A quality index for patent systems
IPTS, Spain, June 2011

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Outline

• Motivations
• Objective of the paper
• The quality index
• Cross-sectional analysis
• Concluding remarks
Global patent warming?
Number of claims filed at 3 patent offices, (Million), 1980-2008

Common trend but structural differences
A vicious cycle?

• Low quality examination lead to more filings of lower quality, which in turn reduces the examination quality through overloaded examiners...

• Jaffe and Lerner (2004); Bessen and Meurer (2008); Maskus (2006); Quillen (2008)... For the US system
Quality seems to matter

• Important patent reform currently under scrutiny in the US
• EPO: raising the bar project
• But has not been strongly analyzed so far
A gap in the literature?
When « stronger » means « weaker »

- Economists implicitly or explicitly consider patent ‘strength’ as
  - Larger geographical scope
  - Improved enforcement mechanism (whatever the quality of patent)
  - New patentable subject matters
  - Number of patents

- The “Ginarte and Park (1997) index”, and Lerner (2002)’ index are actually “applicant-friendliness” indices, mainly composed of subject matters, longer duration, favourable enforcement mechanisms, but no insight on selection mechanisms
A gap in the literature?
Authors tend to focus on a specific dimension of a multifaceted selection process

- Scotchmer and Green (1990): novelty requirement and ownership rules (“first-to-file” vs “first-to-invent”)
- Franzoni and Scellato (2010): consequence of the grace period
- Cockburn et al. (2002): examiners’ characteristics
- Friebel et al. (2006), Langinier and Marcoul (2009): organisational practices and incentive mechanisms
- Lemley (2001): resources put in place to examine patents.
- Graham and Harhoff (2006), Graham et al. (2002): post-grant opposition process...
Outline

• Motivations

• Objective of the paper

• The quality index

• Cross-sectional analysis

• Concluding remarks
Objective

- Broad question: Can “quality” explain structural differences in patenting behaviour?
- Heterogeneous rigor (quality) could be due to different designs, hence to policy makers at large (lawyers, PO, policy makers...)
- The objective of this paper is to develop a quality index for 32 patent systems, and test the ‘vicious cycle’ hypothesis across countries
This paper is the fourth one on ‘quality’ in patent systems. Start with a broad idea in a Bruegel Blueprint (available online), followed by 3 WPs:

**Lost property:**
The European patent system and why it doesn’t work

By Bruno van Pottelsberghe

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**Qualitative (USA, Japan, EPO):**

**Theoretical (governance, Q, fees, U)**

**Quantitative (32 countries):**
- De Saint Georges M. And B. van Pottelsberghe, 2011, A quality index for patent systems, ECARES WP
Quality is defined as the extent to which patent systems *comply* with their patentability conditions in a *transparent* way.
Quality level and patent rights in force, 2008

This paper: 9 components, 32 patent offices
van Pottelsberghe, 2011, many components, for three offices

<table>
<thead>
<tr>
<th></th>
<th>Novelty</th>
<th>W13</th>
<th>WB</th>
<th>Inventiveness</th>
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Outline

• Motivations

• Objective of the paper

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• Concluding remarks
The quality index: the weighted sum of 9 components

\[ \sum_{i=1}^{9} w_i \cdot x_i \quad \sum_{i=1}^{9} w_i = 1. \]

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
First-to-Invent (F2I = USA + 1)

- No need for a patent in order to maintain a claim on the market (*Sankyo vs Merck*), favours secrecy;
- Litigation: first find the true inventor, then validity

First-to-File (F2F = RoW)

- Favours early disclosure and diffusion of knowledge;
- Litigation: first challenge validity of the patent, or infringement...

\[ x_1 = \begin{cases} 
1 & \text{if the prevailing system is "first-to-file".} \\
0 & \text{if the prevailing system is "first-to-invent".}
\end{cases} \]
The quality index: the weighted sum of 9 components

\[
\sum_{i=1}^{9} w_i x_i \quad \sum_{i=1}^{9} w_i = 1.
\]

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Publication of search report?
Transparency: provides more info to inventor and to third parties

- **EPO**
  - **YES**
  - 18 months: third parties can identify and assess

- **USPTO**
  - **NO**
  - Third parties have less access; for PCT after 32 months

- **JPO**
  - **NO**
  - Third parties have less access; for PCT after 32 months

\[ x_2 = \begin{cases} 
1 & \text{if the patent office provides and publishes a search report.} \\
0 & \text{if it does not.} 
\end{cases} \]
The quality index: the weighted sum of 9 components

\[ \sum_{i=1}^{9} w_i x_i \quad \sum_{i=1}^{9} w_i = 1. \]

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Time to request examination (self selection)
Quality: improves self selection process, drop out of low quality and/or low value

EPO
18 months

USPTO
automatic

JPO
36 months

\[ x_3 = 1 - \frac{\text{term to request examination}}{\max_i \{\text{term to request examination}\}} \]

= 0 if no ‘request’
The quality index: the weighted sum of 9 components

$$\sum_{i=1}^{9} w_i x_i \quad \sum_{i=1}^{9} w_i = 1.$$ 

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Opposition allowed for 9 months after EPO decision to grant a patent: the only way for third parties to bring new arguments in the ‘PO-applicant’ interaction

- **EPO**: YES, affordable
- **USPTO**: NO, Post grant litigation, re-examination
- **JPO**: NO, Post grant litigation

\[ x_4 = \frac{\text{term to file post grant opposition}}{12} \]

\[ = 0 \text{ if no opposition allowed} \]
The quality index: the weighted sum of 9 components

\[ \sum_{i=1}^{9} w_i x_i \quad \sum_{i=1}^{9} w_i = 1. \]

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Grace period allows the publication of an invention and still being able to file a patent for \( x \) months.

- **EPO**: NO
- **USPTO**: 12 months
- **JPO**: 6 months

Essentially aims at allowing scientists to publish and still have access to patentability.

\[
x_5 = 1 - \frac{\text{Grace period}}{12},
\]
Assessment of grace period:
Transparency: scientists (or authors) have one year to decide if they want to patent a supposedly « public » domain information (in the US even until grant date)
The quality index: the weighted sum of 9 components

$$\sum_{i=1}^{9} w_i x_i \quad \sum_{i=1}^{9} w_i = 1.$$ 

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Hidden applications:
USA vs Europe (different degrees of transparency)
\[ x_6 = \begin{cases} 
1 & \text{if the applications are published after a period of maximum 18 months from the filing date and there is no possibility to hide the application.} \\
0 & \text{otherwise.}
\end{cases} \]
The quality index: the weighted sum of 9 components

\[ \sum_{i=1}^{9} w_i x_i \quad \sum_{i=1}^{9} w_i = 1. \]

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Number of NTP claims granted by the USPTO: 1594 (used against RIM) (cf. van pottelsbergh and Archontopoulos, 2011)

Controlled adaptability: CIPs can be dangerous
\[ x_7 = \begin{cases} 
1 & \text{if CIPs and patents of addition are not allowed.} \\
0 & \text{if CIPs or patents of addition are allowed.} 
\end{cases} \]
The quality index: the weighted sum of 9 components

\[ \sum_{i=1}^{9} w_i x_i \quad \text{subject to} \quad \sum_{i=1}^{9} w_i = 1. \]

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Incentives: budget per examiner

EPO

High
Wages and resources

USPTO

Medium

JPO

High
Wages and resources

\[ x_8 = \frac{\text{personnel expenses per total staff}}{\max \{ \text{personnel expenses per total staff} \}}. \]
The quality index: the weighted sum of 9 components

$$\sum_{i=1}^{9} w_i x_i \quad \sum_{i=1}^{9} w_i = 1.$$  

- Invention ownership
- Publication of a search report
- Examination request (term)
- Post-grant opposition
- Grace period
- Hidden applications
- Adaptability
- Incentives
- Workload
Evolution of the number of claims ‘in search’ or ‘in examination’ per examiner

USPTO (searches or examinations)

JPO (examinations)

EPO (searches)

EPO (examinations)

JPO searches are outsourced
<table>
<thead>
<tr>
<th>Workload per examiner</th>
<th>EPO</th>
<th>JPO</th>
<th>USPTO</th>
<th>E.U./US</th>
<th>JP/US</th>
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<td>Claims filed (inc. PCT)</td>
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<td>2095</td>
<td>1776</td>
<td></td>
<td></td>
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<tr>
<td>Claims 'searched'</td>
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<td>outsourced</td>
<td>1776</td>
<td>0,59</td>
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<td>Claims examination request</td>
<td>642</td>
<td>1406</td>
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<td>0,79</td>
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<td>Claims granted</td>
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<td>857</td>
<td>613</td>
<td>0,45</td>
<td>1,40</td>
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</tbody>
</table>

Equivalent workload

(claims searched + examined)         1698 1406 3551 0,48 0,40

Table 3. Workload per examiner, 2008

\[
x_9 = 1 - \frac{\text{claims per examiner}}{\max \{\text{claims per examiner}\}} \quad \text{and}
\]

\[
x_9 = 0 \quad \text{if there is no substantive examination,}
\]
\[ \sum_{i=1}^{9} w_i x_i \]

Where \( \sum_{i=1}^{9} w_i = 1 \)

Three alternative weighting schemes are used

- **QUW**: unweighted, \( w = 0.111 \)
- **Q13**: weights from a 1-3 scale, some components are more important than others
- **QBW**: Bilateral weights, bilateral comparison of importance
Table 1. Spearman’s rank correlation of the quality indices (QUW, QW13, QBW)

<table>
<thead>
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<th></th>
<th>QUW</th>
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<th>QW1-3</th>
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<td>0.96</td>
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<td></td>
<td>QUW</td>
<td>QW1-3</td>
<td>QWB</td>
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<td>----------------</td>
<td>------</td>
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<td>------</td>
</tr>
<tr>
<td><strong>High</strong></td>
<td></td>
<td></td>
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<tr>
<td>EPO</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
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<tr>
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<td>80.97</td>
<td>72.97</td>
<td>69.29</td>
</tr>
<tr>
<td>Sweden</td>
<td>72.28</td>
<td>74.36</td>
<td>72.19</td>
</tr>
<tr>
<td>Norway</td>
<td>72.08</td>
<td>74.08</td>
<td>71.90</td>
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<tr>
<td>Denmark</td>
<td>71.90</td>
<td>73.83</td>
<td>71.55</td>
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<tr>
<td>Finland</td>
<td>71.79</td>
<td>73.68</td>
<td>71.19</td>
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<tr>
<td><strong>Medium high</strong></td>
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<td></td>
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<td>67.84</td>
<td>62.40</td>
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<td>61.74</td>
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<tr>
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<td>67.16</td>
<td>60.63</td>
<td>58.90</td>
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<tr>
<td>The Netherlands</td>
<td>65.23</td>
<td>58.71</td>
<td>52.74</td>
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<tr>
<td>France</td>
<td>63.88</td>
<td>56.78</td>
<td>50.04</td>
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<td>61.95</td>
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<td>59.65</td>
<td>58.86</td>
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<td>37.16</td>
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<td>US</td>
<td>17.60</td>
<td>24.99</td>
<td>32.99</td>
</tr>
</tbody>
</table>

**The US reform (2011)**

- $US11^a (medium low)$
  - 38.51
  - 43.37
  - 44.18
- $US11+25%^a (medium low)$
  - 40.74
  - 46.55
  - 48.65
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Unweighted quality index (QUW) and the relative demand for patent rights (claims filed per 000 researchers), 2008
\[ P_i = c + \lambda L_i + \sum_n \delta_n X_{ni} + \varepsilon_i, \]

where \( P \) is the observed demand for patent rights at the national patent office of country \( i \) (\( i = 1, ..., 32 \)),

\( \lambda \) captures the impact of the number of researchers (\( L \)) on the demand for patent rights,

\( c \) is the intercept
\( \varepsilon \) is the error term.

Several factors (\( X \)) are used: fees, strength index, quality
Dependent variable: Number of claims filed in 2008, n=32

<table>
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<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
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<th>(4)</th>
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<td>3.87***</td>
<td>3.95***</td>
<td>2.59***</td>
<td>2.74***</td>
<td>3.97***</td>
</tr>
<tr>
<td></td>
<td>(3.27)</td>
<td>(6.03)</td>
<td>(4.64)</td>
<td>(4.11)</td>
<td>(5.84)</td>
<td>(3.31)</td>
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<td>(-3.01)</td>
<td>-29.62**</td>
<td>(-2.17)</td>
<td>-12.67**</td>
<td>-13.71*</td>
<td>-4.94*</td>
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<td>(-2.29)</td>
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<td>(-1.77)</td>
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<td>USA, China</td>
<td>EPO</td>
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<td>USA, China, EPO</td>
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</tbody>
</table>
Dependent variable: Number of patents filed in 2008/09, n=32
Explanatory variable: quality, relative fees, patent strength

<table>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(7)</th>
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<tr>
<td>Researchers</td>
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<td>3.57***</td>
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<td>-43.12***</td>
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<tr>
<td>FCGDPC²</td>
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<td>(2.15)</td>
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<td>646.88**</td>
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<td>1197.78***</td>
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</table>
Claims filed by non-residents are much more sensitive to fees, quality, and IPI index than claims filed by residents; previous results similar with number of patents

<table>
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<th>Claims filed by non-residents (000s)</th>
<th>Patents filed (000s)</th>
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<td>(6.40) (8.64)</td>
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<td>(-2.85) (-2.97)</td>
<td>(-2.26) (-1.90)</td>
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<td>FCGDPC$^2$</td>
<td>0.52* 0.33</td>
<td>0.87** 0.66**</td>
<td>0.0006* 0.0006*</td>
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<td>(1.87) (1.09)</td>
<td>(2.67) (2.75)</td>
<td>(1.98) (1.71)</td>
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<td>31 31</td>
<td>31 31</td>
<td>32 32</td>
</tr>
</tbody>
</table>

* denotes significance at the 10% level, ** at the 5% level, *** at the 1% level.
Concluding remarks

• **Systemic approach** must be adopted: many interdependent facets form a coherent system; it is not “just” about F2F, Opposition,...
  – Structural (rules) components
  – Strategic/managerial (workload, budget) components

• **EPS provides a higher quality selection service (stringency and transparency)** than the USPTO, JPO is in an intermediate position (implications for **patent counts**).

• The **quality metric** helps explaining **structural differences** (demand for patent rights, or claims in force, both domestic and foreign)

• IPI index (patent friendliness) and fees also affect the patenting behaviour
This paper ‘only’ provides evidence on relative positions; no insight into optimal level:

RQ: Impact on rate of return to R&D; or on innovation?

Lemley (2001)
Rational ignorance?

Or Jefferson’s hesitation?
Three main references


http://econpapers.repec.org/paper/brewpaper/440.htm