The relationship between patent age and selling price across bundling strategies for United States patents, predominately for computer and communication technology

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ABSTRACT

The age at which a patent yields maximum price remains under explored. This paper attempts to demystify the patent age-price relationship using 510 US patents sold in US auctions. Results show computer and communication singletons sold during second half of their life (~after 10 years 2 months) exhibit significantly higher price than those sold before. No such relationship came significant for the portfolios sold. Further, age-price relationships are analysed with different bundling strategies composed of different patent family types and others, and technology fields as controls. The paper concludes with discussing the managerial implications.

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1. Introduction

Apart from providing legal protection for inventions, patents in recent times have become a direct source of revenue. A patent generates revenue either through licensing or sale. Around 20% of US patents granted to small innovators (with less than 5 patents) get traded at least once during their life of 20 years [1]. However, value of a patent changes over time [1–3]. Therefore, given the limited time for enforcement of patent rights (20 years in US) and the change in value over time, knowledge about the age at which the patent when sold can gain maximum value during its life becomes critical.

In this paper, we aim to demystify the relationship between age and selling price of a patent. Specifically, we look at four dimensions. Firstly, we attempt to understand whether there exists a cut off age before or after which the selling price of a United States patent becomes significantly higher especially when the US patent

gets sold in a single invention lot. Secondly, we verify whether the cut off age changes when multiple United States patents get sold in portfolio lots. Thirdly, we explore whether the relationship between patent age and selling price changes across different bundling strategies used for forming the single invention lot and the portfolio lot. The bundling strategies include four different bundling variations for single invention lots and eight different bundling variations for portfolio lots. Fourthly, we explore technology field variations in the age and selling price relationship. For the paper, age refers to the time elapsed from grant of the patent to sale [1,3,4], and selling price of a patent forms the surrogate for patent value [5–8].

Price of a patent becomes difficult to predict because of the uncertainty associated with its commercial gains [9]. The uncertainty reduces when the patent moves forward in its commercialization process into a new product prototype stage confirming its translational potential [10]. From the non-linearity perspective, we can argue for the distribution of prices to have one or more change points across the life of a patent. Change point in a distribution refers to the point dividing the curve into segments such that each segment follows a different distribution [11,12]. In other words,

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change point marks whether the price a patent fetches changes significantly before or after a particular age and if so then at what age. Sneed and Johnson [3] found the effect of age on selling price as convex, that is, the probability of a successful patent sale becomes minimal at 9 years 9 months with higher probabilities before and after. Similarly, Serrano [13] found only 2% probability of a patent being traded at age 9, but 27.8% probability of the patent getting expired at age 9. In other words, literature, albeit limited, finds patents have higher chance of fetching a high price during certain years of age. Should a patent holder wait for the uncertainty to mitigate? If yes, then the decision about how long to wait needs to be researched.

Change in the age-price relationship with changes in the strategy used for bundling a set of patents is important to know as well. Literature demonstrates the advantages of bundling or tying of patents as scenario specific [14–17]. Large patent family (simple, extended or Derwent), indicating wider geographical protection, has high value [2,18]. However, patenting in multiple jurisdictions adds to the cost in terms of filing fee, processing fee, patent attorney fee and maintenance fee [8,19,20] and hence influences the price of the patent [8]. Patents sold in different bundled lots, therefore, may exhibit varying relationship between age and price. We explore these variations in selling price for more insights.

Additionally, we explore the differences between technology fields. Different technology fields have different life cycle time periods. For example, ICT inventions may have shorter life cycle than the pharmaceutical inventions [21] and hence impact the age-selling price relationship. Portfolios formed of technologically related patents are considered more valuable than unrelated ones [15,16]. As an important aspect from the bundling perspective, technology fields are statistically explored for selling price variations.

For the analysis we classify the single invention lots as (1) a pure US singleton which includes only one US grant without bundling with any foreign rights, (2) a simple patent family which includes one US grant and the associated foreign rights or equivalents (also referred as parallel patents) related based on a single priority date (3) a pure US singleton along with an expired provisional application or a US continuation application abandoned before sale, and (4) a simple patent family along with an expired provisional application or a US continuation application abandoned before sale.

A portfolio lot includes (1) a pure US singleton with US pending application(s) or a US national patent family with US pending application(s). A US national patent family refers to group of US patents related through one or more priorities and does not include foreign filings. (2) a simple patent family with US pending application(s) or an extended patent family with US pending application(s). Extended patent family or INPADOC family refers to all the patent filings linked to one or more priority dates either directly or indirectly and includes foreign filings as well [8,22]. (3) multiple pure US singletons or a US national patent family without pending/expired/abandoned US applications (4) multiple simple patent families or extended patent families without pending/expired/abandoned US applications (5) multiple pure US singletons with expired/abandoned US applications or a US national patent family with expired/abandoned US applications (6) multiple simple patent families or extended patent families with expired/abandoned US applications (7) multiple pure US singletons or a US national patent family with pending US applications (8) multiple simple patent families or extended patent families with pending US applications. INPADOC extended patent families and US national families are classified as portfolio bundles. The Derwent patent family, which classifies patents into families based on experts' decision and priority dates, remains unexplored in the paper due to total lack of access to relevant data.

2. Data and method

2.1. OceanTomo

The set of US patent grants auctioned during 2006–2008 by an US based auction firm called OceanTomo form the dataset. The first ever live public IP auction in the US, the auction was conducted online to incorporate buyers and sellers from varied locations. First, the patents got confidentially evaluated by the OceanTomo Patent Ratings division, and patents meeting their quality standards got funnelled into the auction, either individually or in groups. The registered bidders were given time to evaluate the lots through a two-phase due-diligence process. First, the buyers were provided with a catalogue of patent lots with the expected price and details like patent numbers, assignees, inventor names, and descriptions. In the second phase, the interested bidders were provided detailed information about the patents. OceanTomo received 15% and 10% from the seller and the buyer respectively, for any successful sale.

Following the auctions, the company publicly disclosed the selling price of the patent, but maintained confidentiality about the buyer. In 2009, OceanTomo sold its transaction division with the auction business to ICAP for $10,000,000 [8]. From then on, the IP auctions were conducted under the newly created company name, 'ICAP OceanTomo', and ICAP stopped disclosing the price data in the public domain. For the paper, we have restricted our analysis to the available set of patents auctioned between 2006 and 2008.

2.2. Sample

Of the 638 lots listed for auction in the eight live auctions conducted during the period April 2006 to October 2008, 269 lots (~42%) were sold. Table 1 gives the auction details.

Out of the sold lots, the US public pair database reflected only 6 single invention lots with continuous applications under prosecution at time of sale but not included in sale, and are not included in the analysis. Since all the lots had at least one US grant, we use US patents as the basis for categorization and bundling to maintain consistency across the lots [7] and patents in jurisdictions other than US are considered as foreign rights.

Steps followed for data cleaning: 11 lots were excluded due to either part of non-patent assets like domain names & trademarks, had missing price data, had pending application without grant, or were a licensed case. Lots with prices falling outside the range of 3 standard deviations from mean price (±3SD) were removed as outliers. 3 from single invention lots and 2 from portfolio lots fell into the outlier category. The remaining 253 sold lots form the sample.

Amongst the 253 sold lots (containing a total of 510 US grants, after removing outliers), 135 lots (135 US grants) sold with at most one US grant in each lot either without foreign rights (pure US singletons) or with foreign rights (a simple patent family) and with or without expired/abandoned US applications get classified as single inventions lots. 118 lots (containing a total of 375 US grants) sold with at least 2 US grants or one US grant with one or more pending US applications, forming a part of multiple simple patent families, US national families or extended patent families with or without expired/abandoned US applications get classified as portfolios.

Fig. 1 depicts the various bundling strategies. A total of 12 bundling strategies are identified, based on the following criteria. Firstly, as patenting in multiple jurisdictions adds to the cost like filing fee, processing fee, patent attorney fee and maintenance fee [8,19,20] and has a bearing on the selling price [7,8], we have included presence of foreign rights in the lot as one of the control variables in classifying the bundles.