents (Riordan 2004). While precise data on the distributions of prices paid and settlements received by nonpracticing entities is unavailable, it is useful to consider the following back-of-the-envelope calculation based on the numbers above. If 99/100 settlements are uniformly distributed between \$50,000 and \$1 million and 1/100 settlements are for \$100 million, then the net expected payoff for a risk-neutral nonpracticing entity for purchasing a patent is approximately \$1.15 million. Even after litigation costs, this offers an attractive arbitrage opportunity.

Nonpracticing entities have attracted financing from investors looking for novel diversification opportunities with high returns. A number of hedge fund, venture capital, and private equity firms either invest in nonpracticing entities or approach small patent-holders directly, offering to finance lawsuits against operating companies in exchange for a cut of any resulting payments (for some examples, see Masnick 2009; Bergelt 2010; McCurdy 2009).

Nonpracticing entities are sometimes pejoratively known as “patent trolls.” The originator of the patent troll model is generally agreed to be the company TechSearch and its lawyer Raymond Niro. Beginning in the late 1990s, TechSearch originated the practice of buying up patents and suing companies for infringement to demand payments (Bario 2011). In 2001, Intel’s in-house lawyer Peter Detkin referred to Niro as a “patent troll” and popularized the term. (Perhaps ironically, Detkin went on to cofound Intellectual Ventures, the largest nonpracticing entity today, which we discuss below.) The meaning of the term “patent troll” has evolved over time, and there is no commonly agreed-on definition. However, trolls are generally viewed as combining the following characteristics: 1) they acquire intellectual property assets, like patents, solely for the purpose of extracting payments

from alleged infringers; 2) they do not do research or develop any technology or products related to their patents; and 3) they behave opportunistically by waiting until industry participants have made irreversible investments before asserting their claims (Lemley 2008; Schmalensee 2009).

In itself, buying and reselling patents solely for price arbitrage is not necessarily a harmful practice. One could even argue that it increases market efficiency by creating liquidity and a way for small patent owners to get paid, similar to the function performed by dealers and market-makers in financial markets (McDonough 2006; Schmalensee 2009; Spulber 2011). The main reason that nonpracticing entities can instead create economic harm is that they seek to extract disproportionate payments through two practices. First, they typically engage in “nuisance value” litigation: they sue many companies simultaneously for moderate amounts so that targets are more likely to settle instead of risking a costly and uncertain trial. Second, they attempt to hold up (or “ambush”) practicing companies by bringing the lawsuits at the most vulnerable times for the targets, like just before the release of a new product, when the target can ill afford a risky trial involving its new product shipments. Memory chip companies, for example, accused Rambus of ambushing the industry with litigation just after a new industry standard had been set (Schmalensee 2009).³ These two practices exacerbate patent market inefficiencies. The net effect is to create perverse incentives for some small patent owners to seek out nonpracticing entities to acquire and enforce patents of questionable merit. In addition, the expansion of such lawsuits may well produce a defensive backlash by large operating companies against all small patent owners, even the ones that might have a legitimate and valuable claim.

Two-sided Patent Platforms: A Failed Solution

In parallel with the increased activity of nonpracticing entities during the 2000s, a number of companies built two-sided platforms in an attempt to create more efficient ways to bring buyers and sellers of patents together. The goal of two-sided patent platforms was to facilitate patent transactions without taking title or ownership of the patents involved. Two main categories of such platforms have been attempted: online marketplaces and live auctions.

Online patent marketplaces appeared as early as 1998, but replicating in the market for patents what eBay has done for collectibles has proven difficult. Some of the online portals dedicated to facilitating patent search and transactions have been shut down or renamed and redirected towards other services.⁴ The online platforms

³ The law does try to address this problem through the doctrine of “equitable estoppel,” which can bar enforcement of patents by someone who has deliberately waited until after an investment decision has been locked-in to assert patents. We are grateful to Douglas Melamed for bringing this to our attention.

⁴ For instance, Patent License and Exchange (pl-x) was created in 1998 as an online intellectual property and licensing marketplace. By 2006 it had been renamed PLX Systems and completely dropped the marketplace idea; instead, it provided software solutions for business and financial management of

that are still independent have limited scale, and they function more as brokerage or consulting companies: two representative examples are Yet2 (<http://www.yet2.com>) and Tynax (<http://www.tynax.com>). Both websites contain thousands of listings for both sides of the market. Sellers post detailed information about the patents they want to sell, along with any special conditions (for example, perhaps a license must be granted back to the seller) and without revealing their identity. Buyers can find information about patents that are in the market for sale, search by keywords and patent classes, and post descriptions of specific intellectual property assets in which they have an interest, also without revealing their identity. Both Tynax and Yet2 work with Fortune 500 companies, and for both, keeping the identities of buyers and sellers confidential is a key part of their value proposition. Furthermore, they employ various mechanisms like screening through upfront fees and disclosure requirements to mitigate adverse selection in which only weak patents are offered for sale (Dushnitsky and Klueter 2011)—a potentially serious concern for online trading platforms. Indeed, in the absence of fees, the ratio of low-quality to high-quality products is very high on any online marketplace (for example, Craigslist). This clutter significantly raises search costs for buyers, which in turn disincentivizes high-quality product suppliers from participating. The problem is even worse for patents, because search costs are already very high.

Despite the extensive listings on Yet2 and Tynax's online portals, no transactions are completed online. Instead, once a buyer or a seller expresses clear and credible interest in a posting, Tynax or Yet2 manages and facilitates the buyer-seller interaction offline through one of its dealmakers—who is an actual person. The majority of revenues come from commissions on completed transactions: \$100,000 to \$10 million for Tynax or 15 percent of licensing fees for Yet2. Thus, both Tynax and Yet2 remain essentially patent and technology brokerage firms.

At first glance, auctions might have seemed like a useful mechanism for eliciting market valuations for patents. The fact that Chicago-based Ocean Tomo managed to organize ten live intellectual property auctions between April 2006 and June 2009 generated significant buzz and optimism regarding the potential for bringing liquidity to the patent market via platforms. These auctions functioned like other live auctions—for example, like art at Sotheby's and Christie's—with an auctioneer taking bids for each lot, which could be a single patent, copyright, trademark, or domain name right, or a bundle of such assets. The lots were sold to the highest bidder on condition that the highest bid exceeded the seller's reserve price.

But the auctions struggled to gain traction. The total value of transactions through Ocean Tomo's ten intellectual property auctions was only \$114.6 million (Jarosz, Heider, Bazelon, Bieri, and Hess 2010, p. 17). This total is relatively small, especially when compared to, say, the billions of dollars spent on patent portfolios by

intellectual property for the music and entertainment industry. Other online platforms for matching patent sellers or licensors with buyers or licensees that have disappeared include Open-IP.org, TechEx, PricewaterhouseCoopers' IPEX, and Ocean Tomo's "The Dean's List."

Google in 2011–12 alone. The average sales-to-listings ratio over all ten Ocean Tomo auctions was reportedly 38 percent, and the spring 2009 auction only sold six out of 85 lots listed (*Inside IP* 2012). Part of the reason for the lack of activity in spring 2009 was the financial crisis, but all auctions had been characterized by low participation and little bidding (Jarosz, Heider, Bazelon, Bieri, and Hess 2010, p. 20–22). In June 2009, Ocean Tomo sold its transactions line of business (including auctions and the now-closed “The Dean’s List” online platform) to ICAP, an interdealer broker, for just \$10 million (ICAP 2009). The live intellectual property auctions were subsequently revived in March 2010 under the joint brand ICAP–Ocean Tomo. The spring 2010 auction (the 11th overall) was reported to have generated \$14.3 million in transaction value, including buyers’ premiums (ICAP 2010).

Thus, while the idea of creating two-sided platforms for matching and facilitating transactions between patent buyers and sellers is appealing in principle, so far none of these platforms has been able to gain significant traction. None is close to creating a sustainable eBay or Sotheby’s for intellectual property. One might argue that Tynax and Yet2.com are creating the economic equivalent of Craigslist for patents, but little more. Why is it so hard to establish two-sided platforms for patent transactions?

First, two-sided platforms that attempt to bring together buyers and sellers without ever taking possession of the goods being exchanged face a difficult chicken-and-egg problem. Unlike market-makers who buy and resell, two-sided platforms have to attract a critical mass of both buyers and sellers. Some online platforms managed to attract many listings, but (as pointed out above) they do not facilitate many actual transactions. Ocean Tomo’s auctions never achieved sufficient scale to convince buyers and sellers that they would become an important venue for trading patents. Owners of valuable patents did not *expect* these platforms to offer attractive monetization opportunities for their assets compared to other options like licensing directly, selling to nonprofit entities and splitting the proceeds from litigation, or raising venture capital funding and incorporating. In turn, the lack of valuable patents meant that few large operating companies would participate actively, which confirmed the initial negative expectation of sellers-owners. A broad market was never created; instead a handful of nonprofit entities were very active as buyers in Ocean Tomo’s auctions (Malek 2009).

Second, while online intellectual property platforms like Tynax and Yet2.com have generated some search cost reductions through their thousands of listings, they have been unable to create significant reductions in transaction costs. The sensitivity of intellectual property information and the need for “close-touch” and often in-person due diligence make potential buyers and sellers reluctant to reveal enough details for completing a patent transactions online. Of course, this is why Tynax and Yet2.com still function as offline brokers for the actual transactions. But if personal dealmakers have to be directly involved in each transaction, their business model cannot easily scale up at low marginal cost. Moreover, the final transaction prices and valuations are private information, which cannot be leveraged to create greater transparency and liquidity in the patent market.

Will two-sided patent platforms remain limited in scope and scale? Even if they overcome the chicken-and-egg hurdle of how to attract the high-quality and high-value patents, patent platforms seem unlikely to solve the liquidity problems that plague the market for patents. Indeed, given the heterogeneity and strategic sensitivity of patent transactions, it is hard to see how one could create the equivalent of an eBay for patents. Furthermore, the strong complementarities and portfolio effects across modern patents imply that two-sided platforms are at an inherent disadvantage relative to other types of patent intermediaries who take ownership of patents and are able to exploit those complementarities directly. By definition, two-sided platforms cannot do so. That diagnosis does not rule out the emergence (or growth) of platforms specializing in reducing search costs—similar to Tynax and Yet2.com. There is value in being able to browse through thousands of patents, bundles of patents, and technologies wanted or for sale in one place and in a unified format. The official Patent Office listings—patents granted or under review and searchable patent abstracts—leave significant scope for quasi-brokers to further reduce search costs with better listings and search functionality. As pointed out above, many official patent abstracts are written in such a way as to discourage workarounds and to make the broadest possible claims, which often makes it hard to identify potential applications. In this context, firms such as Yet2 create their own abstracts written in clear language in order to help potential buyers assess the potential benefits of the patented technology they are investigating.

Defensive Aggregators and Super-aggregators

The rise of nonpracticing entities combined with the failure of patent platforms to bring transparency and liquidity to the patent market (which might have reduced the arbitrage opportunities for nonpracticing entities) have posed a growing threat to operating companies. In response, two new novel patent intermediaries have emerged, which we call defensive aggregators and super-aggregators.

Defensive Aggregators

There are currently two prominent defensive aggregators: RPX (a for-profit firm, publicly traded since May 2011) and Allied Security Trust (a not-for-profit). In essence, defensive aggregators offer an incomplete insurance policy against patent troll risk to large operating companies. Firms such as Barnes & Noble, Best Buy, Cisco, eBay, HTC, IBM, Intel, McAfee, Microsoft, NEC, Nokia, Panasonic, Research In Motion, Samsung, Sony, and Verizon pay RPX annual subscription fees ranging from \$65,000 to \$6.9 million, depending on operating income (as explained at RPX's website: <http://www.rpxcorp.com/index.cfm?pageid=85>, accessed May 2012). In exchange, RPX identifies patents that *might* threaten subscribers, acquires those patents (or the right to grant sublicenses) in the open market, and provides all of its subscribers with licenses to those patents. The patents owned by RPX are also made available for use in counterlawsuits against nonmembers who initiate litigation against members.

Unlike a traditional insurance policy, RPX faces no liability if a subscriber is sued or loses a patent case.

Allied Security Trust, known as AST, offers two main variations on the RPX model. First, RPX decides unilaterally (sometimes in consultation with members) which patents to buy and uses its own capital to do so, while AST identifies patents or portfolios of patents and then solicits acquisition bids from its subscribers, who are also its governing members. Within AST, the bids and the identity of the bidders are kept secret from one another, and each member is required to have sufficient funds in an escrow account in order to support every bid it makes (as explained at the Allied Security Trust website at <http://www.alliedsecuritytrust.com/Services/AcquisitionModel.aspx>). If the sum of the bids for a particular set of patents is sufficient to close the transaction, then only the members who bid for that particular acquisition receive a license to the relevant intellectual property (as explained at <http://www.alliedsecuritytrust.com/Services/LicensingModel.aspx>). In the case of RPX, all members receive a license to all patents acquired by RPX. AST's licenses are perpetual from the outset, unlike RPX which introduces vesting periods in its licenses. Members who do not bid in the initial acquisition can still subsequently purchase a license to the patents involved, at a price equal to the highest bid.

Second, after AST acquires a set of patents and licenses its bidding members, it looks to sell those patents. It starts by offering each of the original bidders, starting with the highest one, the opportunity to buy out the entire portfolio by reimbursing the other bidders and AST's related expenses. If none of the bidders is interested, AST places the portfolio for sale with a broker (a divestiture process explained at <http://www.alliedsecuritytrust.com/Services/DivestitureProcess.aspx>). In contrast, RPX only sells patents occasionally, when it deems that they are no longer useful to its subscribers.

For economists, defensive aggregators raise some interesting issues about contracting. First, the value of RPX to its subscribers seems difficult to verify. Unlike traditional insurers who pay customers when "accidents" happen, defensive aggregators get paid to reduce the probability of "accidents"—in this case, lawsuits from nonproducing entities. But how can members know that RPX is effectively reducing litigation risk on their behalf? Presumably, part of the answer lies in the number of relevant patents that RPX buys. But perhaps more importantly, subscribers view RPX as offering a more efficient buying service for patents they have *already* identified as threatening. When patents are critical to their business, operating companies will often buy them on their own. The issue for many firms is what to do about marginally relevant patents: the expected value of the potential damage may not be sufficient to justify the cost of buying the patent unilaterally, but it may be worth the membership fee paid to RPX, who in turn can aggregate payments across multiple subscribers.

Second, defensive aggregators make an intriguing public commitment *never* to litigate in order to extract revenues (for example, see RPX's website <http://rpxcorp.com/>, accessed May 2012). This commitment helps differentiate them from patent trolls and serves to reassure potential subscribers, but at the same time,

it creates a significant free-rider problem. When RPX buys a patent (say, for Nokia in smartphones), and eliminates the threat from a troll, then nonsubscribers in the same industries (say, Motorola) equally benefit, so they may be less likely to pay RPX's subscription fees. One way in which RPX mitigates this problem is by adopting a "catch-and-release" approach: it acquires a patent, grants its subscribers a license, and then resells the patent on the open market (preferably to a nonpracticing entity), which means nonsubscribers remain exposed to litigation risk (Hansell 2009). Still, reselling the patents acquired reduces the value of subscribing to RPX for *new* members. This approach also complicates the decision for existing members, who have to determine whether to renew their subscriptions.

Third, the defensive aggregator business model faces an inherent limitation by relying exclusively on subscription revenues. RPX has no shot at the huge payoffs that can be achieved by nonpracticing entities (or a super-aggregator like Intellectual Ventures, which we discuss below). In turn, this puts RPX at a disadvantage in acquiring patents. For example, nonpracticing entities can offer payments for patents that are at least partially contingent on what might be received in a later lawsuit—and therefore a much larger potential payoff to owners—whereas RPX can only offer a fixed payment. RPX may also face unreasonable prices from patent owners if the latter interpret an approach by RPX as a sign of interest from its subscribers—who are, after all, large and potentially rich operating companies. This outcome is related to the issue of "awareness-inducing information" in incomplete contract settings studied formally in Tirole (2009). RPX tries to mitigate this problem by forming buying syndicates among its subscribers and then using shell companies to buy patents of interest to the syndicate.

It is still too early to tell whether RPX has managed to address these issues successfully: it was founded in 2008, and most of its members are locked in for a minimum of three years, so there is insufficient data as yet regarding membership renewal rates.

Super-aggregator(s)

A new type of player, which we call a super-aggregator, has emerged as the largest and most controversial type of intellectual property intermediary. Epitomized by Intellectual Ventures, a super-aggregator is a hybrid between a defensive aggregator, a large nonpracticing entity, and a "weapons dealer," who can provide intellectual property to litigants on both sides of a battle. At the time of this writing, Intellectual Ventures seems unique because of its size—the company has raised more than \$5 billion from a variety of investors—but other entities are trying to emulate its model by raising similar amounts of capital.

Intellectual Ventures is a nonpracticing entity. Its first investor, Microsoft, has publicly said that Intellectual Ventures delivers a highly valued service for technology firms (Haggiu, Yoffie, and Wagonfeld 2011). However, critics have described Intellectual Ventures as "the world's largest patent troll" because it acquires, creates, and seeks to license patents without directly making any products or services itself (Orey 2006). Founded in 2000 by former Microsoft chief

technology officer Nathan Myrsvold, as of mid-2012 the firm has spent approximately \$2 billion building the world's third-largest patent portfolio—roughly 35,000 patents, mostly covering software, semiconductors, communications, and e-commerce. Like a venture capital or private equity firm, Intellectual Ventures is structured as a series of funds. Its two largest funds are dedicated to acquiring existing patents from all possible sources: individual inventors, or small and large companies. Its third fund focuses on developing its own inventions in partnership with scientists; for example, current projects include a new type of nuclear reactor and a laser-based weapon for fighting malaria mosquitoes. A fourth fund is targeted at developing and acquiring pre-filing inventions, mostly from universities in Asia, through a variety of technology transfer deals.

The last two funds distinguish Intellectual Ventures from typical patent trolls, who do not invent. During its first 10 years, Intellectual Ventures also differed from a typical nonpracticing entity in that it had not litigated—at least not directly. The company had instead sought to monetize its patent portfolios through “friendly” licensing deals and, when necessary, by forming shell companies or selling patents to third-party nonpracticing entities who would in turn litigate. This indirect approach changed in December 2010, when Intellectual Ventures started filing direct patent infringement lawsuits against a variety of operating companies. In its first lawsuits, Intellectual Ventures filed three patent infringement suits against nine companies, including McAfee, Symantec, and Hynix Semiconductor. In July 2011, Intellectual Ventures filed its fourth suit against a group of 12 companies, including HP, Dell, Wal-Mart, and Best Buy.

The fundamental feature that sets Intellectual Ventures apart from other nonpracticing entities is that many of its investors are strategic and include prominent technology companies such as Amazon, American Express, Apple, Cisco, eBay, Google, Intel, Microsoft, Nokia, SAP, Sony, Samsung, and Verizon.⁵ For these strategic investors, Intellectual Ventures also functions as a defensive patent aggregator. Indeed, firms that invest in Intellectual Ventures automatically receive licenses for subsets of the patents acquired by the firm (earlier investors receive wider coverage), which serves to shield them against lawsuits from trolls or competitors.

The dual structure of Intellectual Ventures as both a nonpracticing entity and a defensive aggregator means that it has a potentially difficult balance to strike between the economic interests of its two types of investors: its strategic investors, who are operating companies, and its financial investors, who include pension funds and university endowments. This conflict was presumably the reason behind the firm's initial reluctance to litigate directly. The “friendly” licensing approach was aligned with the interests of strategic investors-licensees, while financial investors' interests are conceivably better served by a more aggressive litigation strategy. Suppose, for example, that an operating company is a limited partner in one of Intellectual Ventures' funds, and is only licensed to part of the portfolio. If the

⁵ The list of investors in Intellectual Ventures has been revealed in the filings for a lawsuit initiated by Intellectual Ventures against Xilinx (*XILINX, Inc. v. Intellectual Ventures LLC* (N.D. Cal. 2011)).

operating company were infringing on new patents bought by Intellectual Ventures, Intellectual Ventures might be reluctant to bring a lawsuit against this company, thus creating an opportunity cost borne by all of its financial investors.

The fundamental premise of the Intellectual Ventures model is that its unprecedented scale helps reduce search and transaction costs, as well as patent valuation uncertainty, on both sides of the market. Because of its size, Intellectual Ventures can single-handedly create liquidity in the patent market. It has become an attractive outlet for a number of small patent owners, including smaller universities, most of whom do not have the necessary legal and technical expertise, resources, and credibility to monetize their intellectual property on their own. On the other side of the market, Intellectual Ventures provides patent buyers and users with a “one-stop shop” for their licensing needs: similar to RPX, the company is more efficient when it comes to search and negotiating with multiple patent owners. Furthermore, the scale of Intellectual Ventures allows it to capitalize on huge portfolio and learning effects in aggregating patents.

Of course, the super-aggregator model also carries large risks. Even after accounting for complementarities and portfolio effects, the inventory risk remains very high: no matter how effectively Intellectual Ventures filters the patents that it buys, many patents turn out to be of low value or poor quality or both (as many as 19 in 20 or 49 in 50, according to the company’s own estimates, as described in Hagiu, Yoffie, and Wagonfeld 2011). Furthermore, sorting through and maintaining tens of thousands of patents may actually create diseconomies of scale. After all, patents are rapidly depreciating assets because their value expires after 20 years, and they require payment of maintenance fees to be kept valid (several hundred to a few thousand dollars to be paid at the end of years 3, 7, and 11 (as explained at the USPTO website, <http://www.uspto.gov/patents/process/maintain.jsp>).

Finally, the time-horizon for Intellectual Ventures investment funds is relatively long at 15–20 years, and one may question whether the firm will ever be able to generate returns for its investors comparable to other investment vehicles with similar time horizons, like venture capital and private equity. The last concern suggests that Intellectual Ventures is under pressure to engage in more lawsuits. Yet the lawsuits raise their own problems: cost escalation and, even more seriously, the risk of having some patents invalidated by the courts, which might cast doubts on the value of Intellectual Ventures’ broader patent portfolio.

Implications and Conclusions

The patent system is inherently a second-best mechanism for trading off the benefits of enhanced future innovation against the costs of temporary distortions of the economic system after innovation has occurred. Furthermore, the practical realities of the patent system have created additional problems: for instance, a substantial number of low-quality, overlapping, and excessively broad patents. Patent intermediaries (including the new ones described in this article) are able

to profit from the patent system's inherent tension by improving the payoffs to innovators and/or by taxing more heavily the fruits of past innovations. Given the organizational complexity of the new patent intermediaries and the multiplicity of channels through which they affect participants in the patent market, it is very difficult to draw clear conclusions about whether they generate net benefits or costs for society. Nevertheless, it is useful to point out that intermediation mechanisms that move the imperfect patent system in the direction of enhancing rewards for innovation are more likely to be a positive, while mechanisms that move the system in the direction of extracting taxes on prior innovation are likely to be a social negative. The new patent intermediaries clearly do both—and in fact, cannot do one without the other. But their organizational structures and business models may be skewed more heavily on one side or the other, which provides some basis for considering their net social value.

While defensive aggregators are completely aligned with the interests of operating companies in reducing the patent troll threat, this orientation does not mean that they improve the overall efficiency of the patent market. To some extent, they facilitate collusion between large operating companies at the expense of small inventors. By definition, their incentives are to acquire relevant intellectual property at the lowest possible cost to defend their subscribers, not to maximize the value of the patents they acquire. Thus, they are likely to exacerbate the bargaining and information asymmetries between small patent owners and large operating companies (a similar effect to that of traditional cross-licensing practices).

Intellectual Ventures (and other future super-aggregators) are significantly more complicated because of their hybrid nature. Let us consider how a super-aggregator affects the incentives of operating companies, financial investors, and small inventors. Operating companies may see their operating costs increase when Intellectual Ventures aggregates and asserts previously “silent” patents against them. But a super-aggregator like Intellectual Ventures may also lower their aggregate search and transaction costs by providing a one-stop group-licensing shop—just like defensive aggregators do for their members. This service is particularly valuable for technology companies in sectors with short innovation cycles. As a consequence, the net effect of Intellectual Ventures on the development and innovation incentives on operating companies is ambiguous. Some operating companies like Microsoft view it as providing a useful patent discovery and licensing service; others view it as a dangerous nonpracticing entity which significantly raises their costs. Small patent owners, individual inventors, and small companies and universities involved in invention unambiguously benefit from the existence of Intellectual Ventures, because it channels more financial rewards to previously undercompensated inventors, which should unambiguously increase their innovation incentives. Similarly, financial (nonstrategic) investors see Intellectual Ventures as a viable vehicle for investing in patents as a new, large, and uncorrelated asset class.

Due to huge economies of scale, it seems most likely that in the long run there will only be a few super-aggregators—or even just one. This concentration raises significant hold-up concerns. A super-aggregator may become nothing more

than a super-troll, able to hold up both sides of the market by extracting excessive payments from operating companies (for example, by strategically disaggregating patent portfolios and enforcing the different parts sequentially) while at the same time paying lower compensation to inventors. Perhaps an even greater source of concern is that super-aggregators' incentives may be skewed towards imposing higher fees on operating companies *current production* activities, rather than facilitating the commercialization of *unproven patents* (a riskier endeavor).

But, perhaps surprisingly, there could also be significant social efficiency gains from super-aggregator market concentration. Scale leads to significant learning effects in assessing the value of patents, which may create a more reliable mechanism for patent valuation (where patent platforms have failed). Furthermore, in the second-best world created by patent market failures, which lead to excessive patent infringement, it may be efficient to have only a few (or one) market-based enforcer(s). A super-aggregator, in theory, can compensate inventors of a given patent (or portfolio) who otherwise would fall through the cracks. When a super-aggregator buys patents in order to assert them against operating companies that attempt to free-ride on the intellectual property, it preserves the incentives for future innovation. Finally, scale and capital structure, and the accompanying large returns promised to financial investors, can act as credible commitments to build valuable patent portfolios and license them broadly to many players in any given industry. In particular, a super-aggregator's ability to sign large numbers of licensees, without the risks of litigation, depends on its reputation. Enforcing even one weak patent for "nuisance value" (like many small nonpracticing entities do) would run the risk of casting doubt over the value of the super-aggregator's broader patent portfolio. This is an instance of the reputation-building mechanism by intermediaries in contexts with goods of uncertain quality, as studied formally by Biglaiser (1993).

The task of empirically measuring the *net* economic impact of any intellectual property intermediary and deciding whether it is harmful to society is inherently difficult. Such an analysis would require measuring the net effect on operating companies, inventors, universities, and financial investors, both in terms of short-run payments made or received and in terms of long-run innovation incentives. These effects seem dauntingly complex to measure. For this reason, most recent empirical studies only estimate the effects on one side of the market—and thus are by definition incomplete. Examples include the Bessen, Meurer, and Ford (2011) estimates of the costs imposed by trolls on operating companies between 1990 and 2010, and Tucker (2012) evaluating the effect of trolls on the adoption of medical imaging technology sold by vendors targeted by trolls.

Part of the problem is the difficulty of measuring net transfers to inventors. In many cases, nonpracticing entities make lump-sum payments to inventors in exchange for control of their patents *before* any litigation occurs; for example, Intellectual Ventures spent over \$1 billion dollars acquiring patents from various sources before it began suing publicly in late 2010. These transfers are usually not disclosed publicly, unlike the settlements or damages resulting from lawsuits. In the absence of access to such information, empirical research on intellectual property intermediaries might

tackle some narrower efficiency questions. For example, an important contributing factor to the effect of nonpracticing entities (including super-aggregators) on innovation incentives is whether they seek to enforce *proven* patents on *existing* products or to facilitate the commercialization of *unproven* patents. Thus, perhaps one could categorize and measure the mix of patents monetized by nonpracticing entities (even without transaction prices) to provide a valuable proxy for their likely effect on innovation.

■ *We are grateful to the following people for extremely insightful comments and feedback on earlier drafts of the article: David Autor, Peter Detkin, Chang-Tai Hsieh, Josh Lerner, John List, Douglas Melamed, and Timothy Taylor. Britta Kelley provided excellent research assistance. The views expressed in this paper are entirely our own.*

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