



Knowledge Flows: Science for Innovation

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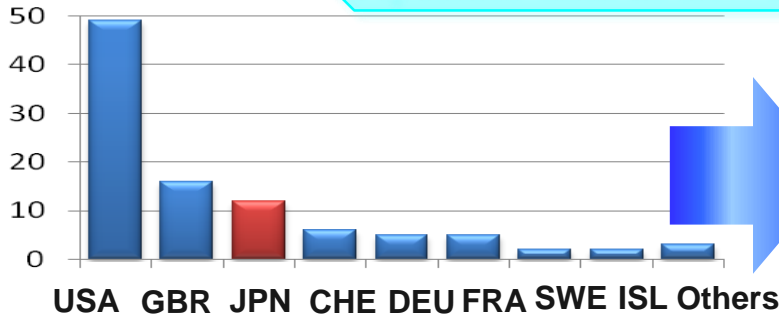
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1. Refined New Indicators

【Example: existing Indicators】

Origin of the world top 100 products

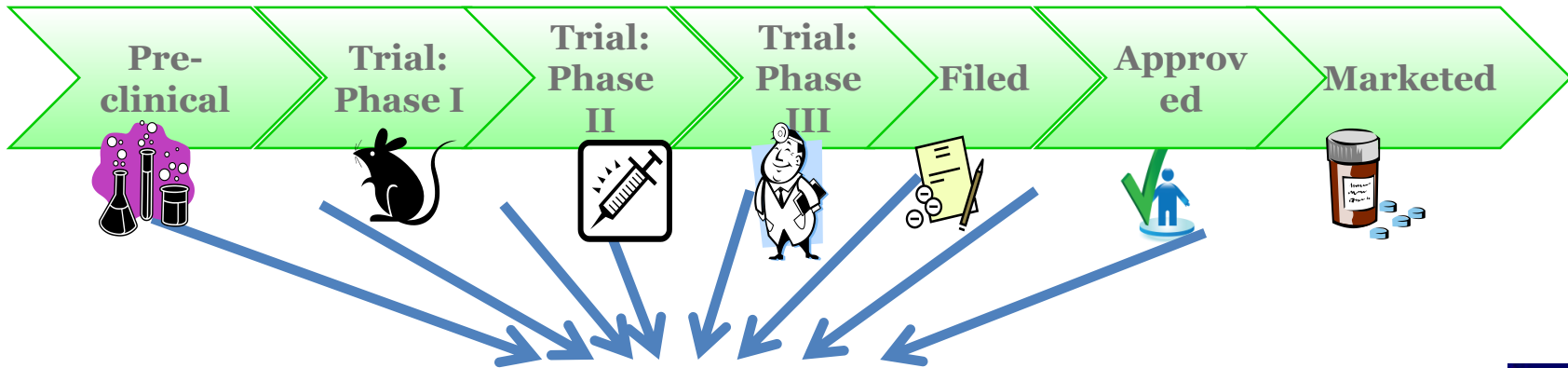


For evidence-based policy making, existing indicators are not enough for foresight
Pipelines data as new indicators for forecasting

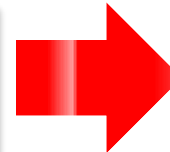
showing only the current competitiveness

Japan is now ranked the 3rd position. How about the future?

Refined New Indicators : Pipelines (Drug candidates in R&D stage)



Collecting pipelines data
⇒ assessing the productivity of new drugs



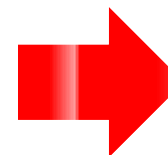
foresight



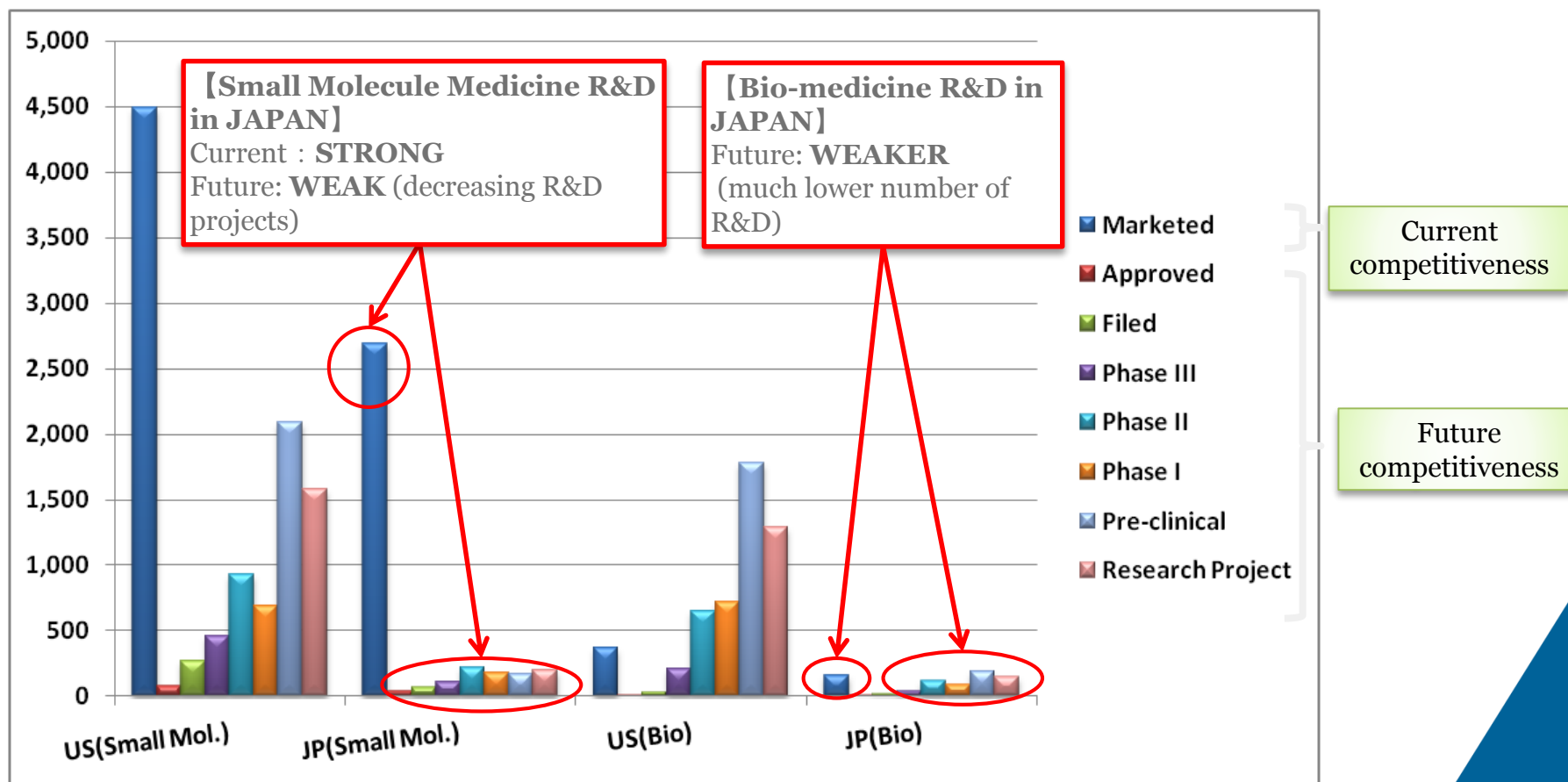


Development of new indicators for Biotechnology and Pharmaceuticals

New indicators (focusing on the R&D projects in the whole world)



Future prospects!
Better evidence!

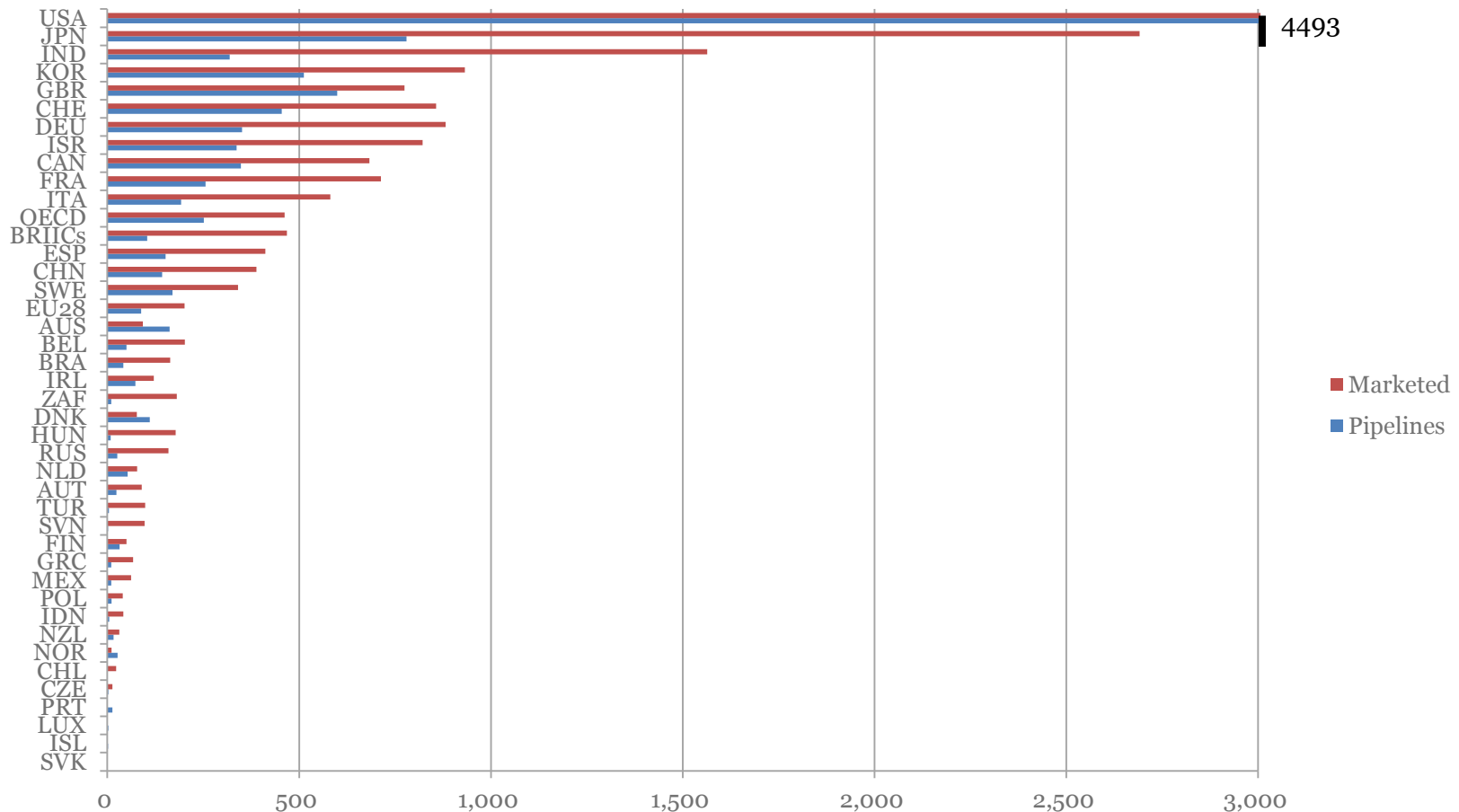




Marketed drugs and pipelines

(Small Molecules)

- Japan was ranked 2nd in the marketed drugs and pipelines, following US
- India was ranked 3rd in the marketed drugs due to Generic products markets.

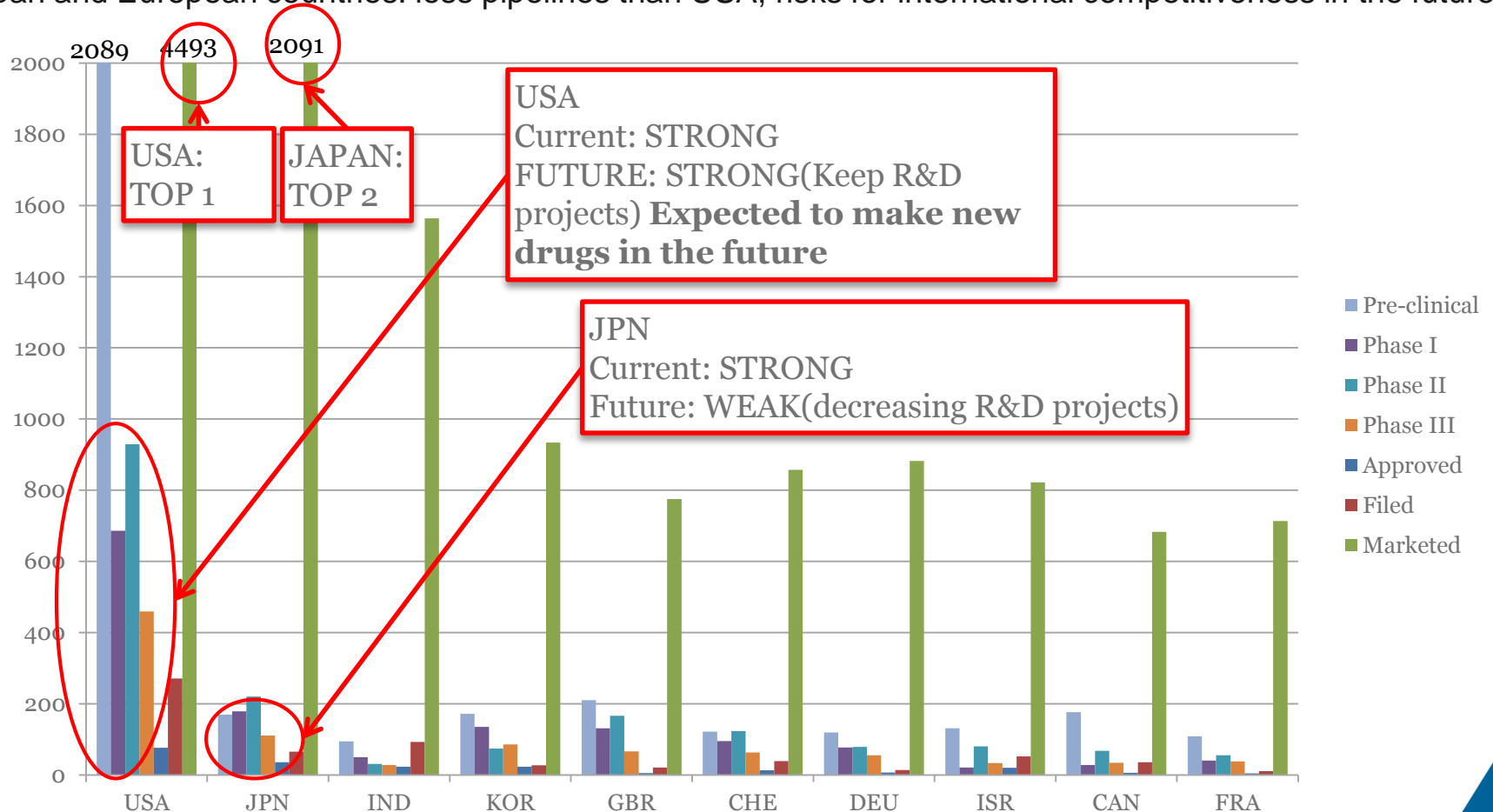


Source) based on Evaluate EvaluatePharma®



Marketed drugs and pipelines (TOP 10: Small Molecules)

- USA: expected to make new drugs in the future.
- Japan and European countries: less pipelines than USA, risks for international competitiveness in the future.

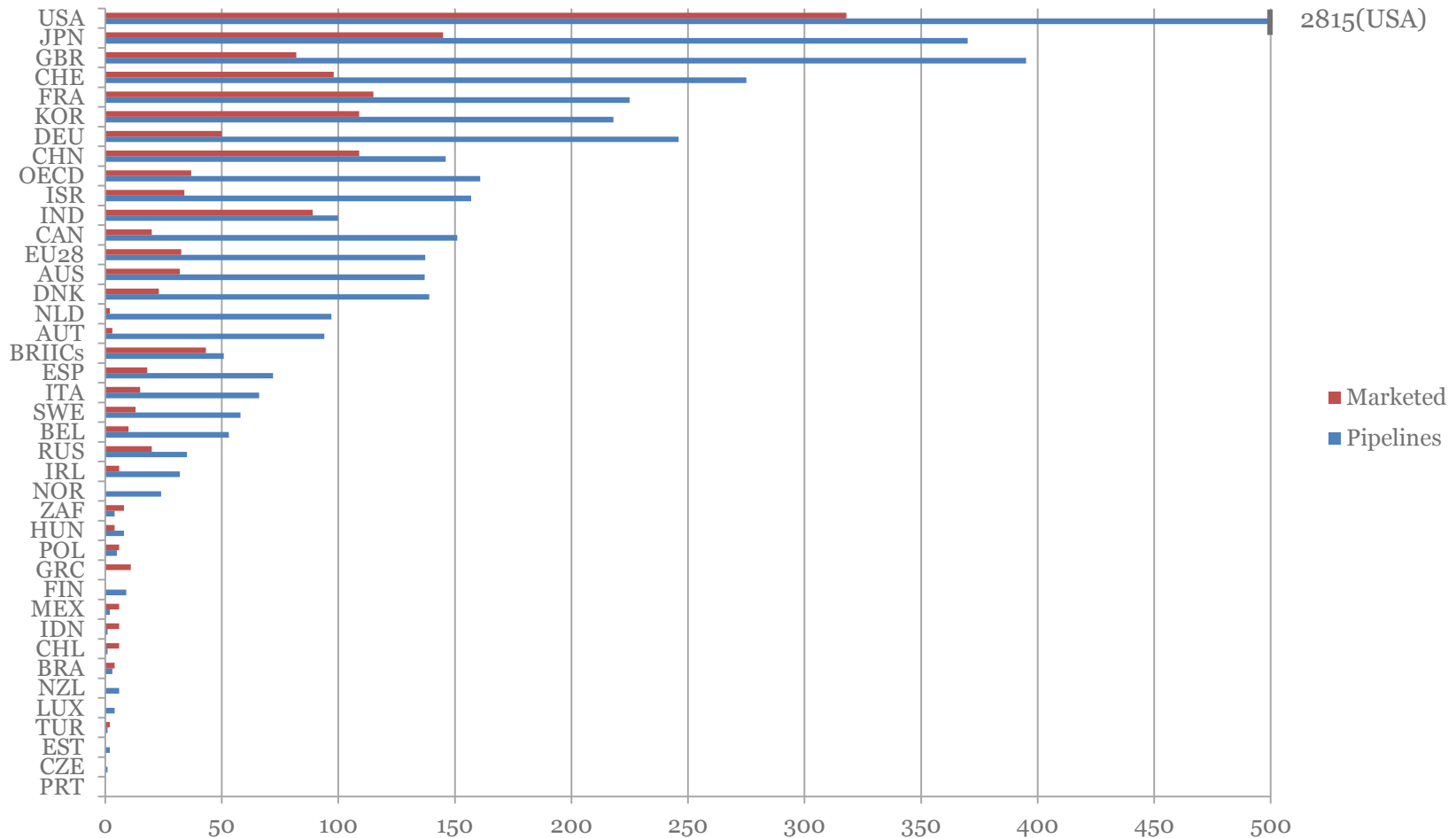




Marketed drugs and pipelines

(Bio-medicine)

- Bio-medicine is expected to grow in the future market. A new drug in this field is an important issue for developed countries.
- The top countries were USA, Japan, United Kingdom, Switzerland, and France.



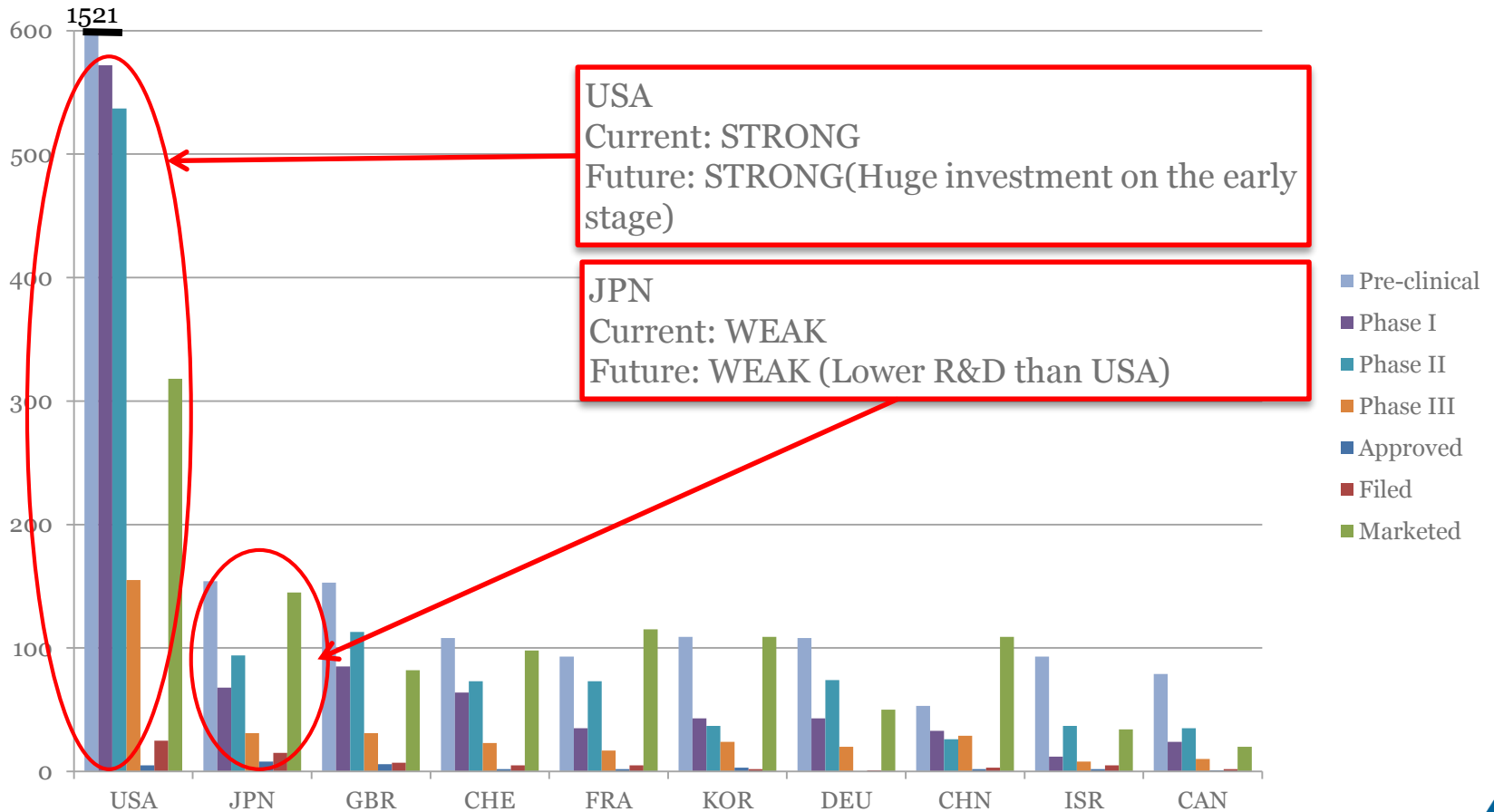
Source) based on Evaluate EvaluatePharma®



Marketed drugs and pipelines

(TOP10:Bio-medicine)

- USA: expected to make new drugs in the future.
- Japan and European countries: same level on the R&D progress of bio-medicine





2. Analyze focusing on business entity

8 categories of business entity related to pharmaceutical industry

Majors

Specialties*

Generics

Non-profits

SMEs

Universities

Government
Agencies

Others

Specialties :

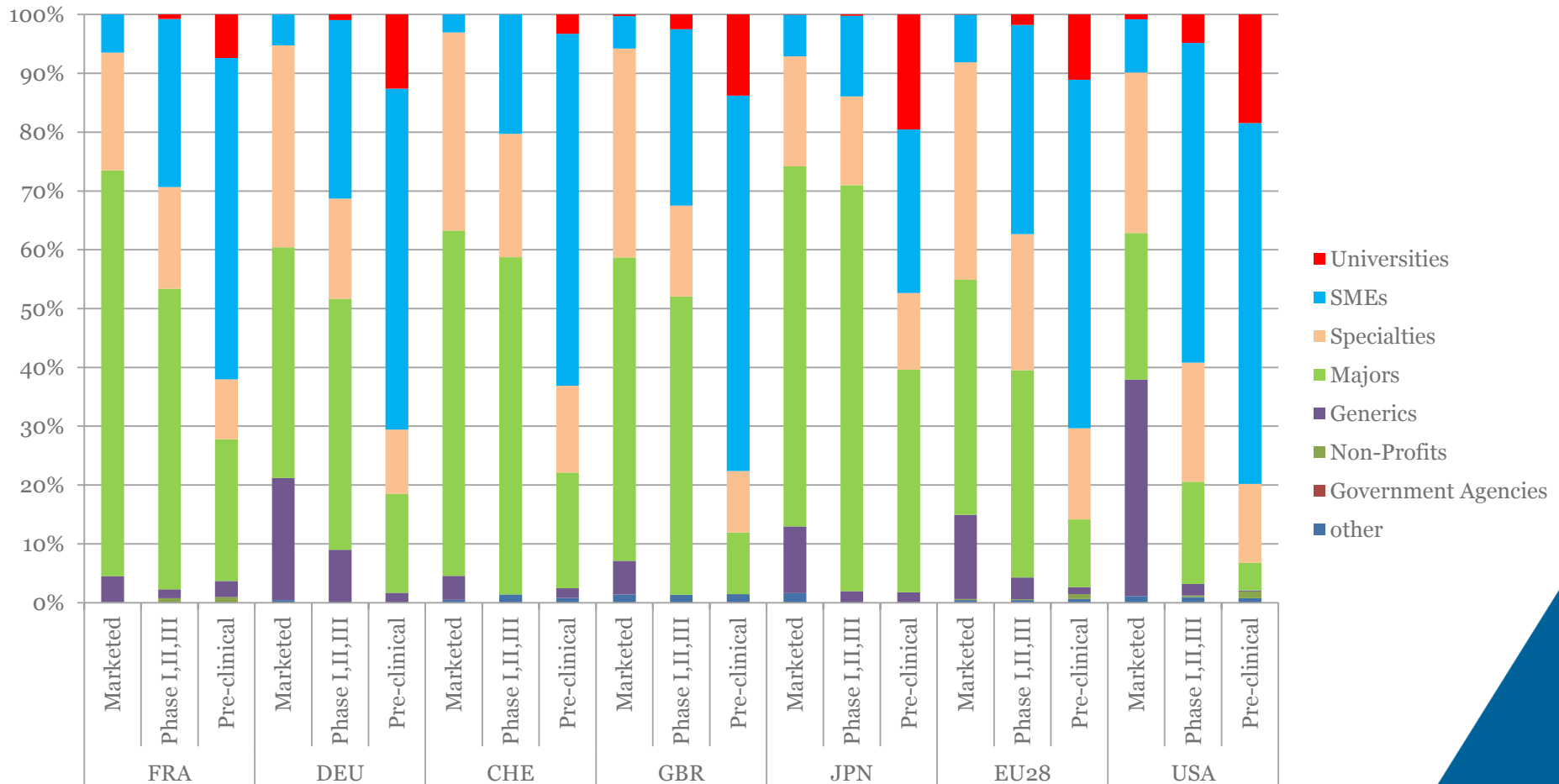
companies developing non-active ingredients

(dosage form and route of administration)



Ratio of entities holding pipelines (Small Molecules)

- USA: SMEs and Univ. dominated in early phase, Generics and Majors in late phase
- Japan and EU: relatively Majors and Specialties dominated

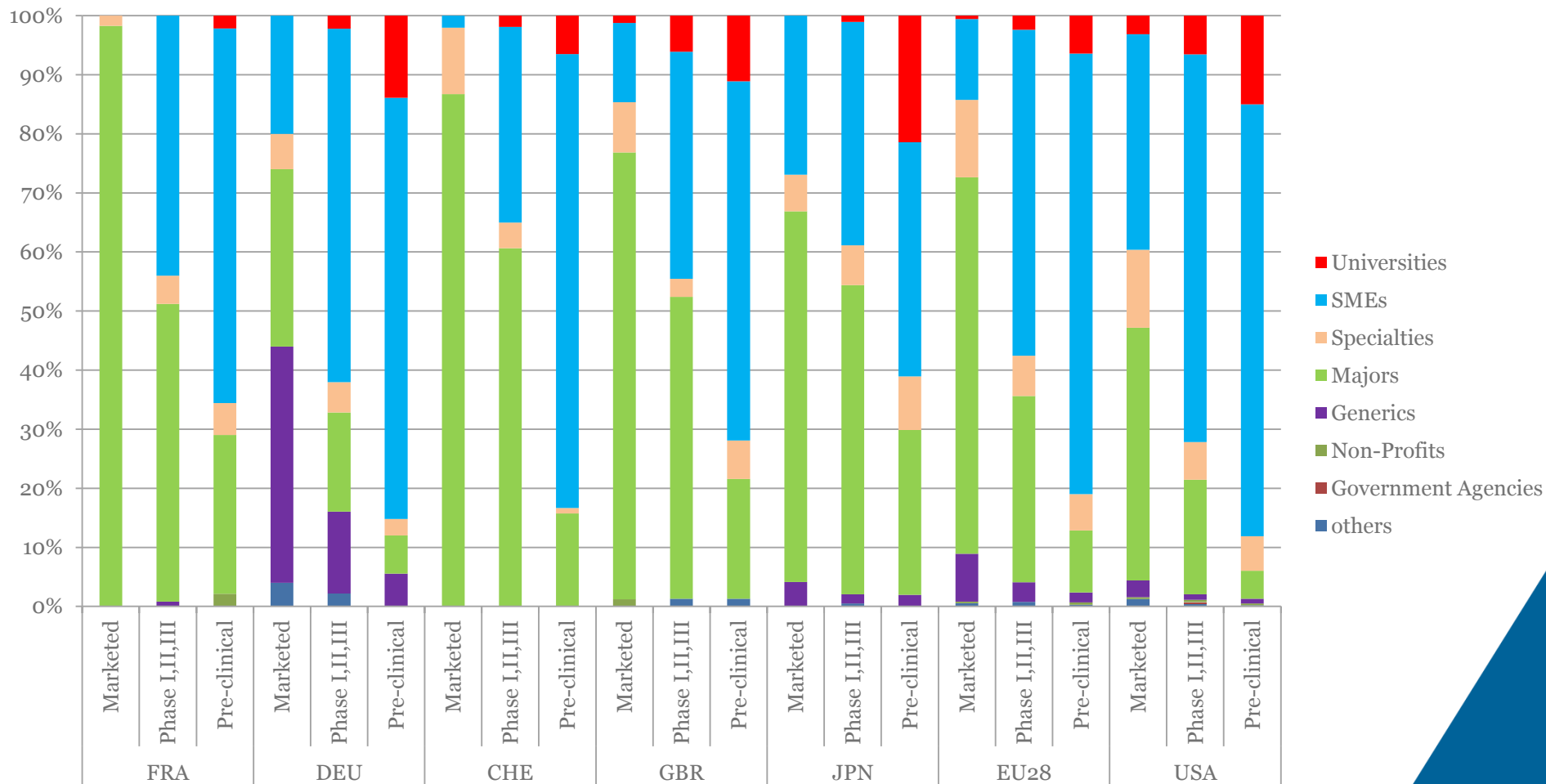




Ratio of entities holding pipelines

(Bio-medicine)

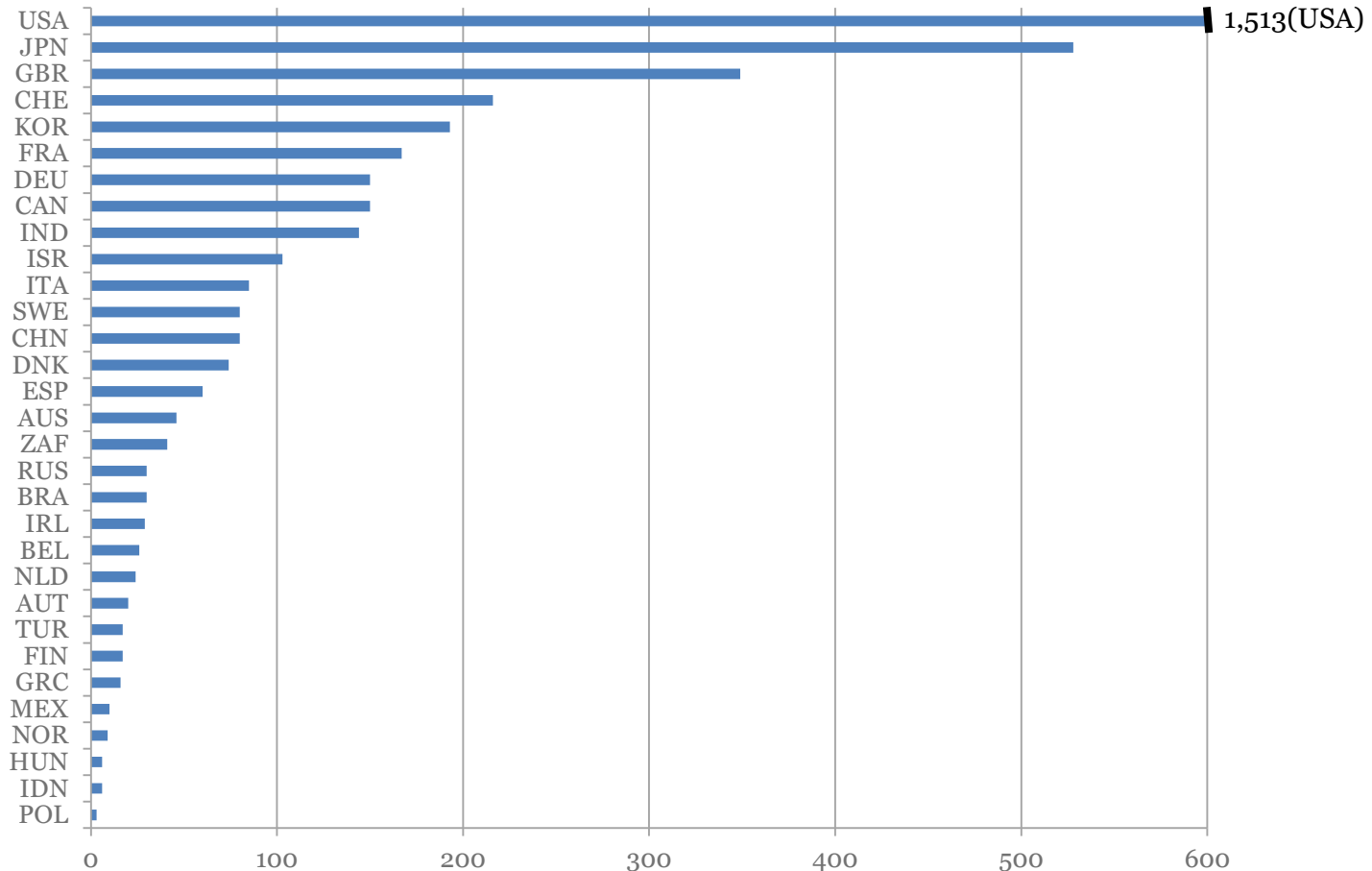
- USA: SMEs and Univ. dominated in early phase
- Role of SMEs in USA and EU28





Deal(licensing) activity

➤ USA was ranked the 1st for the deal activity.

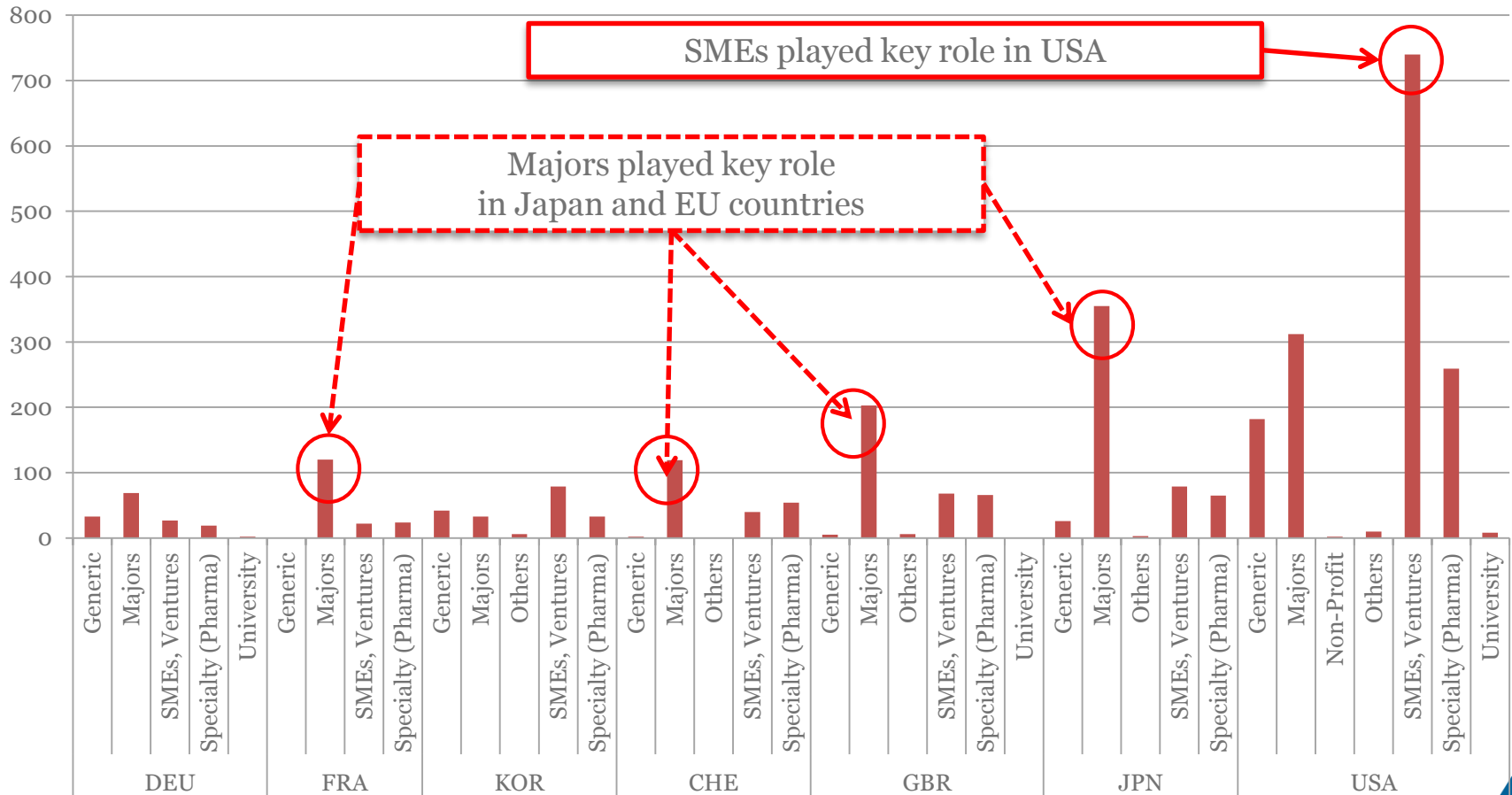




Deal(licensing) activity

Source) based on Evaluate EvaluatePharma®

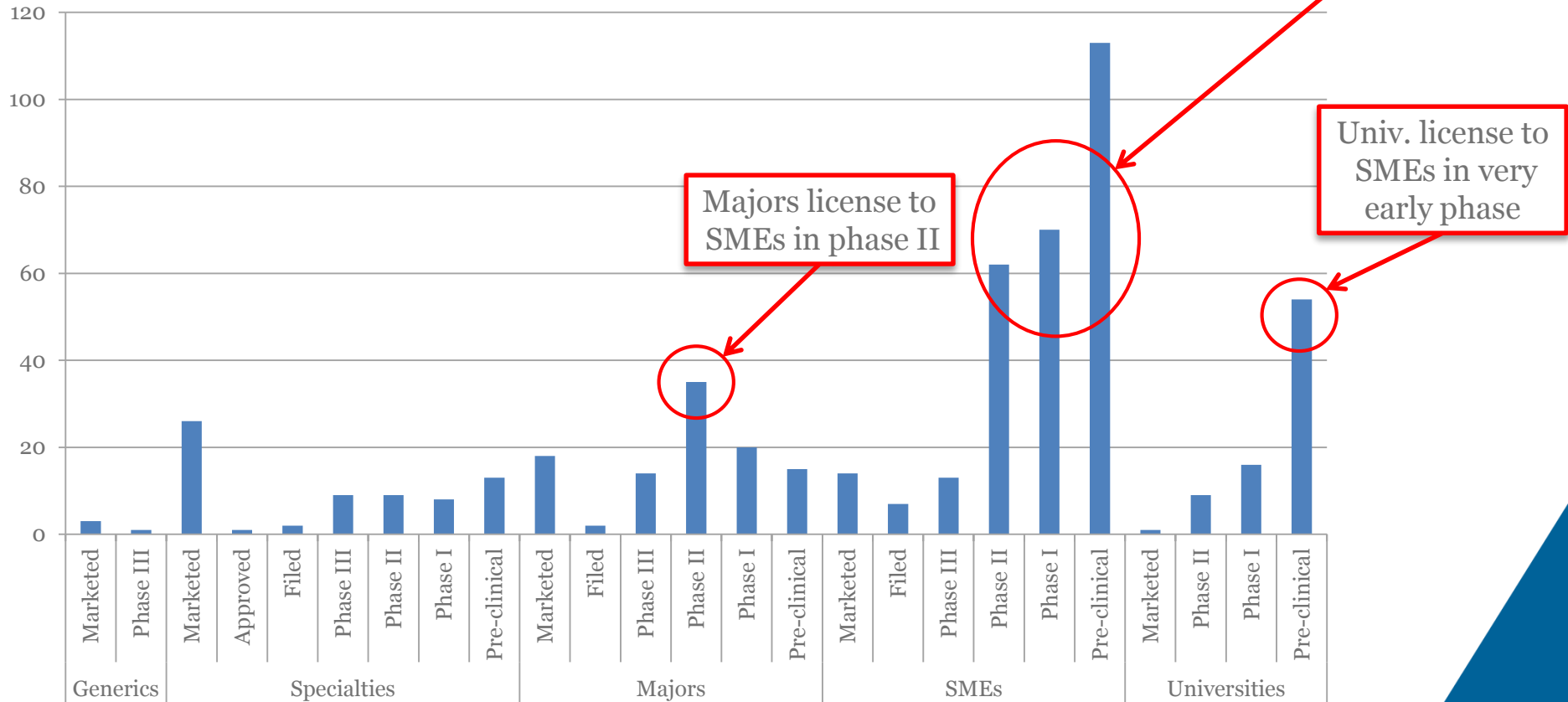
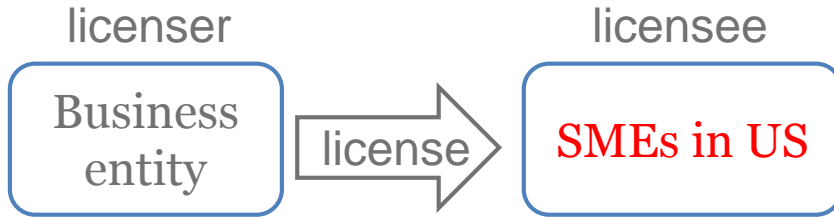
- In USA, SMEs played the key role for the drug R&D.
- However in Japan and European countries, Majors played the key role instead of SMEs.





Deal where the licensee is SMEs in US

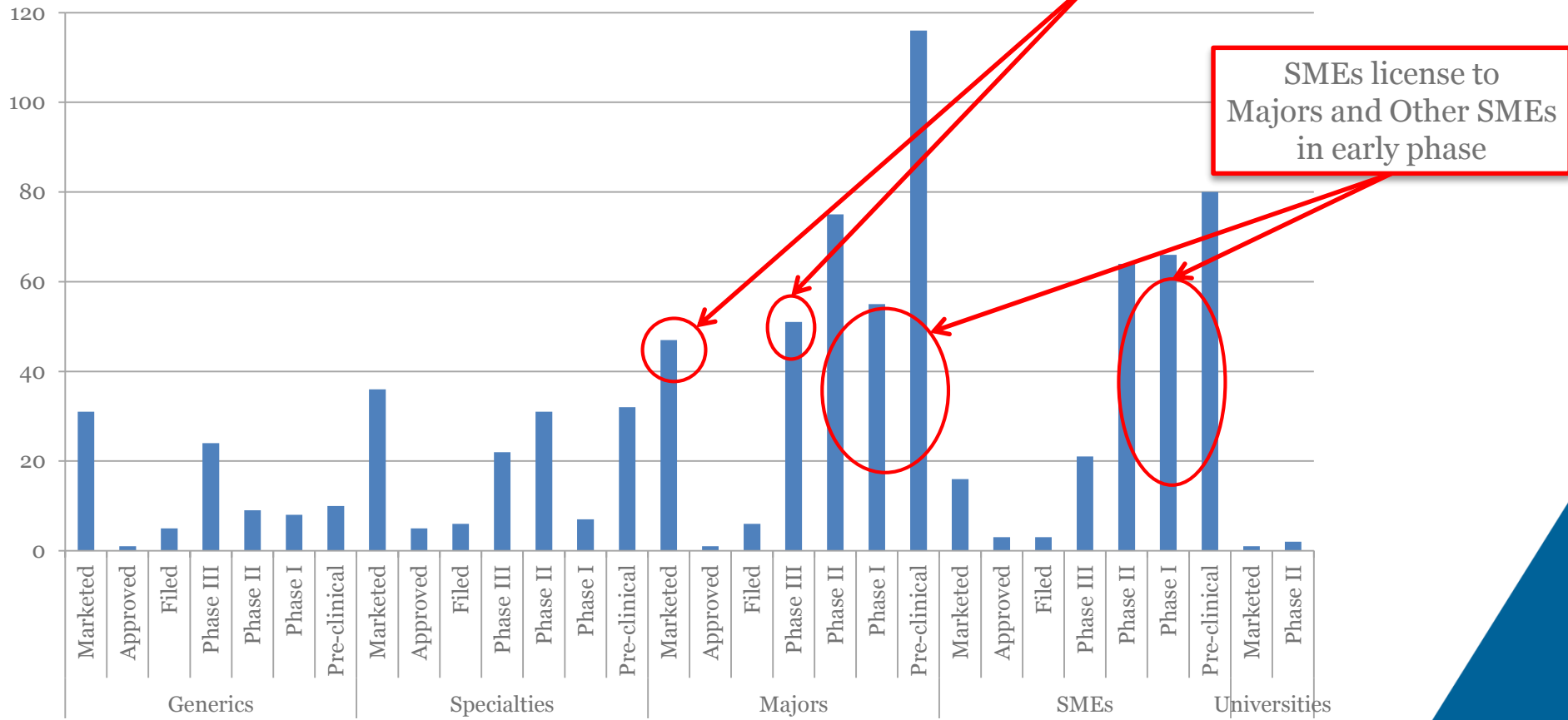
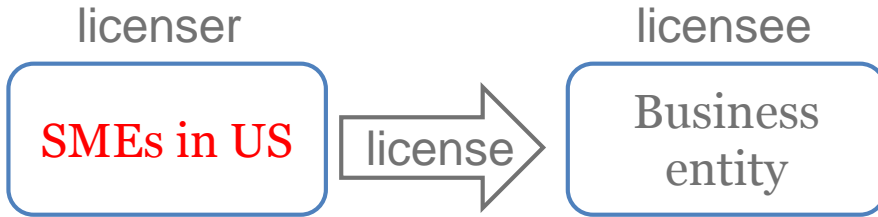
Source) based on Evaluate EvaluatePharma®





Deal where the **licenser is SMEs** in US

Source) based on Evaluate EvaluatePharma®

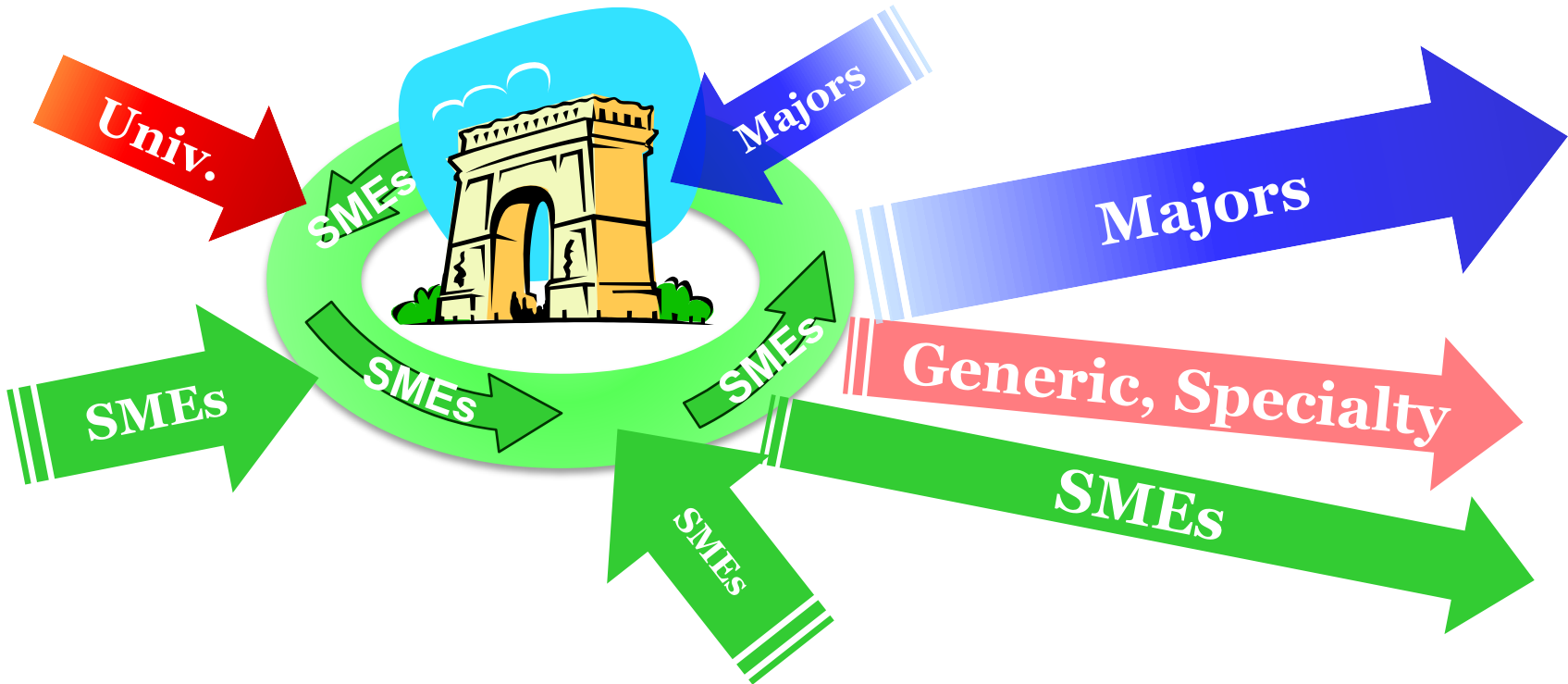




R&D flow in US



R&D Roundabout via SMEs





Deal where the licensee is Majors or Specialties in EU28

Source) based on Evaluate EvaluatePharma®

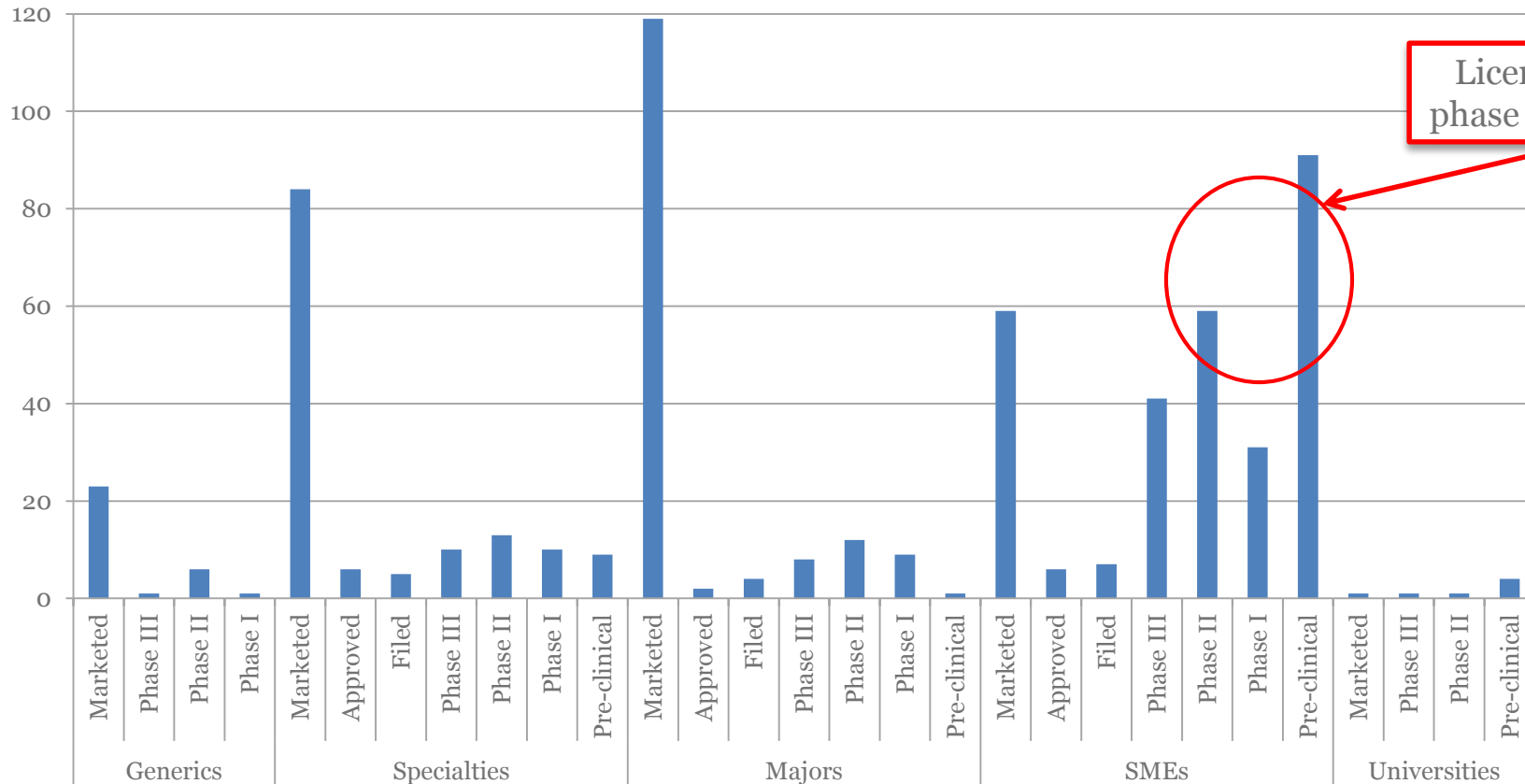
licenser

licensee

Business entity

license

Majors or Specialties in EU

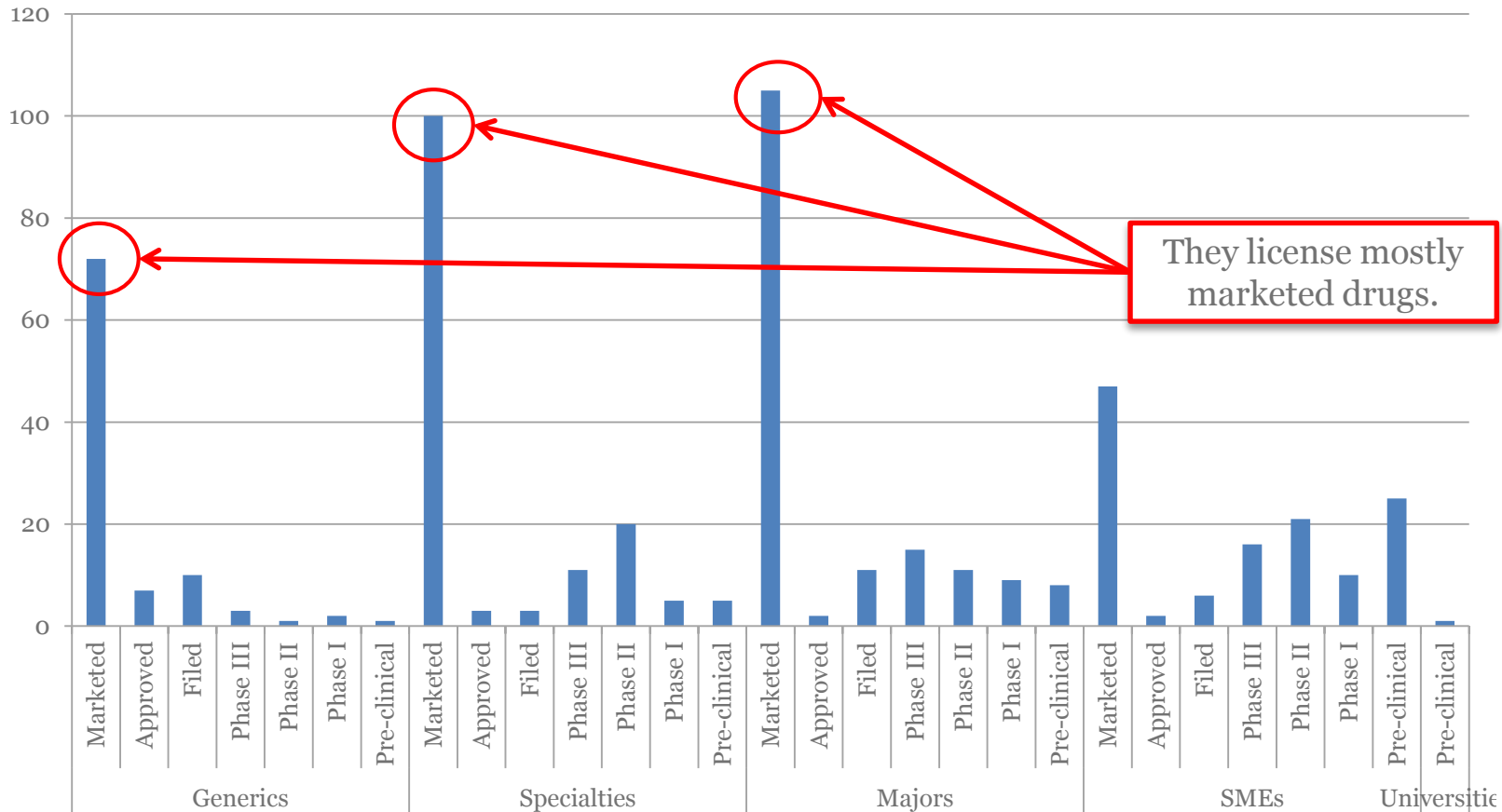
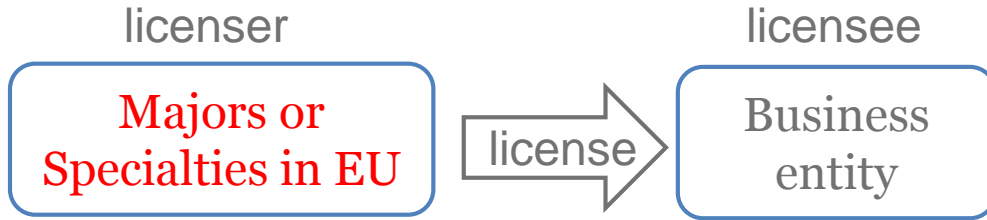


Licensors in early phase are only SMEs



Deal where the **licenser is Majors or Specialties** in EU28

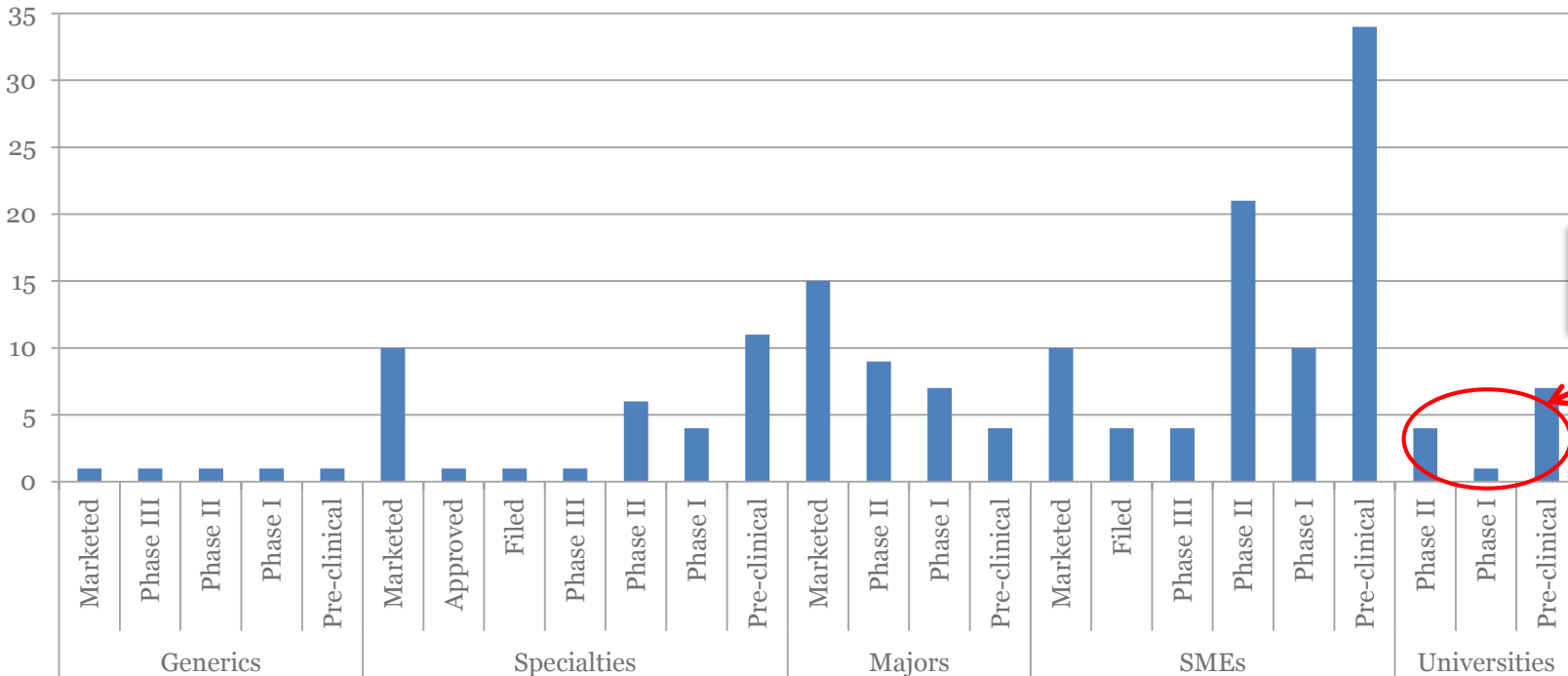
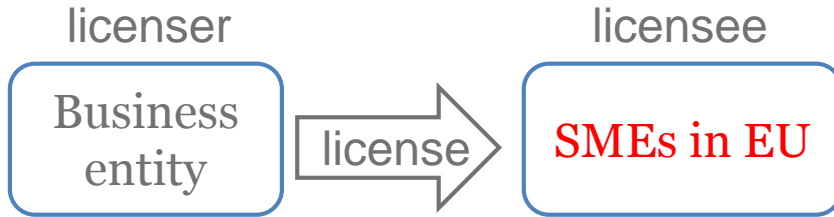
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Deal where the licensee is SMEs in EU28

Source) based on Evaluate EvaluatePharma®

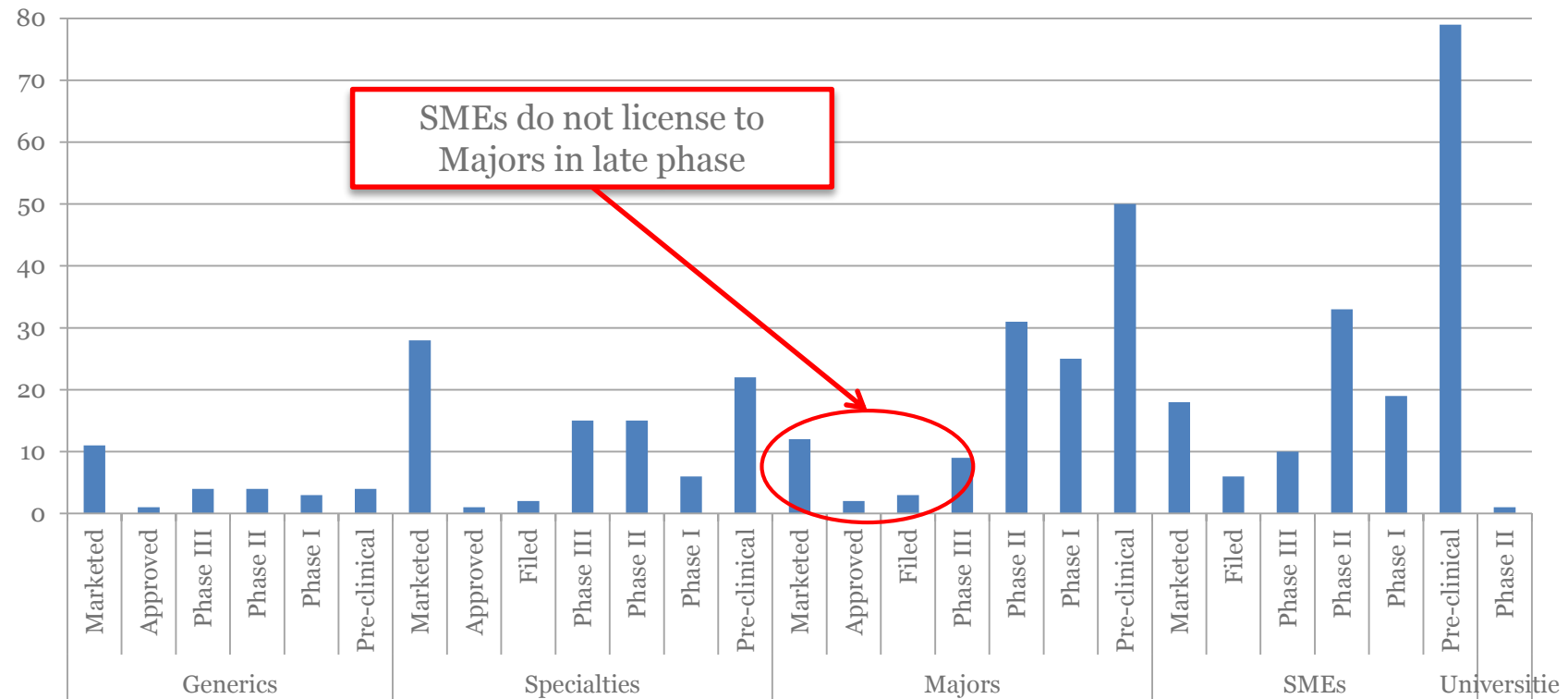
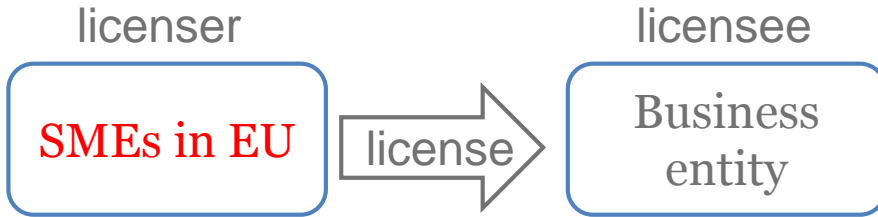


Few license from Univ.



Deal where the **licenser is SMEs** in EU28

Source) based on Evaluate EvaluatePharma®





R&D flow in EU28

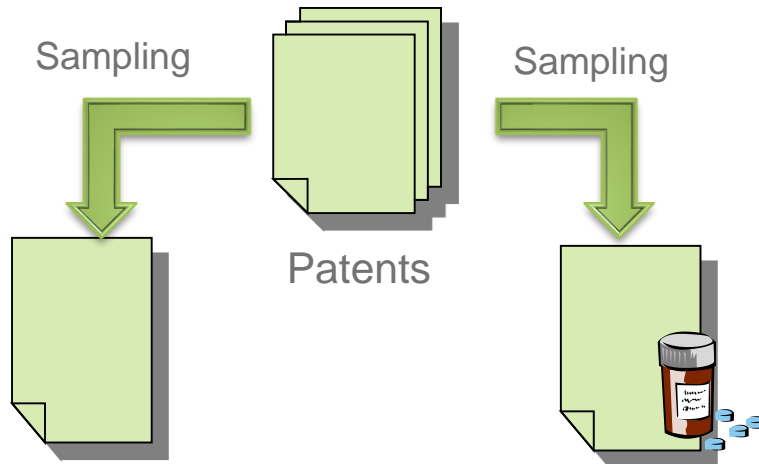


Lack of Roundabout
via SMEs





3. Further foresight by patent quality



Data1: patents
Diabetes Mellitus : A61P 3/10
Cell Therapy : A61K35/12 &
C12N5/07

Data2: patents and pipelines
information
Diabetes Mellitus
Cell Therapy

Verification process:

Need a set of patents leading to pipelines

Analysis:
Logistic regression Analysis



➤ To foresight the potential of making new drugs in longer span, patents directly related with R&D process analyzed

Indicators for measuring patent quality:

- (1) Patent family size
- (2) Claims
- (3) IPC**
- (4) ECLA
- (5) ICO
- (6) Forward citations**
- (7) Backward citations
- (8) Citations to Non-Patent Literature**

(3)(6)(8) are found as new drug-patent-indicators for extracting patents that have linkage with R&D processes.



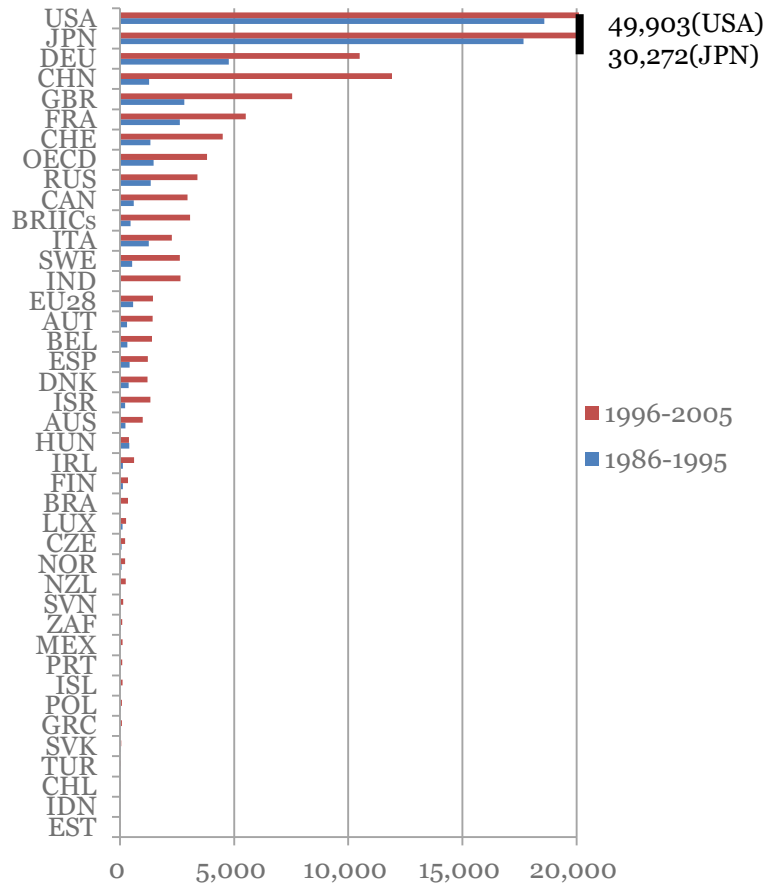
Further foresight by patent quality

(Small Molecules)

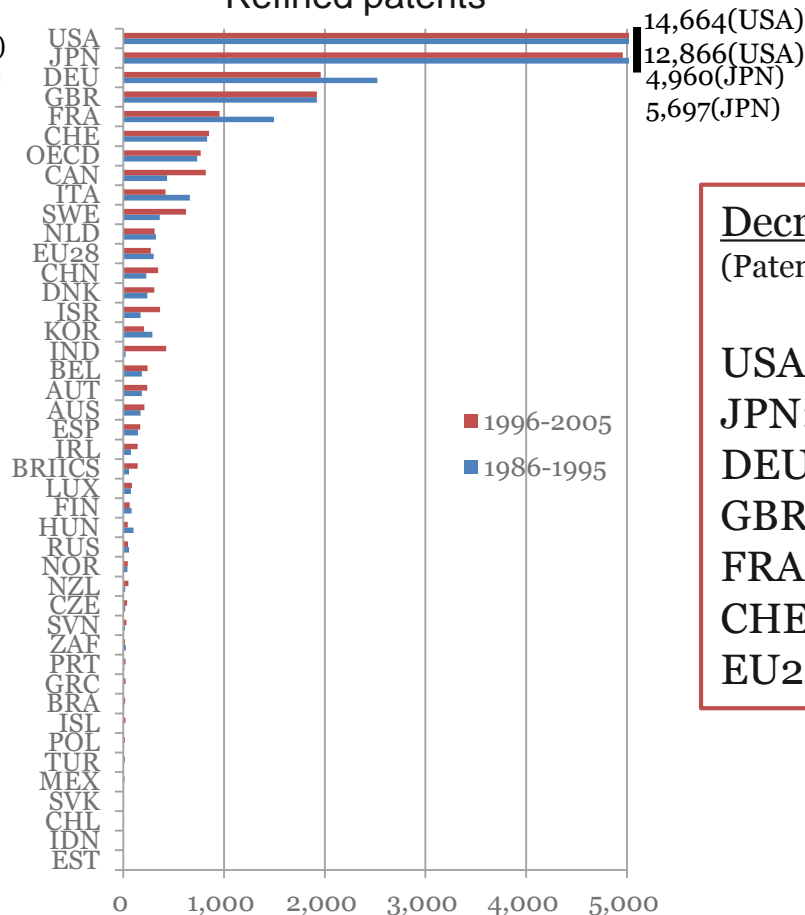
Source) based on Thomson Reuters Derwent World Patents Index, Derwent Patents Citation Index

- recalculate the patents using new refined indicators
- US : increase of refined patents from 1986-1995 to 1996-2005
- Japan, Germany, France: decrease of refined patents.

Patents before refining



Refined patents



Decrease ratio
(Patents to Refined patents)

USA: 70.7%
JPN: 83.6%
DEU: 81.3%
GBR: 74.5%
FRA: 82.6%
CHE: 81.0%
EU28: 81.1%



Further foresight by patent quality

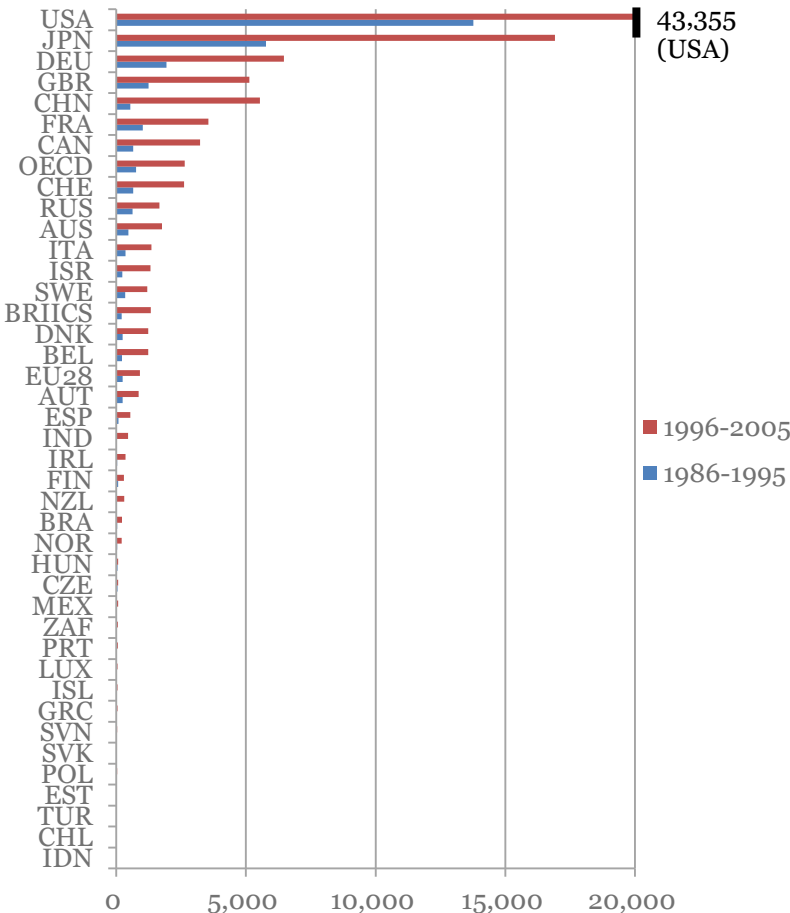
(Bio-medicine)

Source) based on Thomson Reuters Derwent World Patents Index, Derwent Patents Citation Index

- Recalculate the patents using new refined indicators
- Top5 countries increased refined patents from 1986-1995 to 1996-2005.

Patents before refining

Refined patents



Decrease ratio
(Patents to Refined patents)

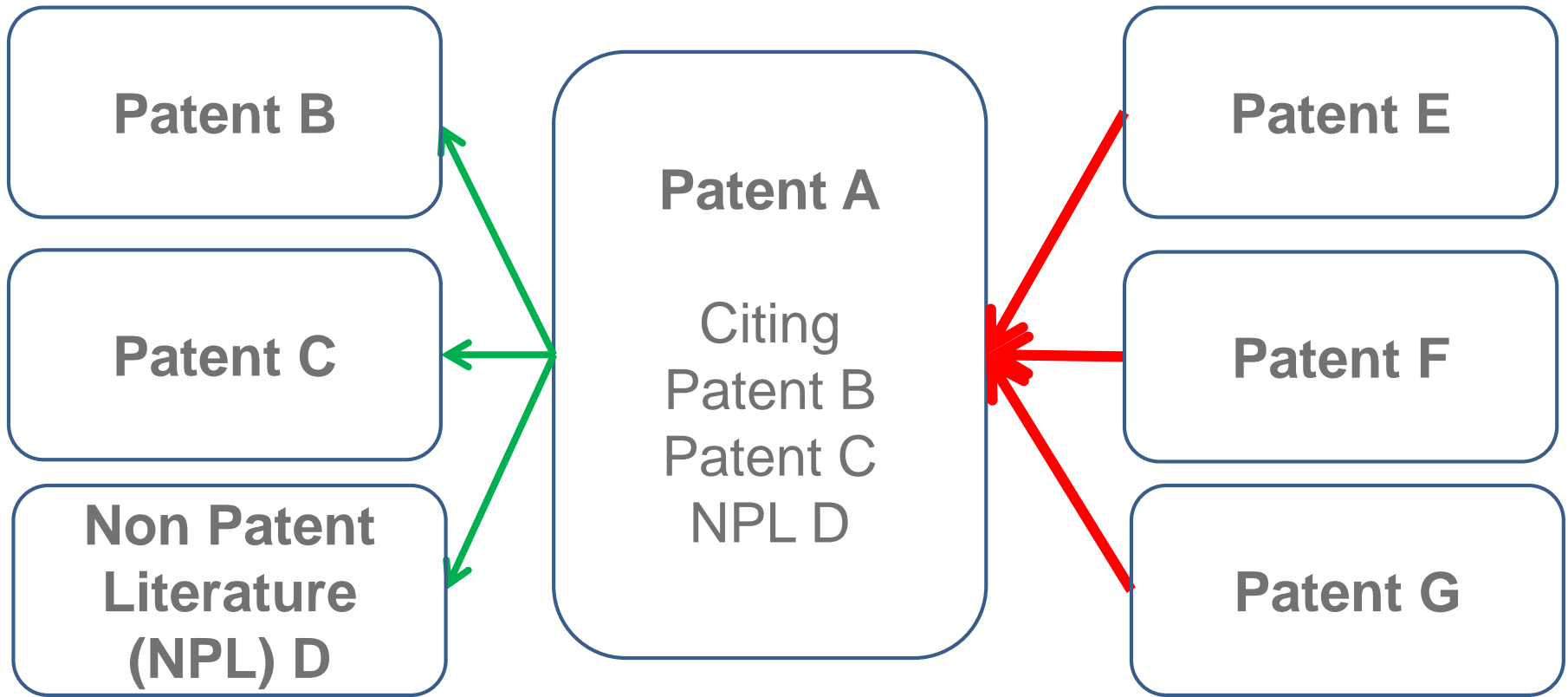
USA: 68.4%
JPN: 74.4%
DEU: 79.4%
GBR: 80.1%
FRA: 81.9%
CHE: 75.9%
EU28: 79.0%



Knowledge emergence and diffusion

Backward Citation

Forward Citation



Citation Lag: implications about the time structure of knowledge spill-overs

Generality Index: diversity of technology

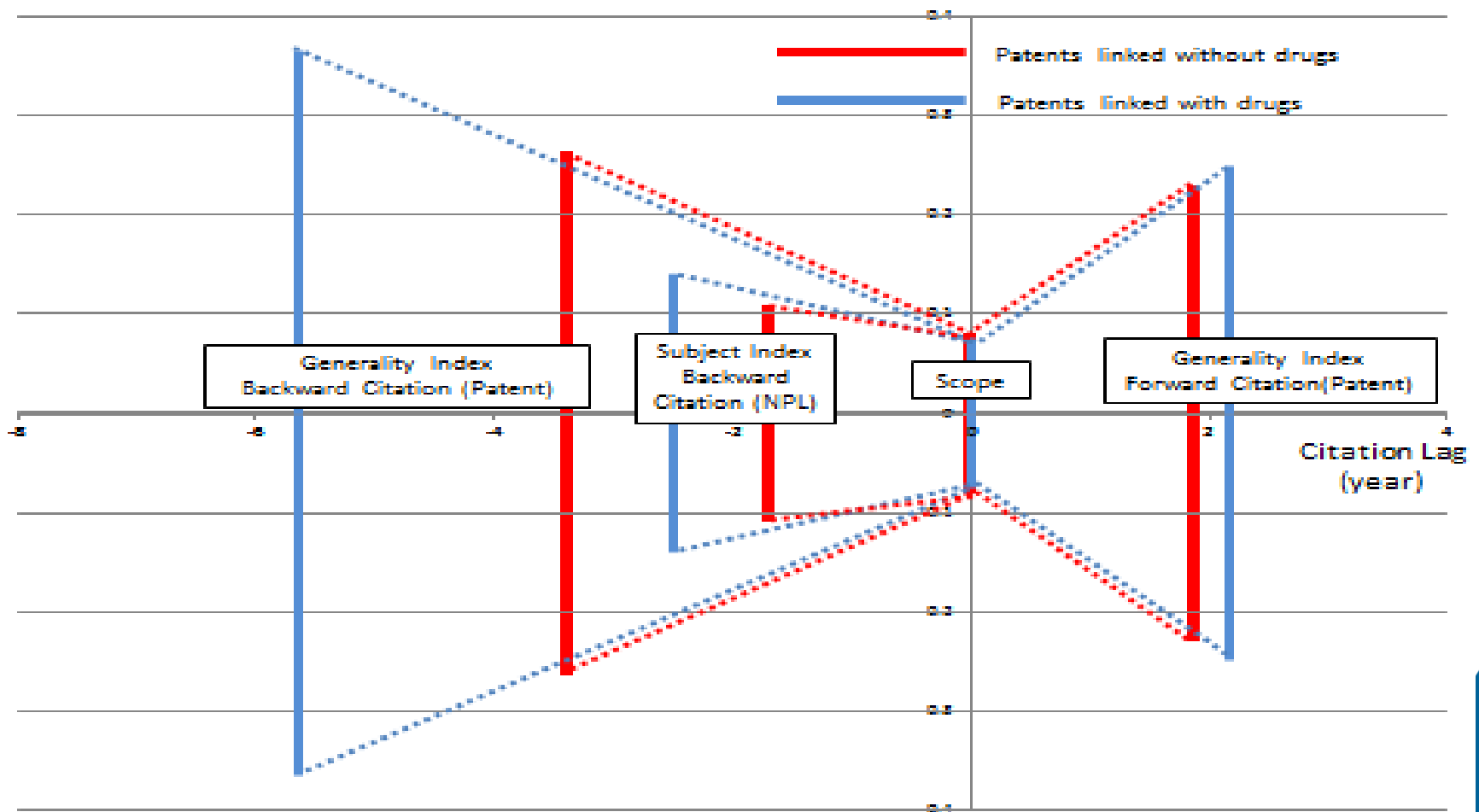
Subject index: diversity of scientific fields

Scope: technological value of patents



Compare between patents linked with drugs and patents linked without drugs

Patents linked with drugs themselves tend to be very technically specialized. They are influenced by wider technological and scientific fields, and make an impact in wider fields as ground-breaking inventions.





NEXT STEP

- Linkage of Pipeline database, Patent database, and Trademark database
- Making new indicators such as subject index(diversity of technical fields) to Trademark database
- Financial analysis



Thank you for your attention.

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