Weak patents

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Background

- Every Tuesday, the day of the week the US Patent and Trademark Office (USPTO) issues new patents, there are roughly 3,500 new patents, that is new IP rights that no American is allowed to infringe, and for which there is no fair use defense to patent infringement like with copyright and trademark.
- This is probably the sign of a very dynamic and innovative economy, except that many of these patents are of very bad quality, in the sense that they do not satisfy at least one of the patentability standards: utility, novelty, inventivity (or non-obviousness) and patentability matter.
- It is now largely recognized that a patent is not an ironclad IP right as are other forms of property. A patent is more likely an uncertain or a probabilistic right whose validity may be challenged under either a reexamination procedure in front of the PO or a litigation trial in front of a court. This uncertainty is strengthened by the issuance of too many bad quality patents.
- I examine very briefly two questions in this lecture:
  - Why bad quality patents are granted?
  - What consequences of bad quality patents?

Organization of the lecture

1. Weak patents: definition and illustrations
2. Why bad quality patents are delivered? Comparison USPTO vs EPO
3. Two negative effects of weak patents

   3.1 Reverse payments

   3.2 Licensing under the shadow of patent litigation

1. Weak patents

1.1 Definition

- 1st notion of a weak patent: patent that ensures a low protection vis-à-vis potential offenders : explains why other modes of protection (e.g. secrecy) may be preferred to patent protection: Encaoua & Lefouili, 2005.
- 2nd notion of a weak patent : bad quality patent granted by the PO despite the absence of some patentability standard $\Rightarrow$ a weak patent would be invalidated with high probability **if** it was impartially reexamined at the PO or **if** it was litigated through a trial in front of a court: Farrell & Shapiro (2008), Encaoua & Lefouili (2009), Choi (2010)

1. Weak patents

1.2 Illustrations

- From PUBPAT (Public Patent Foundation, www.pubpat.org) a non-profit organization representing the public interest and specializing in challenging undeserved patents that are both economically and socially significant.

- **Pfizer Lipitor Patent**
- **Silvers Photomosaic Patent**
- **Breast Cancer Gene Patents**
- **Microsoft Fat Patent**
- **WARF Stem Cell Patents**

2. Why bad quality patents are granted?

- Issuance of bad quality patents more prevalent in the US than in Europe. Why?
- Two possible explanations:
  1. **Rational Ignorance**: At the USPTO, the examiners conduct insufficient *prior art search* that could render weak patents unpatentable. Behavior justified by Lemley (2001)*:* US examiners *"are '**rationally ignorant**' of the objective validity of patents,… because it is too costly for them to discover those facts".* Given the skewed nature of patent value*, "society would be better off economizing on USPTO examinations, deferring rigorous determination of validity until the patent enters litigation"*

2. Why bad quality patents are granted?

2. **Institutional bias**: Examiners devote much time to patents perceived to be weak but pro-applicant bias of policies and procedures at the USPTO renders their effort useless: US examiners are encouraged by various institutional incentives to accept applications that they nevertheless perceive to be ineligible (Jaffe Lerner, 2004).

- Which of these two reasons best explains the issuance of weak patents?
- Empirical analysis by **Lei & Wright (2010)**: sample of U.S. patents that have been granted by the USPTO (1990 -1995) and filed to the EPO (*twin patents*). Since EPO is supposed to grant less dubious patents than USPTO, it is possible to test whether the *probability of failure at EPO* is linked to the *prior art research effort* made at USPTO.

2. Why bad-quality patents are granted?

- Outcome from patent application filed at EPO (accept, withdraw, reject) is used as an indicator of the patents' strength.
- Research effort to discover "prior art" by the US examiner is measured by the ratio: number of *cited* prior art patents (CPP) over total number of patents (*cited* CPP *+ uncited* UPP) technically related to the patent in question.
- Ratio PPSI = CPP/(CPP+UPP)measures the US examiner's *Prior Patents Search Intensity*
- UPP computed by Lei and Wright (2010) according to a specific algorithm.

2. Why bad quality patents are granted?

- *H_1 : Rational ignorance:* a patent with a *high* amount of cited prior art signals a *strong patent* $\Rightarrow$ *a patent with a high PPSI (Prior Patents Search Intensity) would have a high probability to be accepted at EPO*.
- *H_2 : Institutional bias: a patent with* a high amount of cited prior art signals a *weak* patent $\Rightarrow$ *a patent with a high PPSI would have a high probability to be refused at EPO*.
- **Lei & Wright (2010) econometric results in favor of H_2** : the failure's probability at EPO is significantly and positively affected by the research intensity variable PPSI (failure meaning either applicant's withdrawal or EPO's rejection).
- **This suggests that US examiners devote *an appropriate prior research intensity to patents that they perceive as being weak,*** but despite this negative perception, rules and procedures of the USPTO force examiners to grant many of these weak applications. Even though US examiners ultimately fail to reject these weak patents, *their revealed evaluation is a significant predictor of application outcomes at the EPO.*
- The problem of weak patents in the US is broad and systematic rather than anecdotal (Graham *et al*., 2004): For almost 35% of USPTO granted patents in the sample, the related applications at the EPO failed.

2. Why bad quality patents are granted?

- What are the rules and procedures that force PO examiners to grant weak applications? Very roughly, they can be described according to two types of arguments: burden of proof and incentives.

  1. Burden of proof. In the US as in Europe, an applicant has not to prove that his application is patentable but the examiner has to prove that the application is unpatentable, which is much more difficult. However, the **opposition procedure** in Europe allows a third party to make an opposition, (not later than 9 months after the patent issuance) and this procedure is **adversarial** between the challenger and the patent holder. By contrast, in the US, the **re-examination proceeding** is maintained during all the patent life, but it does not involve any adversarial procedure: the re-examination proceeding maintains an **exclusive** relationship between the applicant and the patent examiner (Graham *et al*. 2004).

2. Why bad quality patents are granted?

2. Incentives. US examiners are mainly rewarded on granted patents, and do not bear the aftermath of granting questionable patents. "*The salaries of US examiners are tied to the number of applications they process: they have production quotas to meet, and earn bonuses when they exceed their quotas by at least 10%...Importantly, they are never liable in the event patents are invalidated in court and there are no negative consequences for examiners who produce low-quality work*" (Langinier & Marcoule, 2009).

- Even if an overwhelming majority of applications at the USPTO receive a FOAM letter (First Office of Action on Merit) of non-final rejection, only a minority of them receives a "final" rejection in the second office action. And, more than that, a majority of applications with a second and "final" rejection obtain in fine a patent after a *continuation* bargaining process.
- By contrast, in Europe, the delay allowed to prosecute a patent application is longer, which explains why the EPO grants less dubious patents than its American counterpart. However, the consequence is that the EPO procedure involves very high backlogs (Guellec and van Pottelsberghe, 2007).

3. Some negative effects of weak patents

- Challenging a patent's validity through litigation before a court is difficult.
  - First, litigating may be contractually prevented by the patent holder. Ex: in Japan, Microsoft (MS) forced its licensed OEM suppliers to pledge not to file lawsuits on the grounds that Windows infringes a patent right (Matsushima *et al*., 2011).
  - Second, the US standard required to prove invalidity (**clear and convincing evidence**) is very demanding for the challenger, especially for new patentable subject matters (ex: i4i vs. Microsoft).
  - Third, challenging has the dimension of a **public good**: a firm benefits from a successful challenge initiated by one of the competitors, since they all get freely the new technology → **individual incentives to challenge are low**.
- This is why weak patents result mostly in private settlements rather than in a trial through a judicial litigation challenge.

3. Some negative effects of weak patents

- More precisely, the parties reach private settlements under the shadow of patent litigation. To illustrate, two types of private settlements: **reverse payments** and **licensing**.

1. A litigation on a weak patent may be avoided through a **reverse payment** made by the patent holder to the potential infringer. This is observed in the pharmaceutical industry where the payment of a substantial amount of money to a generic producer is the price paid by a brand name drug manufacturer in order to delay generic entry on the market, depriving thus access to less expensive generic drugs.
2. Contrary to what happens for an ironclad right, Amir, Encaoua and Lefouili, 2O11 show that the owner of a weak patent prefers to **license through a per-unit royalty** rather than through a **fixed fee**. The consequence is that the society is harmed by this licensing scheme, since a per-unit royalty leads to a higher final price.

3.1 Reverse payments in the pharmaceutical industry

- On the two sides of Atlantic, the antitrust enforcers believe that reverse payments are anticompetitive since they improperly raise consumer's costs by keeping out less expensive generic drugs. But some differences appear between the US and Europe.
- In the US, doctrinal opposition between the FTC (who considers that such settlements are unlawful regardless of who ultimately would have won the patent litigation) and the US courts that reject this reasoning. The US courts require those challenging such reverse payments to show that the settlement impacts competition from products not covered by the patents, or that the underlying patent infringement is objectively baseless or based on fraud.
- In Europe, both the DG Competition and the Court of First Instance seem to agree in condemning private settlements that involve a reverse payment, whether the patent is valid or not (*Boehringer Ingelheim* vs *Almirall*).

3.2 Licensing under the shadow of patent litigation R. Amir, D. Encaoua & Y. Lefouili, 2011

- A recent work by Amir, Encaoua & Lefouili, 2011, "***Per-unit royalty vs fixed fee: the case of weak patents,***" investigates the nature of the best licensing scheme for a weak patent and asks whether this licensing scheme is robust against features that matter when the patent is ironclad (features like the nature of the patentee, the type of downstream competition and the product differentiation).
- *Main result of this work*: A weak patent holder prefers a per-unit royalty to a fixed fee if the **strategic effect of a cost increase on the profit is positive**. In other words, if **the positive price effect of a cost increase outweighs the negative quantity effect**. This is a robust result since the condition is satisfied regardless of whether:
  1. The licensor is an *outsider* or an *insider* in the oligopoly,
  2. The licensees compete à la Cournot or a la Bertrand with differentiated products.

3.2 Licensing under the shadow of patent litigation
R. Amir, D. Encaoua & Y. Lefouili, 2011

- *Intuition of the result:* licensing a weak patent through a per unit royalty allows the patent holder to extract a higher revenue than it could expect if licensing was posterior to the patent's validity assessment, whereas a fixed fee leads to the same revenue. Moreover, licensees are also better off because they can **pass-through** the cost increase due to the royalty on users of the final product.
- *Consequence*: consumers are harmed because they pay a higher price than they would pay if patent's assessment through litigation was made prior to licensing.

3.2 Licensing under the shadow of patent litigation: the model

- Patent owner P of a weak patent, active or not in the industry, sells a license for a cost reduction technology from c^+ to $c = c^+ - \varepsilon$. Potential licensees form an oligopoly (n firms if inactive patentee and n-1 firms if active patentee) producing initially at marginal cost c^+.
- 3-stage game:
  - *1st stage*: P offers a licensing contract to all firms, involving the payment of either a per-unit royalty r or a fixed fee F.
  - *2nd stage*: The potential licensees, independently and simultaneously, decide whether to purchase or not a license. If a firm does not accept the license offer, it can challenge the patent's validity before a court. The outcome of such a trial is uncertain: with probability θ the patent's validity is upheld by the court and with probability $1-\theta$ it is invalidated; $\theta \in [0,1]$ = **patent's strength**. Low $\theta \rightarrow$ **weak patent**, high $\theta \rightarrow$ **strong patent** ($\theta = 1$ corresponds to an ironclad patent).
  - *3rd stage*: Competition occurs among the industry members, with the cost structure inherited from 2nd stage: unit costs are $c^+ - \varepsilon$ for licensees and c^+ for non-licensees.
- Note that licensing occurs before an eventual challenge of the patent's validity.

3.2 Licensing under the shadow of patent litigation: the model

- *If the patent is upheld by the court* (probability θ), *it becomes an ironclad right* $\rightarrow$ a non-licensee uses the old technology (cost c^+), while a licensee uses the new technology and pays the royalty r or the fixed fee F.
- *If the patent is invalidated by the court* (probability $1 - \theta$), *all firms, including those which accepted the license offer, use freely the new technology.*
- The type of competition between licensees and non-licensees is not specified except to assume the existence and uniqueness of Nash equilibrium.
- Notations:
  - $\pi^l(k, c)$ (resp. $\pi^n(k, c)$) = equilibrium profit of a licensee (resp. non-licensee) when $k \leq n$ efficient licensees produce at cost $c < c^+$ and $n-k$ inefficient non-licensees produce at cost c^+.
  - $q^l(n, c)$ = equilibrium output with n licensees
- General assumptions on $\pi^l(k, c)$, $\pi^n(k, c)$ and $q^l(n, c)$

3.2 Licensing under the shadow of patent litigation: Intermediate results

- Suppose first the patent owner is an outsider. Optimal per-unit royalty accepted by all firms = solution of the constrained program:

  $\max_r [n\, r\, q^I(n, c^+ - \varepsilon + r) / \pi^I(n, c^+ - \varepsilon + r) \geq \theta\, \pi^n(n-1, c^+ - \varepsilon + r) + (1-\theta)\, \pi^I(n, c^+ - \varepsilon)]$

- *Result 1:* Optimal per-unit royalty that deters any litigation = unique value $r(\theta)$ that binds the constraint.
  - $r(0)=0$; $r'(0)>0$
  - If $r \leq r(\theta)$, $k=n$ is the only 2nd stage equilibrium
  - For low θ, $P_r(\theta) > \theta\, P_r(1)$: **Licensing revenues from per-unit royalties when licensing occurs prior to the patent's assessment are higher than expected revenues if validity were resolved before licensing.**
- *Result 2:* Optimal fixed fee accepted by all the n firms given by: $F(\theta) = \theta[\pi^I(n, c^+ - \varepsilon) - \pi^n(n-1, c^+ - \varepsilon)]$. For θ sufficiently small, it is the only second stage equilibrium. Moreover, $F(\theta) = \theta F(1) \Rightarrow P_F(\theta) = \theta\, P_F(1)$: **Fixed fee licensing revenue per license is the same whether licensing occurs *prior* or *posterior* to the patent's validity assessment**.
- $P_r(\theta) > \theta\, P_r(1)$ and $P_F(\theta) = \theta\, P_F(1) \Rightarrow$ uncertainty over patent validity increases the attractiveness of $r(\theta)$ over $F(\theta)$ for low values of θ.

3.2 Licensing under the shadow of patent litigation: the result when the patentee is an outsider

- *Proposition 1*: *For low values of* θ, *the optimal per-unit royalty* $r(\theta)$ *deterring litigation provides higher licensing revenues to the patentee than the optimal fixed fee* $F(\theta)$ *deterring litigation if the* ***strategic effect of an increase in the marginal cost on a licensee's equilibrium profits is positive:*** $\partial \pi^{I}(n, c) / \partial c > - q^{I}(n, c)$ (1)
- *Interpretation :* Since

  $\partial \pi^{I}(n, c) / \partial c = - q^{I}(n, c) + q^{I}(n, c)\, \partial p^{I}(n, c) / \partial c + (p^{I}(n, c) - c)\, \partial q^{I}(n, c) / \partial c$

  (1) ⇔ ***positive price effect*** $q^{I}(n, c)\, \partial p^{I}(n, c) / \partial c$ **of a cost increase outweighs** ***negative quantity effect*** $(p^{I}(n, c) - c)\, \partial q^{I}(n, c) / \partial c$

  ⇔ Lerner index is below the ratio of the price and quantity elasticity relative to the marginal cost.
- *Consequence of the proposition*: since a per-unit licensing contract leads to a higher price and a lower consumers' surplus than a fixed fee contract, proposition 1 states that licensing a weak patent under the shadow of patent litigation harms consumers.

3.2 Licensing under the shadow of patent litigation: the result when the patentee is an insider

*Proposition 2: For an **insider** firm holding a weak patent, the optimal per-unit royalty $r(\theta)$ provides higher revenues than the optimal fixed fee $F(\theta)$, if the **strategic effect of an increase in a potential licensee's unit cost on the aggregate equilibrium profit of the industry is positive** :*

$\partial \Pi(c,\dots c)/ \partial c_I > -q_I(c,\dots,c)$ *for all* I (condition 2)

where Π *is the aggregate equilibrium profit.*

- Condition (2) generalizes condition (1). It gives a precise formulation of the *pass-through* argument: negative quantity effect of an increase in one firm's marginal cost on the aggregate profit is outweighed by the positive price effect.

- Literature on oligopoly focused on the *overall effect* (direct + strategic effect) of a cost change on profits, and showed that it could be positive (Kimmel, 1992, Février and Linnemer 2004). But what matters here is the sign of the *strategic effect*.
- Even in a setting where a patent holder would have used a fixed fee if the patent was certain ($\theta=1$), it prefers a per-unit royalty if the patent is weak (low θ), as long as the strategic effect of a cost variation on the aggregate profit is positive (condition (2)).

3.2 Robustness test: Cournot competition

- **Cournot competition** with an homogenous good and an inverse demand function $P(.)$ satisfying regular assumptions, among which $P'(Q)+QP''(Q)<0$ for all $Q \geq 0$ ensuring downward reaction curves and thus existence and uniqueness of equilibrium, Novshek (1985)

- *Proposition 3: Under Cournot competition and regular assumptions on the demand function , a weak patent's holder prefers to license through a per-unit royalty rather than a fixed fee, regardless whether the patentee is active or not in the market.*
- Recall that the reverse holds for an outsider holding an unquestionable patent (i.e. $\theta=1$, Kamien, 1992).

3.2 Robustness test : Bertrand competition

- Demand functions $D_i(p_1, \dots, p_n)$ satisfying regular assumptions leading to the uniqueness of Bertrand equilibrium:

B_1 (i) $(\partial D_i/\partial p_i) < 0$, (ii) $(\partial D_i/\partial p_j) > 0$, (iii) $\sum_k (\partial D_i/(\partial p_k) < 0$, $i=1,\dots,n$: for each product, own price effect dominates cross-price effects for the demand level

B_2 $D_i(\partial^2 \log D_i)/(\partial p_j \partial p_i) - (\partial \log D_i/\partial p_j)(\partial \log D_i/\partial p_i) > 0$, $j \neq i$: the price elasticity of demand increases in any rival's price (Milgrom and Roberts, 1990)

B_3 $\sum_k(\partial^2 D_i/\partial p_i\, \partial p_k)) < 0$, $i=1,..n$: for each product, own price effects dominate cross-price effects for the slope of demand (B_3 guarantees uniqueness of Bertrand equilibrium, Milgrom and Roberts, 1990, Vives, 1999)

- *Proposition 4: Under Bertrand competition and some regular assumptions on the demand functions , the competition game is of strict strategic complements and the weak patent's holder prefers to license through a per-unit royalty rather than a fixed fee, regardless whether the patentee is active or not in the market.*

- Recall that for an unquestionable patent, this result holds only when the products are close substitutes or when the size of the cost-reduction is small (Kamien and Tauman, 1986, Kamien, Oren and Tauman, 1987, Muto,1993).

To sum-up

- To sum-up, undeserved or weak patents harm the public in different ways, in particular by impeding successive innovations due to more expensive knowledge inputs; by preventing scientists from advancing technology; by unfairly harming small businesses; and by restraining civil liberties and individual freedoms.
- One particular harm concerns the consumers through the licensing of a weak patent under the shadow of patent litigation. The per-unit licensing scheme is preferred to the fixed fee scheme since the weak patent holder is more able to capture unjustified rents in this way. The robustness of this result has been checked against the nature of the downstream competition, the degree of product differentiation and whether the patent holder is active or not, while varying any of these features overturns the outcome of the comparison when ironclad patents are considered. Clearly, the higher price induced by a per-unit royalty licensing scheme harms consumers.
- More generally, "*weak patents incur social costs without commensurate social benefits associated with increased innovation incentives. Furthermore, there is generally no reason to expect that private incentives to challenge weak patents through litigation line up well with the social incentives." (Lei and Wright, 2010).*
- The Patent Reform Act, which has been recently voted in the US, tries to include measures addressing the problems raised by weak patents.