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An approach to measuring patent quality using citation data

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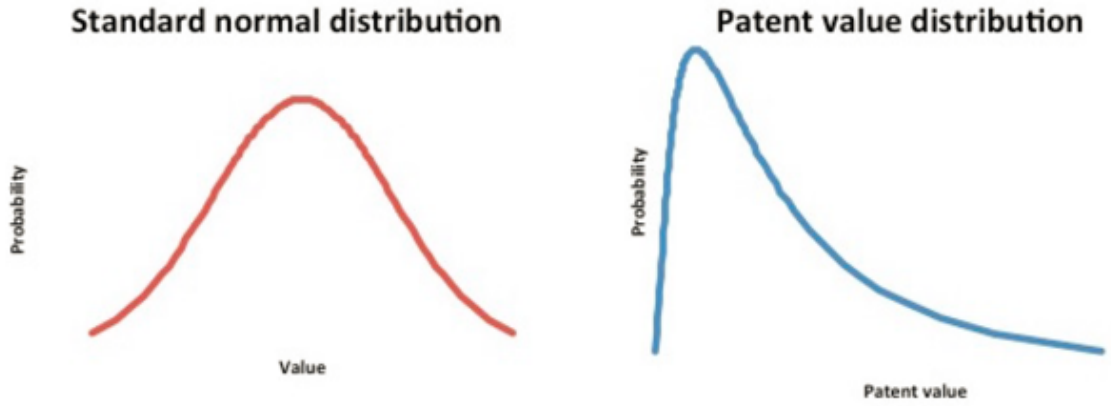
The same erroneous claim is repeatedly raised in court – that the quality of a patent portfolio can be proxied by the quantity of its patents. Counting patents to proxy for their unobserved quality has a long and discredited history (J Lanjouw, A Pakes and J Putnam, "How to Count Patents and Value Intellectual Property: Uses of Patent Renewal and Application Data", *Journal of Industrial Economics* 46(4), December 1998: 405-32). This article summarises how counting the number of patents will lead to inaccurate inferences and describes a better method, which uses patent citations to measure patents' quality and value.

There is little relationship between the total number of patents and the total value or the aggregate quality of patents. In particular, the literature on patent value distributions has shown that patent values are not distributed like a normal bell curve, but instead are known to have a significant skew to the right, as the figure below shows.



This means that, in any given sample of patents, there are likely to be a large number of low-value patents. With a relatively low probability, there may also be a few patents having very high values. In

other words, the lion's share of a portfolio's value is likely to be accounted for by the relatively few. Simply counting the number of patents ignores this fact when it comes to measuring patent quality and value. For a given sample of patents, quantity is a poor proxy for quality.

To properly measure the quality of a patent sample, one needs to employ a better approach than a simple patent-counting exercise. Fortunately, an extensive economic literature exists that shows how to account for the different qualities of individual patents in a patent portfolio or other sample, and how to aggregate this result to obtain the overall quality of the portfolio. While that literature identifies multiple indicators that are correlated with patent quality, by far the most common and simplest to use is patent citation analysis.

For almost 30 years, economists have used patent citations as a method to ascribe relative qualities to patents in a value distribution. In general, there is a strong, positive correlation between the number of citations received and other measures of economic value. The basic idea is that a patent is cited because its specification is important to determining the patentability of subsequent innovations. If the claims are as broad as the specification then there should be a positive correlation between the number of citations a patent receives and the scope of its exclusivity, which helps to determine the value of the patent to its owner.

Hundreds of economic studies have documented the relationship between the number of citations that a patent receives and other measures of value. In a large sample, (eg, all patents potentially essential to the long-term evolution (LTE) telecommunications standard), it is unfeasible to obtain objective technical evaluations of the quality of every patent. Patent citations provide the most reliable, feasible method of ordering the industry's patents.

Because the number of citations that a patent receives accumulates over time and at rates that vary with the patent's age, it is important to compare the number of citations it has actually received with the number one would expect it to receive, had it been an average patent of a given age. For that reason, a 'citation score', defined as the ratio of the actual number of citations received to the number expected given its age, can be calculated to rank individual patents. This score is an indication of patent quality.

However, a patent's citation score is not a direct measure of its value – a patent that receives twice as many citations as another is not twice as valuable. To translate a patent's citation-based rank into its value, one must consult literature on the distribution of patent values. The value of any individual patent in relation to the value of the average patent in a sample can be computed by relying on studies of the patent-value distribution conducted by economists over a wide variety of technologies, countries, and time periods (a review of the literature on patent-value distributions is provided in "Value Shares of Technologically Complex Products" by J Putnam, available at: **https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2461533**). An important finding emerges from a review of these studies: while the absolute level of patent values may differ across divergent circumstances, an individual patent's share of the total value is remarkably consistent, assuming that the patent's ranking within the sample is held constant.

Thus, once we make use of patent citations to rank patents within a given sample, we can reliably calculate each patent's share of the sample's total value, whether that total is large or small. Unlike the simplistic patent counting approach, this method recognises that patents can and do have widely different qualities and values.

This method also has a wide range of applications. For example, in the recent *Apple v Qualcomm* litigation, the authors of this article employed this method to determine the relative qualities of patent portfolios among contributors to 3GPP telecommunication standards. Portfolio quality is one determinant of the payments observed in industry patent licences. We were able to test, and reject, the hypothesis that the payments negotiated in these licences were based on the quantity of patents in the licensed portfolio only, and not their quality.

In litigation and business settings where the reliable ranking and relative valuation of large numbers of patents are important, one should favour quality-based analyses over those that rely on simple patent counts.

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