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## Patent Valuation within the context of Patent Auctions

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# Summary

As the economy becomes more knowledge-based and innovation-driven, the issue of how knowledge is created, disseminated, retained and used to obtain economic returns is increasingly more relevant. Firms are constantly changing their businesses from traditional scale-based manufacturing, mainly relying on tangible assets, toward new innovation-oriented activities largely based on human capital and knowledge: the stronger a company's patent portfolio, the more it is worth on the stock market, and the higher the price a competitor must pay in the case of a takeover. Together with intellectual assets, also networking, co-operation and knowledge flows within and across firms and national borders are also gaining in importance. These uses of patents as vehicles for transferring information to markets, investors and customers call for more reliable and valid information regarding patent value, upon which to base decisions. Patent valuation is nowadays hampered by three kind of uncertainty deriving from market, legal and technological factors. A number of approaches have been developed in order to estimate the value of a patent both at individually and portfolio level, but none of them reached the goal of attributing them in advance a precise monetary value.

Patent auction mechanism born from the widespread urgency to facilitate the matching between supply and demand on market for technologies, giving advantages to both sellers and buyers. From a seller perspective, the auction is the first forum for transacting intellectual property in which the burden of purchasing is actually shifted to the buyer, also affording their intellectual property great exposure even if a sale is not completed on the auction floor. Seller may also offer a pre-set terms and conditions including a minimum price, "the reserve". For buyers the foremost benefit is open, informed access and an equal opportunity to buy. The auction also provides market transparency and price discovery because without auction floor, buyers of IP have extreme difficulty in understanding "market pricing" as a very limited public data set for comparable transactions is available. While the auction brings transparency to the IP marketplace, buyers can conduct diligence and bid for auction lots anonymously. In actuality, the most affirmed and successful platform for auctions is provided by a Chicago based intellectual capital merchant bank called Ocean Tomo. The new information coming from the Ocean Tomo Auction Environment have been linked in this thesis with other data like patent metrics and characteristics, in the attempt to verify to what extent some of them are able to explain the monetary value of a single patent. The empirical research is based upon a sample of 343 U.S. patents listed in the auctions between 2006 and 2008. The observations have been analyzed through 23 different metrics providing information about patents' selling prices, technological classes, inventors, sellers and its entity, buyers, cost of the invention, breadth, scope, novelty, technological impact and disclosure, returning the following results: patents sold confirmed the positive skewness of their distribution value, being

only the 3,21% of the entire sample sold for prices higher than \$1.000.000. Litigations and Forward Citations confirm themselves as the most strongly reliable indicators of value and sale potential. The second one presents the highest correlation coefficient among all the variables, while for Litigations it is enough to know that the within the most valuable 3,21% of the sample there is the 30% of all litigated patents, that is, within the 11 patents sold for prices higher than \$1.000.000, three are litigated. The last metric definable as substantially correlated with value, but negatively, is the delayed payment of Renewal Fee at the fourth year, whereas the verification of this event at the eighth or twelfth year is less relevant. Family Size and Number of inventors, which are supposed to be positively correlated with value because proxies of the cost, turned out, from the research, to be not good and reliable indicators. Large entities better ability to sell patents, as already anticipated by Bessen (2006) is here confirmed, but it is not a good proxy for value. Both Claims and Backward Citations seems noisy variables, not really correlated with value, probably because of the contrasting influence of their different components, that are, independent and dependent claims, where the first is positively correlated while the second negatively, and Domestic Patent Citations, Foreign Patent Citations and Non Patent Literature, where the first is negatively correlated and the remaining two positively. Also for Disclosure similar conclusions can be drawn since it has a poor correlation coefficient, whereas Drawings seems slightly positively correlated with value as indicator of "science linkage", and Lines slightly negatively as source for externalities to be exploited by patentee's competitors. Of the analyzed variables the last considerations regard Scope, revealing a slightly negative correlation coefficient, as found by Sneed

and Johnson (2007), probably indicating that a not well-defined identification of the potential market for a patent detracts from value.

Among all the correlations within the variables, the two strongest pairs are Drawings with Non Patent Literature and Forward Citations with Scope. The first prove Drawings are proxy for "science linkage" as Non Patent Literature, and calls for further investigations aiming at merging the two in a unique indicator of scientific value of the patent. The second maybe indicates that a patent with more technical classes assigned, has higher chances to generate diverse downstream research efforts for different market applications, but also to be cited by examiners to limit the scope of protection claimed by subsequent patentees accordingly belonging to different technical fields. Creating a ratio between Forward Citations and Scope a new indicator of value turns out, presenting the second highest positive correlation coefficient among all the analyzed variable. It also has a regression coefficient higher than Forward Citations alone. This result probably explain that a relatively new technology is more valuable when its market application is clearly identified.

In further researches more effort will be devoted to the task of finding the identities of buyers in order to determine their patent portfolios' strategies. The value of a single patent could not clearly depend only upon some characteristics of its own token alone, but also upon the role it will play in the portfolio and the interaction with the other intellectual assets a company owns. Two approaches could be developed: one comparing and linking patents portfolio's characteristics, understanding the actual degree of development of the technologies to the market and benchmarking it with the average degree pursued by competitors, and finally correlating these data with the

expected future economic trend of the markets the technologies will be developed for; the second starting from the determination of the whole patent portfolio value, and then assigning a corresponding "value weight" to each patent according to their characteristics. Clearly this kind of research could be conducted on patents not yet transacted, assuming them in the portfolio of selected potential and interested buyers yet.