The New Patent Intermediaries

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1. Introduction

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 (IP) 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 (sale or cross-licenses) between large companies, privately negotiated and might involve hundreds or thousands of patents. Outside of these bilateral deals, patent sellers or licensors and patent buyers or licensees have a hard time finding each other. There is no eBay or Amazon or NYSE or Kelley's Blue Book equivalent for patents, and when buyers and sellers do find 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. During the last decade a variety of novel patent intermediaries has emerged, including online patent platforms, and two new intermediaries, which we call defensive patent aggregators and super-aggregators. In particular, the rising prominence of a new and powerful patent aggregator (Intellectual Ventures) has sparked heated debates about the economic role played by intermediaries in the patent market and their effects on innovation. One might expect that competition among intermediaries 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 played by these new patent intermediaries and the efficiency tradeoffs they raise. Patent platforms have failed to gain meaningful traction. Meanwhile, defensive patent aggregators and super-aggregators have become quite influential and controversial in the technology industries they touch. Why have

patent platforms not been successful in creating a liquid market for patents? What are the economic functions performed by defensive aggregators and super-aggregators for the two sides of the market (inventors and operating companies)? What is their impact on economic welfare?

We focus specifically on patent intermediaries[1] as opposed to other forms of IP and more general notions of markets for technology (Arora, Fosfuri and Gambardella (2001)) and for ideas (Gans and Stern (2010)).[2] The reason is that most of the recent IP intermediation activity has been largely focused on patents. Patents have recently become a particularly hot commodity due to a series of high-profile settlements and auctions involving huge price tags for patent portfolios. In June 2011, a consortium made 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.

The emergence of the US International Trade Commission (ITC) as new forum for patent battles is raising the stakes even further. By offering much faster decisions (12-15 months vs. several years in federal courts[3]) and the possibility of injunctive relief against defendants, the ITC has made patent litigation very risky for operating companies. There are no monetary damage awards but the threat of trade bans 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 in the ITC and facing an import ban.[4] Thus, the ITC has significantly increased the costs of patent exposure, which in turn implies ever growing risks for

[1] 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 restrict attention to intermediaries who *directly* facilitate transactions in order to keep the paper focused. Thus, we do not include pure patent rating, valuation and search services that aim to create liquidity indirectly by providing useful patent information (examples include ArticleOne Partners (http://www.articleonepartners.com/) and Prior IP (http://www.prior-ip.com/)).

[2] Thus, our study does not cover firms like InnoCentive and NineSigma, which connect companies with science and/or technology problems with individuals or institutions that can create pre-patent solutions.

[3] "Patent Litigation Before the International Trade Commission," *Analysis Group*, p. 2, http://www.analysisgroup.com/uploadedFiles/Practice_Areas/Patent_Litigation_Before_the_ITC.pdf accessed May, 2012. Jeffrey Fisher, "The Pros and Cons of Patent Litigation Before the International Trade Commission," *Farella, Braun, and Matel*, November 15, 2006, http://www.fbm.com/docs/publications/381f0cc6-b7fa-4f90-a21d-3e4c72b4b22f_document.pdf accessed May, 2012.

[4] Brooke Crothers "Qualcomm, Broadcomm Reach $819 Million Settlement," *CNET News*, April 26, 2009, http://news.cnet.com/8301-13924_3-10227815-64.html, accessed May, 2012

technology companies with vulnerable patent positions (e.g., Qualcomm in chips, or HTC and Samsung in smartphones).

2. 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 (Gans and Stern (2010) offer a review of market failures in the market for ideas, many of which apply to patents), it is useful to summarize them briefly here, highlighting the issues most relevant for the intermediaries we study.

First, patents are much more difficult to value than most other goods. This is not simply because they are intangible assets. Other intangibles such as brand equity are routinely valued. What sets patents apart is that every patent is by definition unique: they lack comparables, which are used in many markets to estimate a given asset's value. More importantly, patent value is subject to strong complementarities and portfolio effects (Gans and Stern (2010), Parchomovsky and Polk Wagner (2005)). In many modern technology industries, where products are covered by dozens or even hundreds of inter-dependent patents (e.g. semiconductors, smart phones), the value of *individual* patents is heavily discounted. Potential buyers or licensees are unlikely to 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 potential buyers for any given patent and thereby its liquidity as an asset.

Portfolio effects also create asymmetries between large operating firms on one side and individual inventors and small companies on the other side (Jaffe and Lerner (2004)). Patents owned or created by the latter have a lower probability of being monetized because they are part of smaller portfolios and because their owners typically have limited financial resources and legal expertise, which severely undermines their ability to bargain effectively.[5]

[5] 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' requests to sign licensing agreements and began producing cars featuring the wiper system in 1969. Kearns spent decades battling 26 car companies 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. Matt Schudel, "Accomplished, Frustrated Inventor Dies," *The Washington Post*, February 26, 2005.

Second, there are high search costs on both sides of the patent market. For patent owners, it is prohibitively costly to find *all current* users (infringers) and *potential* applications of their patents. For patent buyers or users, it is very costly to find all prior art and patents that "read" on 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, the individual claims that constitute each patent are usually generic and opaque. This makes it very difficult to figure out the relationship with other patents and prior art, particularly with millions of patents in circulation.

Third, patent transactions always happen in the shadow of litigation, which exacerbates valuation problems and creates large transaction costs. Because of litigation, patents are best viewed as "probabilistic property rights" or "lottery tickets" (Lemley and Shapiro (2005)): approximately 50 per cent of patents that are litigated 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 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 counter-sued and brought to accept a cross-licensing agreement? Or a non-practising entity against which injunctions will not work and that is more willing to go to trial? Furthermore, some courts have a reputation for bias in favour of small players and against large companies, which makes them attractive patent litigation forums for small players and non-practicing entities.[6] This increases the amount of (inefficient) litigation.

These patent market failures are most problematic for small patent owners (individual inventors or small companies), who find it most difficult to get paid for their ideas. This is an important issue as individual inventors and small companies account for the majority of patents.[7] Alternatively, one might argue that instead of trying to sell their patents, small patent owners

[6] For example, the Eastern District of Texas received 25% of all U.S. patent infringement cases during 2011 and found in favor of patent owners almost 75% of the time. Susan Decker, "A Crackdown on Patently Absurd Lawsuits," *Businessweek*, May 10, 2012.

[7] According to an Intellectual Ventures study compiling data from a variety of public sources, inventors and SMBs contribute 60% of all patents in the United States, but only extract 1% of total licensing revenues. The remaining 99% goes to large companies. Hagiu Yoffie and Wagonfeld (2011), Exhibit 11.

could incorporate in start-ups and seek to either compete with incumbent companies or cooperate with them by licensing or being acquired (Gans Hsu and Stern (2002)). Thus, investors, particularly venture capitalists, could mitigate some of the market failures mentioned above. 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 also pursuing commercialization, a point argued by Lamoureaux and Sokoloff (2003) in the context of late 19th century United States and which is likely at least as valid today.

In this context, having intermediaries that facilitate the sale of patents from inventors to users (operating companies) could be critical. Patent intermediaries have existed for a long time, but the traditional patent intermediaries studied in the existing economics literature have not managed to solve many of the patent market's problems. In the remainder of this section we provide a brief overview of these traditional intermediaries.

Brokers/Agents

As in many markets, there is a large number of patent brokers that tend to be small companies with fewer than 10 employees.[8] Patent brokers help patent owners sell or license their technologies in exchange for a fee contingent on successful transfer. Oftentimes brokers 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.

Such brokers have existed since at least the 19th century and their activity helps reduce search and transaction costs by investing in specific knowledge and connections on both sides of the market. Indeed, Lamoureaux & Sokoloff (2003) document the positive effect of brokers on the U.S. market for patented technology between 1870-1920. These brokers were typically patent agents or lawyers who matched inventors looking to sell new technologies with investors or buyers eager to commercialize them. It is important to note, however, that at the time there

[8] Some examples are Thinkfire (http://www.thinkfire.com/), iPotential (http://ipotential.com/), IPValue (http://www.ipvalue.com/), Pluritas (http://www.pluritas.com/), Competitive Technologies (http://www.competitivetech.net/)

were no products encompassing hundreds of patented technologies like today: thus, there were fewer valuation issues related to portfolio effects and patents with fuzzy and overlapping boundaries.

Today, the job of patent brokers is much harder as search costs are arguably much higher. Unlike other markets (e.g. stocks, real-estate), the existence of many brokers in the patent market does not create sufficient liquidity on its own. Indeed, given their small scale, patent brokers tend to focus on facilitating high-end licensing transactions that carry large price tags. Furthermore, their fees are above 10% and sometimes reach 20-30%,[9] which confirms the inefficiencies that prevail in the patent market.

Patent pools and Standard Setting Organizations (SSOs)

Patent pools (e.g. the original sewing machines, Bluetooth, RFID, MPEG-4) are formal or informal organizations in which for-profit firms come together in order to license patents to each other or to third-parties (Lerner Strojwas and Tirole (2007), Shapiro (2001)). Patent pools emerged to solve the double marginalization problem (also known as "royalty-stacking"), which arises when owners of complementary patents attempt to license or sell their IP to the same downstream buyers or users independently. While pools do indeed create social value by reducing royalty stacking, they raise several concerns. 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 (Shapiro (2001), Lerner and Tirole (2004)). Second, pools create barriers to entry (innovation) favoring large companies with sizeable patent portfolios and discriminating against small companies or individual inventors. Third, the applicability of patent pools is limited to a small number of markets, where the essential IP to producing a specific product or service is more or less evenly distributed among several large, identifiable players.

Similarly, standard-setting organizations (SSOs) have made it possible for participants in industries where there is an important need for interoperability between many components, to voluntarily come together and produce consensus technical standards (Simcoe (2012)). SSOs create economic value by enabling coordination on (Simcoe (2012)) and certification of (Chiao Lerner and Tirole (2007), Lerner and Tirole (2006)). The issue is that SSOs are subject to

[9] Eric Young, "Patent Marketeers," *San Francisco Business Times*, March 23, 2008.

conflicts of interest and oftentimes dominated by large practicing firms (Schmalensee (2009)). Furthermore, the scope of SSOs 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 SSOs have a role in making the market more efficient, their impact is 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 SSOs and most of them are not worth the time of professional brokers.

3. Exploiting Market Failures: Non-Practicing Entities (NPEs)

These patent market failures have created a particularly favorable environment for NPEs, which have become the most controversial patent intermediaries. In essence, NPEs act as arbitrageurs, acquiring patents, typically from individual inventors or small companies, and then seeking licensing revenues from operating companies through litigation or the threat of litigation.

Both NPE-driven litigation activity and the number of operating companies targeted have increased significantly during the last decade. In 2000, NPEs had brought nearly 100 lawsuits targeting just over 500 operating companies, while in 2010 the numbers had increased to more than 400 and more than 2,500 respectively.[10] Two main factors account for the explosion in NPE activity. First, the Internet has greatly reduced transaction costs for inventors to find intermediaries to which they can sell their patents (Spulber 2011). Although NPEs appeared in the second half of the 1990s, before the Internet became widespread, the way they found undervalued IP assets was largely serendipitous, e.g., through personal connections to inventors or sale of distressed assets containing obscure patents. Today, any inventor can use a quick online search to locate and contact NPEs directly or contact brokers who can help them do so or even help them organize auctions for their patents.[11] Second, the value and prominence of patents have increased along with the revenues and profits associated with IP-intensive

[10] Patent Freedom research, https://www.patentfreedom.com/research-lot.html
[11] Steve Lohr "Patent Auctions Offer Protections to Inventors," *New York Times*, September 21 2009.

businesses. This growth was fuelled in large part by the explosion of the information and communication technology sectors (software, Internet and mobile communications). Not coincidentally, most of the NPE activity is concentrated in those same sectors. This is because the software, semiconductor and mobile phone industries produce complex products and services, which involve many inter-related processes and components. For example, manufacturing an integrated circuit requires hundreds of steps, with literally billions of transistors and thousands of complex algorithms. No firm – even the industry's largest ones – has more than 30% of the patents required to cover all aspects of semiconductor design and manufacturing. Consequently, the potential for newly issued patents to have "fuzzy boundaries" (cf. Besen and Meurer (2008)) and to overlap with prior art is very high in these sectors, exacerbating the problems of the patent system. This leads to fragmented ownership of the relevant IP and significant uncertainty regarding the relative merits of the many patents involved. Contrast this situation with the pharmaceutical industry where patents also play a crucial role, but IP boundaries are much more clearly defined. Not surprisingly, NPEs and other patent merchants have been largely absent from the pharmaceutical sector.

The arbitrage opportunities available to NPEs are sizeable. As of 2010, the median price paid by NPEs for a patent was approximately $100,000 and the mean was $400,000.[12] On the other side of the market, most patent settlements range between $50,000 and a few million dollars.[13] In a few notable cases, however, NPEs 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 NPE, which had sued RIM for infringing on eight wireless email patents.[14] Unsurprisingly, NPEs have attracted financing from investors looking for novel diversification opportunities with high returns. A number of hedge funds, venture capital and private equity firms either invest in NPEs or approach small patent holders directly, offering to finance lawsuits against operating companies in exchange for a cut of any resulting payments.[15]

[12] Patent Freedom, https://www.patentfreedom.com/research-lot.html, accessed December 2010.
[13] Amol Sharma and Don Clark, "Tech Guru Riles the Industry by Seeking Huge Patent Fees," *The Wall Street Journal*, September 17, 2008.
[14] Teresa Riordan, "Contest Over BlackBerry Patent," *The New York Times*, June 7, 2004.
[15] Mike Masnick, "Patent Holder Sues McAfee, Gets $25 Million…But May End Up Losing $5 Million Due to Everyone it Has To Pay Off," *Techdirt*, November 4, 2009,

NPEs are 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.[16] 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 co-found Intellectual Ventures, the largest NPE today, which we discuss below). Due to its widespread use, however, the meaning of the term "patent troll" has evolved over time and today there is no commonly agreed-on definition. Still, trolls are generally viewed as combining the following characteristics: i) they acquire intellectual property assets (patents) solely for the purpose of extracting payments from alleged infringers; ii) they do not do research or develop any technology or products related to their patents; iii) they behave opportunistically by waiting until industry participants have made irreversible investments before asserting their claims (Lemley (2008) and Schmalensee (2009)).

In itself, buying and re-selling patents solely for price arbitrage purposes 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, similarly to the function performed by dealers and marketmakers in financial markets (McDonough (2006), Schmalensee (2009), Spulber (2011)). Instead, the main reason NPEs 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, not too high so that most targets are more likely to settle instead of going to costly and risky trials. Second, they attempt to hold up (or "ambush") practicing companies by bringing the lawsuits at the most vulnerable times for the targets, e.g. just before the release of a new product, when the target can ill afford a risky trial involving its new product shipments (Schmalensee (2009)).

These two practices are clearly harmful and exacerbate patent market inefficiencies. The net effect is to create perverse incentives for some small patent owners, who may seek out NPEs

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http://www.techdirt.com/articles/20091103/0333046778.shtml. Keith Bergelt, "Patents, Probes and Strength in Unity: Participate in Keeping Open Source Open," Presentation, *LinuxCon* (Boston, MA), August 10, 2010, http://events.linuxfoundation.org/linuxcon2010/bergelt. Daniel P. McCurdy, "Patent Trolls Erode the Foundation of the U.S. Patent System," *Science Progress*, January 12, 2009, http://www.scienceprogress.org/2009/01/patent-trolls-erode-patent-system/

[16] David Bario, "'Original Patent Troll' Is Back After long Hiatus, with a New Name and New Patents," *The Am Law Litigation Daily*, August 17, 2011.

to acquire and enforce patents of questionable merit; as well as produce a defensive backlash by large operating companies against all small patent owners, even the ones that might have a legitimate and valuable claim.

4. A failed solution to IP market failures: patent platforms

In parallel with the increased activity of NPEs during the 2000s, a large number of companies built platforms in an attempt to create more efficient ways to bring buyers and sellers of patents together. The goal of patent platforms was to facilitate patent transactions without taking title or ownership of the assets (patents) involved. The two main categories of patent platforms that have been attempted are online patent marketplaces and live auctions.

Online patent marketplaces appeared as early as 1998. But replicating what eBay has done for collectibles in the market for patents has proven difficult. Some of the online portals dedicated to facilitating patent search and transactions have been shut down or renamed and re-directed towards other services.[17] The online platforms that are still independent have limited scale and function more as brokerage or consulting companies. Two representative examples are Yet2 (www.yet2.com) and Tynax (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 (e.g., a license must be granted back to the seller), 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 IP assets they might be looking for, 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, as shown by Dushnitsky and Klueter (2010), they employ various mechanisms (e.g. screening through upfront fees and disclosure requirements) to mitigate adverse selection, a potentially serious concern for online trading platforms. But despite the extensive online listings, no transactions are completed online.

[17] For instance, Patent License and Exchange (pl-x) was created in 1998 as an online IP 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 IP 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, Ocean Tomo's The Dean List.

Instead, once a buyer or a seller express clear and credible interest in a posting, Tynax or Yet2 manages and facilitates the buyer–seller interaction offline through one of its deal makers (an actual person). The majority of revenues come from commissions on completed transactions ($100,000 to $10 million for Tynax or 15% 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 the best mechanism for eliciting market valuations for patents. The fact that Chicago-based Ocean Tomo managed to organize 10 live IP 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 any other live auctions (e.g., art at Sotheby's and Christie's), with an auctioneer taking bids for each lot, which could be a single IP asset (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 10 IP auctions was only $114.6 million.[18] The average sales-to-listings ratio over all 10 auctions was reportedly 38% and the Spring 2009 auction only sold 6 out of 85 lots listed.[19] Part of the reason for the lack of activity on the last one was the financial crisis, but all auctions had been characterized by low participation and little bidding.[20] In June 2009, Ocean Tomo sold its transactions line of business (including auctions and the now closed The Dean List online platform) to ICAP, an inter-dealer broker, for just $10 million.[21] The live IP 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).[22]

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[18] John Jarosz, et al. "Patent Auctions: How Far Have We Come?" *les Nouvelles*, March 2010, p. 17.
[19] "Going…Going…Gone?: The Rises and Falls of Patent Auctions," *Inside IP*, June 14, 2010, http://www.vennershipley.co.uk/show-news-id-249&p=2.html, accessed May, 2012.
[20] John Jarosz, et al. "Patent Auctions: How Far Have We Come?" *les Nouvelles*, March 2010, p. 20-22.
[21] "ICAP Reaches Agreement to Acquire Patent Brokerage Business of Ocean Tomo LLC," *ICAP*, June 16, 2009, http://www.icap.com/news-events/in-the-news/news/2009/icap-reaches-agreement-to-acquite-patent-brokerage-business-of-ocean-tomo-llc.aspx, accessed May, 2012.
[22] "ICAP Ocean Tomo Auction Sees Record Bidding," *ICAP*, March 26, 2010. http://www.icap.com/news-events/in-the-news/news/2010/icap-ocean-tomo-auction-sees-record-biding.aspx, accessed May 2012.

Thus, while the idea of creating platforms for matching and facilitating transactions between patent buyers and sellers is in principle quite appealing, 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 IP. One might argue that Tynax and Yet2.com are creating the economic equivalent of Craiglist for patents, but little more. Why is it so hard to establish platforms for patent transactions?

First, two-sided platforms that simply attempt to bring together buyers and sellers without ever taking possession of the goods being exchanged face difficult chicken-and-egg problems. Unlike market-makers who buy and re-sell, 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. And Ocean Tomo's auctions never achieved sufficient scale to convince buyers and sellers that they would become important venue for trading patents. Owners of valuable patents did not *expect* these platforms to offer attractive monetization opportunities for their assets relative to existing alternatives (e.g. seeking VC funding and incorporating, licensing directly or selling to NPEs and splitting the proceeds from litigation). In turn, the lack of valuable patents meant that few prominent buyers (i.e. large operating companies) would actively participate,[23] which confirmed the initial negative expectation of sellers-owners.

Second, while online IP platforms like Tynax and Yet2.com have generated some search cost reductions through their thousands of listings, they have been unable to create any significant reductions in transaction costs. The sensitivity of IP information and the need for "close-touch" (oftentimes in-person) due diligence make potential buyers and sellers very reluctant to reveal much information and to conduct patent transactions online. This is why Tynax and Yet2.com still function as offline brokers for the actual transactions. This further hampers their ability to create scalable platforms in two ways: i) the model cannot scale to thousands of transactions if deal makers have to be directly involved in each of them; ii) the final

[23] The exception was a handful of NPEs, who were allegedly very active in Ocean Tomo's auctions. See Marcus Malek, "R.I.P. Ocean Tomo: Complete Auction Analysis," Presentation slides, June 23, 2009, http://www.slideshare.net/marcusmalek/complete-ocean-tomo-auction-analysis-marcus-malek-intangitopia, accessed May 2012.

transaction prices are private information and therefore cannot be leveraged to create more valuation transparency and liquidity in the patent market.

Given the lack of traction that has hampered patent platforms to date, it is natural to wonder: will they always remain limited in scope and scale? Even if they overcome the chicken-and-egg hurdle, patent platforms are unlikely to solve the liquidity problems that plague the market for patents in a major way. 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 patents imply that platforms are at an inherent disadvantage relative to intermediaries who take ownership of patents and are able to exploit those complementarities directly (by definition, platforms cannot do so). That does not rule out the emergence (or growth) of platforms specializing simply in reducing search costs – the way Tynax and Yet2.com do today. 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. This is because the official Patent Office listings – patents granted or under review and ability to search abstracts – leave significant scope for quasi-brokers to further reduce search costs with better listings and search functionality. Indeed, the original patent abstracts are written in such a way as to protect against infringement, which oftentimes 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.

5. Defensive Aggregators and Super-Aggregators

The increasing threat posed to operating companies by NPEs and the failure of patent platforms to bring significant transparency and liquidity to the patent market (and thereby reduce the arbitrage opportunities available to NPEs) are the main factors behind the emergence of two novel types of intermediaries: defensive aggregators and super-aggregators.

Defensive aggregators

Today, there are two prominent defensive aggregators: RPX (for profit, publicly traded since May 2011) and AST (not-for-profit). In essence, they offer a form of insurance against troll risk to large operating companies. Large operating companies (e.g. Barnes & Noble, Best Buy, Cisco, eBay, HTC, IBM, Intel, McAfee, Microsoft, NEC, Nokia, Panasonic, Research In Motion, Samsung, Sony, Verizon) pay RPX annual subscription fees ranging from $65,000 to $6.9 million, depending on operating income.[24] In exchange, RPX identifies patents that might be threatening to subscribers, acquires them (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 counter-lawsuits against non-members who initiate litigation against members.

Allied Security Trust (AST) offers a variation of the RPX model with several differences. 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.[25] If the sum of the bids for a particular set of patents is sufficient to close the transaction, then only the bidding members for that particular acquisition receive a license to the relevant IP.[26] (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 acquiring a set of patents and licensing its bidding members, AST looks to sell them. 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.[27]

For economists, defensive aggregators raise some interesting contracting issues. First, the value of RPX to its subscribers seems difficult to verify. Unlike traditional insurers who pay

[24] RPX's website: http://www.rpxcorp.com/index.cfm?pageid=85, accessed May 2012.
[25] 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. "Acquisition Model," *Allied Security Trust*, http://www.alliedsecuritytrust.com/Services/AcquisitionModel.aspx.
[26] "Licensing Model," *Allied Security Trust*, http://www.alliedsecuritytrust.com/Services/LicensingModel.aspx.
[27] "Divestiture Process," *Allied Security Trust*, http://www.alliedsecuritytrust.com/Services/DivestitureProcess.aspx.

customers when "accidents" happen, defensive aggregators get paid in order to reduce the probability of "accidents" (NPE lawsuits) happening in the first place. So how do members know that RPX is effectively reducing litigation risk on their behalf once they have paid their subscription fees? Part of the answer is the number of relevant (threatening) 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 it comes to patents that are critical to their business, operating companies will often buy them on their own. The issue 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 and therefore afford to pay more than each individual subscriber would on their own.

Second, an intriguing feature of defensive aggregators is that they make public commitments *never* to litigate in order to extract revenues.[28] This commitment helps differentiate them from patent trolls and serves to re-assure potential subscribers, but at the same time it creates a significant free-rider problem. When RPX buys a patent (e.g., for Nokia in smartphones), and eliminates the threat from a troll, non-subscribers in the same industries (e.g., 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 re-sells the patent on the open market (preferably to a NPE), which means non-subscribers remain exposed to litigation risk.[29] Still, the problem is that 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 or not.

Finally, the third potential sustainability issue of the defensive aggregator model is the inherent limitation created by relying exclusively on subscription revenues. RPX has no shot at the huge payoffs that can be achieved by NPEs (or a super-aggregator like Intellectual Ventures, which we discuss below). In turn, this puts RPX at a disadvantage in acquiring patents relative to some NPEs. The latter offer contingent payments and therefore a much larger potential payoff

[28] RPX's website: http://rpxcorp.com/, accessed May 2012.
[29] Saul Hansell, "Trolling for Patents to Fight Patent Trolls," *The New York Times*, March 30, 2009.

to owners of valuable patents, whereas RPX can only offer a limited fixed payment. At the same time, RPX may face unreasonable ask prices from patent owners if the latter interpret an approach by RPX as a sign of interest from its subscribers – large and potentially rich operating companies. This is related to the issue of "awareness-inducing information" in incomplete contract settings studied formally in Tirole (2009). RPX can and does somewhat mitigate this problem by forming buying syndicates among its subscribers and then using shell companies to buy patents of interest to the syndicate in order to disguise their identity.

It is still too early to tell whether RPX has managed to successfully address these issues: it was founded in 2008 and most of its members are locked in for a minimum of 3 years, so there is no sufficient information yet regarding membership renewal rates.

Super-aggregator(s)

A new player, which we call a super-aggregator, has emerged as the largest and most controversial type of IP intermediary. Epitomized by Intellectual Ventures (IV), a super-aggregator is a hybrid between a defensive aggregator, a large NPE, and a "weapons dealer," who can provide IP to litigants on both sides of a battle. While today IV seems unique because of its size ($5 billion raised), other entities are trying to emulate its model by raising large amounts of capital.

IV is a NPE. While its first investor, Microsoft, has publicly said that IV delivers a highly valued service for technology firms (Hagiu, Yoffie and Wagonfeld (2011)), other critics have described IV as "the world's largest patent troll"[30] because it acquires, creates and seeks to license patents without directly making any products or services itself. Founded in 2000 by former Microsoft CTO Nathan Myrhvold, the company has raised more than $5 billion from a variety of investors and as of mid-2012 it has spent approximately $2 billion building the world's third largest patent portfolio – roughly 35,000 patents, mostly covering software, semi-conductors, communications, e-commerce. Similarly to a venture capital or private equity firm, IV is structured as a series of funds. Its two largest funds are dedicated to acquiring existing patents from all possible sources (individual inventors, small and large companies). Its third fund focuses on developing IV's own inventions in partnership with scientists (e.g. a new type of

[30] "Inside Nathan Myhrvold's Mysterious New Idea Machine," *BusinessWeek*, July 3, 2006.

nuclear reactor and a laser-based weapon for fighting malaria mosquitos), while 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 IV from typical patent trolls, who do not invent. During its first 10 years, IV also differed from a typical NPE 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 NPEs, who would in turn litigate. This indirect approach took a distinctive turn in December 2010, when IV started filing direct patent infringement lawsuits against a variety of operating companies in semiconductors, software and electronics.[31]

But the fundamental feature that sets IV apart from other NPEs 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.[32] For these strategic investors, IV also functions as a defensive patent aggregator. Indeed, the latter automatically receive licenses for subsets of the patents acquired by IV (earlier investors receive wider coverage), which serves to shield them against lawsuits from trolls or competitors.

IV's dual structure as NPE and defensive aggregator means that it has a potentially difficult balance to strike between the economic interests of its strategic investors (operating companies) and its financial investors (mutual funds, university endowments). This conflict was presumably the reason behind IV'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.

The fundamental premise of the IV 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, IV can single-handedly create the illusion of liquidity in the patent market. It

[31] In its first lawsuits, IV filed three patent infringement suits against nine companies, including McAfee, Symantec, and Hynix Semiconductor. In July 2011 IV filed its fourth suit against a group of 12 companies, including HP, Dell, Wal-Mart, and Best Buy.

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

has become an attractive outlet for small patent owners, including smaller universities, most of whom do not have the necessary expertise (legal and technical), resources and credibility to monetize their IP on their own. On the other side of the market, IV provides patent buyers and users with a "one-stop shop" for their licensing needs: similar to RPX, they are more efficient when it comes to search and negotiating with multiple patent owners. Furthermore, IV's scale 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: many patents are of low value or poor quality or both (as many as 19 in 20 or 49 in 50 according to the company – Hagiu Yoffie and Wagonfeld (2011)). Furthermore, sorting through and maintaining tens of thousands of patents may actually create diseconomies of scale.[33] Finally, the time-horizon for IV's investment funds is very long (15-20 years): one may question whether IV will ever be able to generate sufficient returns for its investors (i.e., returns comparable to venture capital and private equity). The last concern suggests that IV 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 IV's broader patent portfolio.

6. Efficiency implications and conclusions

Due to the current state of the patent system – many low-quality, overlapping and excessively broad patents – the patent market is arguably in a second-best world. Starting from this basis, it is important to ask: do the new patent intermediaries (defensive aggregators and super-aggregators) increase efficiency or further accentuate structural problems? Given the organizational complexity of these intermediaries and the multiplicity of channels through which they affect participants in the patent market, it is very difficult to provide a clear-cut answer to this question. In the remainder of this section, we will however attempt to point out the main efficiency tradeoffs raised by these intermediaries.

[33] Recall indeed that patents are rapidly depreciating assets (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 according to the USPTO, http://www.uspto.gov/patents/process/maintain.jsp).

While defensive aggregators are 100% aligned with the interests of operating companies in reducing the patent troll threat, this 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 IP 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. IV incentives are a convex combination of those of operating companies, financial investors and small inventors. Let us consider each in turn.

Operating companies may see their practicing costs increase when IV aggregates and asserts previously "silent" patents against them. But IV 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, IV's net effect on operating companies' development and innovation incentives is ambiguous. This is reflected by the contrast in operating companies' attitudes towards IV: some (e.g., Microsoft) view it as providing a useful patent discovery and licensing service, others view it as a dangerous NPE which significantly raises their costs.

Small patent owners (individual inventors, small companies and universities) unambiguously benefit from IV's existence. Indeed, IV channels more financial rewards to previously undercompensated inventors, which should unambiguously increase their innovation incentives. Similarly, financial (non-strategic) investors see IV 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 – or one – super-aggregators. What are the implications of such an extreme form of concentration? 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. They may

extract excessive payments from operating companies (e.g., 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 taxes on *current* production, rather than facilitating the commercialization of *unproven* patents (a riskier endeavor).

But, perhaps surprisingly, there could be some significant social efficiency gains from super-aggregator market concentration. Indeed, 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 (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 IP, it preserves the incentives for future innovation. Finally, scale and capital structure (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 NPEs 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 studied formally by Biglaiser (1993)).

Given that there seem to be sound economic arguments going in both directions, is there a way to empirically determine the net economic impact of these patent intermediaries?

One key point to emphasize is the difficulty of empirically measuring the *net* economic impact of any IP intermediary and deciding whether it is harmful to society or not. That would require measuring the net effect on all sides of the market (operating companies, inventors, universities, financial investors), both in the short-run (payments made or received) and in the long-run (innovation incentives). Our discussion above makes it clear that these effects seem

dauntingly complex to measure. For this reason, most of the recent empirical studies that only estimate the effects on one side of the market are by definition incomplete (e.g. Besen Ford and Meurer (2011) estimating the costs imposed by trolls on operating companies between 1990-2010 and Tucker (2011) 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. For instance, in many cases, NPEs make lump-sum payments to inventors in exchange for control of their patents *before* any litigation occurs (e.g. 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 IP intermediaries could tackle narrower efficiency questions with greater chances of success. For instance, as pointed out above, an important contributing factor to the effect of NPEs (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, categorizing and measuring the mix of patents monetized by NPEs (without necessarily taking into account transaction prices) could provide a valuable proxy for their likely impact in innovation.

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