Is This Obvious?

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Screening Patents

- Classic economics discussion of screening patents concerns screening for quality
  - Mill (1848): "the reward conferred by it depends upon the invention's being found useful, and the greater the usefulness, the greater the reward."
  - If private value is correlated with what you care about (e.g. investment), you can screen with a menu of patents, longer (but more expensive; think renewal fees) for higher value innovations, like price discrimination
- But what about obviousness?
  - May be just as privately valuable to monopolize something obvious as not
  - Scrutiny of patents may be needed!
- This paper:
  - Incorporate scrutiny into a mechanism design model of screening for obviousness

What are some of the reasons that screening for obviousness is hard?

- Others (including the applicant, but also challengers) may have better information than the examiner
- Disclosure and impermissible hindsight: a very well explained solution may make the solution seem obvious.

Disclosure and Impermissible Hindsight

- The patent office is well aware of this problem:

> *"In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at [the time of invention] to [a person of ordinary skill in the art]. Knowledge of applicants disclosure must be put aside in reaching this determination (...). The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art."*

USPTO, Manual of Patent Examining Procedure, Section 2142

- But then there is a tradeoff between screening for obviousness and other motives for disclosure

Features of the model, and questions we ask

- Mechanism design approach:
  - Can we elicit information from the applicant?
- Stages of examination:
  - What if we can get scrutiny from different sources (examiner, challenges)?
- Concern of impermissible hindsight:
  - What should be disclosed?

Preview of results

- The planner should offer a menu of patents:
  - Strong patent with high scrutiny
  - Weak patent with low scrutiny
    $\rightarrow$ resembles a "utility-model patent", e.g., Gebrauchsmuster (Germany), Petty Patent (Australia)
- Intuitive condition for getting scrutiny at different stages "right"
- Disclosure that risks impermissible hindsight can be optimal
  - Planner may care not only whether idea is obvious, but also whether applicant has actually solved the problem
  - Disclosure about solution may provide indirect information about obviousness

Basic setup: ideas and inventions

- Inventor endowed with privately observed idea θ to solve a technical problem in a particular way
- The idea's type $\theta \in [0, 1]$ is a measure of its non-obviousness, the probability that it can be invented
  - To fix ideas today, let θ be either low (L) or high (H), where high type is fraction λ of applicants
  - Fine to think of this as zero and one for most of the results.
  - This value is known by the patentee but not the patentor (planner)
- R&D investment $c(\theta)$ required to work out the solution, i.e., develop the idea into an invention

Payoffs

- The solution to something non-obvious has social value v, minus any costs of strength of protection
- The idea can be developed at cost $c(\theta)$
- Yields profit S, interpreted as strength of patent protection
  - An undeveloped idea gives profits S only if obvious
  - Key feature: an obvious idea and a nonobvious, developed idea equally value S, in contrast to Mill quote

Scrutiny

- Let $e \in \{0, 1\}$ denote the inventor's decision whether to develop the idea
- e and θ are unobservable to the planner
- However, the planner receives a signal σ
  - Probability of "pass" $\sigma = 1$ to be $p_1^H(x)$, otherwise "fail" $\sigma = 0$, with

$$\frac{p_0^L(x)}{p_0^H(x)} > \frac{p_1^L(x)}{p_1^H(x)}$$

  - Later we'll consider more complicated signals, and the probabilities depending on choices of the applicant (e)
- The distribution of signals depends on the planner's choice of scrutiny x, with associated cost $\gamma(x)$
- The planner can condition patent strength on signal and (report of) type: $S(\theta) = (S_0(\theta), S_1(\theta))$
  - Suppose the planner wants high types to invest and low types not to

Patent strengths for high and low types

Proposition

Let $P(x) = p_1^L(x)/p_1^H(x)$. *Optimal patent strengths are such that* $S_0(\theta_H) = 0$, $S_1(\theta_H) = \dfrac{c_H}{p_1^H(x_H)\theta_H}$, *and* $\bar{S}_L = P(x_H)\dfrac{c_H}{\theta_H}$.

- The high type gets a strong patent if the signal is good and nothing if the signal is bad
  - Patent just strong enough to pay $c(\theta)$
- The low type gets a patent which is weaker in expectation: $\bar{S}_H = c_H/\theta_H > P(x_H)c_H/\theta_H = \bar{S}_L$

Scrutiny for high and low types

- Assume $P'(x) < 0$: scrutiny makes the signal more informative

Proposition

Optimal scrutiny is such that $x_L = 0$ and $x_H = x^*$ implicitly other motives for disclosure defined by

$$\gamma'(x^*) = -P'(x^*)\frac{\delta(1-\lambda)(1-\theta_L)c_H}{\lambda\theta_H}.$$

- Only high type is scrutinized, low type is not
- Implications for the low type's patent:
  - Giving the low type a patent whose strength does not depend on σ works: $S_0(\theta_L) = S_1(\theta_L)$. That is, a patent which is weaker but which you're sure to get
  - Giving the low type the same patent as the high type, but without scrutiny is not IC

Intuition

- Why load it all on $S_1(\theta_H)$?
  - This is where the likelihood ratio favors the high type most strongly
  - Hence, makes it unattractive for the low type to misreport
- Why scrutinize only the high type?
  - Planner cares about deadweight loss
  - Scrutiny is an inefficient way of reducing DWL: can decrease S instead
  - Only purpose of scrutiny is sorting

Interpretations

- Interpretation 1: x as examination intensity at the patent office
  - Regular patent and utility-model patent
  - No examination for utility model but weaker protection
  - German *Gebrauchsmuster*: only registration (no examination), maximum duration 10 years
- Interpretation 2: x as availability (and attractiveness) of post-grant validity challenges
- But what if you considered these signals separately, and with different levels of scrutiny?

Two-dimensional scrutiny

- Suppose scrutiny comes in two stages: $x = (x_1, x_2)$
  1. Patent office examination
  2. Post-grant review (by patent office or courts)
- Signals $\sigma = \sigma_i \in \{\sigma_0, \sigma_{10}, \sigma_{11}\}$
- Natural to assume that $\min_\sigma p_i^L(x)/p_i^H(x) = p_{11}^L(x)/p_{11}^H(x)$
  - In other words, passing twice provides the most information of non-obviousness

Two-dimensional scrutiny

- Previous results can be extended:
  - No protection for high type unless pass at both stages
  - Low type gets low (zero) scrutiny
- Optimal scrutiny on the high type is $x_H = x$ satisfying

$$\frac{\partial \gamma(x)/\partial x_1}{\partial \gamma(x)/\partial x_2} = \frac{\partial P(x)/\partial x_1}{\partial P(x)/\partial x_2}$$

What about disclosure?

- Return to one level of scrutiny.
- Suppose the agent could also take an observable action to explain what their innovation is
  - Call this disclosure, d
- For sorting: would want to choose d to minimize $p_1^L(x)/p_1^H(x)$
  - Impermissible hindsight is the concern that too much disclosure might not minimize that ratio
  - But disclosure provides information about two things: the obviousness (i.e. the problem the inventor solved) and the investment (do they actually have a solution to the problem?)
  - To understand the role of both of these, we need a model with signals about both obviousness and investment.

Signals about obviousness and investment

- Now suppose that the planner can obtain two signals: $\sigma = (\sigma^O, \sigma^I)$
  - $\sigma^O \in \{\sigma_0^O, \sigma_1^O\}$ is informative about obviousness
  - $\sigma^I \in \{\sigma_0^I, \sigma_1^I\}$ is informative about investment
- Assume for simplicity the two signals are independent, with

$$p_i^\theta(x,d) = \Pr(\sigma^O = \sigma_i^O | x, d; \theta)$$
$$q_j^e(x,d) = \Pr(\sigma^I = \sigma_j^O | x, d; e)$$

and

$$\frac{p_0^L(x,d)}{p_0^H(x,d)} \geq \frac{p_1^L(x,d)}{p_1^H(x,d)} \qquad \frac{q_0^0(x,d)}{q_0^1(x,s)} \geq \frac{q_1^0(x,d)}{q_1^1(x,d)}$$

Signals about obviousness and investment

- Let $P_O(x,d) = \dfrac{p_1^L(x,d)}{p_1^H(x,d)}$ and $P_I(x,d) = \dfrac{q_1^0(x,d)}{q_1^1(x,d)}$ with
  - $\partial P_O/\partial x < 0$ and $\partial P_O/\partial d > 0$
  - $\partial P_I/\partial d < 0$, $\partial P_I/\partial x = 0$, and $P_I(x,0) = 1$
- Scrutiny makes the signal about obviousness more precise
- d makes the signal about investment more precise but the signal about obviousness less precise
  - Just a normalization: would always ask for disclosure that makes both the signal about obviousness and investment better!
  - $d > 0$ implies that there is some impermissible hindsight to worry about.

The screening problem revisited (2)

- For $d = 0$, the problem collapses to the previous one ($P_I(0) = 1$)
- Extending previous results then yields expected patent strengths:

$$\bar{S}(\theta_H, 1) = \frac{c_H}{1 - (1 - \theta_H)P_I(x_H, d)}$$

$$\bar{S}(\theta_L, 0) = \frac{P_O(x_H, d)P_I(x_H, d)c_H}{1 - (1 - \theta_H)P_I(x_H, d)}$$

Decomposing the effect of an increase in d

- Negative effect of disclosure:
  - $\uparrow d$ raises $\bar{S}(\theta_L, 0)$ through its effect on P_O (because $\partial P_O / \partial d > 0$)
  - Disclosure blurs the direct signal of obviousness ("impermissible hindsight")
- Positive effects of disclosure:
  - $\uparrow d$ lowers $\bar{S}(\theta_H, 1)$ through its effect on P_I (because $\partial P_I / \partial d < 0$)
  - Signal about investment makes not investing less attractive for the high type
  - $\uparrow d$ lowers $\bar{S}(\theta_L, 0)$ through its effect on P_I
  - Investment provides an indirect signal about obviousness

Sufficient condition to risk impermissible hindsight

Proposition

It is optimal to require disclosure that obscures obviousness if

$$\left(\lambda \left. \frac{\partial \bar{S}(\theta_H, 1)}{\partial x_I^H} \right|_{x_I^H = 0} + (1-\lambda)(1-\theta_L) \left. \frac{\partial \bar{S}(\theta_L, 0)}{\partial x_I^H} \right|_{x_I^H = 0} \right) < 0.$$

Further questions the model suggests might matter

- Which level is good at what sort of scrutiny?
- How much disclosure do you want "right away?"

Conclusion

- We propose a mechanism design approach to tackle the issue of screening for obviousness
- Key results:
  - To sort applicants, should offer a menu of patents differing in strength and scrutiny
  - Thinking about disclosure at different levels requires thinking about what is being scrutinized
  - Requiring disclosure can be optimal even when it makes scrutinizing obviousness harder
- Further results:
  - Can be used to explore comparative statics like how should things change if scrutiny gets "harder" in some sense