The Bright Side of Patents

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The research was conducted while Hegde was Edison Scholar at the United States Patent and Trademark Office (USPTO). However, the views and comments expressed herein are solely the opinion of the authors, do not reflect the performance of duties in the authors’ official capacities, and are not endorsed by, nor should be construed as, any viewpoint official or unofficial of the USPTO.
Do patent rights help or harm inventors?

- Patents award their holders the right to exclude
  - Patents increase imitation costs
  - Patents facilitate licensing
  - Patents facilitate access to capital

- But patents may not help their holders if....
  - Too costly to enforce patents (patent litigation costs > $20 billion)
  - Awarded for trivial inventions
The Beerbrella

ABSTRACT

The present invention provides a small umbrella ("Beerbrella") which may be removably attached to a beverage container in order to shade the beverage container from the direct rays of the sun. The apparatus comprises a
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– But patents may not help their holders if….
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  • Awarded for trivial inventions
  • Take too long to process (average patent takes > 3 years to issue)
How important are patents for startups – and why?

QUESTIONS

I. How much do patent rights benefit startups?

II. How badly do patent grant delays affect patents’ benefits?

III. What are the mechanisms through which patents benefit startups?
Measuring the causal effect of patent rights on startups is challenging

EMPIRICAL CHALLENGES

1. Complete data on rejected patent applications are not publicly available
2. Data on firm outcomes for privately-held startups are not easily available
3. Large sample correlations between firm success and patenting do not imply causality
   • Better firms/inventions may be more likely to win patents and be successful
We use unique data to estimate the effect of patents on startups

- USPTO data on 45,817 US startups that filed for their first patent application after 2001 and received a final decision by 2014
  - Population of first-time US-based applicants that claimed small-entity status
  - 66% approved, 34% rejected

- NETS (Dun & Bradstreet) data on sales, employment, financial indicators and demographics for public and private US firms
  - Coverage comparable to Census’ LBD
  - 65% match rate
  - USPTO data on subsequent patent applications and grants
  - VentureXpert data on VC funding

- We use econometric techniques (IV regressions) to estimate the **causal effect** of patent grants on startups’ success
### Sample statistics – At first patent application

<table>
<thead>
<tr>
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<th>Firms whose first patent application is …</th>
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<tbody>
<tr>
<td></td>
<td>approved</td>
</tr>
<tr>
<td>No. firms</td>
<td>30,121</td>
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<tr>
<td>% of firms</td>
<td>65.7%</td>
</tr>
<tr>
<td>Age at first patent filing (years)</td>
<td>median 2</td>
</tr>
<tr>
<td>Employees at filing date</td>
<td>mean 28.7</td>
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<tr>
<td></td>
<td>median 8.0</td>
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<tr>
<td>Sales at filing date ($ million)</td>
<td>mean 4.4</td>
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<tr>
<td></td>
<td>median 1.0</td>
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<tr>
<td>Pre-patent-filing employment growth</td>
<td>mean 17.1%</td>
</tr>
<tr>
<td>Pre-patent-filing sales growth</td>
<td>mean 18.7%</td>
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</table>
Approval of first patent application leads to persistent employment growth

Median firm has 8 employees at first-action → Approval of its first patent application leads to 3 more employees 5 years later on average.
Approval of first patent application leads to persistent sales growth

Median firm has $4.3M in revenues at first-action → Approval of its first patent application leads to $2.3M higher sales 5 years later on average. (Average estimated cost of patent application = $20,000 according to Lemley 2001)
Approval of first patent application leads to higher rate and quality of subsequent innovation

Approval of first patent application leads to:
• 66.4% increase in no. of subsequent applications, 48.4% in no. of approved patents
• 17.6 p.p. higher approval rate of patent applications
• 68.5% increase in no. of total citations, 26.9% increase in no. of citations per patent
Delays in patent approval have a persistent negative effect on employment growth
Delays in patent approval have a persistent negative effect on other measures of startup growth

- Delays in patent approval reduce sales growth
  - Sales growth decreases by 3.6%, 12.8%, 28.4% over 1 year, 3 year and 5 years for each year of delay

- Delays reduce the quantity and quality of subsequent innovation
  - 14% decrease in no. of subsequent applications and patents
  - 4 p.p. lower approval rate of applications
  - 8% decrease in no. of citations per patent
Mechanism: Patents facilitate access to venture capital

- Patent approvals causally increase probability of venture capital (VC) funding by 57%

- Patents’ effect on VC funding is higher in settings characterized by information frictions
  - early funding rounds
  - IT sector, where expropriation concerns are higher
  - markets where competition among startups is high
  - founders without prior entrepreneurial experience

- Patents trigger startup growth by facilitating access to capital
Timely patent rights substantially benefit startups

- Patents have a long-lasting and large positive effect on startups
  - Patents set startups on a growth path by facilitating access to capital

- Patent grant delays adversely affect startup growth and success
  - Study quantifies the costs of prolonging uncertainty about patent rights
  - Patent reform should prioritize timely examination

- CAVEAT: Study does not suggest patent system is net welfare-enhancing
Thank you!

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