# The value of software-related patents in the European Patent System

Salvatore Torrisi

Department of Management, Università di Bologna and CESPRI-Bocconi
torrisi@unibo.it

EUPACO, What Future for the European Patent System? 15&15 May 2007

# goals

- What is the value of EPO patents?
- How to find "software-related" patents in the EPO dataset?
- what is the value of "software-related" patents in Europe?

# Research

- This presentation is based on Thoma and Torrisi ( 2006) and Hall-Thoma-Torrisi (2006)
- See www.cespri.unibocconi.it/working papers
- Research framework: "Study of the effects of allowing patent claims for computer-implemented inventions" sponsored by the European Commission
- Disclaimers: The opinions expressed are those of the speaker and do not necessarily reflect in any way opinions of the European Commission or any of the partners

# Motivations

- Traditionally, patents are a weak instrument to protect innovation in many sectors (Cohen, Nelson and Walsh, 2000)
- … why, then, so many patents around?
- Increased tech opportunities? Stronger enforceability? Lower barriers to patent?
- What is their value to the owners?

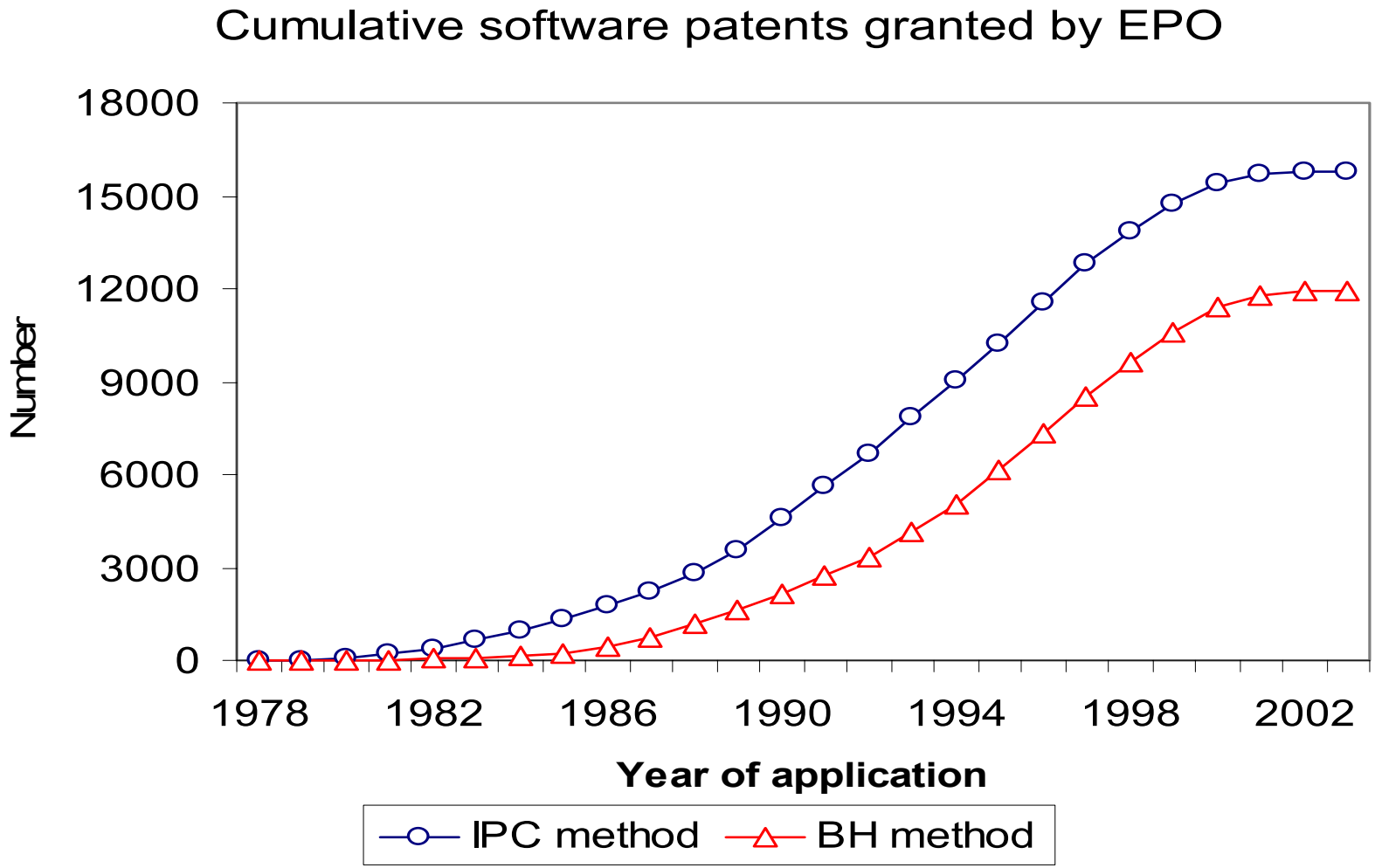
# Motivations

- What about “software” patents?
- EPC (art. 52): computer programs “as such” not patentable but …EC has been considering standards for “computer implemented inventions”

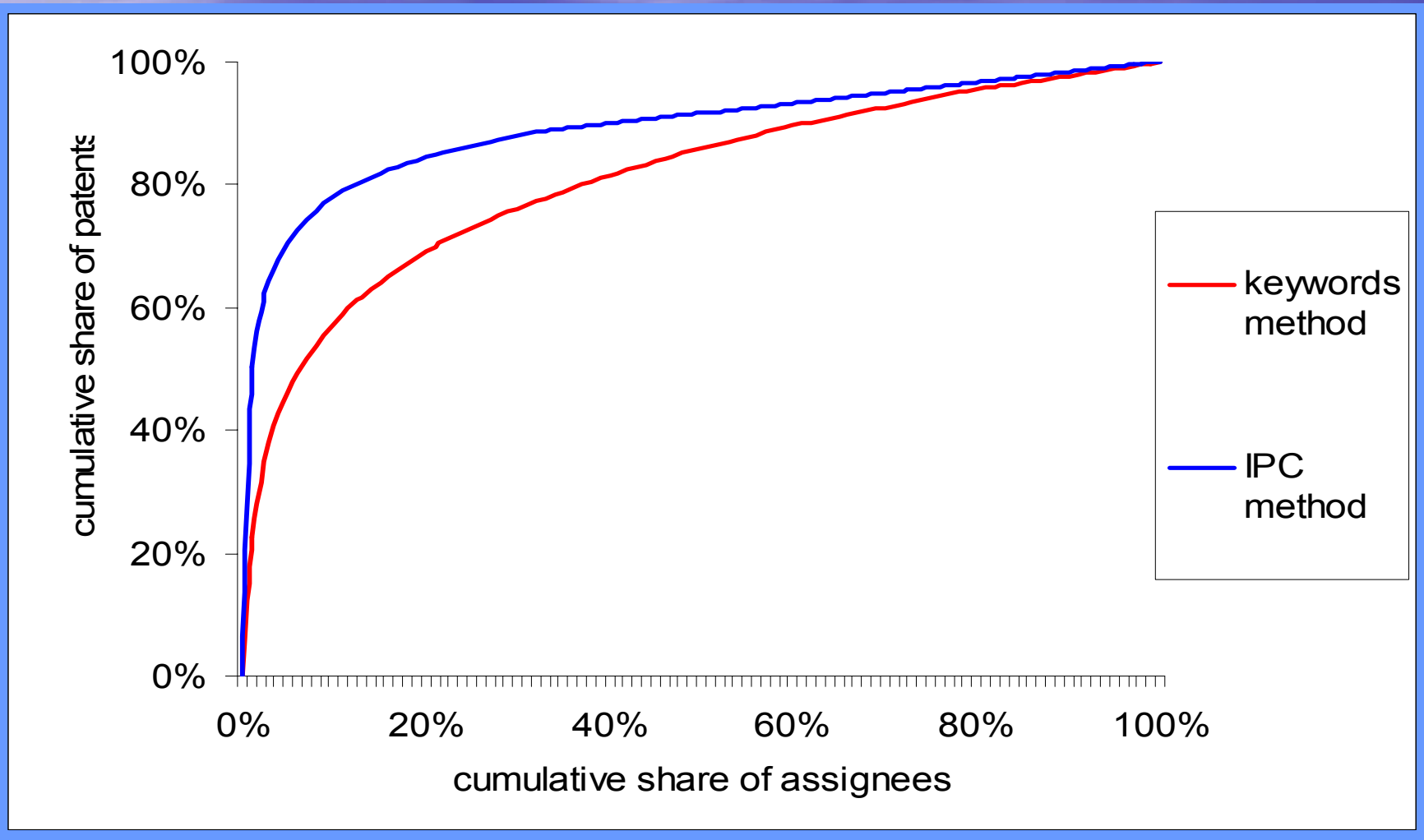
# 1. How to find "software" patents?

1. Keywords method (Bessen-Hunt 2004)
   - Search for ((software) OR (computer AND program)) AND NOT (chip OR semiconductor OR bus OR circuit OR circuitry <in> TI) AND NOT (antigen OR antigenic OR chromatogra phy) in the patent document (title and full text)
2. Patent class method (Graham-Mowery, Hall-MacGarvie)
   - IPC classes in the patent portfolios of the world's largest specialized software firms
   - $\Rightarrow$ 3,518 classes-subclasses (117 if only the main IPC codes in each patent are considered).
3. Hall,Thoma and Torrisi (2006): a combination of these two methods

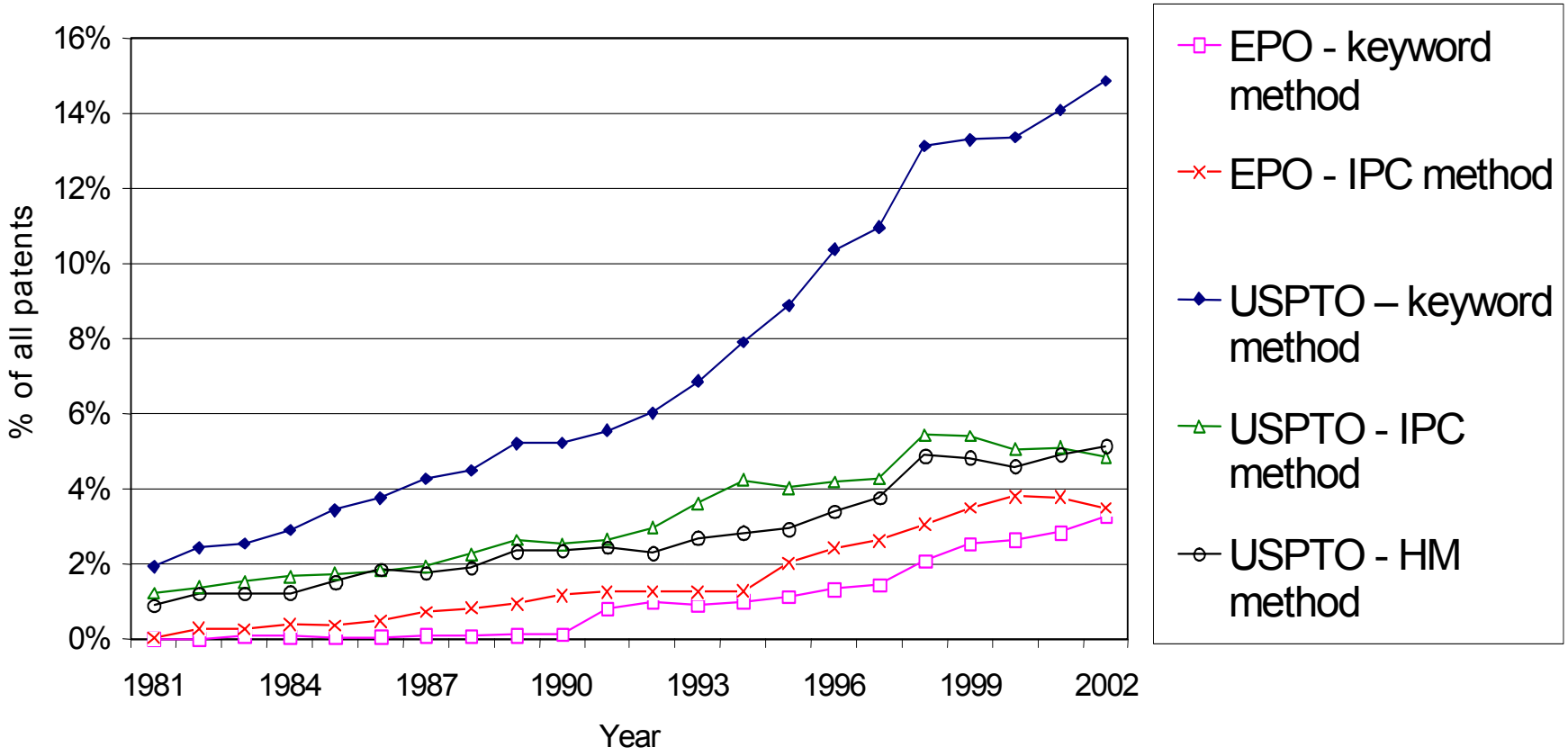
# Cumulative number of "*software*" patents granted by the EPO by year of application



# Concentration of "software" patents



# "software" patents as a share of all patents: USPTO vs. EPO



# 2. What is the value of 'software-related' patents in Europe?

- Publicly-traded firms from 17 European countries (1984-2002)
- Data sources:
  - EPO PATSTAT, Delphion
  - Bureau van Djik's Amadeus, Hoovers, D&B's WOW, Thomson Financial's Datastream

# Estimating the economic value of patents

- The sample: 572 firms in 5 countries, 3,555 obs, 1985-2005 (Hall, Thoma and Torrisi, 2006)
- This presentation: a larger sample - 1,046 firms, 5,444 obs from 16 countries
- Our dependent variable:
  - Tobin's q = Market value (M)/tangible assets (A)
- main explanatory variables:
  - R&D stock/A
  - Pat stock/R&D
  - SWPat stock/R&D stock
  - Quality: cites and Lanjouw & Schankerman 'composite' index: forward cites, family size, No. 8-digit IPC classes

Table

Log Q regressions 1984-2002

(5444 observations, 1,046 firms, 17 countries)

Nonlinear least squares (robust s.e.s)

| Variable | model 5 | | | model 6 | | | model 7 | | | model 8 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R&D stock/assets | 0.762 | (0.079) | *** | 0.785 | (0.094) | *** | 0.669 | (0.066) | *** | 0.634 | (0.068) | *** |
| Pat stock/R&D stock | 0.153 | (0.034) | *** | 0.152 | (0.038) | *** | 0.131 | (0.029) | *** | 0.116 | (0.029) | *** |
| D (no patents) | 0.174 | (0.054) | *** | 0.171 | (0.056) | *** | -0.013 | (0.038) | | -0.010 | (0.036) | |
| SW pat stock/R&D stock | | | | 0.169 | (0.499) | | | | | 0.221 | (0.522) | |
| D (no sw patents) | | | | 0.051 | (0.055) | | | | | -0.045 | (0.032) | |
| Cit stock/Pat stock | 0.041 | (0.008) | *** | 0.039 | (0.008) | *** | | | | | | |
| SW cit stock/ SW pat stock | | | | 0.013 | (0.006) | ** | | | | | | |
| Index stock/Pat stock | | | | | | | 0.313 | (0.062) | *** | 0.310 | (0.061) | *** |
| SW index stock/ SW pat stock | | | | | | | | | | -0.072 | (0.058) | |
| log (sales) | 0.022 | (0.010) | ** | 0.021 | (0.012) | * | 0.020 | (0.008) | ** | 0.016 | (0.009) | *** |
| D (sales missing) | 5.873 | (1.579) | *** | 6.138 | (1.703) | *** | 5.169 | (1.313) | *** | 4.907 | (1.268) | *** |
| Adjusted r-squared | 0.268 | | | 0.264 | | | 0.264 | | | 0.265 | | |
| Standard error | 0.719 | | | 0.738 | | | 0.721 | | | 0.721 | | |

Elasticities from nonlinear least squares

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R&D stock/assets | 0.425 | (0.054) | | 0.438 | (0.062) | | 0.323 | (0.040) | | 0.314 | (0.042) | |
| Pat stock/R&D stock | 0.085 | (0.019) | | 0.085 | (0.022) | | 0.063 | (0.014) | | 0.057 | (0.015) | |
| SW pat stock/R&D stock | | | | 0.095 | (0.279) | | | | | 0.109 | (0.259) | |
| Cit stock/Pat stock | 0.022 | (0.004) | | 0.022 | (0.005) | | | | | | | |
| SW cit stock/ SW pat stock | | | | 0.007 | (0.003) | | | | | | | |
| Index stock/Pat stock | | | | | | | 0.169 | (0.035) | | 0.173 | (0.037) | |
| SW index stock/ SW pat stock | | | | | | | | | | -0.040 | (0.033) | |

All equations include country dummies, year dummies, and sector dummies.

# Main results

| variable | Effect on M/A | comment |
|---|---|---|
| R&D stock/A | ++ + | < than in USPTO |
| Pat stock/RDstk | + + | > than in USPTO |
| Cites/Pat stock | + | ≠ from US |
| Swpatstk/RDstk | Not significant | H-M (2006):+/sign |
| Cites/Swpatstk | Not significant | H-M (2006): sign. x specialised sw firms |
| LS composite index (software) | ++ (software: not sign) | Total patents: similar to LS(2004) on US data |

# Conclusions (1)

- EPO patents worth more to European firms than US patents to US firms
- But citation-weighted EPO patents worth less than citation-weighted US patents.
- Why?
  - Are EPO patents different? Are European firms different?
  - in the EPO system cites are assigned by examiners … upper bound to the number of citations
- Future research: US patents and EPO patents for the same sample of firms

# Conclusions (2)

- LS index: Investors have information to distinguish patents with a consistent set of characteristics (forward cites, family size and tech fields)

# Conclusions (3)

- Why are software patents not valued by the market? (the private value)
- few observations and high concentration of EPO software pats
- Limited enforceability (normative framework)
- Investors see these as 'strategic' patents in a field with highly cumulative, sequential change $\Rightarrow$ litigations, transaction costs ...

# What about the social value of software patents?

- Sequential, cumulative change
- Relatively large number of claims/patent
- Lack of documented prior art
- IP protection reinforces increasing returns (network externalities)
- The low (private and social?) value of sw patents suggests:
  - reduce the scope of patents (n. of claims)
  - Allow a limited right to reverse engineering
  - More aggressive compulsory licensing
  - …….

# thanks