Inventors and Invention Processes in Europe:
Facts & Implications from the PatVal-EU Survey

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Objectives of this presentation

- Present (briefly) the PatVal-EU questionnaire and how it was conducted
- Discuss its main findings and business/policy implications

Background papers

- Giuri et al. (2007) “Inventors and invention processes in Europe: Results from the PatVal-EU survey”, ***Research Policy****,* October
- Three more papers in the same **Research Policy** issue (October) on 1) Markets for Patents; 2) Inventors; 3) German Inventors’ Compensation Act
- Gambardella, Harhoff, Verspagen (2008) “The Value of European patents”, *European Management Review*, Vol.5 (2).
- Gambardella, Harhoff, Verspagen (2009) “Exploring the Determinants of the Value of European Patents”, draft

The PatVal-EU questionnaire

- EPO patents with priority date 1993-1997 (survey conducted in 2003-4)
- France, Germany, Italy, Netherlands, Spain, UK (later Denmark, Hungary)
- Questionnaire sent to first inventor (if not available: any other inventor)
- Several questions about patent, inventor, invention process, invention characteristics
- 27,000 questionnaires mailed, about 9,000 responses (9550 w/ DK & HU)

Sample vs population

Table 1. The PatVal-EU Survey: targeted number of patents and response rates. Distribution by country.

	GER	SP	FR*	IT	NL	UK	EU6
Number of patents whose inventors were contacted	10,215	815	4,199	1,857	2,594	7,846	27,531
Number of patents whose inventors responded	3,346	269	1,486	1,250	1,124	1542	9,017
Response rate (Responses/Contacts)	32.8%	33.0%	35.4%	67.3%	43.3%	19.7%	32.8%
Country share of patents in the final sample	37.1%	3.0%	16.5%	13.9%	12.5%	17.1%	100%

* The French survey was directed to both inventors and applicant organisations.

- EU6 = 42% of all 93-97 EPO patents & 88% of all EU-15 patents
- Our target (27K patents) more than 50% of population (49K patents)
- Country shares in full population (EPO 93-97):
  - GE 50%; FR 20%; IT 9%; NL 6%; SP 1%; UK 15%

Sample by sectors and type of inventors' employers

Table 2. Composition of the sample by "macro" technological classes and by type of inventors' employers

	Large firms	Medium sized firms	Small firms	Private Research Inst.	Public Research Inst.	University	Other Govt Inst.	Others	Total
Electrical Eng. (15.8%)	79.9%	5.5%	9.1%	0.4%	1.8%	2.9%	0.1%	0.3%	100%
Instruments (10.9%)	60.4%	7.9%	16.7%	3.2%	3.8%	7.0%	0.1%	0.9%	100%
Chemicals & Pharm (18.5%)	81.1%	4.9%	4.9%	0.6%	2.6%	5.7%	0.1%	0.1%	100%
Process Eng. (24.9%)	64.4%	12.3%	17.2%	0.7%	2.2%	2.4%	0.2%	0.6%	100%
Mechanical Eng. (29.8%)	67.8%	10.5%	17.8%	0.2%	1.1%	1.2%	0.2%	1.2%	100%
Total (100%)	70.6%	8.8%	13.7%	0.8%	2.0%	3.2%	0.2%	0.7%	100%

Number of observations = 8,809. The share of patents by technological class (first column) use 9,014 observations.

Source: Giuri, Mariani et al. (2007) Research Policy

Facts & comments (I)

- More than 2/3 of the patents are held by large firms (> 250 employees)
- Have we given too much emphasis on inventions by universities or even smaller firms?

Inventors' motivations (1-5)

Table 4. Inventors' rewards

	GER	SP	FR	IT	NL	UK	Total
Average importance of inventors' rewards							
Monetary rewards	3.0	2.1	3.6	3.0	2.7	3.0	3.1
Career advances and opportunities for new/better jobs	2.7	2.6	3.3	3.1	2.9	3.3	3.0
Prestige/reputation	3.7	3.3	2.9	3.1	3.2	3.7	3.4
Innovations increase performance of the organisation the inventor works for	4.1	4.1	4.1	4.0	4.1	3.9	4.0
Satisfaction to show that something is technically possible	4.0	4.0	3.9	3.9	3.9	4.0	3.9
Benefits in terms of working conditions as a reward by employer	3.0	2.2	1.9	2.8	2.2	2.4	2.6
Share of inventors who received monetary compensation							
% Monetary compensation	61.3%	14.7%	NA*	23.1%	17.5%	28.2%	41.7%
% Permanent	4.6%	3.2%	NA*	5.2%	3.8%	3.2%	4.6%
% Transitory	56.7%	11.5%	NA*	17.9%	13.6%	25.0%	37.1%

Number of observations differs across rows, between 7,360 (monetary compensation) and 8,424 (satisfaction).
* France not included because of too many missing data.

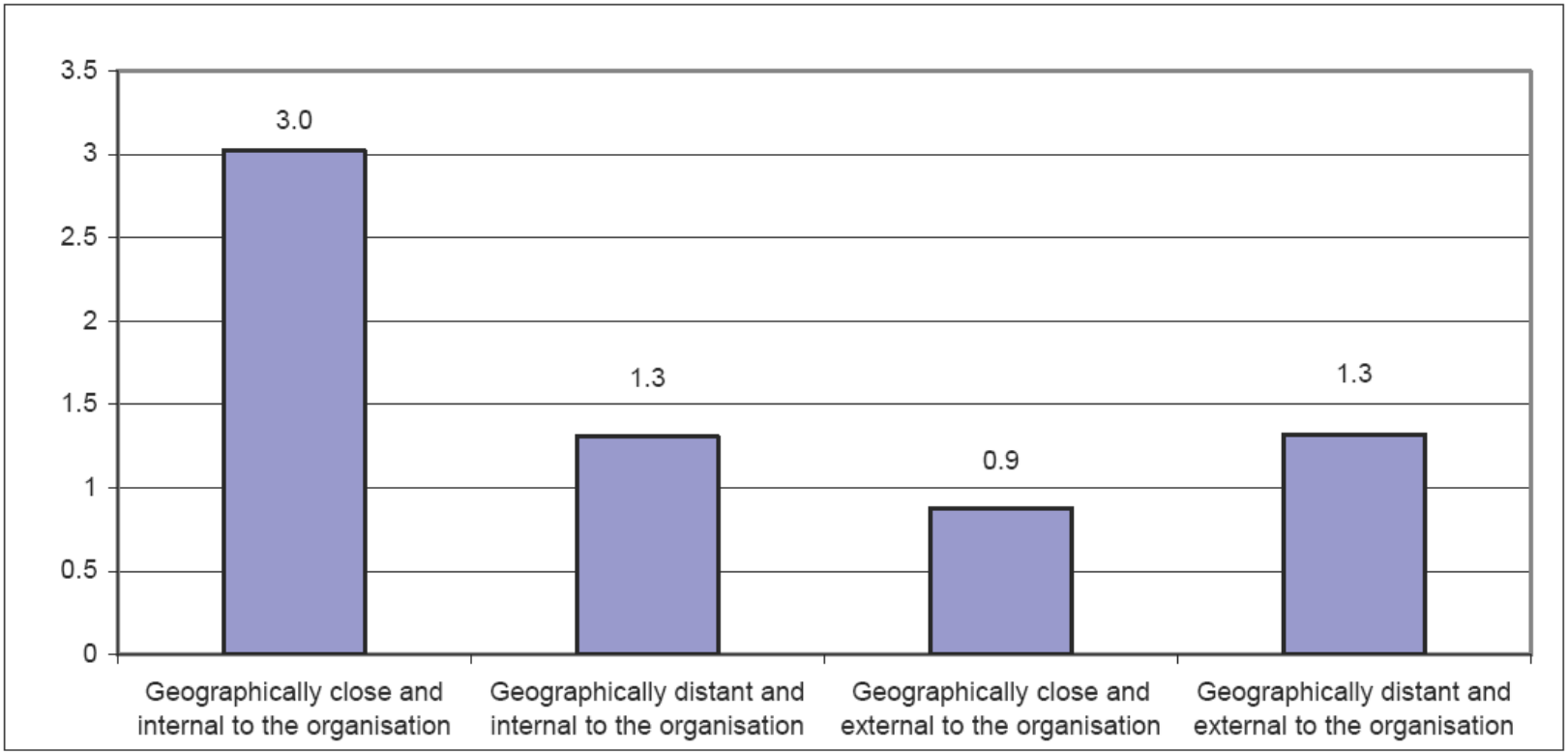
Source: Giuri, Mariani et al. (2007) Research Policy

Facts & comments (II)

- European inventors have ***motivations similar to scientists***
- Policy should preserve this ethos b/c it produces effort and spillovers
- Thinking about policy:
  - A German Inventor Compensation Act?

Geographical & organizational proximity

Figure 1. Importance of geographical and "organisational" proximity of inventors. Scale: 1 (not important) to 5 (very important)



Number of observations = 8,180

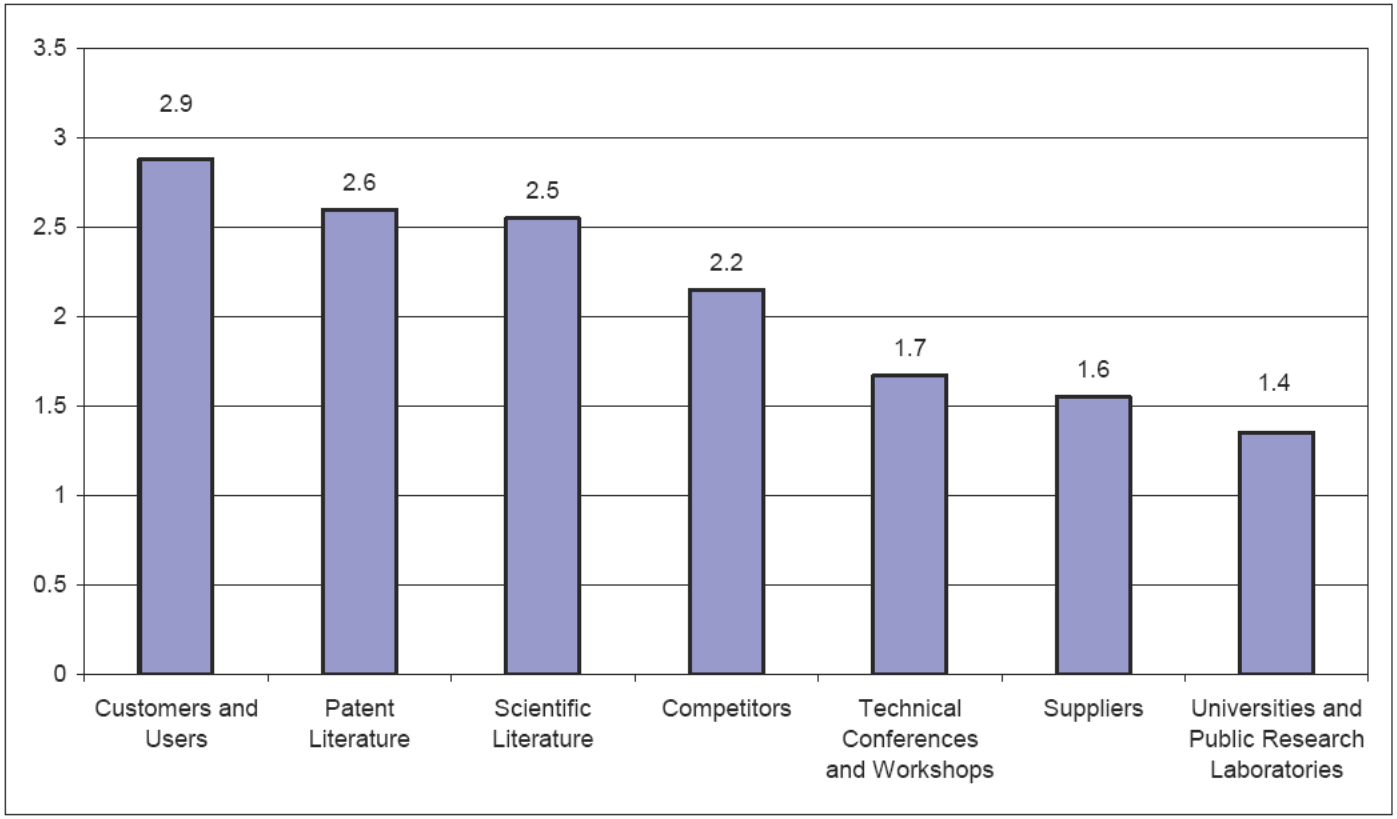
Source: Giuri, Mariani et al. (2007) Research Policy

Facts & comments (III)

- Most interactions within the organization (and location) (80%)
- Next are the “distant” interactions outside the organization (mostly PhDs w/ their int’l networks)
- Too much emphasis on geography vs organization as vehicle for spillovers?
- Policy
  - local spillovers vs local formation of human capital

Sources of knowledge

Figure 2. Average importance of six sources of knowledge used to develop innovation (Scale 1 to 5)



Number of observations = 8,824.

Source: Giuri, Mariani et al. (2007) Research Policy

Facts & comments (IV)

- Customers and users are the most important source of knowledge for patented inventions
- Well known (SAPPHO, Von Hippel)
- Reiterates that innovation policy should also be about demand

Patent uses

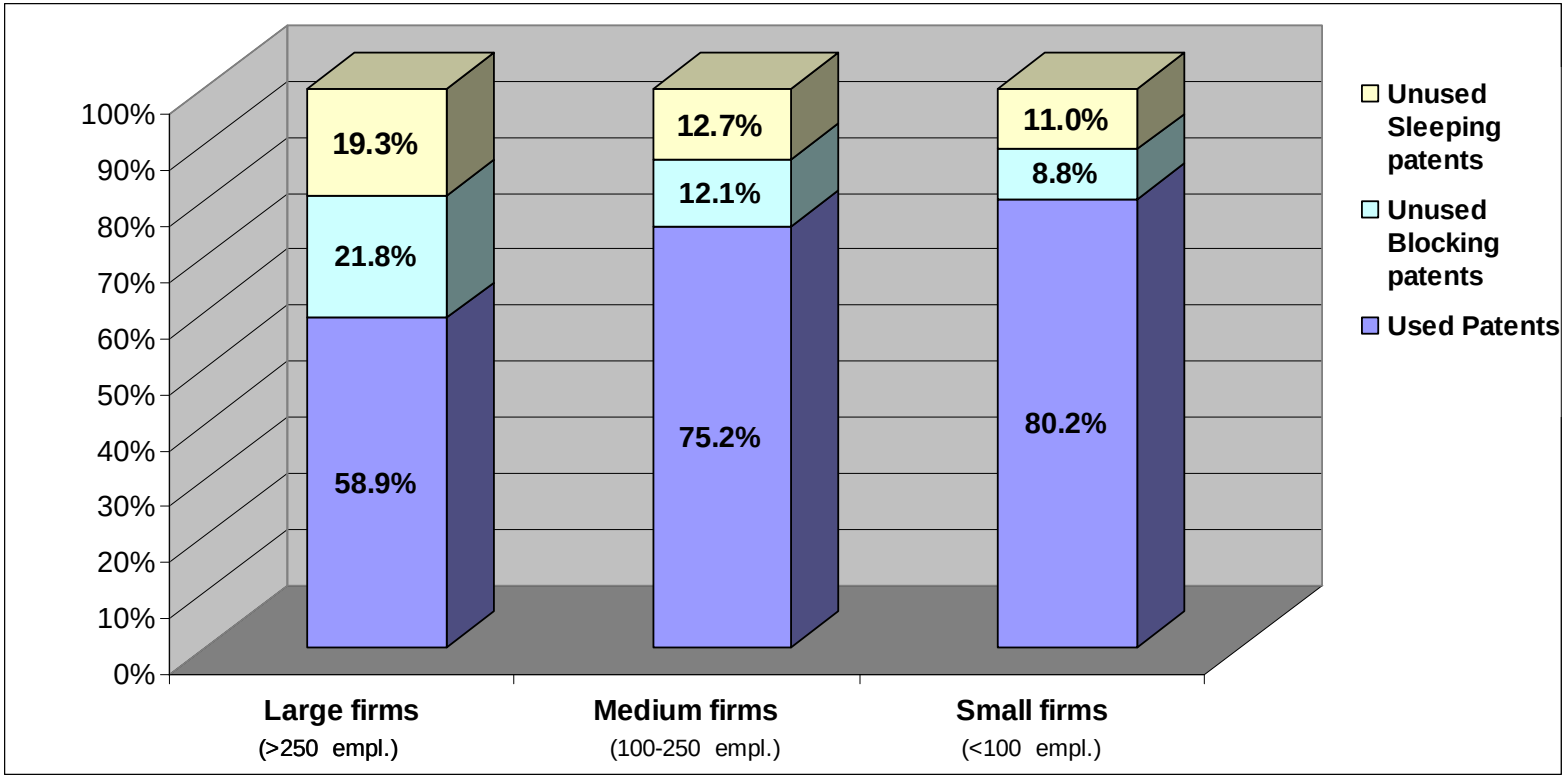
Table 6. Patent use. Distribution by technological class

	Internal use	Licensing	Cross-licensing	Licensing & Use	Blocking Competitors (unused)	Sleeping Patents (unused)	Total
Electrical Engineering	49.2%	3.9%	6.1%	3.6%	18.3%	18.9%	100.0%
Instruments	47.5%	9.1%	4.9%	4.3%	14.4%	19.8%	100.0%
Chemicals & Pharm	37.9%	6.5%	2.6%	2.5%	28.2%	22.3%	100.0%
Process Engineering	54.6%	7.4%	2.0%	4.9%	15.4%	15.7%	100.0%
Mechanical Engineering	56.5%	5.8%	1.8%	4.2%	17.4%	14.3%	100.0%
Total	50.5%	6.4%	3.0%	4.0%	18.7%	17.4%	100.0%

Number of observations = 7,711

Source: Giuri, Mariani et al. (2007) Research Policy

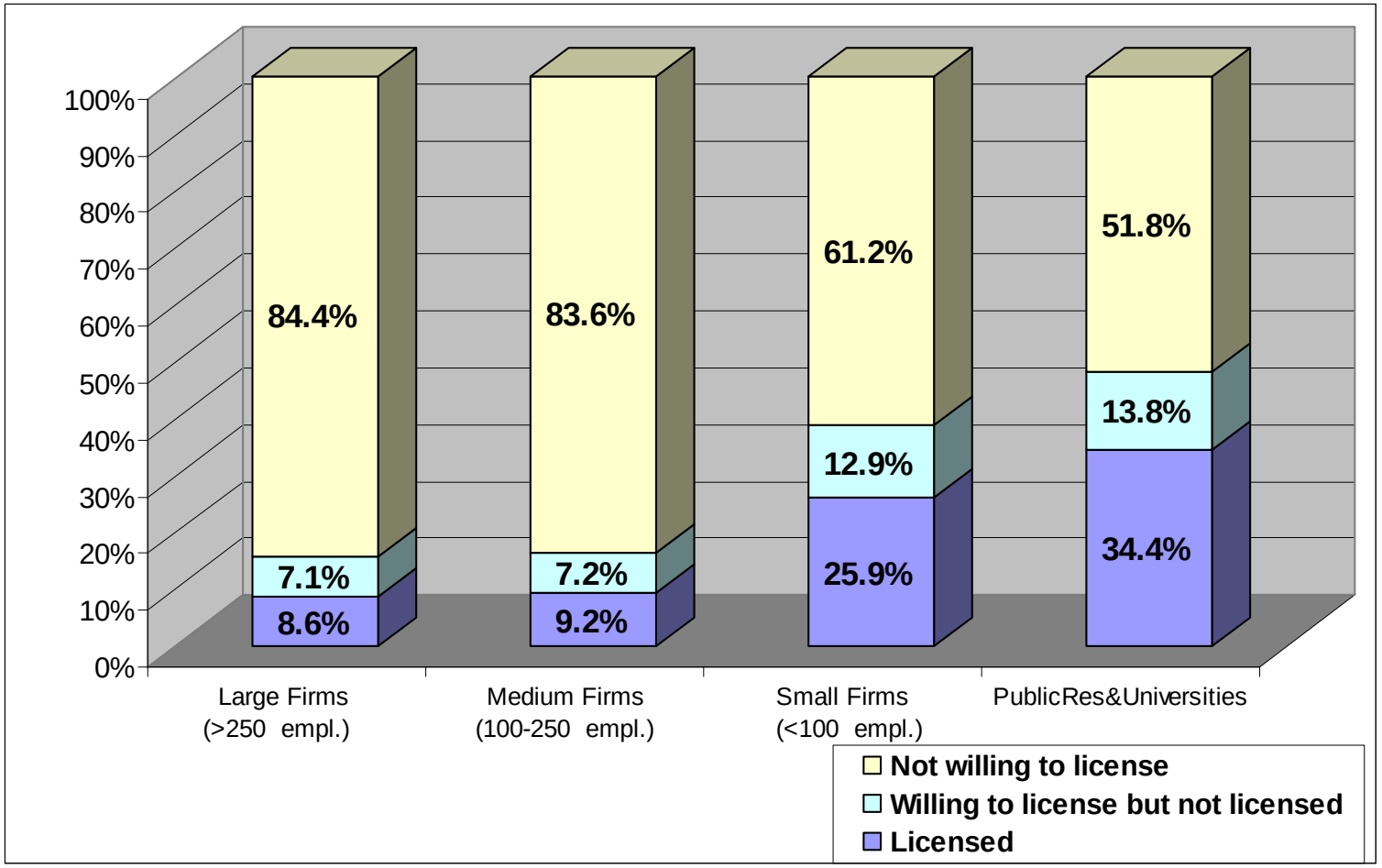
Share of unused patents



SMEs = higher utilization rates;

Large Firms = more blocking and more sleeping patents

Share of licensed patents



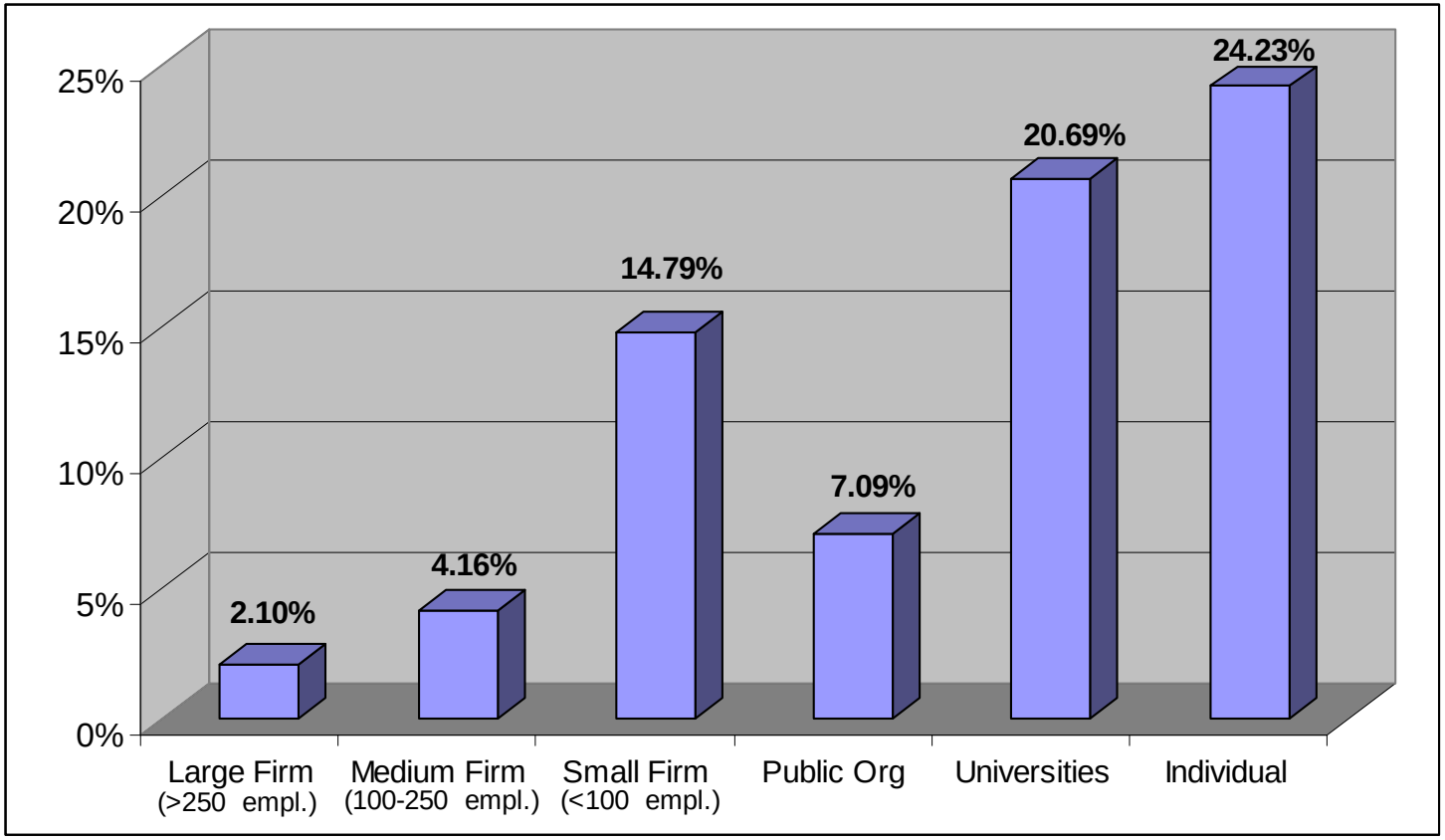
Facts & comments (V)

- Willingness vs Actual Licensing
  - Large firms 16% vs 9%
  - Small firms 37% vs 26%

  *[Gambardella et al. (2007) Markets for Patents in Europe, **Research Policy**, October]*

- Large firms less likely to license even when they want to
  - Fear to buy technology from a serious competitor
  - Large firms not much effort to license
  - Put lower quality patents on the market?
- Large firms = reservoirs of licenseable technologies (policy)

New firms from patents

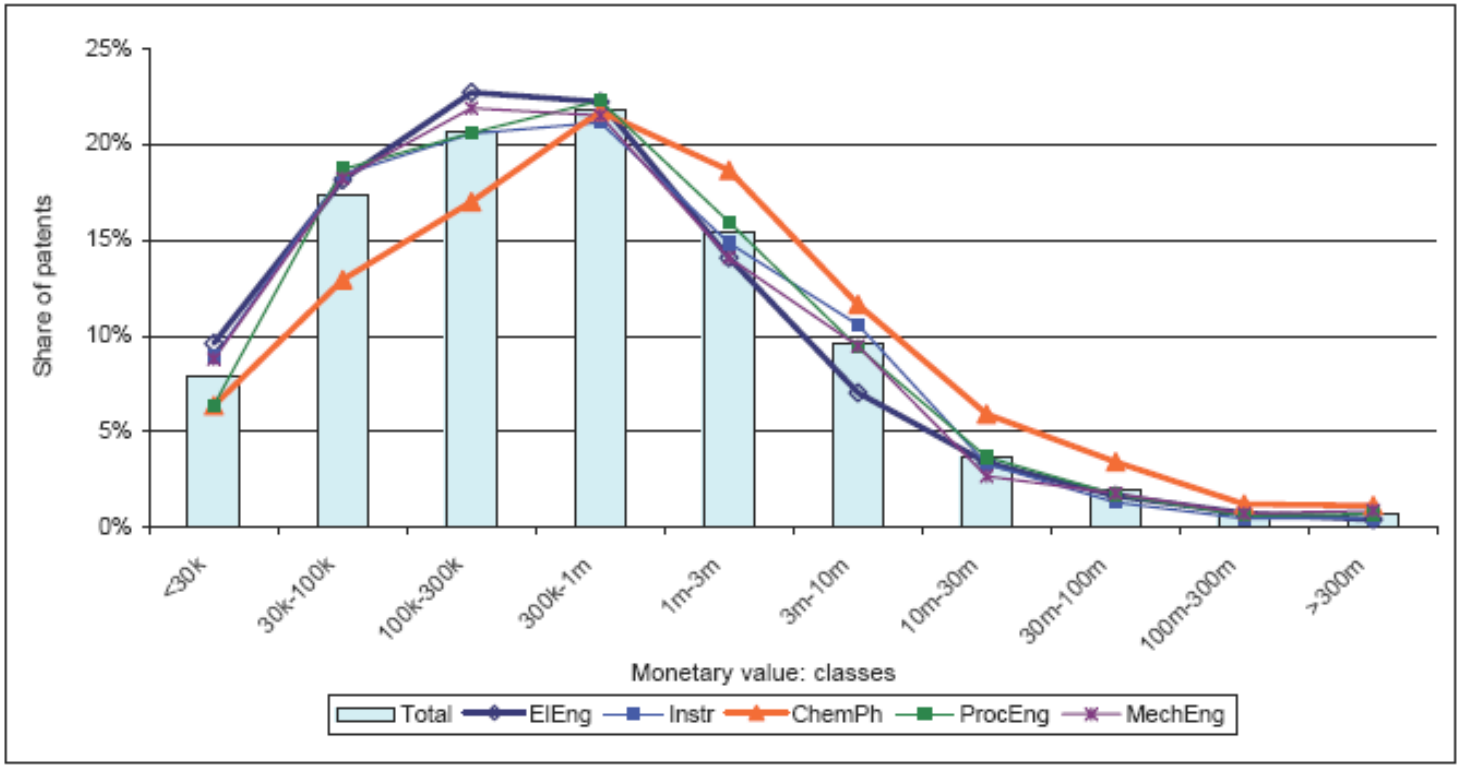


Facts & comments (VI)

- Small firms spawn new firms
- But large firms are also important
  - a small share of many patents can be many new firms
  - large firms spawn new firms when technology is not core but large firm is important in technology

Value of European patents

Figure 4. The value of European patents across macro technological classes



Number of observations = 7,752.

Source: Giuri, Mariani et al. (2007) Research Policy

Value of European patents

- GHV (2007) finds that the key determinants of higher patent values are:
  - R&D investments
  - Talent of the inventors
- However, only 40% of the projects are expected outcomes of targeted R&D
- Rest is by-products (40%) or serendipituous (20%)

Facts & comments (VII)

- The novelty here is that there is no novelty … classical innovation policy:
  - Invest in R&D
  - Invest in Human capital
- Both also useful for by-product and inspiration outcomes (spillovers)

Summary (firms & inventors)

- Fact:
  - 2/3 patents from established firms
- Policy Implication:
  - Large firms matter

- Fact:
  - European inventors exhibit intrinsic motivations
- Policy Implication:
  - Ethos should be preserved (effort, spillovers)

Summary (spillovers & users)

- Fact:
  - Lots of spillovers inside organizations. PhDs tap into their international networks
- Policy Implication:
  - Over-emphasis on geography vs firms? Importance of human capital networks

- Fact:
  - Users still a key source of knowledge for inventions
- Policy Implication:
  - Innovation policy should (also) be about demand

Summary (technology markets)

- Fact:
  - 1/3 European patents not used, higher share in larger firms. Small firms spawn new firms from patents
- Policy Implication:
  - Technology markets increase rate of use of patents … policies for reducing transaction costs
  - Special focus on large firms: unused technologies, which are not licensed

Summary (value of patents)

- Fact:
  - European patents are valuable
  - Value determined by R&D investments and individual human capital
- Policy Implication:
  - Classical policy options: encourage R&D and human capital
  - Moreover, R&D and HK produce spillovers

Thank you

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