The impact of joining the European Patent Convention

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Why this paper?

• Growth in worldwide patenting post 2000
  – Fink et al. (WIPO) – due to increase in multiple filings
  – Several patent offices working on harmonization to reduce workloads
  – One solution is regional patent systems, which can lower cost

• TRIPS encourages all WTO members to operate some kind of patent system
  – encourages growth of regional systems as a cost-saver

• We ask what the consequence of joining a regional patent system is for inventor patenting
European Patent Convention

• Created in 1977 with 7 countries (now 38)
• Single application to the EPO
  – Application designates states in which it may be validated
  – After grant, must be validated in every state in which coverage is desired
  – Enforcement is national (some progress towards a EU-wide court at present)
  – In principle, lower cost than applying at each national office
Accession to the EPO

• **Pre 2000:** Belgium, France, Germany, Luxembourg, Netherlands, Switzerland, UK, Sweden, Italy, Austria, Liechtenstein, Greece, Spain, Denmark, Monaco, Portugal, Ireland, Finland, Cyprus
  – average 2005 GDP = $33.8K

• **2000-2008 (our sample):** Turkey, Bulgaria, Czech Republic, Estonia, Slovakia, Slovenia, Hungary, Romania, Poland, Iceland, Lithuania, Latvia, Malta, Croatia, Norway
  – average 2005 GDP = $18.7K, without Iceland and Norway = $14.6K

• **Post 2008:** FYROM, San Marino, Albania, Serbia
Effects of joining the EPC

• Residents in the country – cheaper to obtain coverage abroad (in Europe)
• Non-resident inventors that already apply to the EPO – cheaper to get coverage in the country
• Full costs difficult to compute.
  – table of fees at the Nat offices around 100 euros for validation, and then 100 euros a year
  – EPO cost substantially higher
  – but there are also legal and translation fees.....
Simple stylized model

\[ V_j = \text{value of patent in country } j, \ j = 0,1,\ldots,J \]

\[ C_j = \text{cost of filing/renewal/legal in country } j \]

\[ \theta = \text{domestic country} \]

If \( V_j - C_j > 0 \); except that may choose EPO if

\[
\sum_{j=1}^{J} V_j - C_{EPO} > \sum_{j=1}^{J} (V_j - C_j) \quad \text{or} \quad \sum_{j=1}^{J} C_j - C_{EPO} > 0
\]

after accession, if value and fees remain unchanged, will patent at EPO if

\[
C_0 + \sum_{j=1}^{J} C_j - C_{EPO} > 0
\]
Implications

• Inventor who only applies to domestic office will not change behavior post accession
• Inventor who applied domestically and at EPO will shift applications to EPO only
• Inventors on the margin who used to apply domestically and to one or two European countries will switch to the EPO
Empirical analysis

• Impact of accession on aggregate patent filings
  – At the EPO
  – At national office
  – By residents in the country
  – By non-residents

• Impact of accession on individual firms in the country
Data

• Patent data from Patstat (October 2011):
  – Applications filed at the EPO, national patent offices, and via the PCT route at WIPO
  – Designation (filed within 6 months of the EPO search report) identifies countries where patent is expected to be validated, but only 44% are actually validated in designated states, so
  – Also collect validation info with a lag, and focus on patents applied for prior to 2008

• Firm data from Amadeus matched manually to patent data by applicant name
  – no data for Turkey
Patent filings by residents in a country
Patent filings at national offices

![Graph showing patent filings at national offices](image)

- **Non-residents**: Black line
- **Residents**: Gray line

Time (by quarter):
- Accession
- September 2012

### Patent Applications (by quarter)
- Applications: 4,000 to 6,000

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**September 2012**

**EPIP - Leuven**
Regression analysis - aggregates

$$\log(p_{it} + 1) = \alpha_i + \delta_t + f(d_{it}, t) + \varepsilon_{it}$$

$i =$ country, $t =$ quarter of the year

$f(d_{it}, t) =$ functions of quarter and accession date:

1. A dummy post-accession
2. A separate trend post-accession
3. A set of year dummies post-accession

924 obs $= 77$ quarters (1990-2009Q1)$*12$ countries
Aggregate results

<table>
<thead>
<tr>
<th></th>
<th>WIPO (PCT) apps by residents</th>
<th>EPO apps by residents</th>
<th>Residents at national offices</th>
<th>Non-residents at national offices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post-accession dummy</td>
<td>0.04 (0.20)</td>
<td>0.18 (0.20)</td>
<td>-0.05 (0.11)</td>
<td>-1.16 (0.32)</td>
</tr>
<tr>
<td>Post-accession trend</td>
<td>0.05 (0.03)</td>
<td>0.04 (0.04)</td>
<td>0.07 (0.04)</td>
<td>-0.14 (0.05)</td>
</tr>
</tbody>
</table>

Standard errors clustered on country.

Results as expected – resident applicant behavior barely changes, while non-resident applications at national offices decline substantially.
Patenting by residents

• Look at behavior of applicant firms in the country
  – domestic firms
  – domestic subsidiaries
  – foreign-owned subsidiaries
Total patent filings by residents

![Graph showing total patent filings by residents over time. The graph includes data points for registered companies, individuals, and institutions.](image-url)
Firm-level analysis

Manufacturing only; 13 countries (exclude Turkey due to lack of firm data)

Compare patent filings at firm-level before & after accession in a given country relative to change observed during the same period in another country that has not yet joined the EPC

\[ p_{ict} \sim f(\alpha_i + \delta_t + \gamma d_{ct} + X_{ict}\beta) \]

\( i = \text{firm}, \ t = \text{time}, \ c = \text{country} \)
\( d_{ct} = 1 \) after a country accedes to the EPC
<table>
<thead>
<tr>
<th>Country</th>
<th>Firms</th>
<th>Patenting pre-accession</th>
<th>Patenting post-accession</th>
<th>Foreign-owned share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>5270</td>
<td>14</td>
<td>32</td>
<td>12.5%</td>
</tr>
<tr>
<td>Croatia*</td>
<td>1337</td>
<td>(27)</td>
<td>na</td>
<td>33.3%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>5619</td>
<td>62</td>
<td>183</td>
<td>26.3%</td>
</tr>
<tr>
<td>Estonia</td>
<td>451</td>
<td>0</td>
<td>1</td>
<td>100.0%</td>
</tr>
<tr>
<td>Hungary</td>
<td>1873</td>
<td>2</td>
<td>25</td>
<td>44.4%</td>
</tr>
<tr>
<td>Iceland</td>
<td>117</td>
<td>1</td>
<td>3</td>
<td>33.3%</td>
</tr>
<tr>
<td>Latvia</td>
<td>232</td>
<td>13</td>
<td>7</td>
<td>12.5%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>221</td>
<td>2</td>
<td>8</td>
<td>10.0%</td>
</tr>
<tr>
<td>Norway*</td>
<td>10906</td>
<td>(438)</td>
<td>na</td>
<td>33.3%</td>
</tr>
<tr>
<td>Poland</td>
<td>8034</td>
<td>192</td>
<td>238</td>
<td>25.8%</td>
</tr>
<tr>
<td>Romania</td>
<td>29163</td>
<td>54</td>
<td>65</td>
<td>86.8%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>766</td>
<td>2</td>
<td>30</td>
<td>9.7%</td>
</tr>
<tr>
<td>Slovenia</td>
<td>1150</td>
<td>34</td>
<td>67</td>
<td>13.2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>65139</td>
<td>376**</td>
<td>659</td>
<td>32.0%</td>
</tr>
</tbody>
</table>

* Joined the EPC in 2008
** Excluding Croatia and Norway
## Firm level estimates

<table>
<thead>
<tr>
<th>Dep var:</th>
<th>Total patent apps</th>
<th>Pat apps at the national office</th>
<th>Pat apps at the EPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>D (post-accession)</td>
<td>-0.13 (0.20)</td>
<td>0.01 (0.20)</td>
<td>1.53 (0.53)</td>
</tr>
<tr>
<td>D (post-accession – foreign owned)</td>
<td>-0.54 (0.26)</td>
<td>-0.71 (0.22)</td>
<td>-0.15 (0.45)</td>
</tr>
<tr>
<td>Log (assets per emp)</td>
<td>0.60 (0.05)</td>
<td>0.54 (0.05)</td>
<td>0.71 (0.09)</td>
</tr>
<tr>
<td>Log (employees)</td>
<td>0.91 (0.04)</td>
<td>0.87 (0.04)</td>
<td>1.03 (0.06)</td>
</tr>
<tr>
<td>D (foreign owned)</td>
<td>0.56 (0.18)</td>
<td>0.44 (0.19)</td>
<td>0.65 (0.46)</td>
</tr>
<tr>
<td>D (subsidiary)</td>
<td>0.44 (0.14)</td>
<td>0.37 (0.16)</td>
<td>0.48 (0.26)</td>
</tr>
</tbody>
</table>

Country and year effects included
Method of estimation: max likelihood on a Poisson model
Standard errors clustered on firm and adjusted for heteroskedasticity
Conclusions

• Post-accession, domestic firms patenting at national offices is unchanged
• Post-accession, foreign-owned firm patenting at natl offices declines substantially
• Post-accession, all firms increase their patenting at the EPO (no difference between foreign & domestic)
• Other variables in the equation as expected:
  – patenting is proportional to firm size
  – is higher in capital-intensive firms
  – is higher in foreign-owned firms
• Including fixed firm effects: mostly insignificant but similar results for post-accession within firm.
Future work

• How were individual and institutional applications affected?
• Can we see any impact on innovation performance?
• What does this have to say about the impact of joining a regional patent system on economic growth in developing countries?