Influenza antiviral agents
Landscaping analysis
IP parameters of technologically promising sectors

Definition of technological sectors

Sectors	Sector definitions
1	Interferones and related products
2	Neutralizing monoclonal therapeutic anti-sera
3	Inhibiting non-immunogenic peptides with known target site
4	Antisense, siRNA and miRNA viral inhibitors
5	Adamantane and cage-like anti-influenza compounds
6	Small molecular antagonists of cap-dependent viral endonuclease
7	Small molecular antagonists of influenza hemoagglutinin (HA)
8	Small molecular antagonists of influenza neuraminidase (NA)
9	Small molecular inhibitors of NS1 influenza matrix protein
10	Small molecular inhibitors, nucleotide analogs
11	Small molecular antagonists of immune hyper-activation ('cytokine storm")
12	Protease inhibitors of apoptosis
13	Protease inhibitors of HA cleavage
14	RAF/MEK/ERK inhibitors and kinase modulators
15	Disruptors of interactions between viral proteins and human counterparts
16	Polyclonal neutralizing anti-sera with the unknown epitopes
17	Antiviral antibiotics of bacterial, fungal, algal and herbal origin
18	Chimeric and attenuated virus, interfering constructs
19	Homeopatic formulations
20	Interleukins as immunomodulators
21	Short peptides with unknown target site
22	Small molecular antagonists with undefined mechanism
23	Herbal and traditional medicines

The major assignees

- The tables in the two slides below present the major assignees (>5 patents) in each sector.
- The assumption is that the presence of diverse assignees supporting numerous patent publications is proportional to sector’s capitalization.

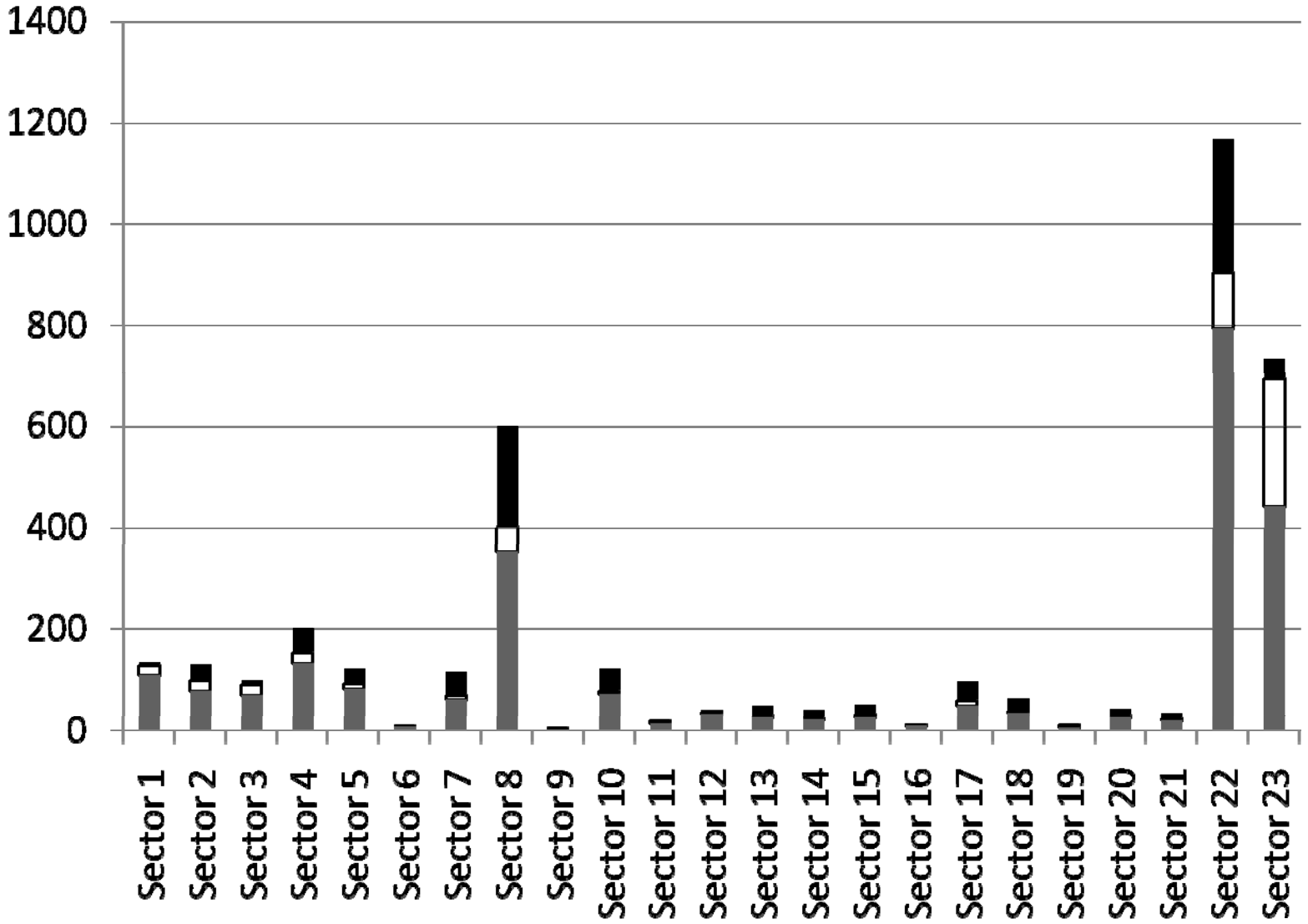
Sectors	Assignees
1	Ares Trading (6), Biogen (20), Petka Biomedical (5)
2	Abbott Labs (13), Crucell Holland (7), Takara Shuzo Co (10)
3	The administrators of Tulane educational fund (9)
4	Intradigm Corporation (11), Europisches, Laboratories Fur Molecular Biologue (9) Massachusetts Institute of Technology (30)
5	Sumitomo Chemical (30)
6	
7	Eli Lilly and Co (36), The Mount Sinai School of Medicine (10)
8	Abbot Labs (23), Biomolecular Research Institute (10), Biota Scientific Management (81), Sankyo Company (64), Synthesome Gesellschaft (10), The Mount Sinai School of Medicine (7), The University of Alabama (11)
9	
10	Meijji Seika Kaisha (7), Pharmasset Limited (11), Southern Research Institute (6), The Wellcome Foundation Limited (18).
11	

Sectors	Assignees
12	Prozymex A.S. (5)
13	Tokyo Tanabe Co (18)
14	Max Planck Gesselschaft (5), Medinnova Gesselschaft (9)
15	Mount Sinai School of Medicine (9), The Mount Sinai Medical Center (10)
16	
17	Bristol Mayers Squibb (11), Ciba Corporation (11), Mitsubishi Chemical Industries (14)
18	The Mount Sinai School of Medicine (16), The University of Warwick (11)
19	
20	Smithkline Beecham (12)
21	SRI International (18)
22	Adinomoto (17), Boehringer (9), Ciba Geigy (5), Daikin Industries (12), Eli Lilly (51), Glaxo Group (17), Eisai Co (5), Imperial Chemical Ind (28), Ku Leuven R@D (5), Les Derives Resiniques (8), Medichem Research Inc (10), Nisshin Flour Milling (9), Recordati (35), Shanghai Institute of Materia Medica (12), Sigma Tau Industrie (15), Sumitomo Chemical (15), Taito Company (10), Techno Network Shikoku (5), Toyama Chemical Company (43), Yeda Research and Development (25),
23	Ciba Geigy (7), Laub Biochemical (13), Livzon Pharmaceutical (6), Suntory Limited (5), Zhu Genxin (5)

The distribution of publications by sectors

- The chart in the slide below displays distribution of patent publications by technological sectors.
- The total number of patents is shown in grey, the number of families is in white and the number of individual patents to the major corporate assignees is in black.
- The sector 23 appears to be the least capitalized per a publication, the sector 8 appears to be the most capitalized.

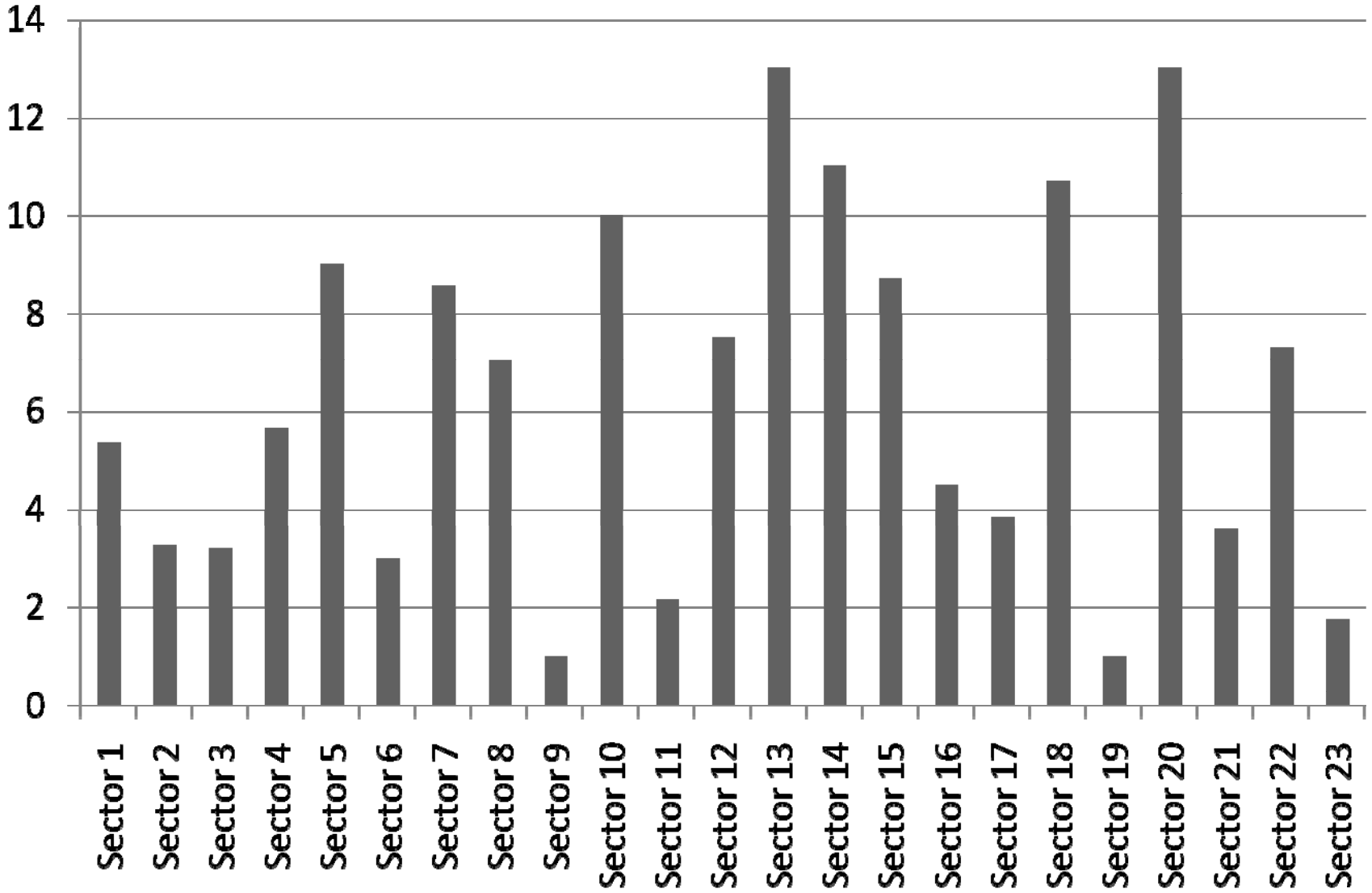
The distribution of publications by sectors



Number of patents per a family

- The chart in the slide below displays distribution of patent publications by technological sectors.
- The chart presents the relative family sizes (the number of publications in the sector vs. the number of families in the sector).
- Likely to correlate with the willingness of an assignee to invest in the protection of the IP.

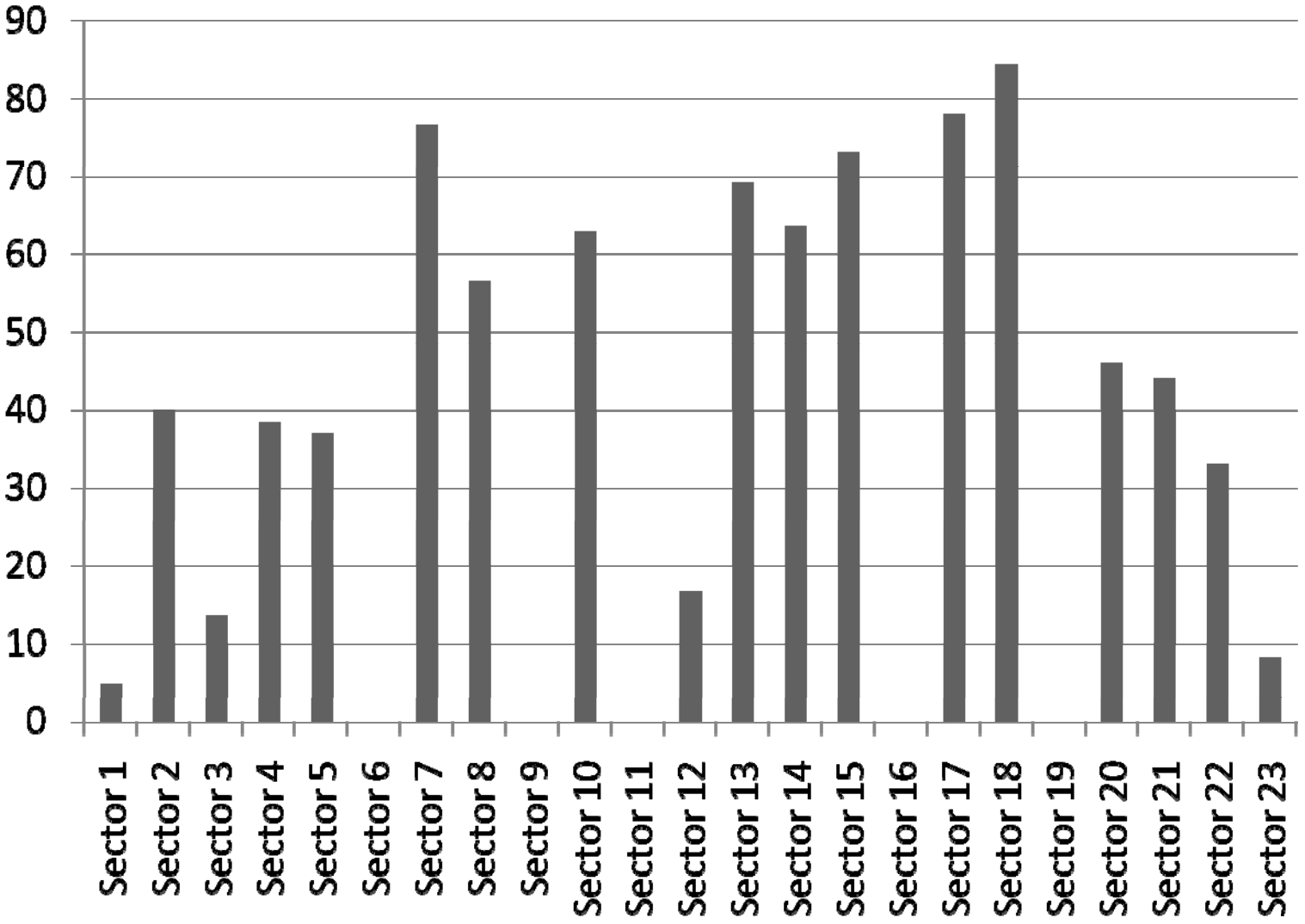
Number of patents per a family



The ratio of publications to Big Pharma, LAIC %

- The chart presents the ratios of publications assigned to large scale assignees to the total number in a sector.
- Measures the interest of Big Pharma to the sector.
- Likely to correlate with capitalization and the diversified expertise required for a successful market entry.

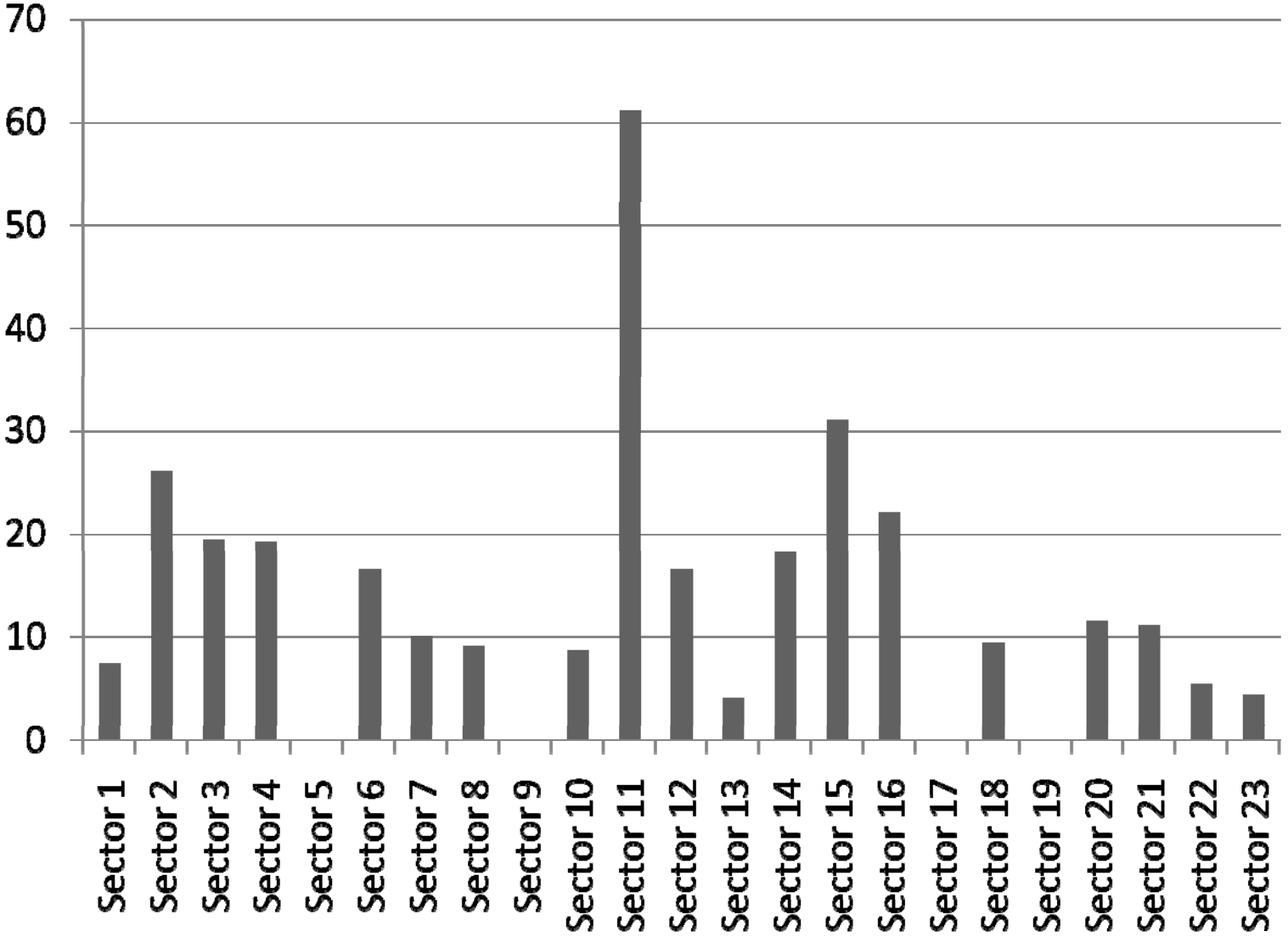
Fractions of the publications by Big Pharma, LAIC , in %



The ratio of PCT publications to the total, WIPOC in %.

- The chart presents the ratios of PCT publications to the total number in a sector.
- Measures the interest of large scale investors to the sector.
- Likely to correlate with capitalization and the willingness to take a risk in the sector.

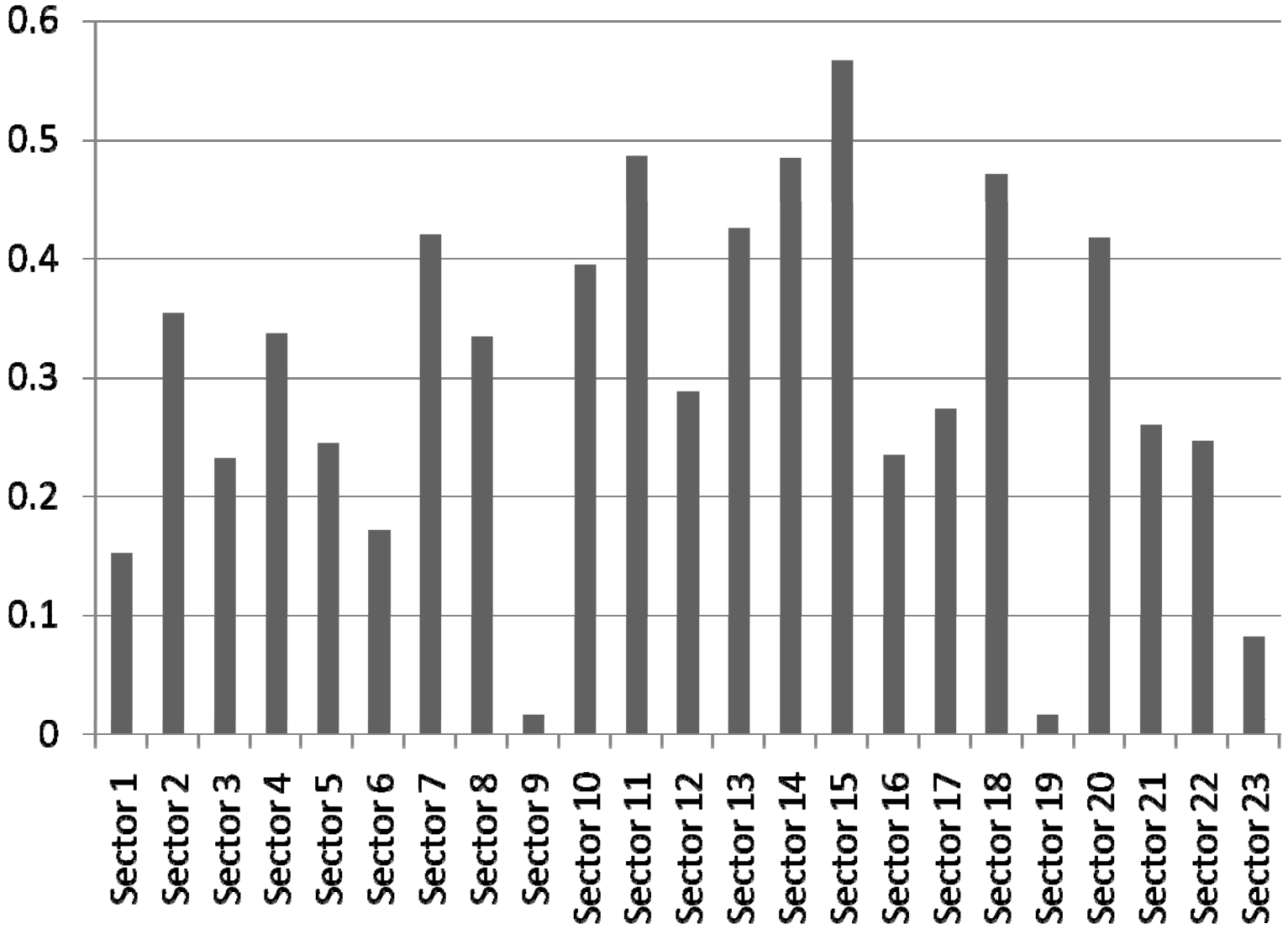
Fractions of the PCT publications in the total, WIPOC in %



The Estimated Capitalization coefficient (EC).

- WIPOC, LAIC and FSC were normalized and integrated.
- Measures the interest of large scale investors to the sector.
- Likely to correlate with capitalization and the willingness to take a risk in the sector.

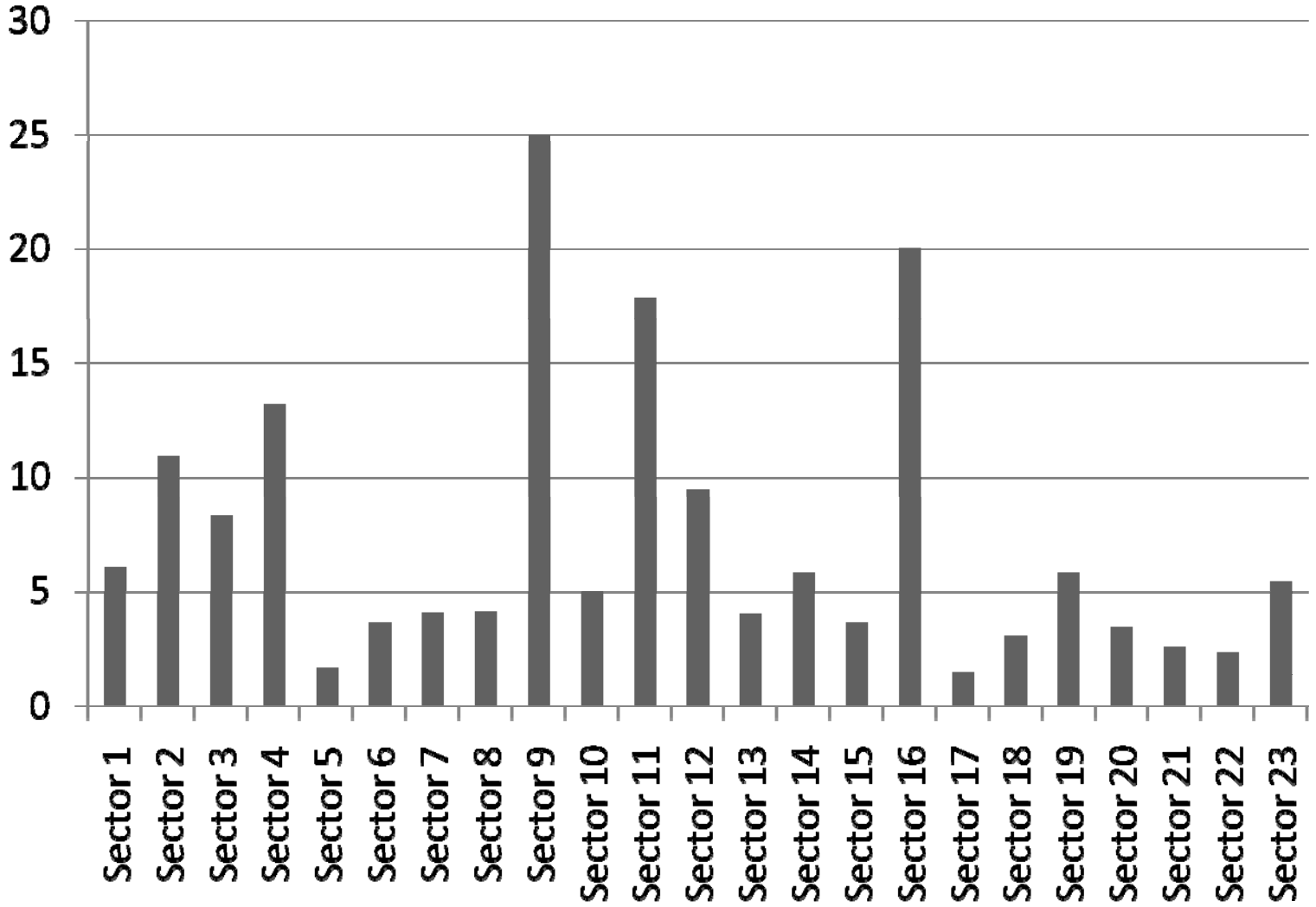
Estimated Capitalization (EC) in arbitrary units



The Recent Interest Coefficient (RIC)

- The chart in the slide below displays distribution of this coefficient by technological sectors.
- This is a convenient short-cut to time-slicing.
- RIC = 0.5/(T – M)x100%, where T – the time, year and month of information collection (200909), M – the median year of the application dates in the sector.

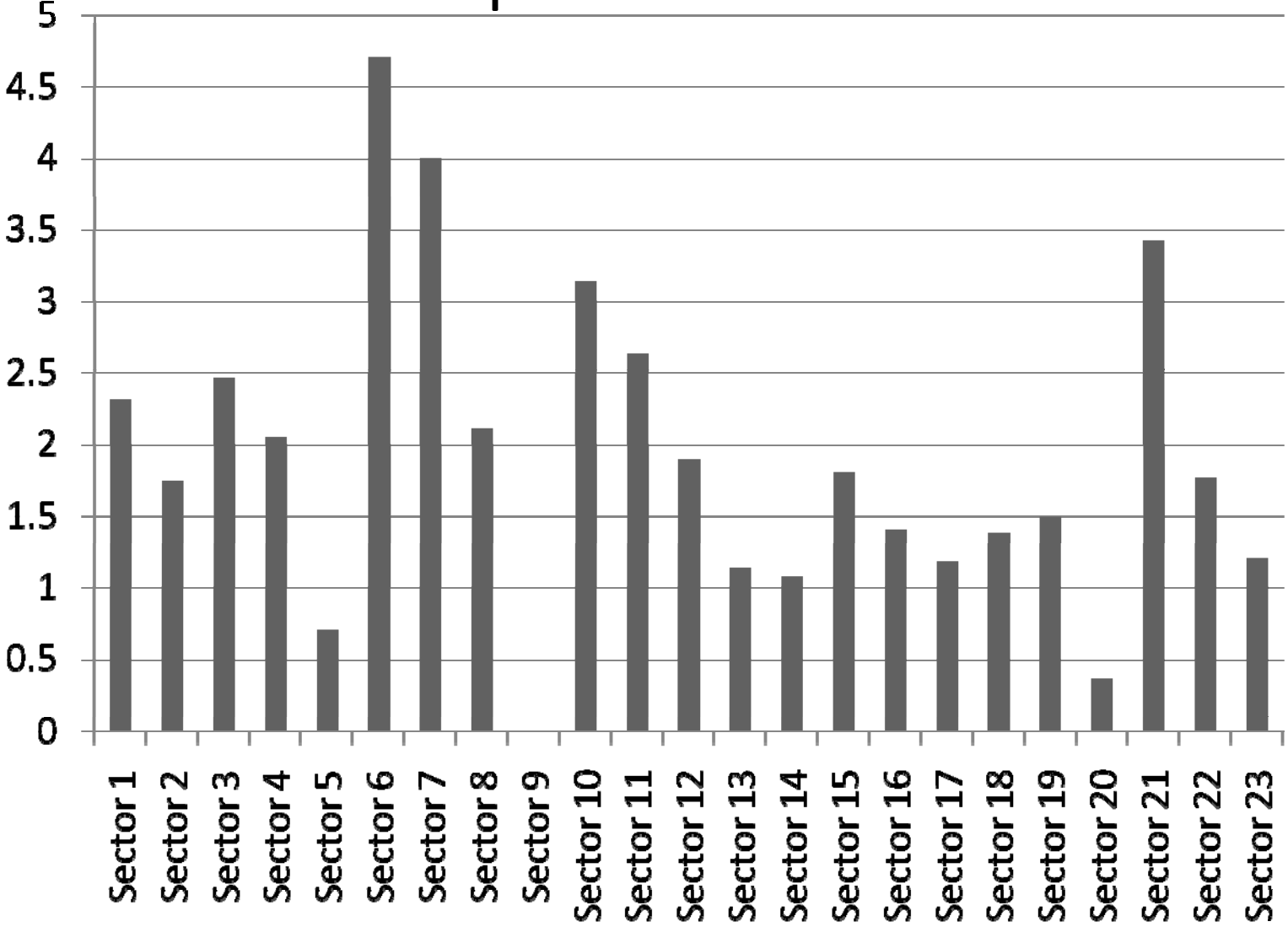
The recent interest coefficient RIC, in arbitrary units



Number of cited families per a publication, CF

- The chart in the slide below displays distribution of this coefficient by technological sectors.
- This is a preliminary proxy to litigation risk assessment.
- More citations may mean stronger patents and more competition in the sector.
- Such competition may reflect both more risk and more promise.

The number of cited families (CF) per a publication



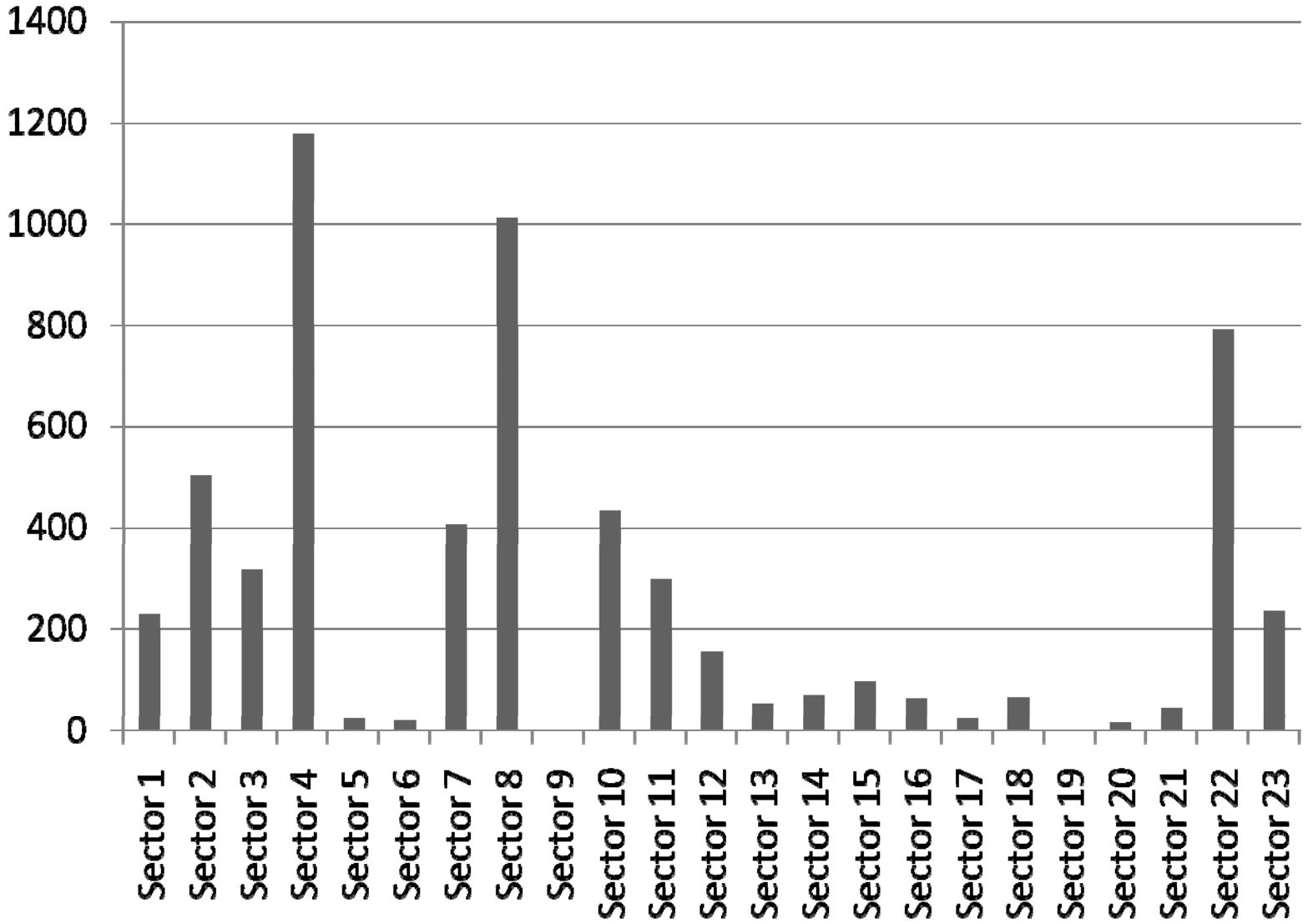
Probability of market entry

- The method analyses the probability of market entry based on predictive features described above.
- The summary probability is the product of the individual feature components:

$$P = \prod F_i^W$$

- Where P is predictive score, W are empirical trainable weight coefficients, F are the features defined in the above-mentioned slides. W = 1 in first approximation.

Probability of market entry (P)



Testing of predictive scores P

- A number of sectors displays low scores (5, 6, 9, 13, 17, 19, 20, 21)
- Since no assumptions were made in obtaining the scores, they are relatively objective and reflect unfavorable mechanistic or regulatory aspects of the sectors
- Sector 5 – viral resistance, side effects; 6 – appears to be lacking pharmacological effect, resistance; 9 – small capital investment, appears to be in a research stage; 13 – many collateral paths; 17 – low efficiency, side effects; 19 – homeopatic formulations are not feasible; 20 – viral resistance, research stage of the sector; 21 – unknown mechanism

Conclusions

- The slide 21 presents the relative probability of a marketed product emerging in each technological sector based on the integrated analysis of the IP landscape internals
- The number of publications per sector can be misleading without considering quality, as suggested by comparing the slide 21 with 7
- The prediction is preliminary due to a small volume of the training set. More data are needed to reliably establish the training coefficients W and the optimal form of the regression function.