

Using Inventors Patent Data
A new approach to the analysis of knowledge
spillovers

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What spillovers are, and why they matter

- ❑ Spillovers as “knowledge externalities”
- ❑ Patents as effective diffusion means
 - ... are they really? A few problems:
 - Geographical reach of spillovers
 - Impact of patenting on academic research

May data on patent inventors help to shed light on such crucial issues of science/technology policy?

Using patent citations to track spillovers: opportunities and problems /1

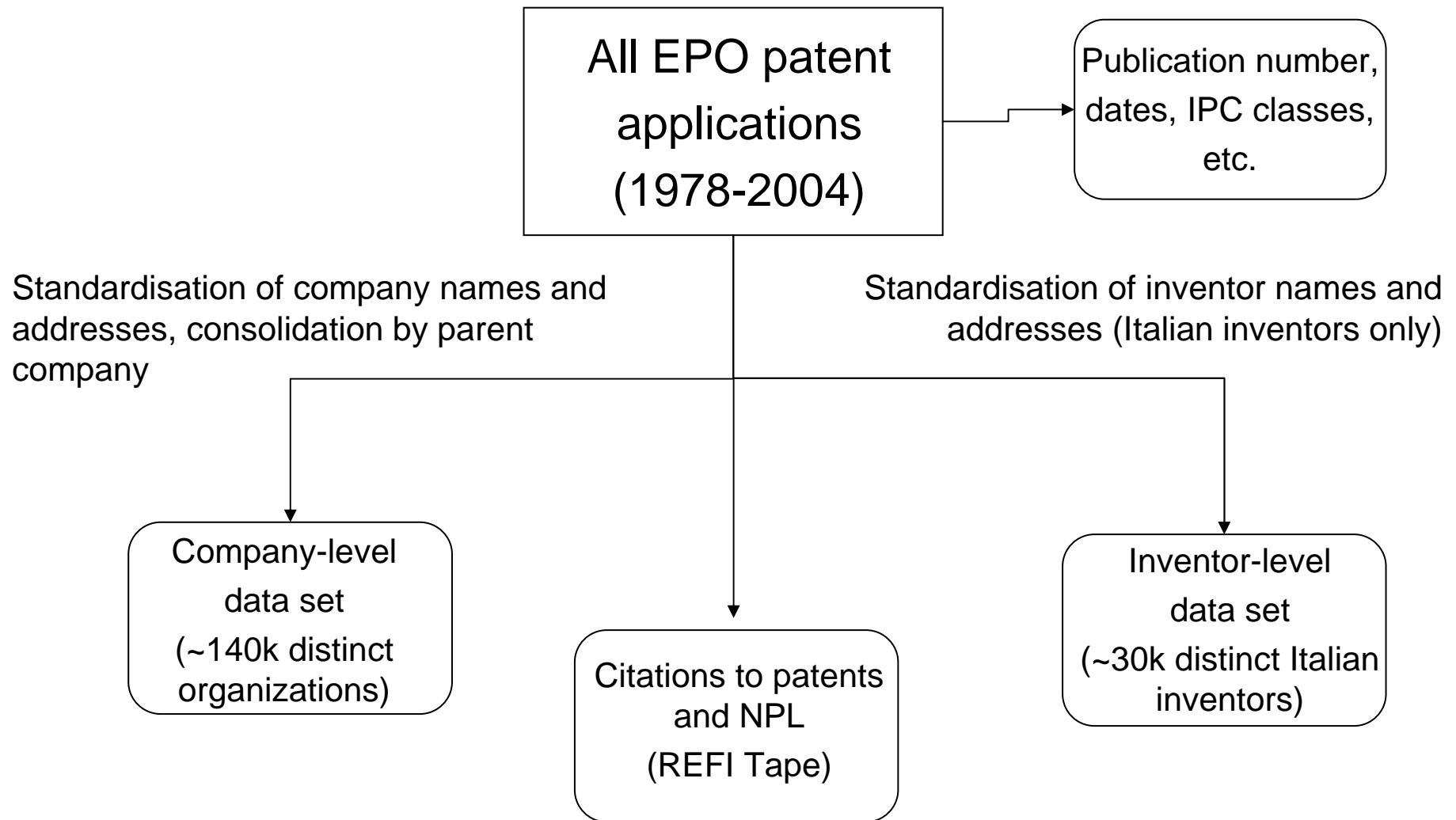
- ❑ Patent citations provide a paper trail of knowledge flows from cited to citing patents
- ❑ Citations added by patent examiners
- ❑ Different citation rules and styles across Patent Offices
 - USPTO: 13 patent cit. – 3 non-patent cit
 - EPO: 4 patent cit. – 1 non-patent cit.
 - PCT: no difference between the offices
- ❑ Examiner fixed effect

Using patent citations to track spillovers: opportunities and problems /2

- ❑ How does knowledge spill over?
 - Direct retrieval from patent databases
 - Direct personal communication
 - Word of mouth processes (social networks)

- ❑ Do citations reflect pure knowledge spillovers?
 - Market vs. non-market channels of knowledge transfer

Description of the EP-Cespri data set



A re-assessment of geographical localisation of knowledge spillovers: the role of social networks

- ❑ Are citing patents likely to come from the same region as the cited patents?

- ❑ JTH-like experiment (Jaffe et al., 1993):
 - Cohort of cited patents
 - All citing patents (excl. company self-citations)
 - For each citing patent a matched sample of “controls” (i.e. non-citing patents)
 - Geographical localisation of patents
 - Social linkage between citing (control) and cited patents

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **84105324.2**

(51) Int. Cl.³: **G 05 F 3/20**

(22) Date of filing: **10.05.84**

(30) Priority: **12.05.83 IT 6753183**

(43) Date of publication of application:
21.11.84 Bulletin 84/47

(64) Designated Contracting States:
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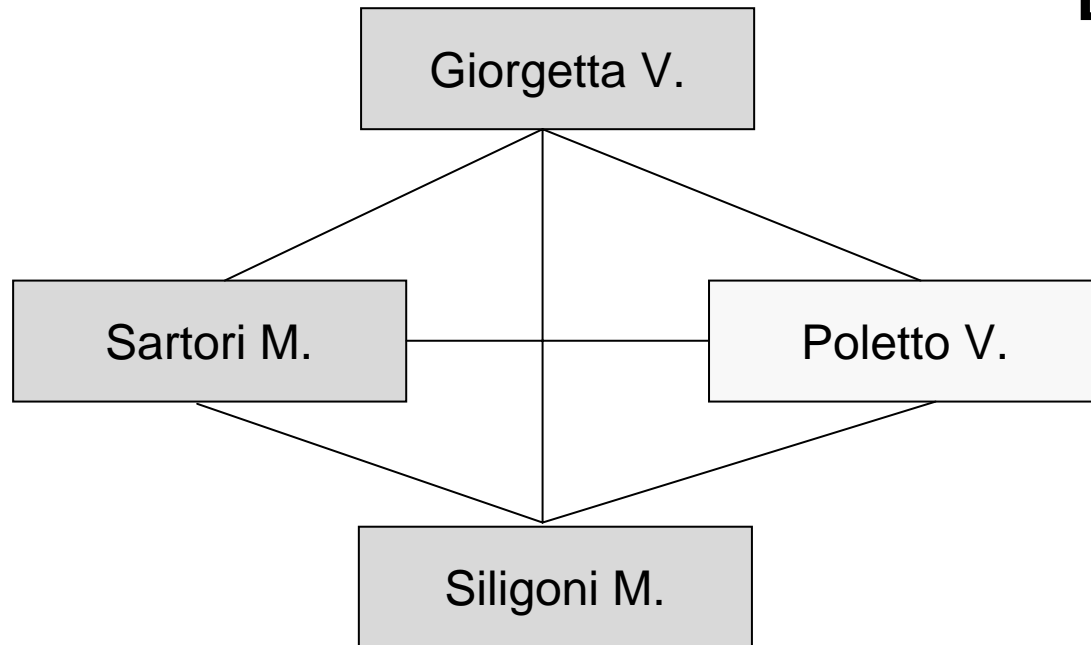
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**Team of patent
EP 125646**





Publication number: **0 501 418 A2**

EUROPEAN PATENT APPLICATION

Application number: **92103172.0**

Int. Cl.⁵: **G05F 1/59**

Date of filing: **25.02.92**

Priority:IT 27.02.1991 TO91A000137.

Priority: **27.02.91**

Date of publication of application:
02.09.92 Bulletin 92/36

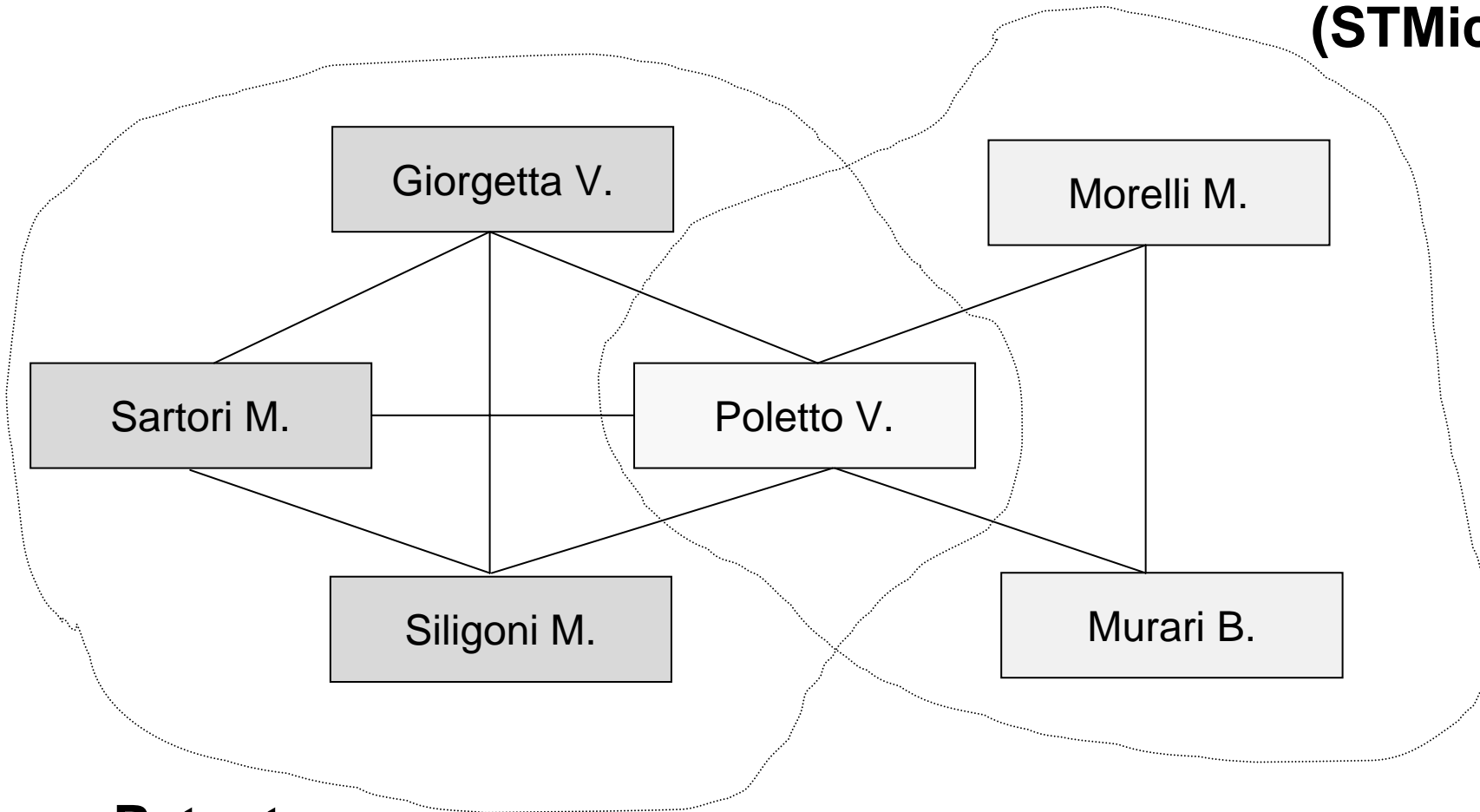
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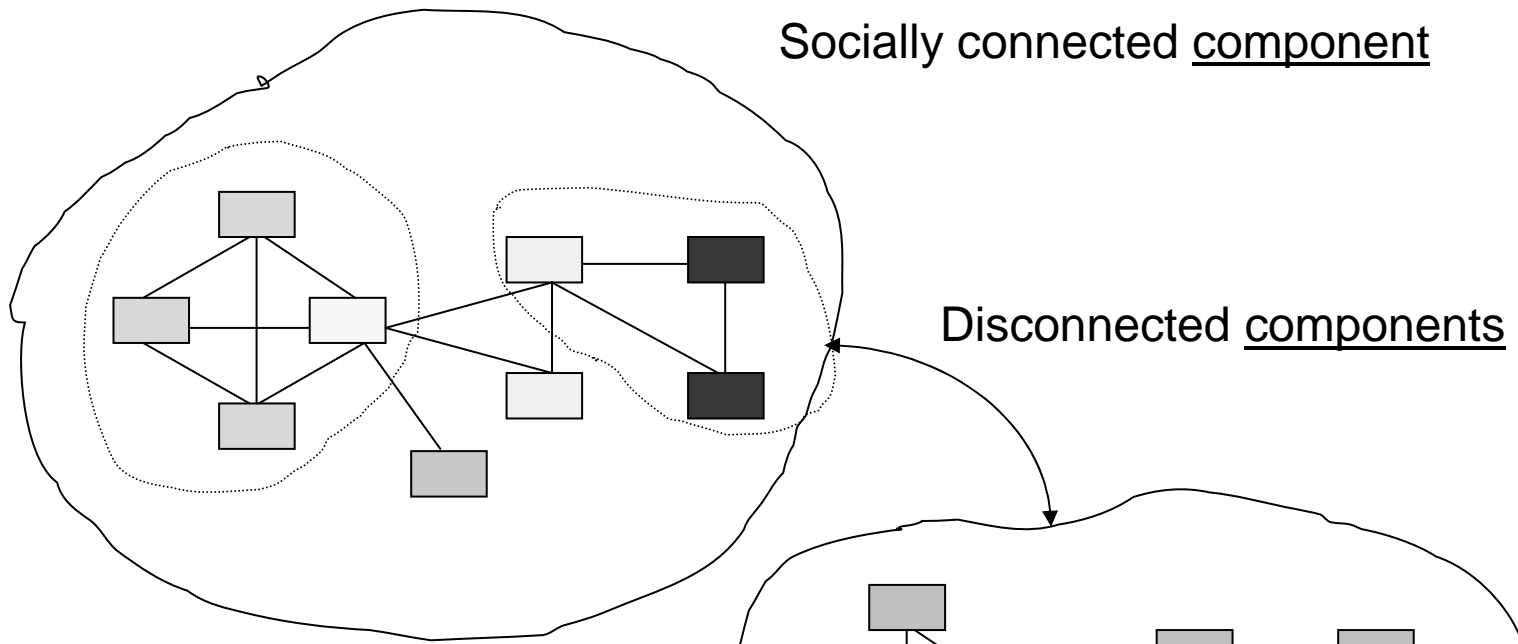
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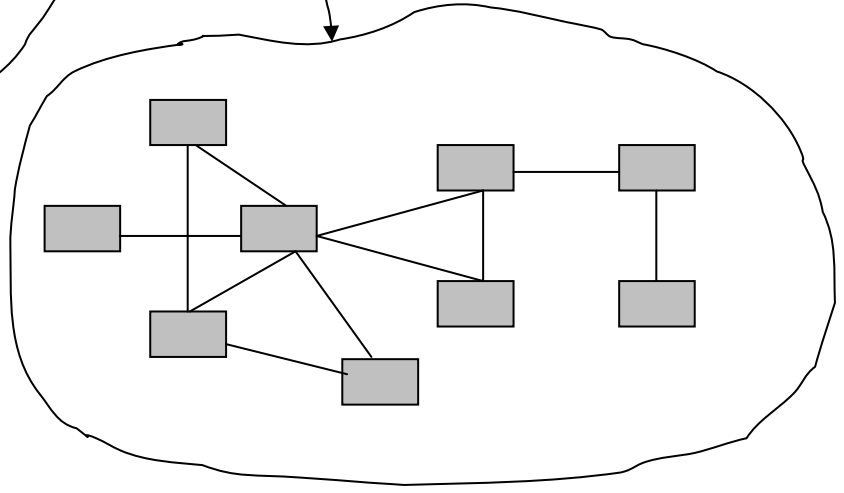
**Patent
EP 501418
(STMicro)**



**Patent
EP 125646
(Telecom Italia)**



Two patents are **socially connected** if their respective inventors are in the same component



Geographical co-location (%)

Co-location level	Co-location %	
	Citing /Cited (# patents)	Control/ Cited (# patents)
City	25.1 (121)	17.4 (84)
Province	38.7 (187)	29.8 (144)

Geographical co-location controlling for social connection (%)

Co-location level	Socially non-connected		Socially connected	
	Citing/ Cited <i>(# patents)</i>	Control/ Cited <i>(# patents)</i>	Citing/ Cited <i>(# patents)</i>	Control/ Cited <i>(# patents)</i>
City	8.8 <i>(31)</i>	10.4 <i>(40)</i>	68.2 <i>(90)</i>	44.4 <i>(44)</i>
Province	22.2 <i>(78)</i>	22.4 <i>(86)</i>	82.6 <i>(109)</i>	58.6 <i>(58)</i>

Intermediate conclusion

- ❑ Spatial proximity *per se* is not enough to benefit from knowledge spillovers
- ❑ Social networks are the drivers of patent citations (knowledge spillovers)
- ❑ Mobility of inventors across companies is the key mechanism that diffuse knowledge

University patents: do they harm or benefit scientific research? /1

- ❑ The debate on Universities as sources of commercial technology
- ❑ Lack of systematic data for Europe, but prevailing view is negative (European Paradox)
- ❑ Key policy issues:
 1. Incentive systems for effective technology transfer (e.g. the professors' privilege)
 2. Patenting-publishing trade-off as a result of conflicting incentives

University patents: do they harm or benefit scientific research? /2

- ❑ Inventors' data as a unique source for tracking not just “university patents”, but all of “academic patents → search by inventor, not just by applicant!!!
- ❑ The surprising results from Italy...



(12) **EUROPEAN PATENT APPLICATION**

(21) Application number: **92830480.7**

(51) Int. Cl.⁵: **H04M 1/00, H04M 1/58, H04B 1/58**

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(43) Date of publication of application:
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(84) Designated Contracting States:
DE FR GB IT

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Company-owned patent signed by an academic researcher


MURST
 Servizio per l'Autonomia Universitaria e gli Studenti

PERSONALE DOCENTE

in collaborazione con **CINECA**
 sito.cineca.it

Personale docente: ricerca di: PAVIA PROFESSORE ORDINARIO CASTELLO*

Fascia	Cognome e nome	Ateneo	Facoltà	S.S.D.
●Po	CASTELLO Rinaldo	PAVIA	INGEGNERIA	ING-INF/01

un nominativo individuato
 ●Po Professori Ordinari ○St Professori Straordinari

Patents signed by academic researchers

- Italy: 27,844 academic researchers on active service in 2000
- 919 academic researchers are also inventors (out of 30,000 inventors)
- 3.3% of all Italian professors are also inventors
- 3.0% of all Italian inventors are academic researchers
- 3.8% of all company-owned Italian patents are signed by academic researchers
- Only 46 patents owned by Italian universities!

Weight of academic inventors' patenting (1978-2000)

	Professors	Professors/ Inventors	% Share of patents
Technology fields			
Chemicals	549	8.5	12.2
<i>Drugs</i>	<i>155</i>	<i>12.2</i>	<i>19.5</i>
<i>Biotechnology</i>	<i>113</i>	<i>12.4</i>	<i>28.4</i>
<i>Organic chemistry</i>	<i>255</i>	<i>9.4</i>	<i>12.1</i>
Consumer goods	21	0.5	0.5
Electronics	101	2.3	3.5
Instruments	179	4.3	6.3
Mechanical engineering	64	0.7	0.6
<i>Nuclear technologies</i>	<i>13</i>	<i>10.5</i>	<i>13.3</i>
Process engineering	123	2.1	2.3
<i>Basic chemistry</i>	<i>33</i>	<i>3.9</i>	<i>4.9</i>
<i>Environmental tech.</i>	<i>36</i>	<i>6.7</i>	<i>8.1</i>
All fields	919	3.0	3.8

Academic patenting by scientific discipline, 1978-2000

	N. of academic inventors	Academic inventors/ all professors
Mechanical bioengineering	22	75.9
Macromolecular materials	51	71.8
Industrial and materials chem.	137	55.5
Terrestrial vehicles	6	54.5
Industrial chemistry	38	50.0
Chemical bioengineering	2	50.0
Applied pharmaceuticals	110	44.5
Nuclear reactors physics	11	39.3
Electronics	137	35.1
Fermentation chem. and biotech	8	32.0
Chemistry	68	28.6
Molecular biology	41	28.5
Telecommunications	67	27.1
Organic chemistry	208	26.6
Biophysics	9	22.5
Pharmaceutical chemistry	99	20.2

Patenting and publishing - Number of publications (1973-2003)

	Academic inventors		Academic non inventors		N
<i>Scientific field</i>	Mean	Median	<i>Mean</i>	<i>Median</i>	
Chemical eng.	51	36	32	26	64
Pharmacology	57	51	44	40	84
Biology	67	52	47	35	78
Electronics	38	37	30	22	73
All fields	54	43	39	32	299

Conclusions

- ❑ Statistics on patent inventors may shed light on some debated issues on knowledge spillovers
- ❑ They have to be linked to other sources of biographical information
- ❑ Future research: mobility of inventors and spillovers, contractual relations between companies and academic researchers