150 Years of Patent Protection

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An Enduring Question

- **"If national patent laws did not exist, it would be difficult to make a conclusive case for introducing them; but the fact that they do exist shifts the burden of proof and it is equally difficult to make a really conclusive case for abolishing them."**
  - Penrose [1950].
- **Similar points made by Mazzolini and Nelson [1998], Jaffe [2000].**

Particularly Urgent Today

- **Debate over LDCs' patent policy:**
  - Commitments in 1993 GATT TRIPs agreement.
  - Continuing debate as deadline approaches.
- **Debate over wisdom of extending patent protection in developed nations:**
  - E.g., business method patents in U.S.
  - Software in Europe.
- **Also, interesting testing ground of theory:**
  - Substantial research into other property rights.

Structure of Paper

- **"Event study" of major patent policy changes in 60 countries over 150 years.**
- **Looks at patterns around 177 shifts:**
  - Domestic patenting in country.
  - Domestic patenting in Great Britain.
    - Use foreign patenting as a control.
- **Look at cross-sectional differences using WLS and IV regressions.**

Related Work

- **"Case studies" of particular events:**
  - Hall and Ham [2001].
  - Kortum and Lerner [1998].
  - Lanjouw and Cockburn [2000].
  - Sakakibara and Branstetter [2001].
- **Cross-sectional analyses of trade, patent protection.**
  - My approach avoids a variety of interpretative issues.

An Additional Benefit

- **Dramatic nature of historical shifts in patent policy:**
  - European anti-patent movement of 1860s:
    - E.g., the Dutch abolition.
  - Patent harmonization movement of first half of 20th century.
  - Anti-patent backlash in LDCs during late 1960s and 1970s.

Theoretical Perspectives

- **Much of economics theory assumes positive relationship between patent strength, innovation, e.g.:**
  - Gilbert and Shapiro [1990].
  - Kamien and Schwartz [1974].
  - Klemperer [1990].
- **Assume that initial innovators' patent does not affect others' incentives.**

Theoretical Perspectives (2)

- **Literature on "sequential innovation" relaxes this assumption:**
  - Scotchmer and Green [1990] and followers.
- **Bessen and Maskin [2000] provide stark illustration:**
  - Only those in product market can do next-generation innovation.
  - Patents may thus radically reduce innovation.

Identifying the Sample

- **60 largest countries by total GDP in 1997:**
  - Include as far back as independent country:
    - Colonies frequently used system of colonial master.
  - Use most significant predecessor when divided:
    - E.g., Prussia, Germany, West Germany, Germany.

Identifying Patent Policy

- **Guides to world patents have been published since early 19th century:**
  - Intended for inventors.
  - Prepared by patent lawyers and agents.
- **Supplemented with patent office publications, research monographs.**

Identifying Patent Policy Changes

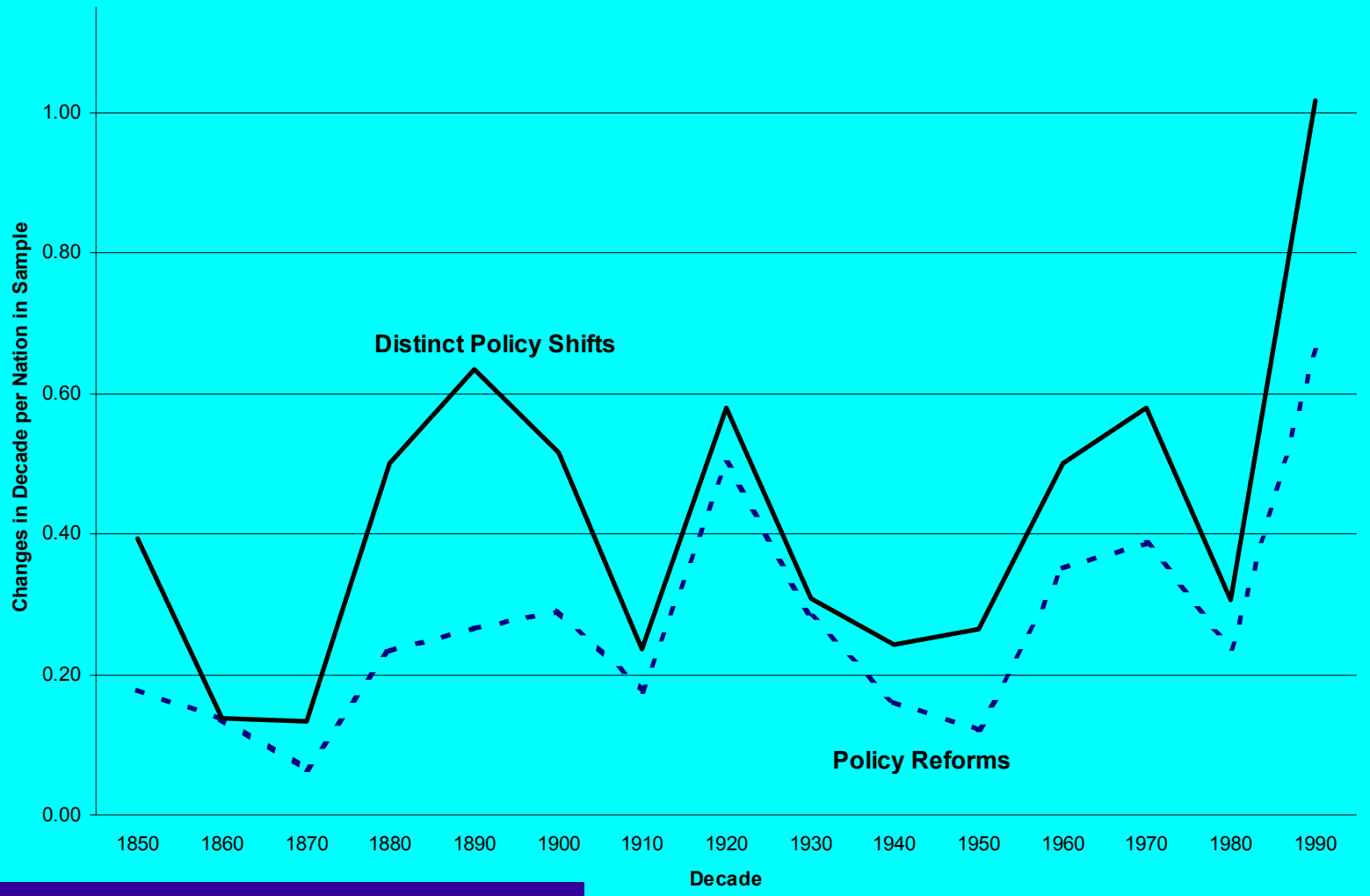
- **Criteria employed:**
  - Focusing on conscious policy shifts:
    - Eliminate changes after formation or revolution.
  - Focusing on events that can be precisely dated.
  - Eliminating on changes to patent breadth:
    - Questions about dependent variables.
  - Eliminating changes happening at same time as discriminatory policies change.

Identifying Patent Policy Changes (2)

- **Criteria employed (continued):**
  - Focusing on substantive shifts:
    - Inception or abolition of protection for all discoveries or important classes.
    - Changes in patent duration.
    - Major changes in patent cost.
    - Changes in "working period."
- **In all, 177 changes in 51 nations.**

Time Sequence

- Many reforms changed several policies.
- Normalized by active nations.
- Five major waves of changes.


Changes in Decade per Nation in Sample
1.00
0.80
0.60
0.40
0.20
0.00
Distinct Policy Shifts
Policy Reforms
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
Decade

Identifying Patenting Around Policy Shifts

- **Patents long used as indicator.**
  - Would ideally use many other measures of innovation as well.
  - Looking only at changes, adjusting by index helps limit the problem.
- **Found in publications of WIPO and national patent offices.**

Gathering Supplemental Information

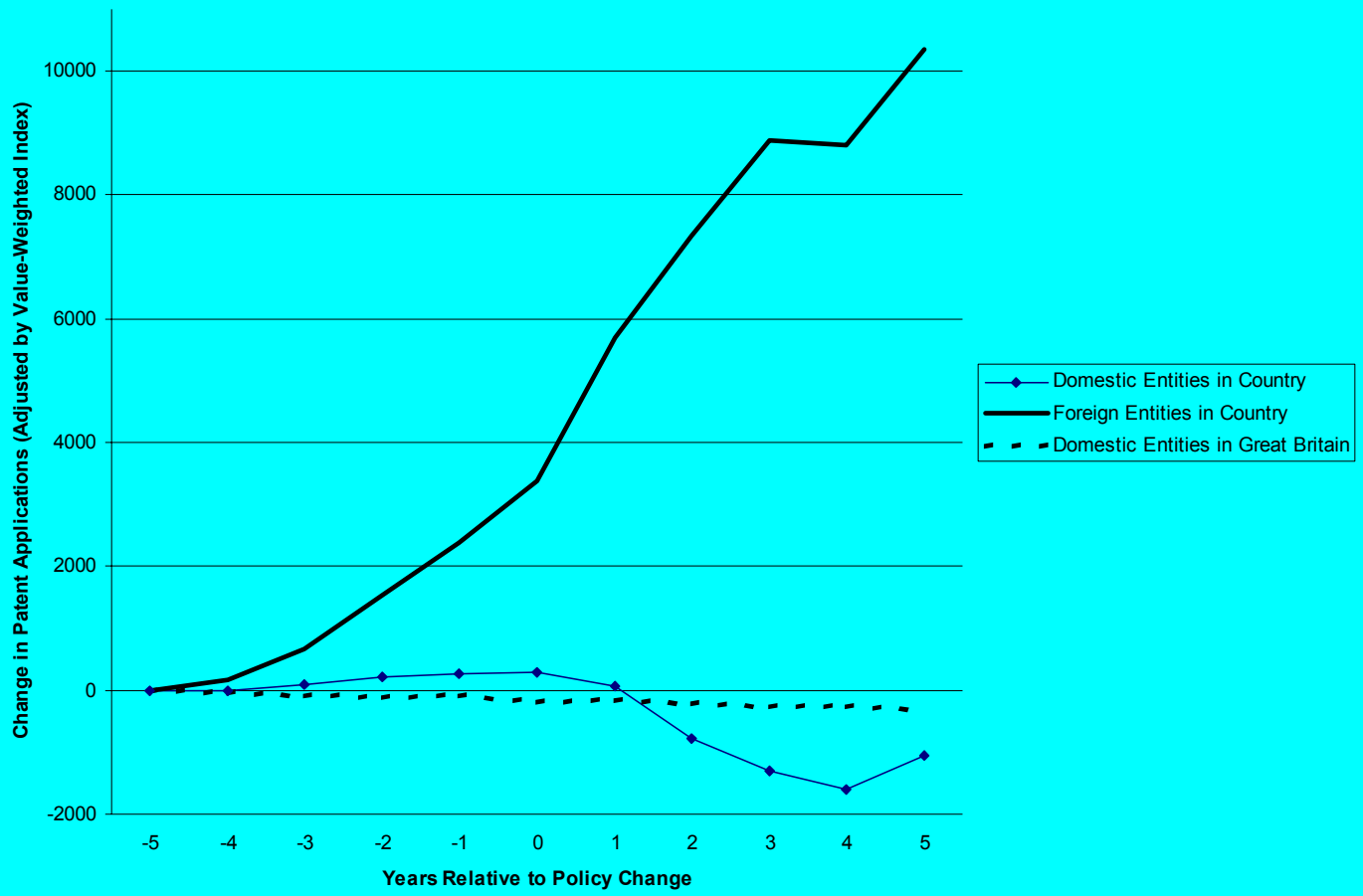
- **Population.**
- **Per capita GDP (PPP adjusted).**
- **Geographic changes, military conflicts in event windows.**
  - Also controls for political system (ruler and legislature) and legal family.
- **Drawn from statistical abstracts, CNTS database.**

Methodology

- **"Event study" approach:**
  - Modeled after finance literature.
- **Look at relative to index:**
  - Computed using 10 nations with longest applications data.
  - Compute equal- and value-weighted indexes.
- **Divide into policy-enhancing (64%) and other changes.**

Figure 2: Patenting around shifts

- **Protection-enhancing changes events have a strongly positive impact on foreign patenting.**
  - Adjusted domestic patenting actually falls!
- **Foreign reaction much weaker for other changes.**


Change in Patent Applications (Adjusted by Value-Weighted Index)
10000
8000
6000
4000
2000
0
-2000
-5
-4
-3
-2
-1
0
1
2
3
4
5
Years Relative to Policy Change
Domestic Entities in Country
Foreign Entities in Country
Domestic Entities in Great Britain

Methodology (2)

- **Need to assess significance.**
- **Finance literature typically weights observations by variability in "estimation period":**
  - I compute the standard deviation of changes in [-20,-5] window.
- **Focus on index-adjusted changes in [-2,+2] window.**

Univariate comparisons

- **For protection-enhancing changes:**
  - Significantly positive for foreign; significantly negative for domestic filings.
  - Also positive foreign change for 2 of 3 most common subclasses of positive changes.
- **No significant differences around other changes.**

Changes in “Raw” Patenting

	U.K.	Domestic	Foreign
Positive Changes	-27	+2424	+8662
Coverage	-63	+2233	+9739
Duration	-80	+2399	+10957
Working	-34	-1081	+3191
Other Changes	+210	+529	+1401

Changes Using Value-Weighted Index

	U.K.	Domestic	Foreign
Positive Changes	-100	-932	+5617
Coverage	-111	+1781	+7963
Duration	-186	-3347	+6690
Working	-27	-1289	+2809
Other Changes	-137	-408	+501

Yellow = .05 sig. level

Regression Analyses

- **Examine cross-sectional patterns:**
  - Does stronger protection have less of an effect when patent policy is initially strong?
  - Does stronger protection have more of an effect when patent policy is initially weak?
  - Does stronger protection have less of an effect when nation trails in per capita GDP?
- **Add interaction terms, controlling for type of change, other events, size.**

Cross-Sectional Predictions

- **Gallini [1992] considers setting where rivals can "invent around."**
  - If patents weak, strengthening patents leads to more innovation.
  - If patents strong, strengthening patents leads to more inventing around, and less innovation.
- **This, other papers predict "inverted U" relationship between patent strength, innovation.**

Cross-Sectional Predictions (2)

- **Nordhaus [1969] argued that impact of patents depends on cost of R&D:**
  - When R&D cost function highly curved, weaker patents desirable
  - Suggests will be case in developing nations.
- **Argument confirmed in a number of two-country models:**
  - E.g., Chin and Grossman [1990], Deardoff [1992], Helpman [1993].

Regression Analysis of Domestic Patenting in U.K.

- **Two interaction terms significant:**
  - Enhanced protection matters less when strong protection already.
  - Enhanced protection matters less for less developed countries:
    - A positive change leads to 636 additional British applications for nation who is 75% of wealthiest.
    - No additional British applications for nation at 25% of wealthiest.

Exploring Robustness

- **Use of different indexes:**
  - E.g., only using nations with <75% of per capita GDP of leading country.
- **Longer event windows.**
- **Other definitions of strong or weak patent regimes.**
- **Dummy variables for counties and time periods.**
- **“Heckit” sample selection regressions.**

Concerns about Causality

- **Nations choose policy changes: timing is not be exogenous.**
- **Address through instrumental variable for positive change dummy:**
  - Dummy denoting if change was in aftermath of Paris Convention of 1883 or TRIPs agreement.
  - Much more likely to be positive here, less likely to be endogenous.

Table 4: IV regressions

- **Results continue to hold when use instrument:**
  - Little pattern in domestic patenting regressions.
  - Interaction terms continue to be significant in British patenting regression.

Wrapping Up

- **Need for caution in interpretation:**
  - Would like to look at other policy changes:
    - Did other forms of IP protection, enforcement change at same time?
  - Would like to measure innovation in other ways as well.
  - Would like to look at consequences on FDI and other shifts.

Wrapping Up (2)

- **But findings at least raise questions about U.S. push for strong patent protection in developing countries:**
  - Little immediate impact on domestic patenting.
  - Particularly weak gains in poorest countries.
- **Claims that will boost innovation by LDCs seem especially problematic.**