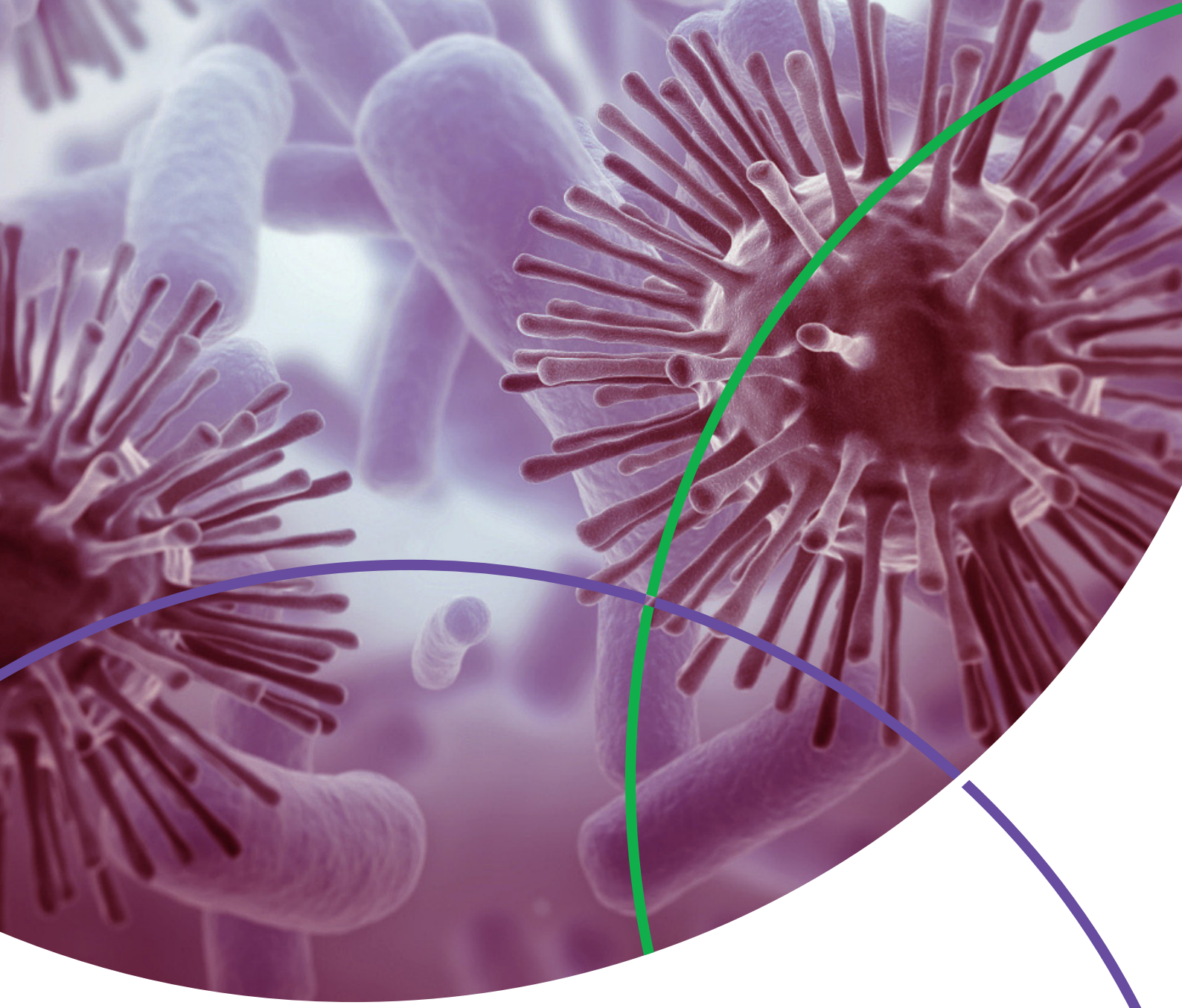
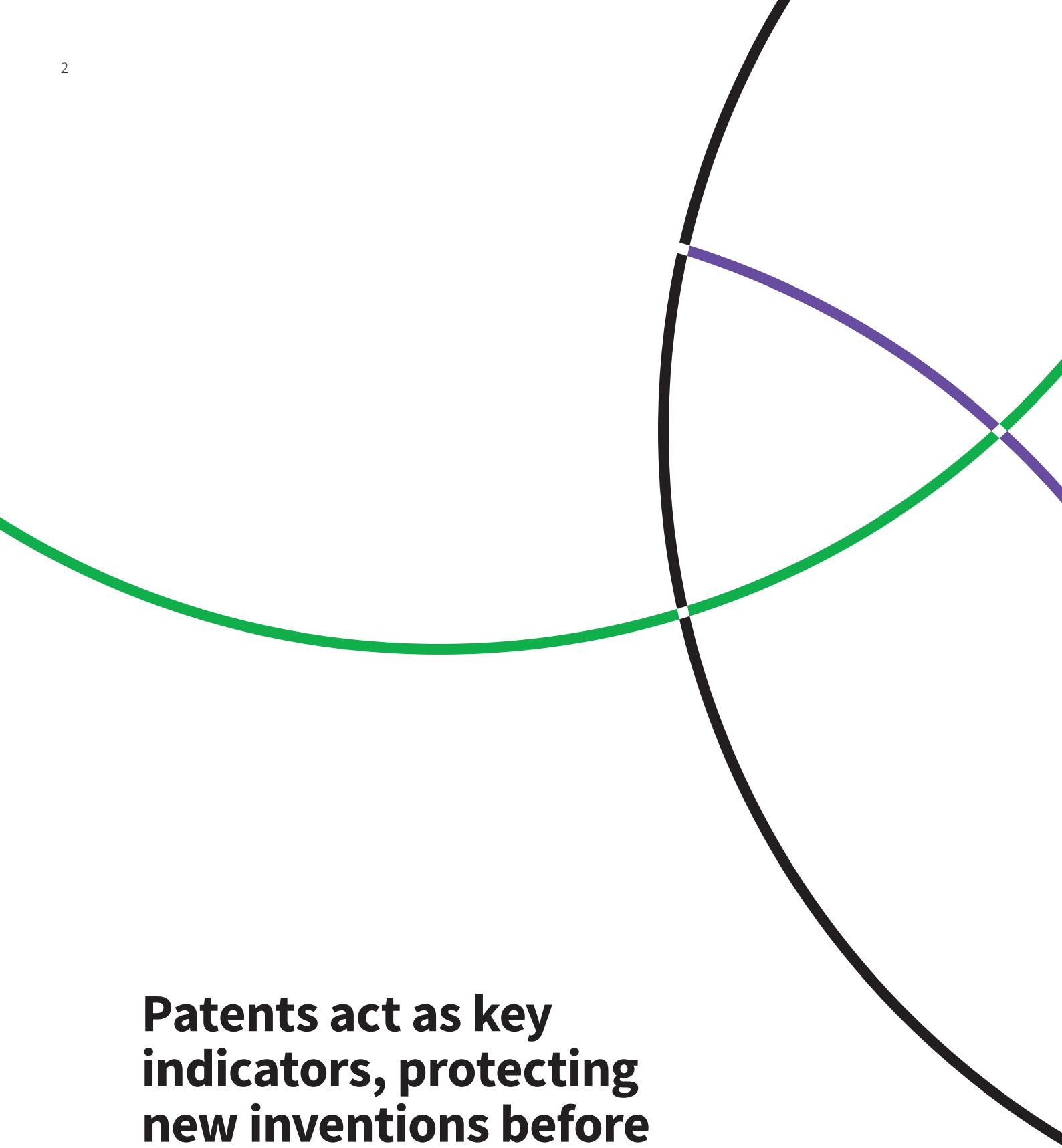


Uncovering Immuno-oncology research potential

How Patent data holds the key

January 2017

Clarivate Analytics



Patents act as key indicators, protecting new inventions before research findings are publicly disclosed

This report examines the potential of cancer research to develop into actual treatments. We used data and analysis from Clarivate's Cortellis™ Capitalize Competitive Intelligence database, along with data from Thomson Innovation™, DWPI™ and Geneseq™. Cortellis contains drug-related patent information from 95 authorities, together with information on over 61,000 drugs and 44,000 deals from big pharma to biotech companies, plus breaking industry news, clinical trials, broker research and conference coverage.

Insights are derived from the following search of Cortellis in October 2016: immuno-oncology OR immunotherapy OR immunotherapies OR T-cell OR cytokine OR "cell therapy" OR Treg OR "Checkpoint inhibitor" OR mAb OR "monoclonal antibody" OR "monoclonal antibodies" OR vaccine.

The search used filters to restrict results to patents linked to cancer or neoplasm index terms.

Unless otherwise indicated, charts were obtained using the Spotfire™ based analyse function in Cortellis.

Executive Summary

- Since 2003 the number of patents filed continues to be consistently high following previous rapid growth.
- A slight decline in patent filings following the global financial crisis is now being reversed.
- Major Biopharma companies dominate, but NIH, Harvard and University of California present a consistently high number of patent filings.
- Filings for vaccines have peaked; antibody based therapies continue to grow.
- Growth in diagnostic, analysis and assay patenting as personalized medicine initiatives and targeted therapies increase.
- Most basic research in the underlying technologies is still done by academic institutions, often with funding from NIH or major bio-pharmas.

Number of Immuno-oncology Patents

The charts on the right highlight how patenting in the immuno-oncology area had increased steadily since the early 1990s until suffering a downturn in the late 2000s, with particular declines in 2007 and 2011, after which there has been a period of growth. This is likely to be a reflection of the general economic situation with the financial crisis in the late noughties affecting the funds available for research.

Commercial investment in research was more considered following the global economic crisis, with pricing and reimbursement issues experienced in most major markets as both governments and private organisations sought to bring spending under control. This is reflected in the number of patent applications being filed in subsequent years as confidence returned.

This has a delayed effect on the number of patent applications published in a given year, as first publication is normally within 18 months of the earliest priority.

Families per first priority year

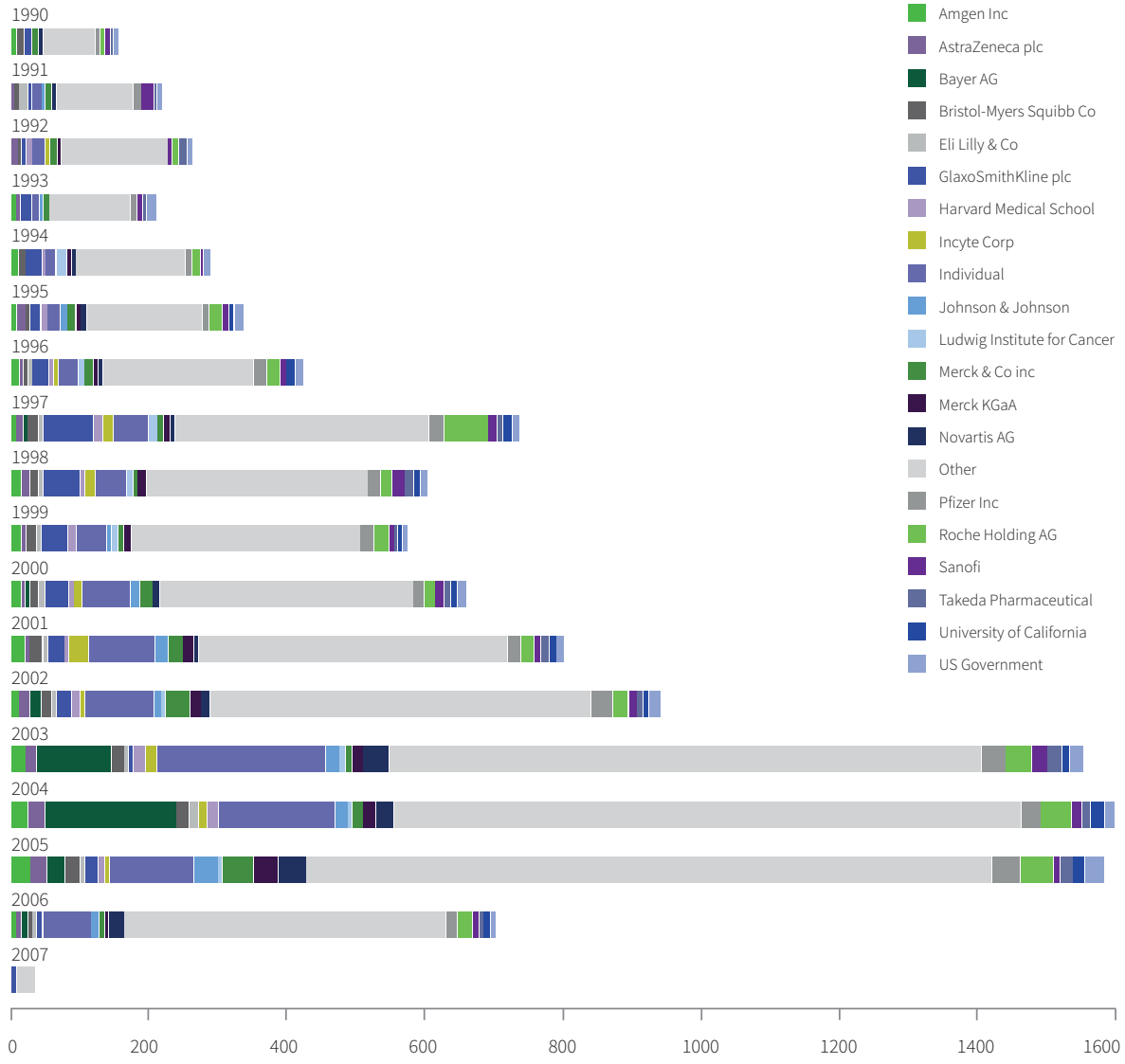
Patent families per first publication year

Companies Involved in Immuno-oncology

For patents published prior to 2008, major players included Roche, Bayer, Novartis, Pfizer, Amgen, BMS and Merck & Co. The remainder of filings were primarily from other large corporate entities with only the University of California, Ludwig Cancer Institute and Harvard Medical School representing research institutes in the top 20. A number of private/individual filings are also present although it's noteworthy that these are often affiliated to universities or research institutes. US governmental agencies, such as NIH, are consistently present. It is also possible that some individual inventors are NIH researchers, given the organisation's history of allowing its researchers to file patents if it does not intend to commercialise an invention itself.

This outlook changes after 2008, with the previously prolific Bayer dropping out of the top 20 and GSK, although still present, showing a declining interest. Conversely the number of academic research institutions represented increases, and the number of filings under "others" also shows an upsurge high – indicating a large number of smaller companies filing in the area.

Number of patents published 1990 - 2008



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