

Overview of main findings

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WIPO Chief Economist

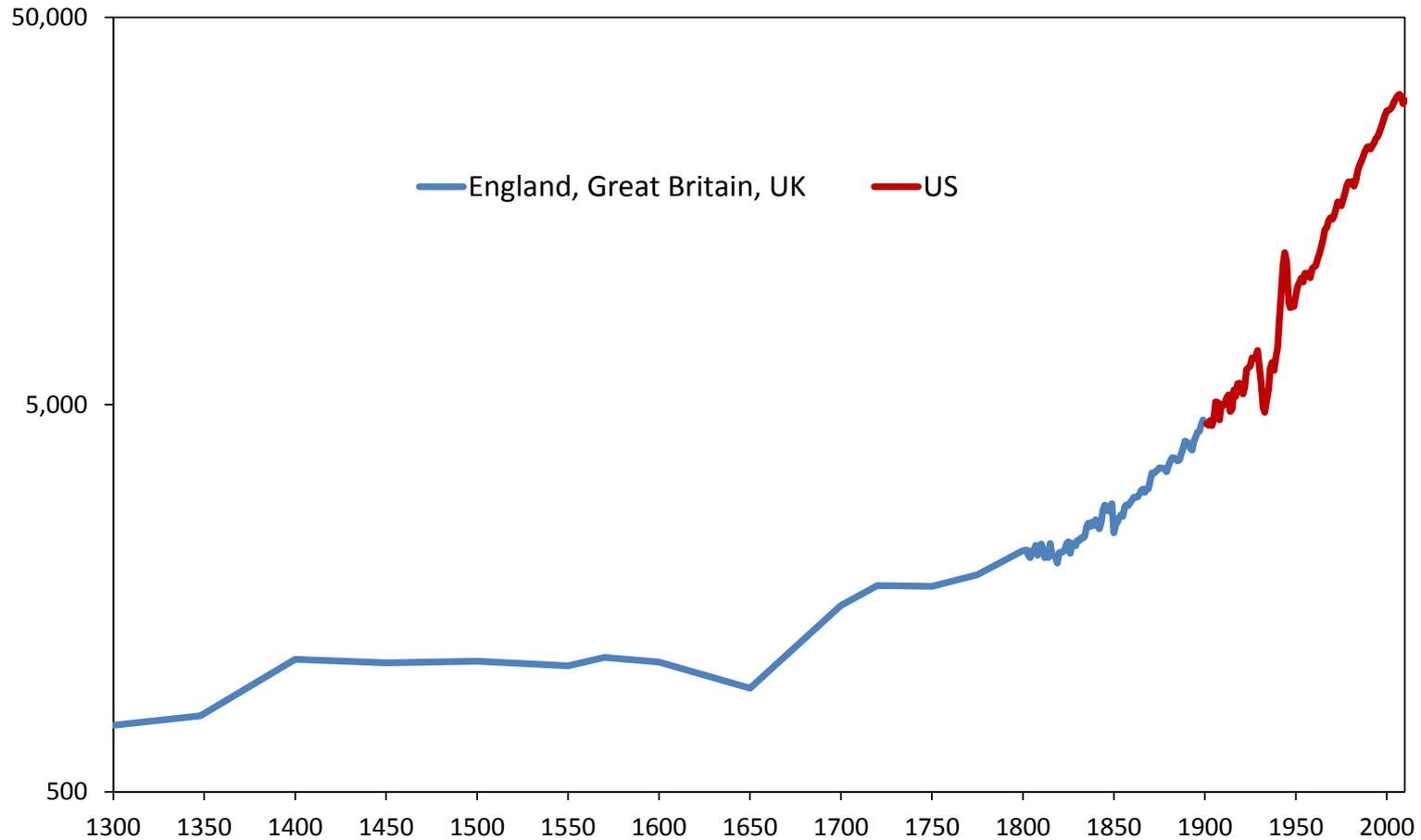
Overview

- History of innovation-driven growth
- Case studies of breakthrough innovations
- Future prospects for innovation-driven growth

History of innovation-driven growth

Growth at the frontier

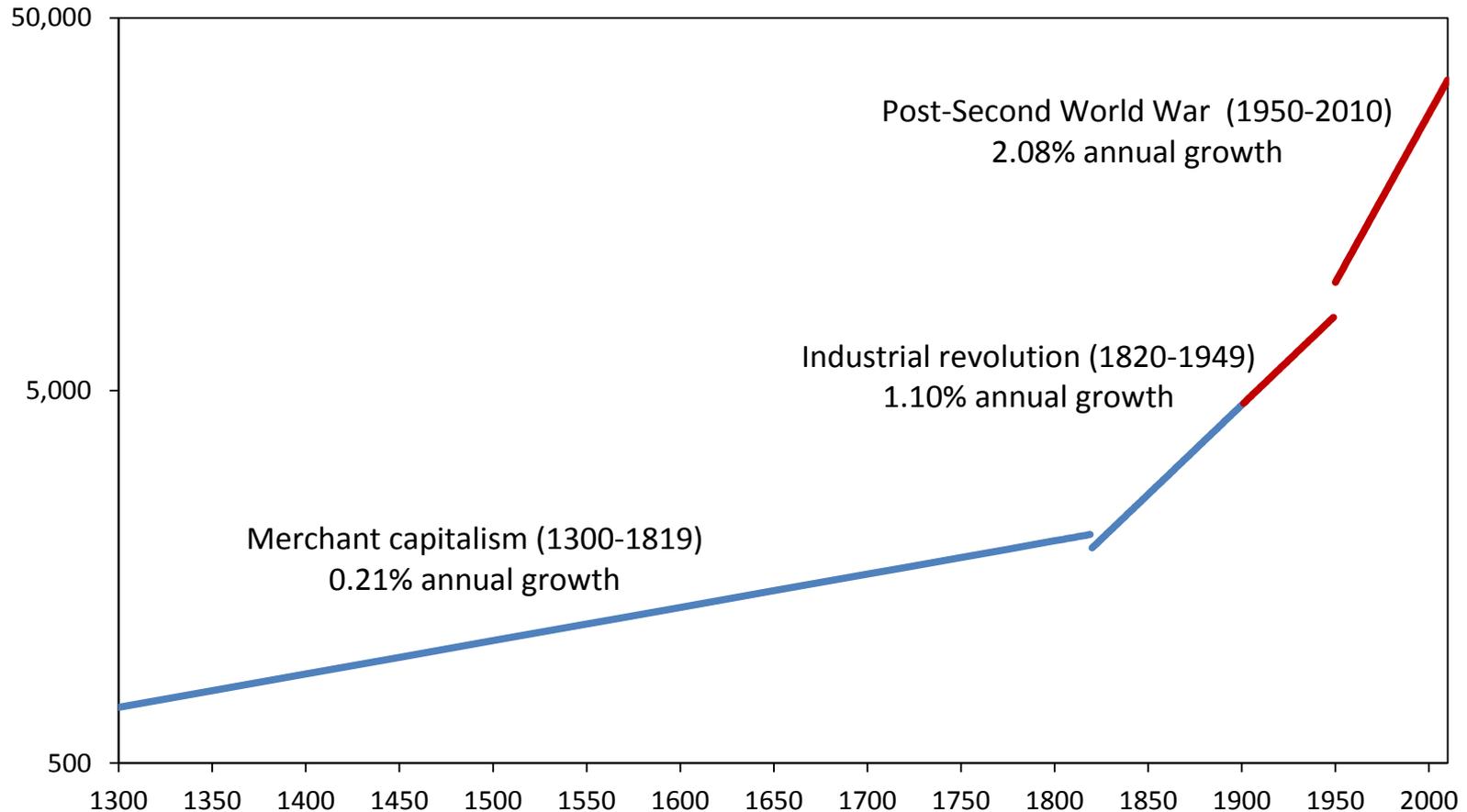
Real GDP per capita, 1300-2000, logarithmic scale



Source: The Maddison Project, 2013 version

Growth at the frontier

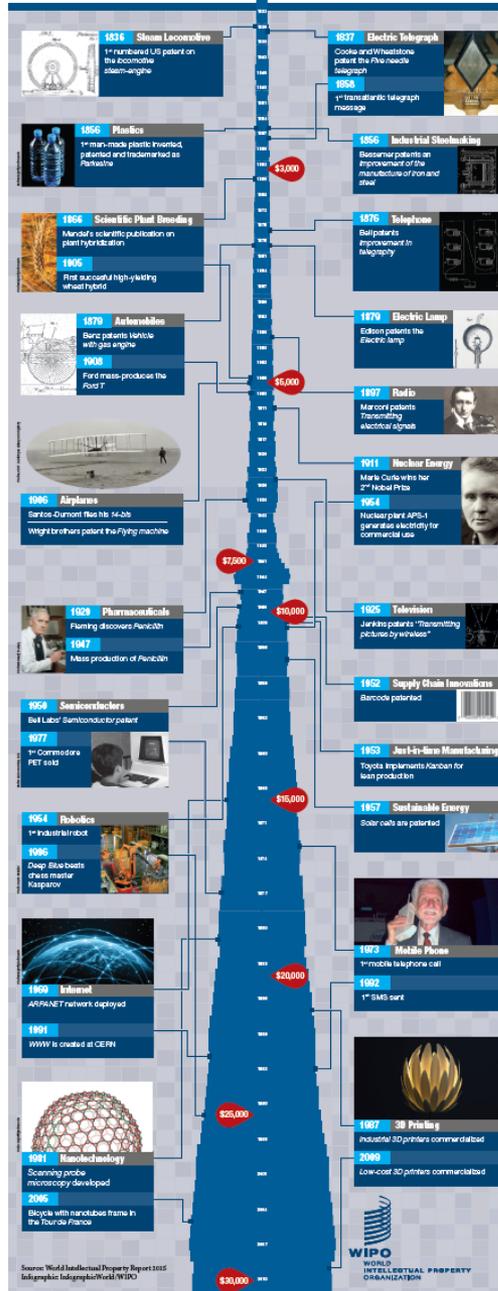
Real GDP per capita, 1300-2000, logarithmic scale



200 Years of Innovation and Growth

\$2,000
GDP per person
in 1800

Man's pursuit of innovative solutions has powered human progress and transformed our world. Two centuries of breakthrough innovations have seen a 10-fold growth in per capita incomes in frontier economies. WIPO's 2015 World Intellectual Property Report looks at six transformative technologies, and explores the role of intellectual property in innovation.



Source: World Intellectual Property Report 2015
Infographic: InfographicWorld/WIPO

Case studies of breakthrough innovations

Approach

■ Case studies

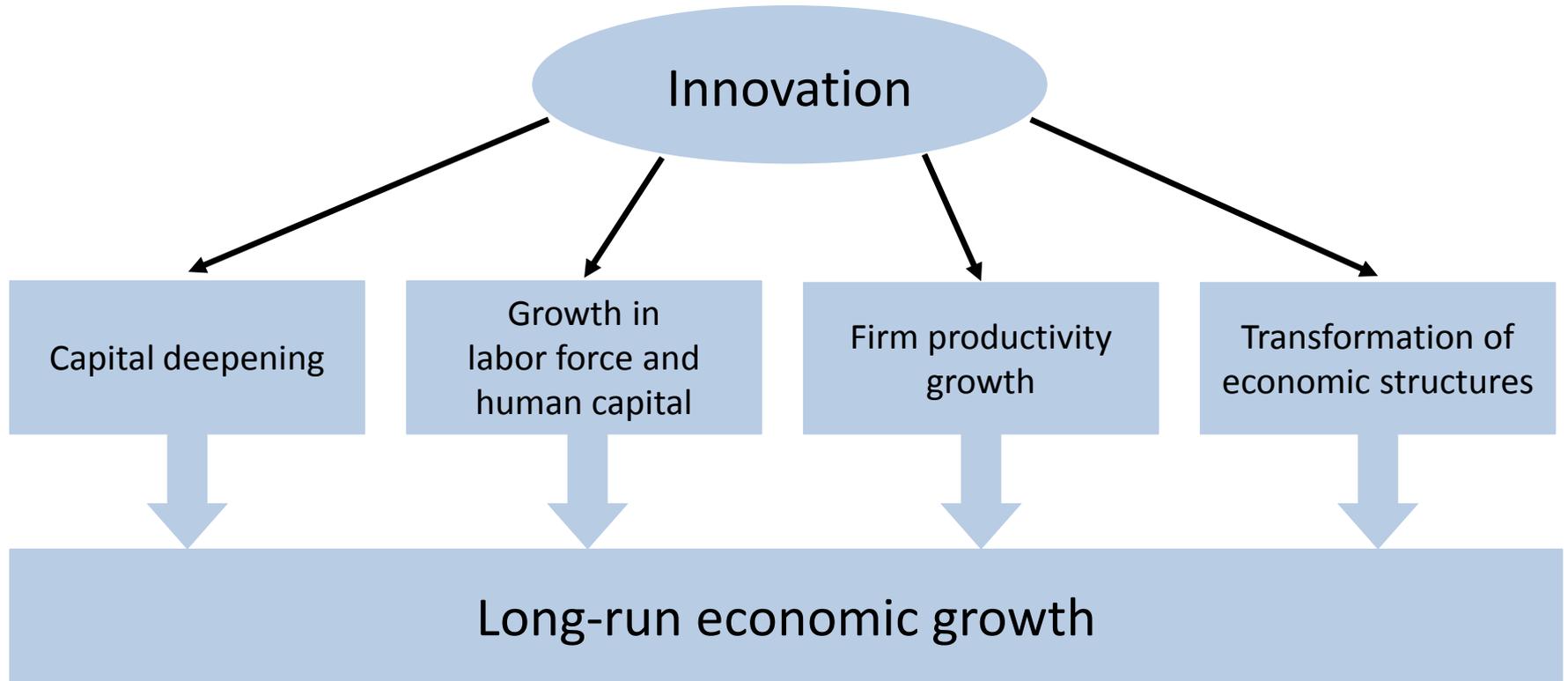
- Historical innovations: airplanes, antibiotics, semiconductors
- Current innovations: 3D printing, nanotechnology, robotics

■ Key questions:

- How did the innovation contribute to growth?
- In which ecosystem did the innovation flourish?
- What role did the IP system play?

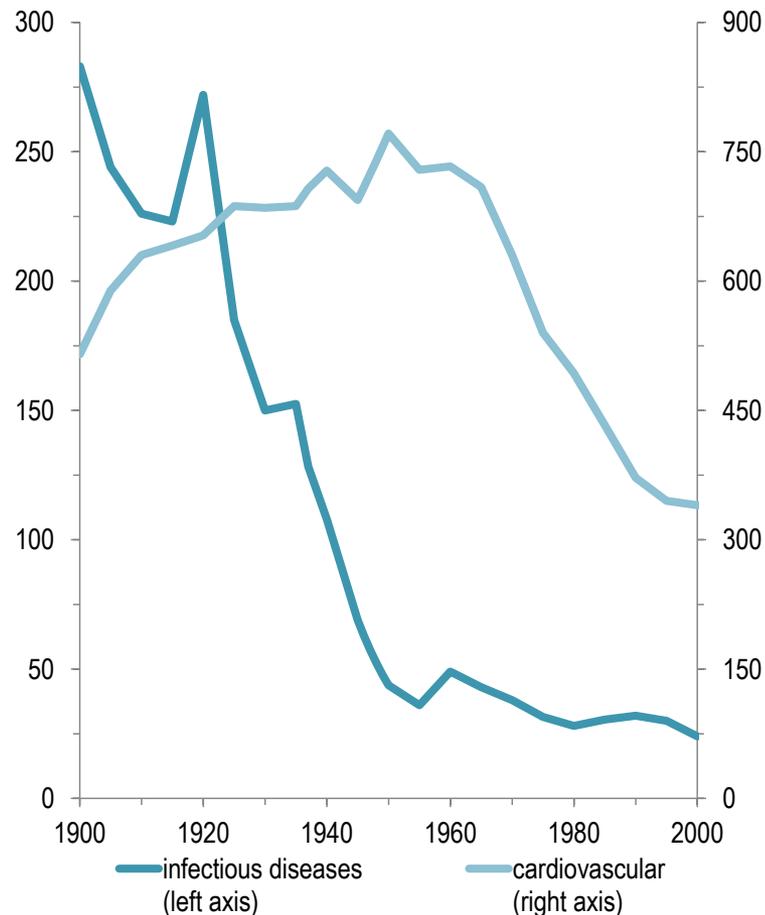
■ Map patents to the six innovation fields

How innovation has spurred growth



Antibiotics: profound impact on health

Mortality due to infectious and cardiovascular diseases, deaths per 100,000 inhabitants, 1900-2000



Source: Cutler *et al* (2006) and Achilladelis (1993).

Enabling innovation ecosystem

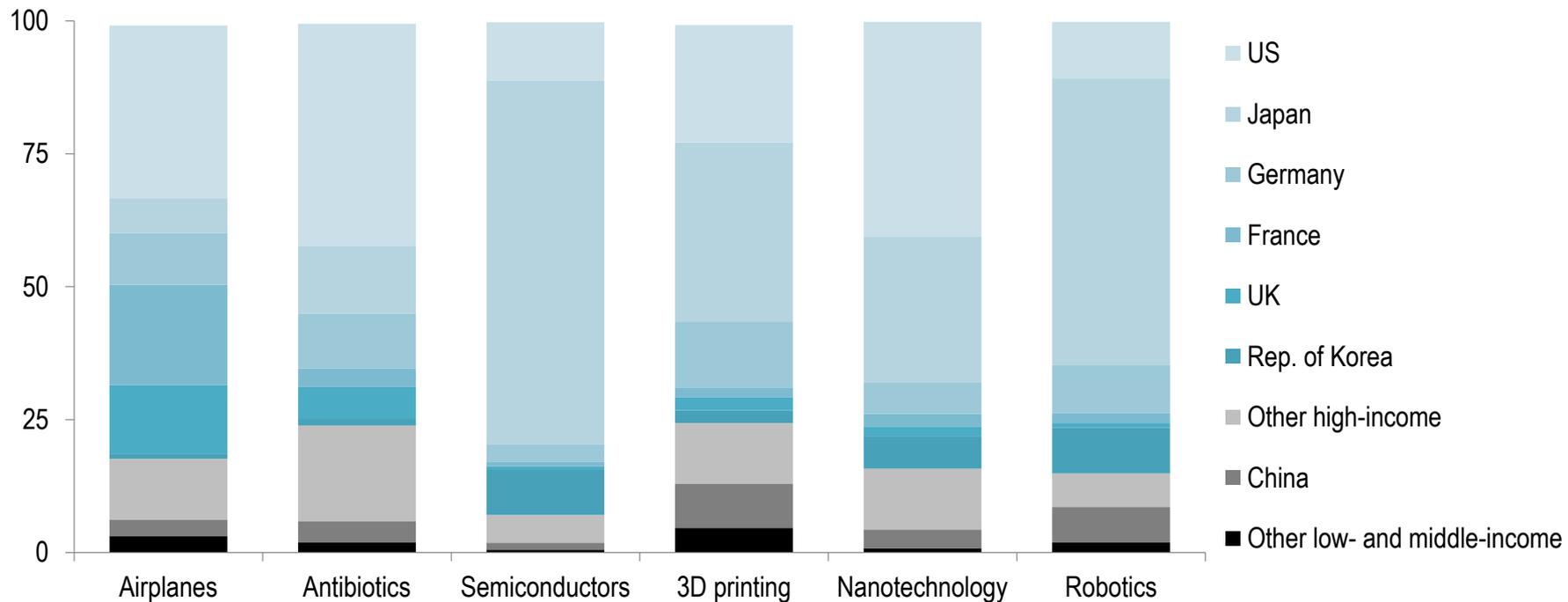
- Fundamental role of governments
 - Main source of funding for scientific research
 - At times, critical in moving promising technology from laboratory to production stage, partly motivated by national defense interests
 - Competitive market forces and efforts of companies
 - Linkages between the various innovation actors
- => Policies, initial conditions, and historical context matters

Ecosystems evolve

- Airplanes: from clubs of amateur inventors to large-scale industrial research
- Antibiotics: dynamic interplay between innovation and regulation
- Two common trends:
 - As technology becomes more complex, innovation actors specialize (except for pharmaceuticals)
 - As technology matures, innovation shifts towards optimizing different uses and adapting it to the needs of the market place

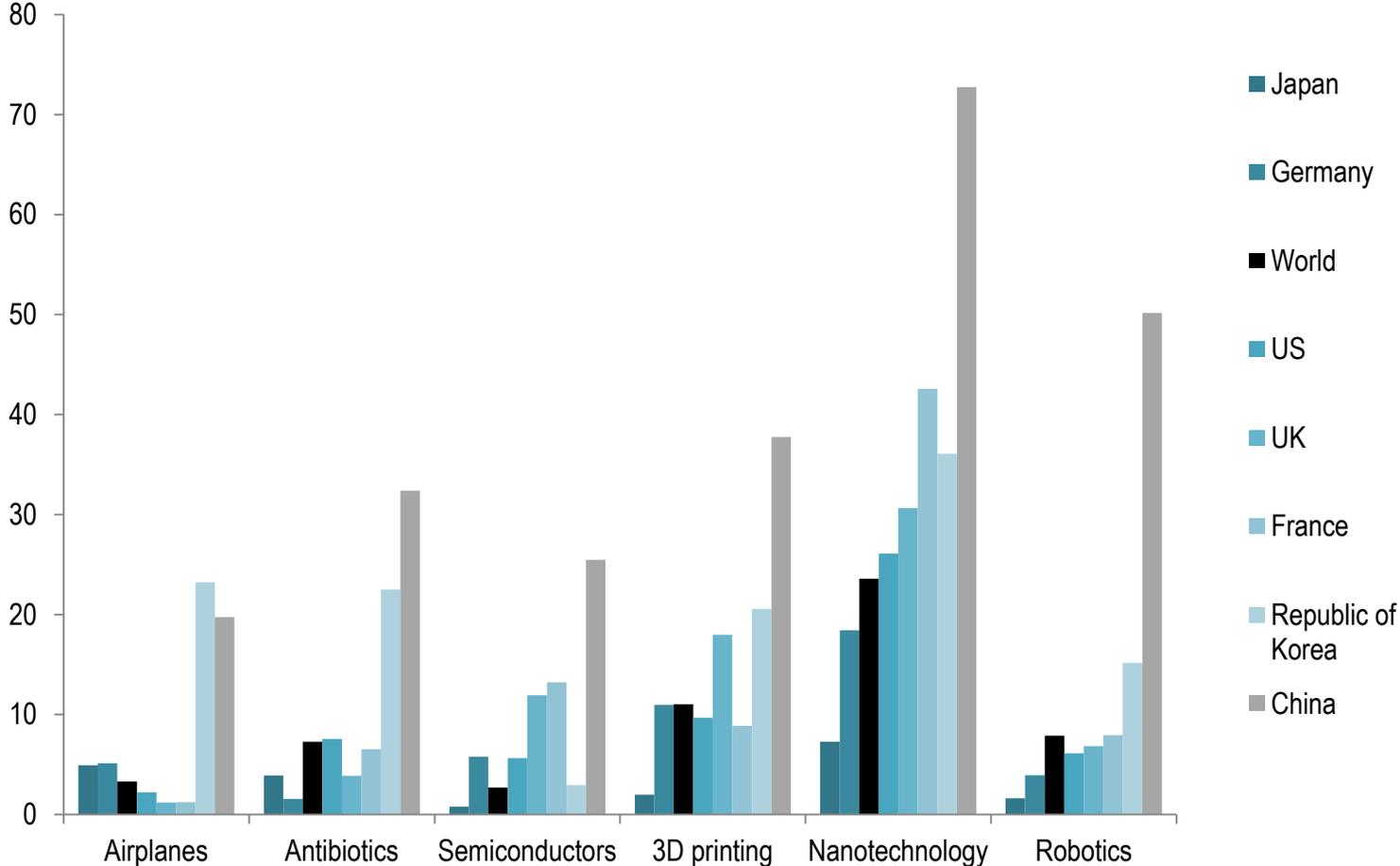
Geographic concentration of patent origins

Share of first patent filings in world total



Rise of academic patenting

Share of university and PRO applicants in first patent filings, in percent



Source: WIPO based on PATSTAT database

Patents mostly in high-income markets

Share of patent families worldwide for which applicants have sought protection in a given country

	3D printing	Nanotechnology	Robotics
US	46.6	84.6	36.5
Japan	33.6	52.1	38.7
Germany	37.7	39.8	28.6
France	32.4	36.9	21.9
UK	32.9	37.6	21.3
Republic of Korea	11.8	25.2	19.2
Other high-income countries	16.4	20.5	9.5
China	38.3	31.8	36.6
Other low- and middle-income countries	2.8	2.7	1.4

Role of IP system

- We do not observe a counterfactual history with different IP policies
- Innovators frequently relied on the IP system to protect the fruits of their innovative activities

(Model.)

5 Sheets—Sheet 1.

R. J. SPALDING.
FLYING MACHINE.

No. 398,984.

Patented Mar. 5, 1889.

Fig. 1.

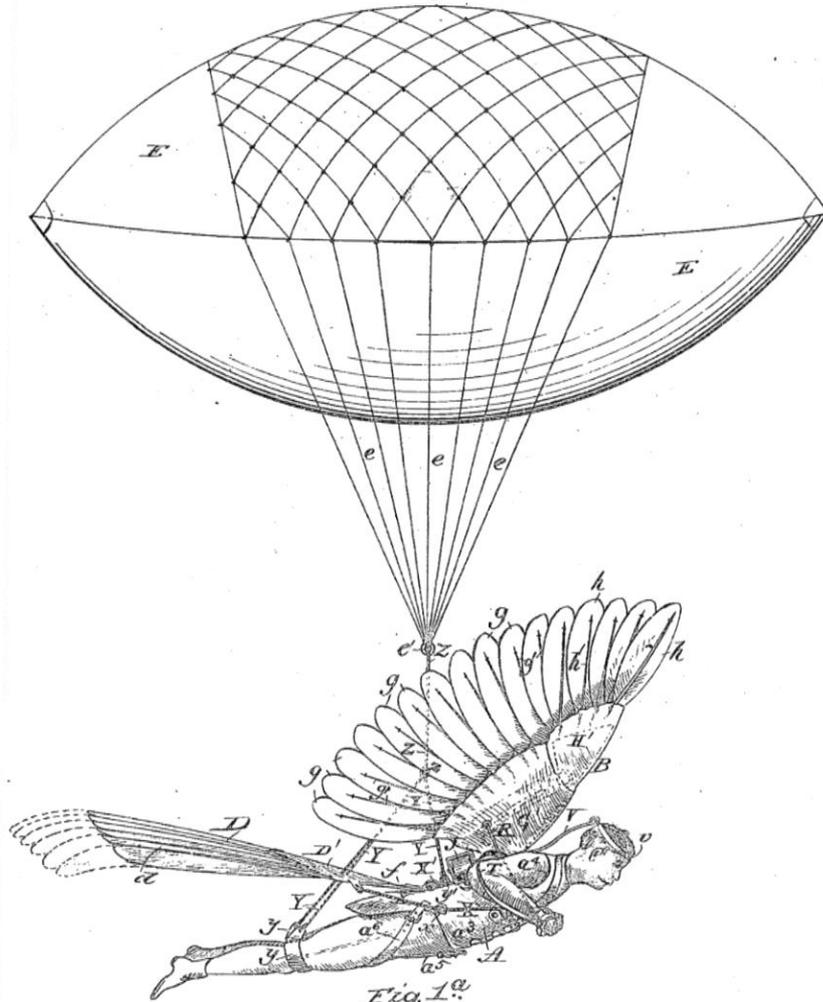
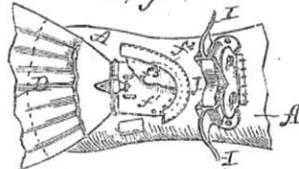


Fig. 1^a

WITNESSES:

J. P. Garfield
E. M. Clark



INVENTOR:

R. J. Spalding

BY

Munn & Co

ATTORNEYS.

WIPO

WORLD
INTELLECTUAL PROPERTY
ORGANIZATION

Role of IP system

- Some evidence that IP rights helped appropriate R&D investments
- Importance of knowledge sharing and technology markets:
 - Airplane hobbyists, 3D printing and robotics open source communities
 - Specialization and licensing in airplane development, airplane patent pools
 - Cross-licensing of semiconductor patents
- IP rights enable technology markets and knowledge sharing, though social norms are also important

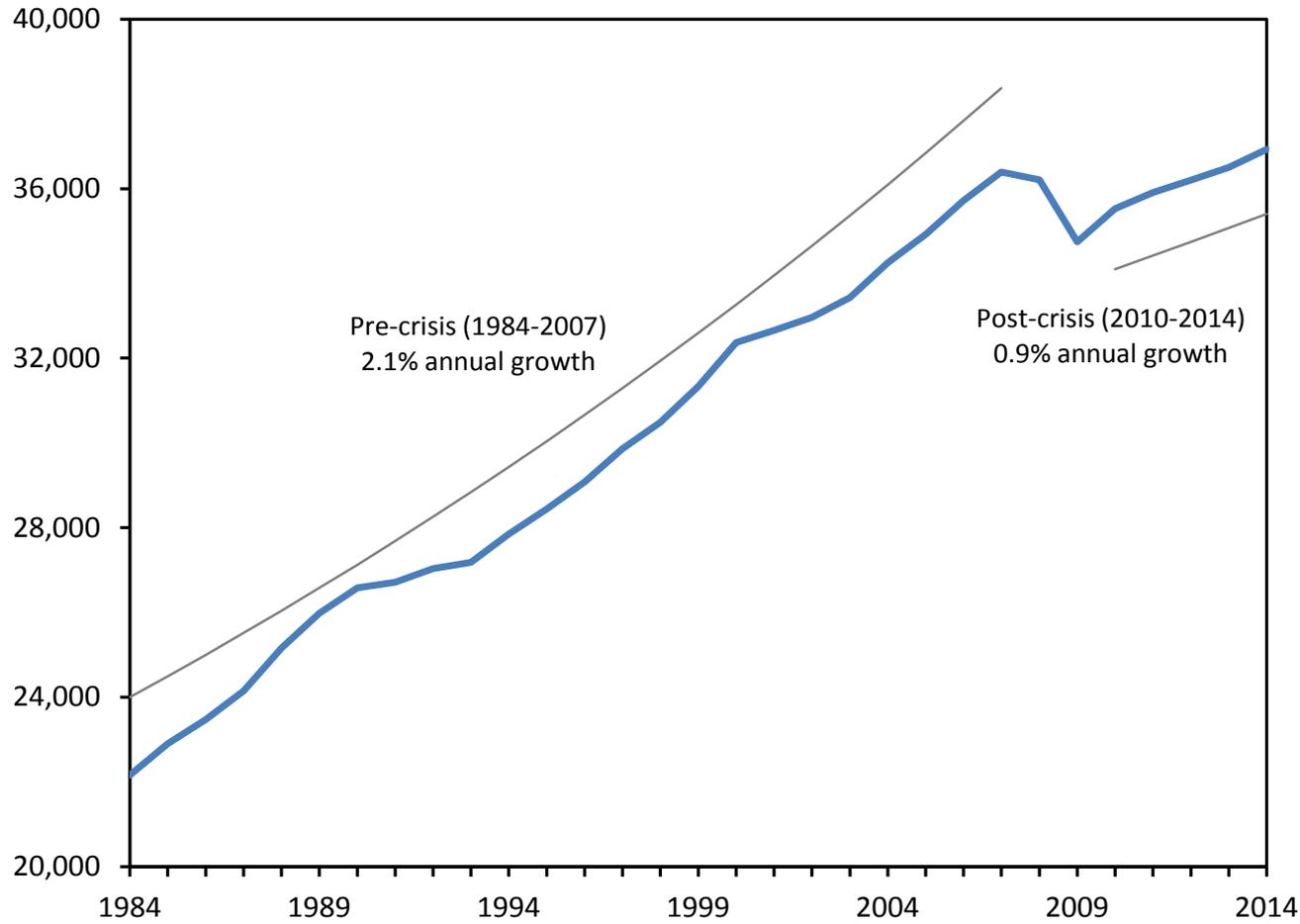
Evolution of IP system

- At the outset, patent offices and courts faced difficult decisions
- Interesting case: creation of a *sui generis* IP right for semiconductors in the 1980s, which subsequently saw little take up

Future prospects for innovation-driven growth

The end of fast growth?

Real GDP per capita in high-income OECD countries, 1984-2014



Source: World Bank Development Indicators

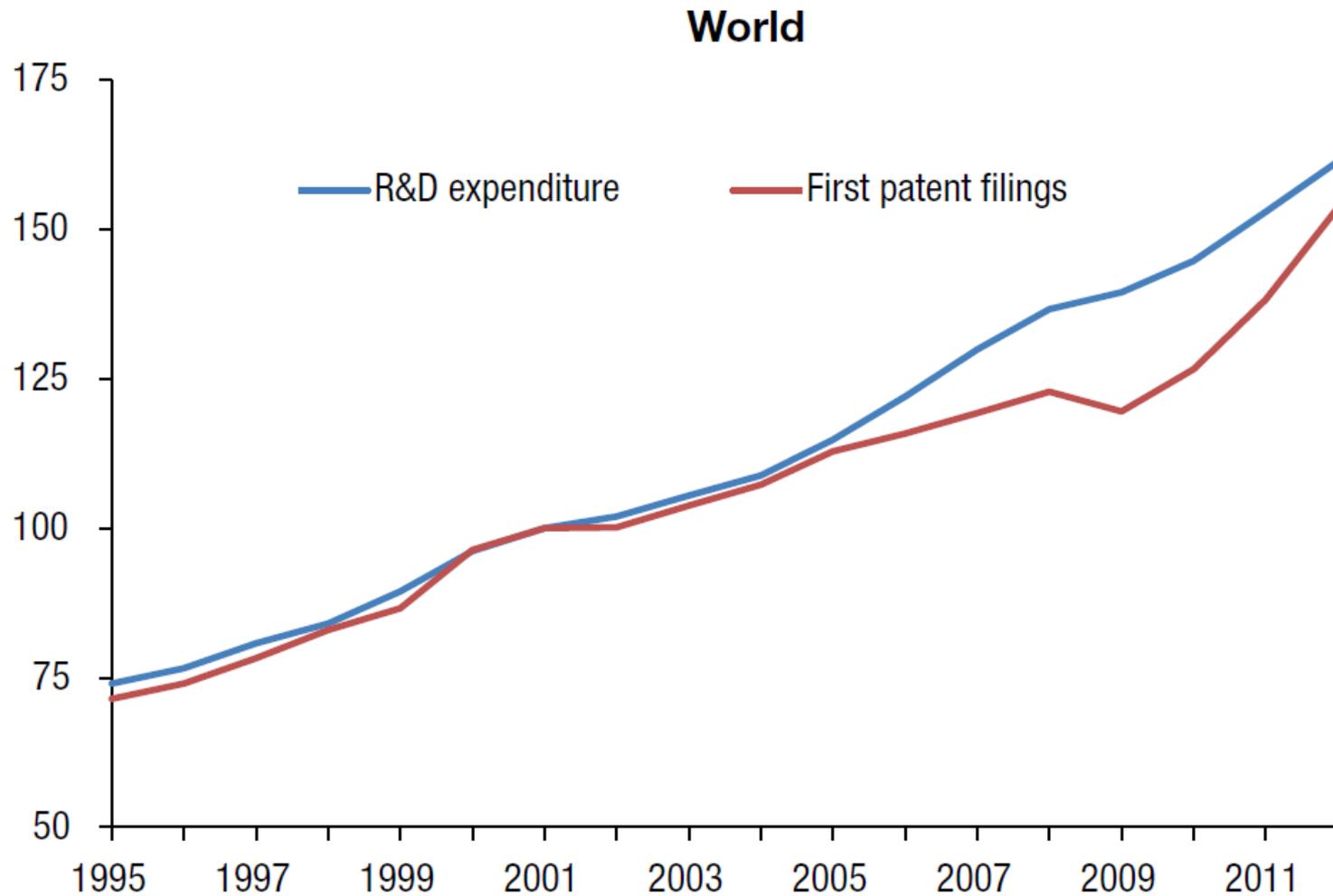
The optimists' case

- We still suffer from a post-financial crisis debt overhang, eventually faster growth will resume
- Unprecedented investments in innovation, more diversified innovation landscape
- Reasons to be hopeful about continued growth contributions from ICTs
- Numerous other promising fields of innovation: 3D printing, nanotechnology, robotics, genetic engineering, new materials, renewable energy
- Technological advances raise R&D productivity

The pessimists' case

- We are in a state of ‘secular stagnation’, which leads growth to persistently fall short of its potential
- Observed slowdown in economy-wide productivity growth since early 2000s
- ICT growth contribution has been realized and it will be hard to match past technological achievements
- Declining R&D productivity: low-hanging fruit has been plucked

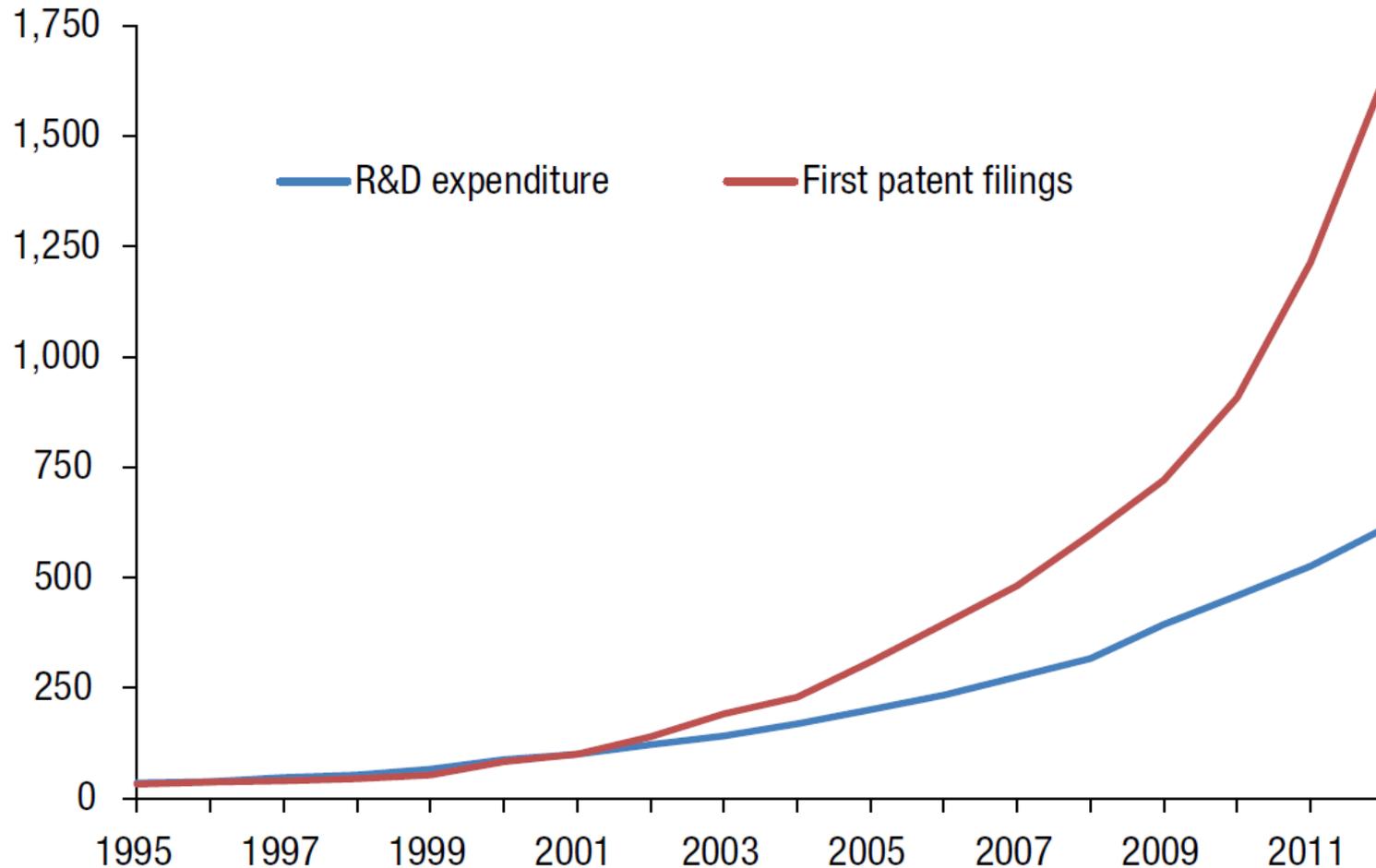
What do patent data tell us?



Source: OECD and WIPO based on PATSTAT database

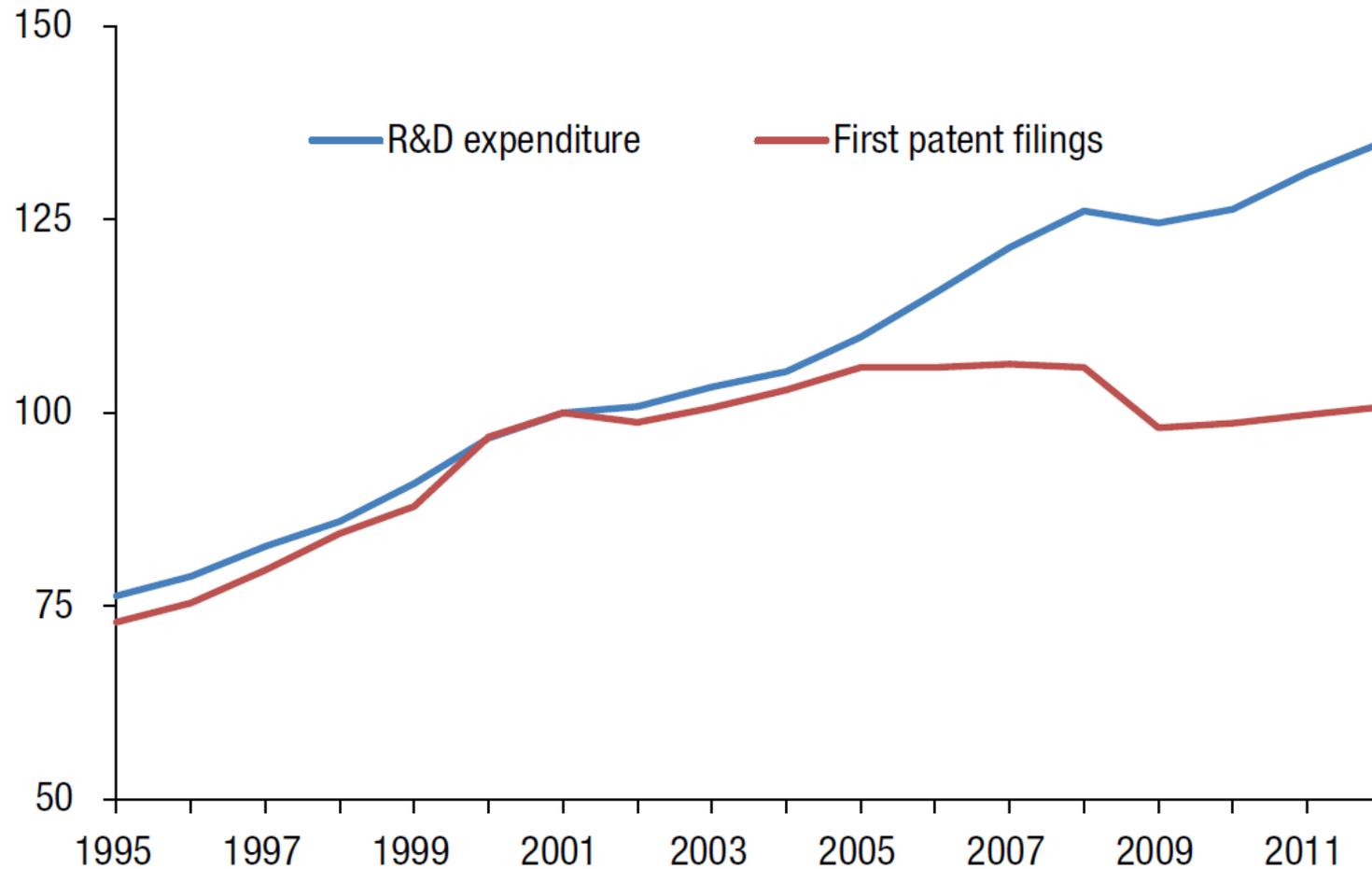
What do patent data tell us? (2)

China



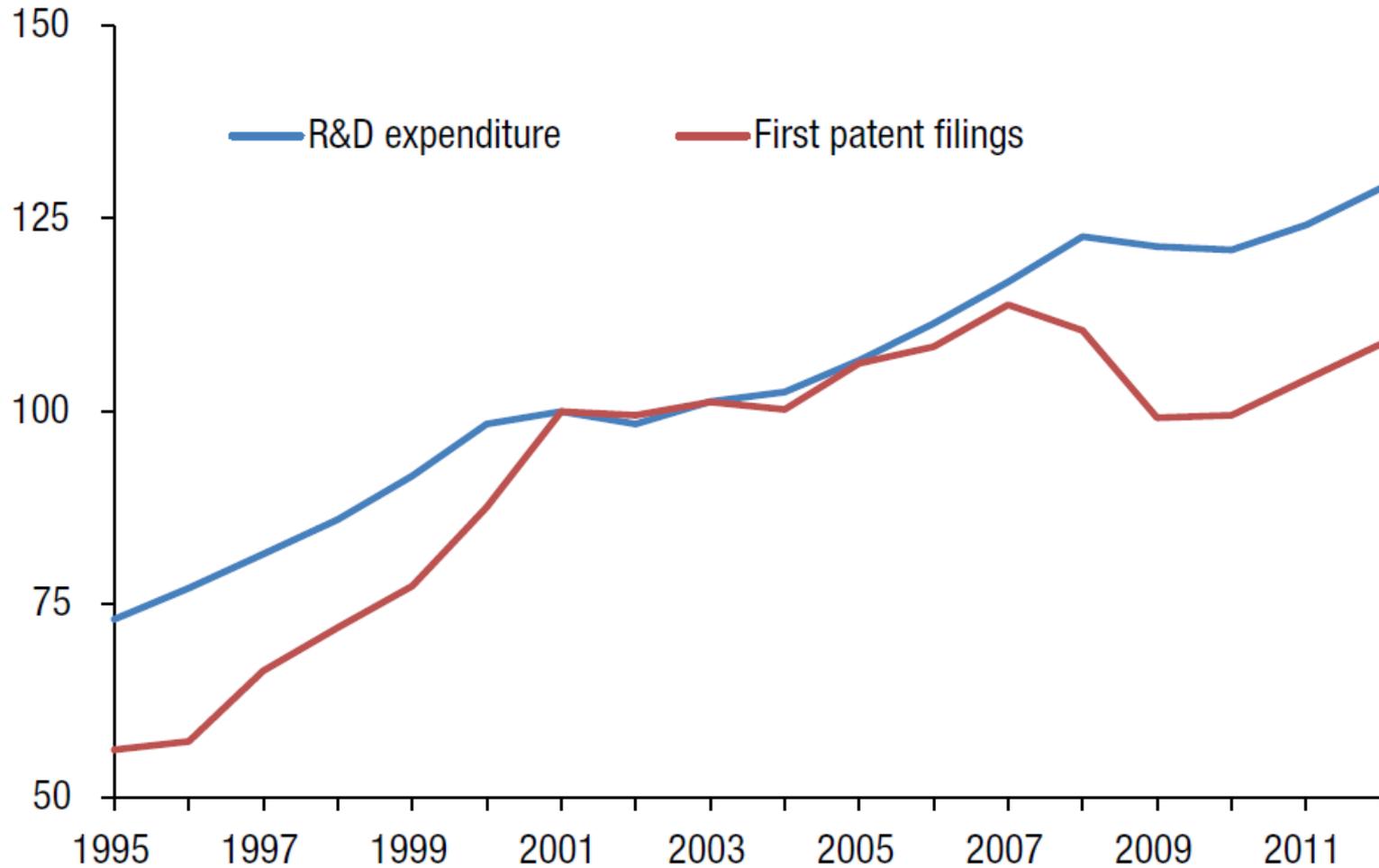
What do patent data tell us? (3)

World without China



What do patent data tell us? (4)

US



Thank you!

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