BETTER POLICIES FOR BETTER LIVES

Measuring patent quality and radicalness of patents filed by regions: example of the ICT sector

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Measuring patent quality

The patent based indicators proposed:

- Are based on **existing** literature;
- Try to capture the **technological importance** of the invention, its **economic value**, and the possible **impact** on subsequent technological developments.
- Rely on information contained in the patent documents:

  → *can be constructed for all patents,*

  → *rely on a homogeneous set of information,*

  → *comparable across countries and over time.*
- Are compiled for each EPO patent document from EPO's Worldwide Statistical Database (PATSTAT).
- Indicators are normalised with respect to maximum values obtained in cohorts - year & technology field (WIPO/Schmoch, 2010)
- ICT patents are identified using OECD definition.

OECD

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NOTES

The assessment of the patent quality relies on the sole content of patent document as available in patent databases.

No additional information about e.g. market transactions or real use of the (patented) technology available are exploited.

Using different data sources may lead to different results.

- ICT patents are identified using OECD definition.

Patent scope

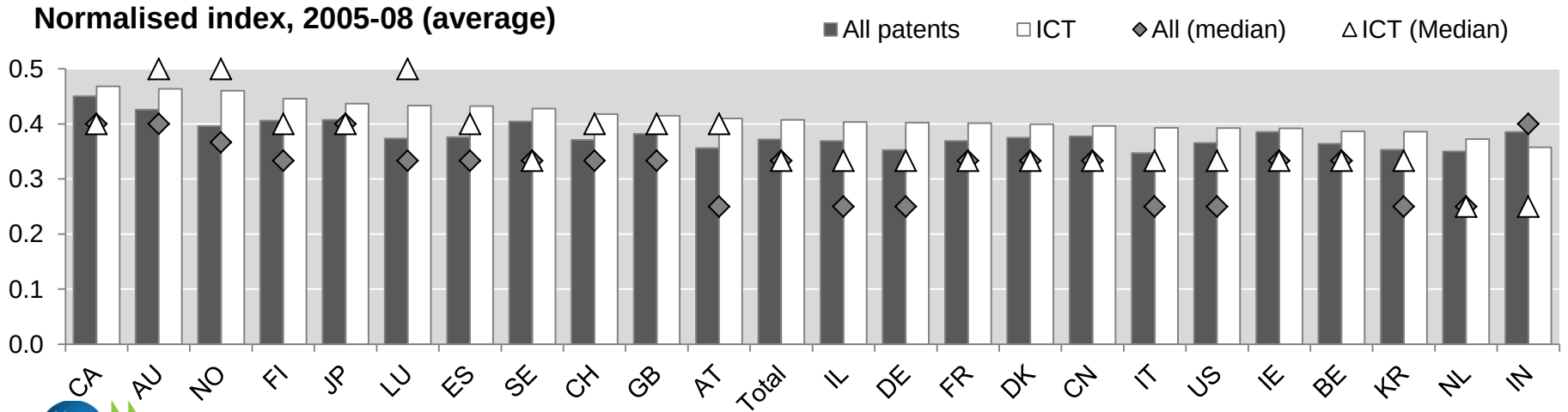
Is associated with the **technological** and **economic** value of inventions:

- Patent scope relates to the valuation of a firm; broad patents are more valuable (Lerner, 1994).
- Patents' scope to be used to foster early disclosure of fundamental innovations (Matutes et al., 1996).

Definition: (follows Lerner, 1994).

Number of 4-digit subclasses of the International Patent Classification (IPC) the invention is allocated to.

Larger number ➔ broader scope.



Source: OECD calculations based on PATSTAT, EPO, October 2011.

Patent family size

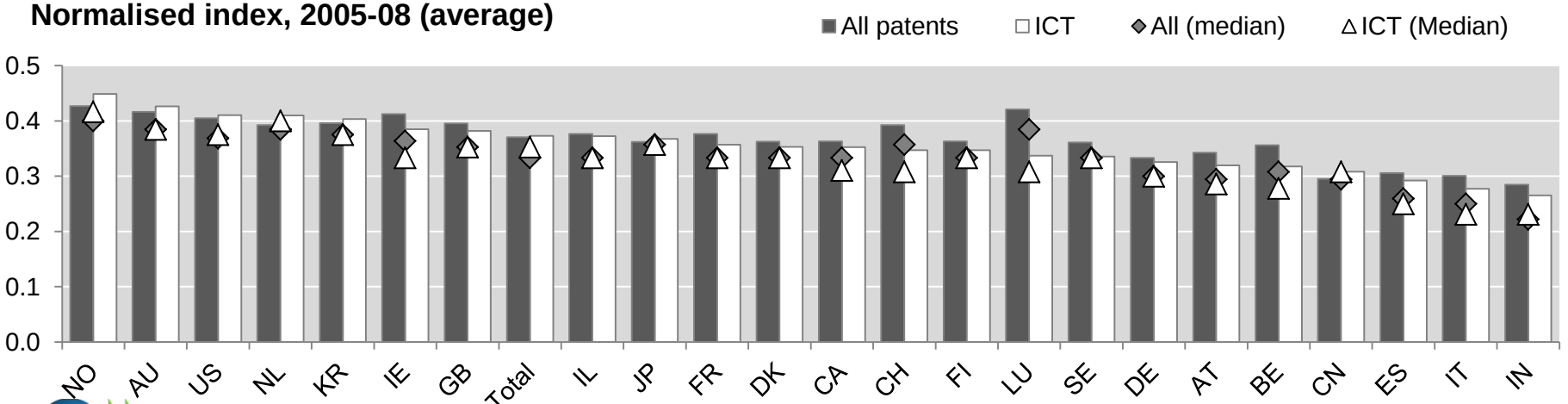
Families are patents filed in several countries and related to each other by one or several common priorities. Patent family size:

- Is associated to the **economic value** of patents (Lanjouw et al., 1998).
- Large international patent families have been found to be particularly **valuables** (Harhoff et al., 2003).

Definition: number of patent offices at which an invention has been protected by a patent.

Larger number
➔ *more valuable patent*.

Normalised index, 2005-08 (average)



Source: OECD, calculations based on PATSTAT, EPO, October 2011.

Number of claims

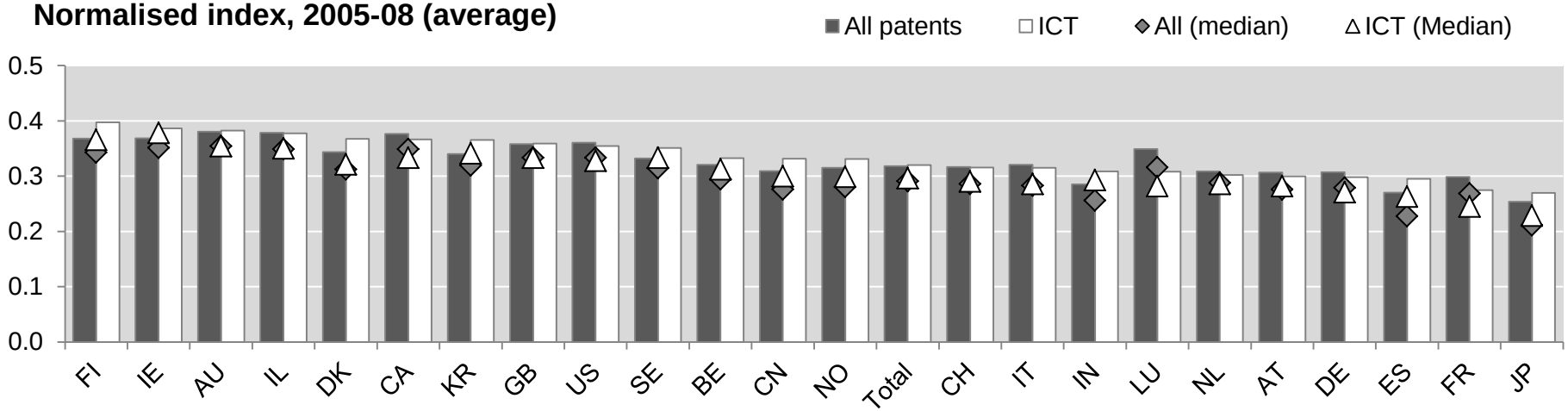
Is associated with the **technological** and **economic** value of inventions:

- Determines the technology and subject matter protected by law.
- Reflects the expected economic value of a patent
  (Tong & Davidson, 1994;
  Lanjouw & Schankerman, 2001, 2004).

Definition: number of claims per patent.

Larger number ➔
more valuable patent.

Normalised index, 2005-08 (average)



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Backward citations

Patents cited in the patent document.
Are used to **assess patentability**:

- Are positively related to value of patents (Harhoff et al., 2003).

BUT

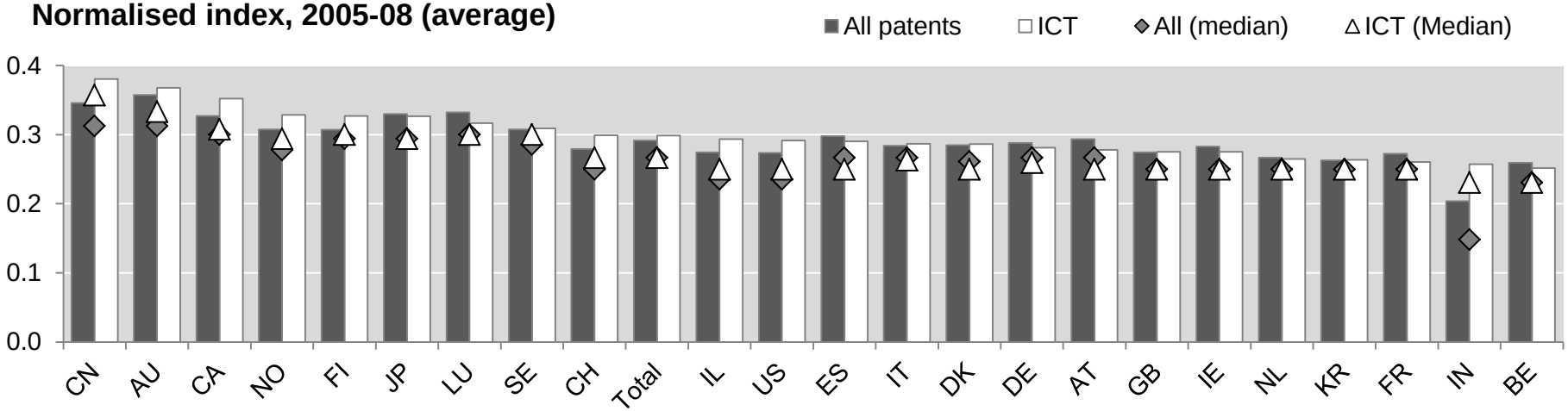
- May signal inventions of incremental nature (Lanjouw & Schankerman, 2001).

Definition:

Number of patents cited in the patent document.
Includes self-citations.

More citations ➔ more valuable patent.

Normalised index, 2005-08 (average)



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

References to Non-Patent Literature (NPL)

Part of backward citations. Help **assess patentability**.

- Reflect closeness to scientific knowledge (Callaert et al., 2006).
- Patents with NPL contain more complex and fundamental knowledge (Cassiman et al., 2008).
- Patents with NPL are of significant higher quality (Branstetter, 2005)

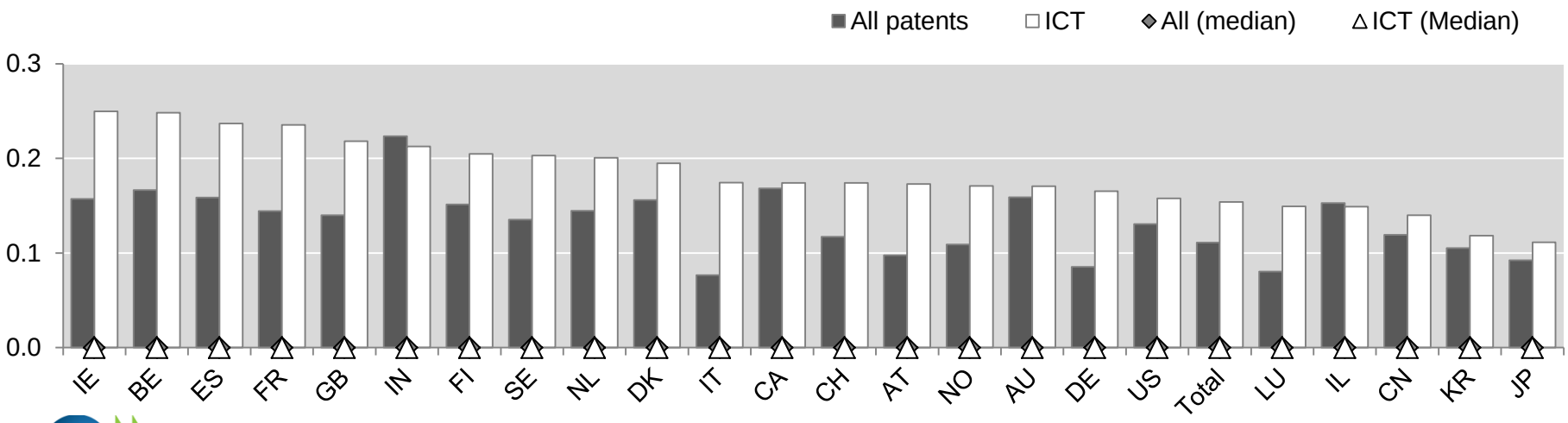
Definition:

Share of NPL citations in a patent document.

Higher NPL share

➔ *more valuable patent*

Shar e of NPL in total backward citations, 2005-08 (average)



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Forward citations

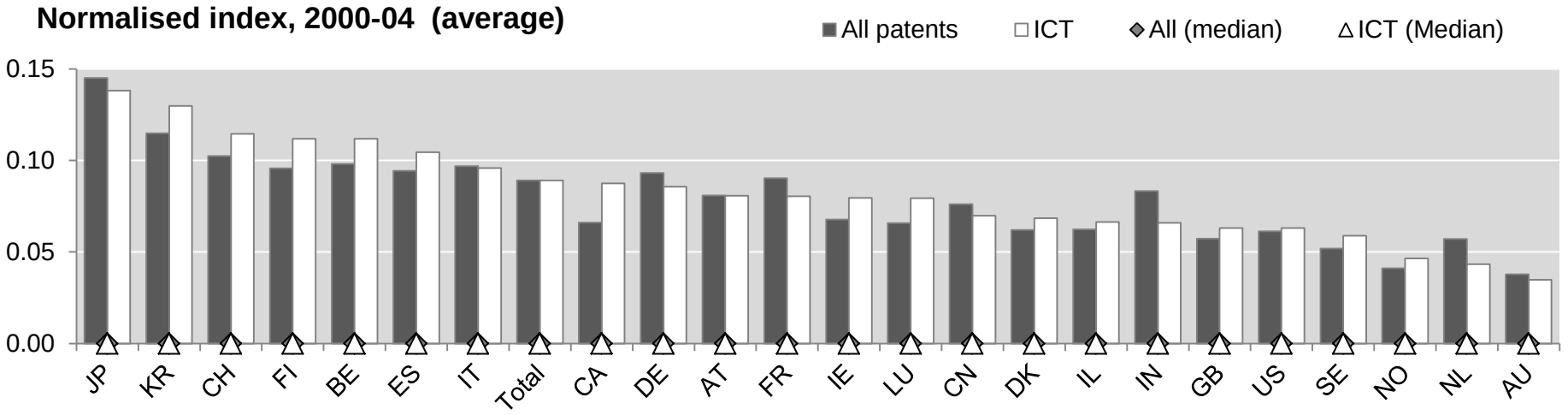
Citations received by subsequent patents.

- Mirror **technological importance** for subsequent developments (e.g. Trajtenberg et al., 1990).
- Include self-citations, as these may be more valuable than external cites (Hall et al., 2005).

Definition:

Number of citations received in 7-year time after publication. Corrected for patent equivalents.

More citations received
➔ *more valuable patent.*



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Breakthrough inventions

Capture the extent to which inventions serve as **basis for future technological developments**.

- Are associated with entrepreneurial strategies.
- Patenting grows much more in cities and technologies where breakthrough inventions occur (Kerr, 2010).

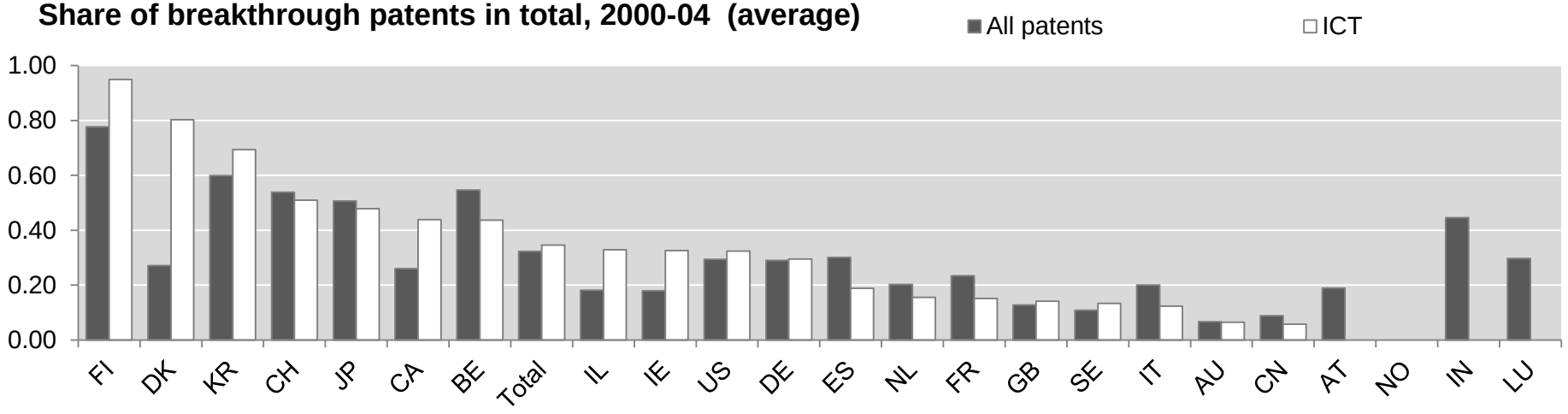
Definition (follows Ahuja & Lampert, 2001)

Top 1% cited patents in each cohort (technology field and year). Forward citations counted up to 7 years after publication.

Counts corrected for equivalents.

Breakthroughs more valuable.

Share of breakthrough patents in total, 2000-04 (average)



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Radicalness

Radicalness difficult to measure.

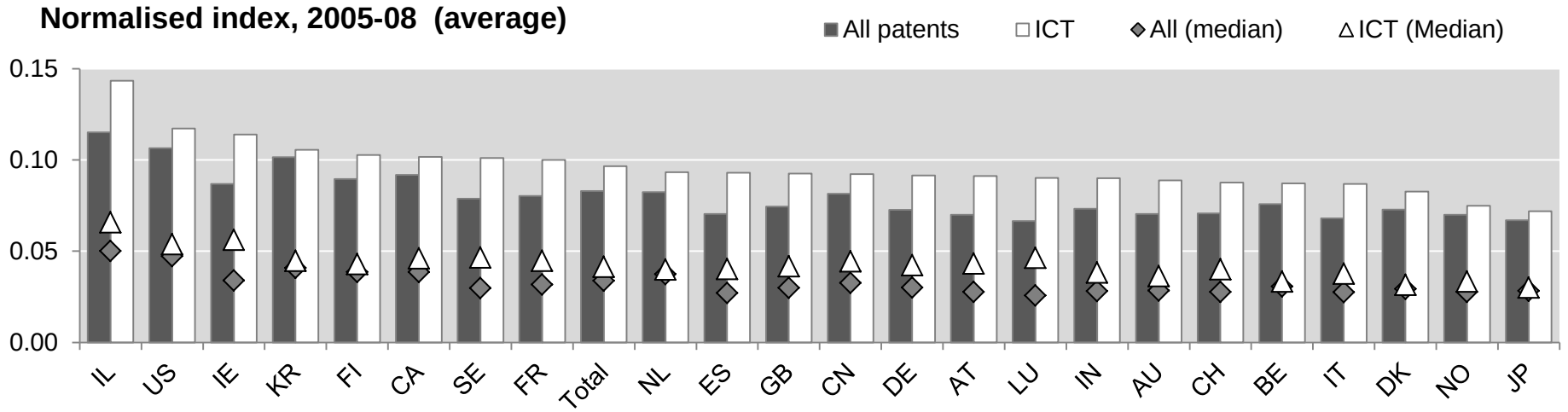
- A radical invention is novel, unique, and **impacts on future technology** (Dahlin & Behrens, 2005).
- Radicalness linked to firm formation and entrepreneurship .

Definition (originality based on Hall, 2005):

Herfindahl-type concentration index

$\text{Radicalness}_p = \Sigma_j \left({}^{N_k}/_{N} \right)^2$, where N_k is the fractional count of backward citations in different IPC classes *k* in total backward citations N out of n_p 4-digits IPC tech classes.

More radicalness ➔ more valuable patent.



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Grant lag

The time elapsed between application and grant dates reveals applicants' belief about value of the patent:

- Well-documented patents are approved faster (Harhoff & Wagner, 2009).
- Time to grant depend on effort made by filing party (Régibeau & Rockett, 2010).

Definition:

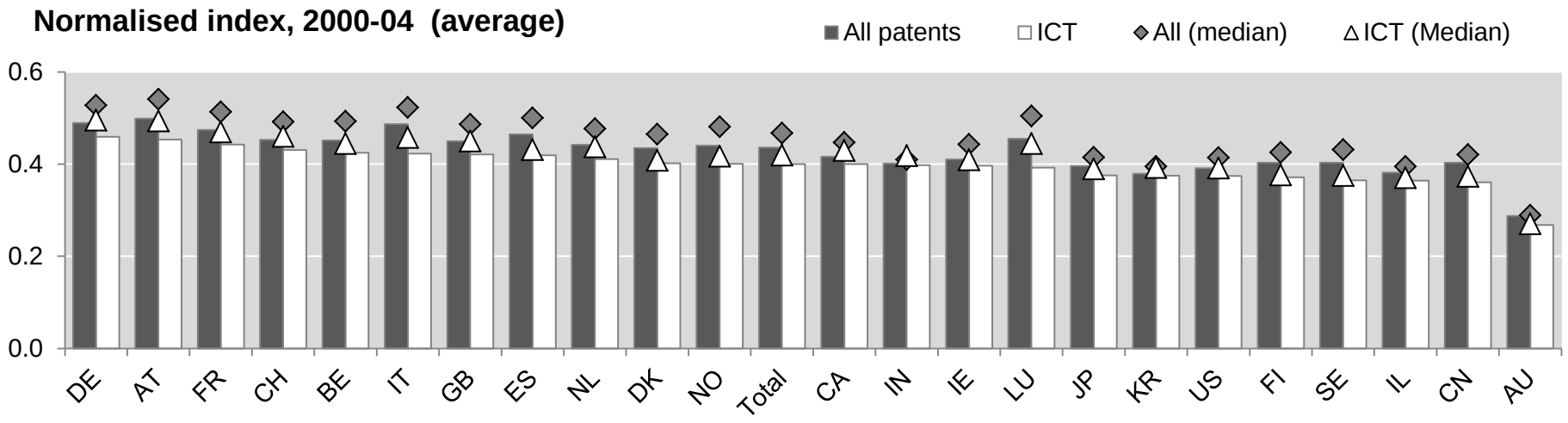
$Grant_{pi} = 1 - {}^{\Delta_t}/_{Max(\Delta_{ti})}$,

where: Δ_t is the grant lag (days);

$Max(\Delta_{ti})$ the max lag of cohort *i*

Shorter grant lag

➔ *more valuable patent.*



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Generality

Mirrors number and distribution of forward citations and IPC classes cites belong to.

- Captures **importance** of patents **for later developments**, and number of fields where they happen (Bresnahan & Trajtenberg, 1995; Hall et al., 2001, Hall & Trajtenberg, 2004).
- Corrections using weights to reflect the technological proximity of the IPC classes.

Definition: (adapted from Hall & Trajtenberg, 2004).

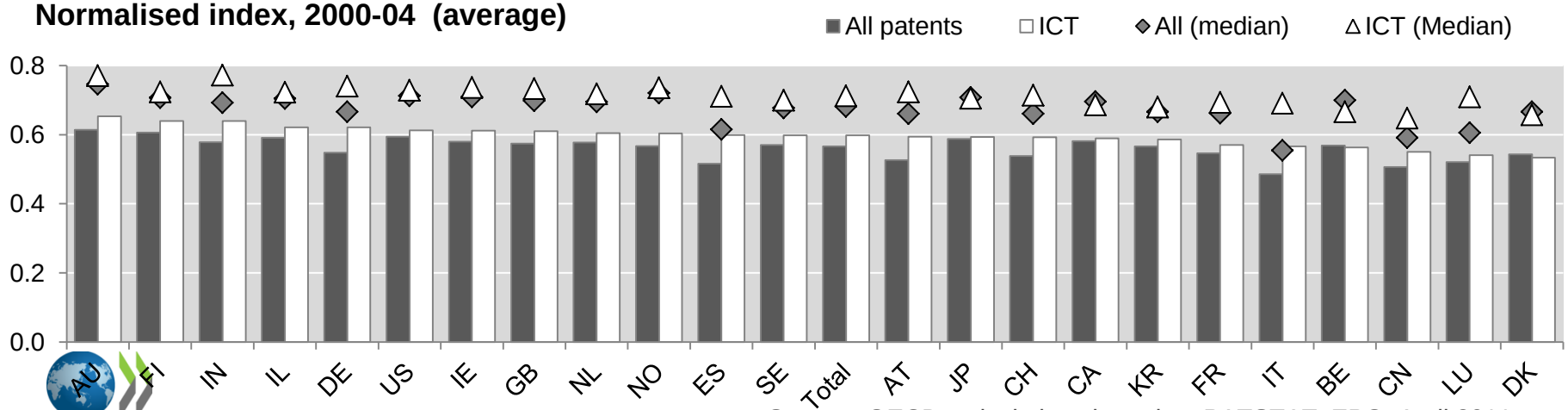
account for technological distance between IPC classes (weighted measure)

$$GW_p = 1 - \sum_i p_i \left[\frac{\sum_j \alpha_{ij} c_j}{C_p}\right]^2,$$

where p_i is the share of IPC class *i* in the patent; α_{ij} is the propensity of IPC class *i* to be cited by IPC class *j*; c_j the share of IPC class *i* in the patent *c* citing *p* and Cp total forward citations of *p*.

Higher generality ➔ *more valuable patent*.

Normalised index, 2000-04 (average)



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Patent quality

Patent quality (PQ) synthesises **economic and technological value** of patents.

Accounts for 4 to 6 dimensions:

- PQ(4): Forward citations; family size; number of claims; generality index.
- PQ(6) = PQ(4) + Backward citations; grant lag.

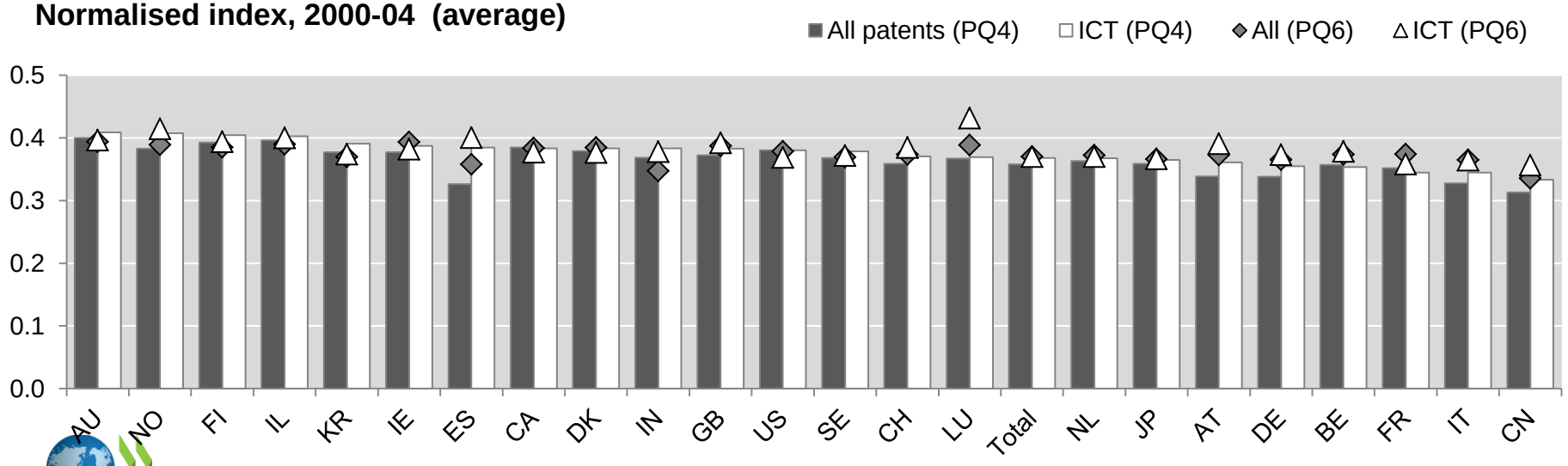
Definition (derived from Lanjouw & Shankerman, 2004):

Unweighted average of 4 (or 6) normalised components. Patents cohorts stratified by year & tech field.

Definition differs from Lanjouw & Shankerman (sector specific weighted average of claims, bwd & fwd cits and family size)

Higher quality ➔ more valuable patent.

Normalised index, 2000-04 (average)



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Insights at the regional level

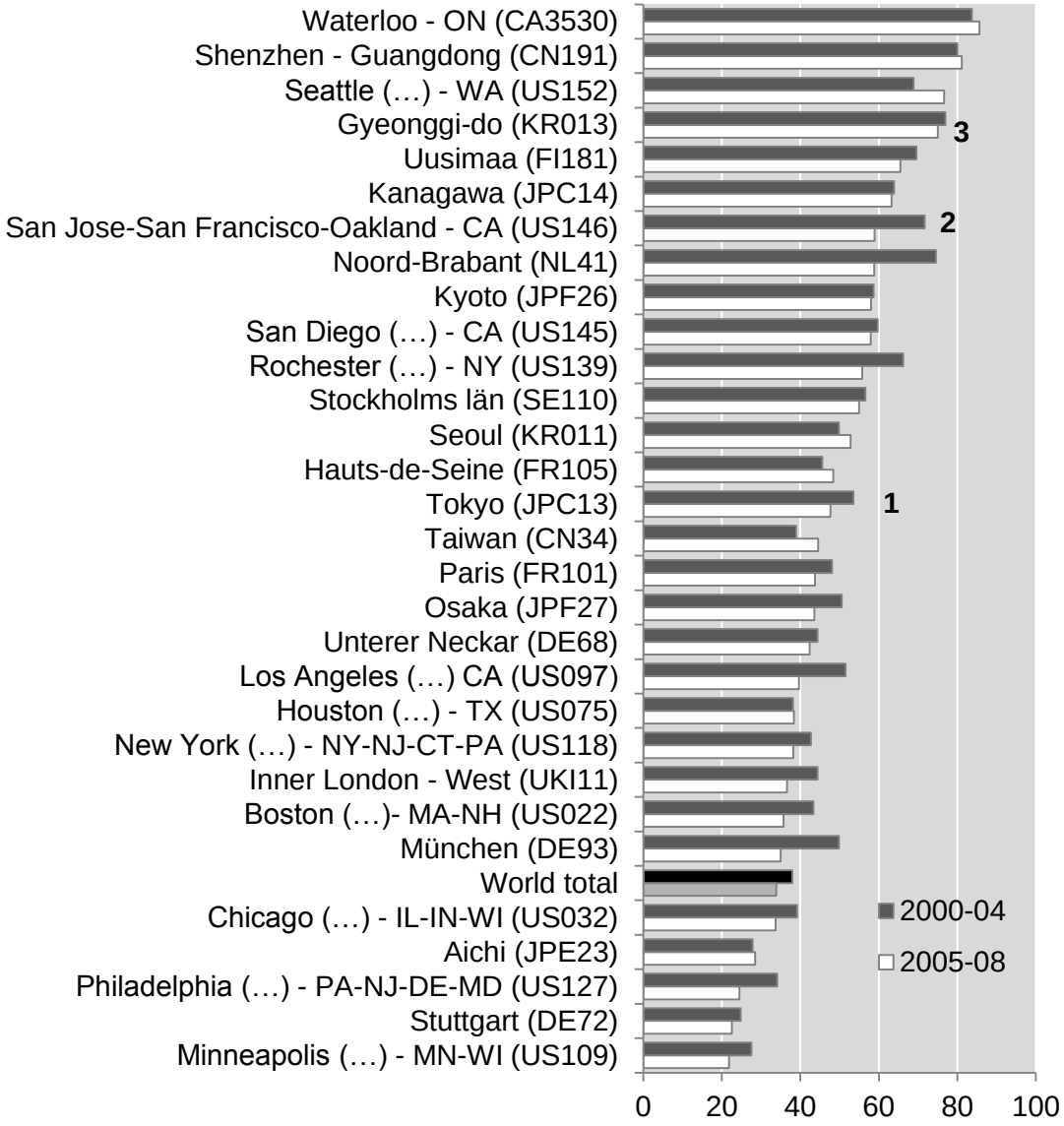
All indicators have been constructed at the level of the patent document.

➔ Using the **OECD REGPAT database** makes it possible to assess the performance of selected regions (OECD's Territorial Level 3 – TL3 regions)

➔ Benchmarking regions having contributed to more than 250 ICT-related EPO patents in 2005-08 (90 regions).

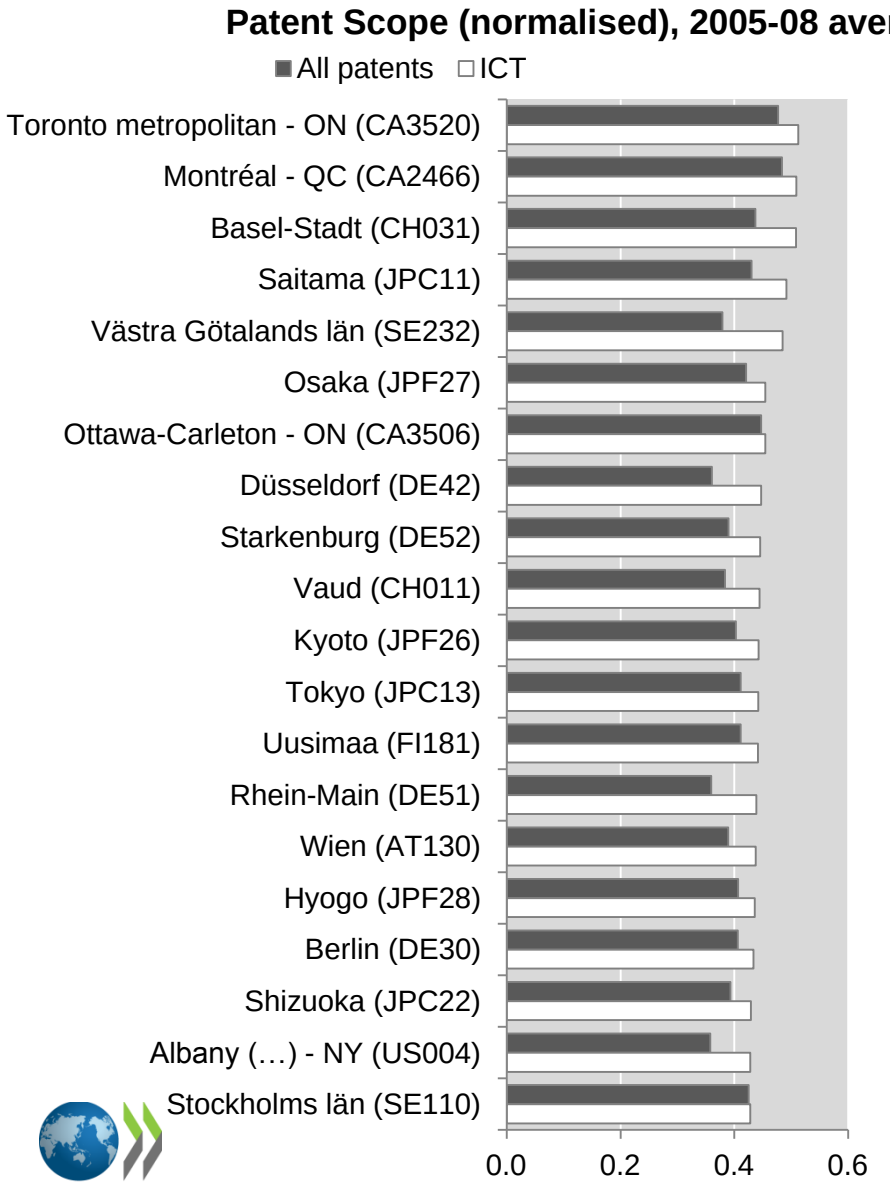
Share of ICT in total EPO patents

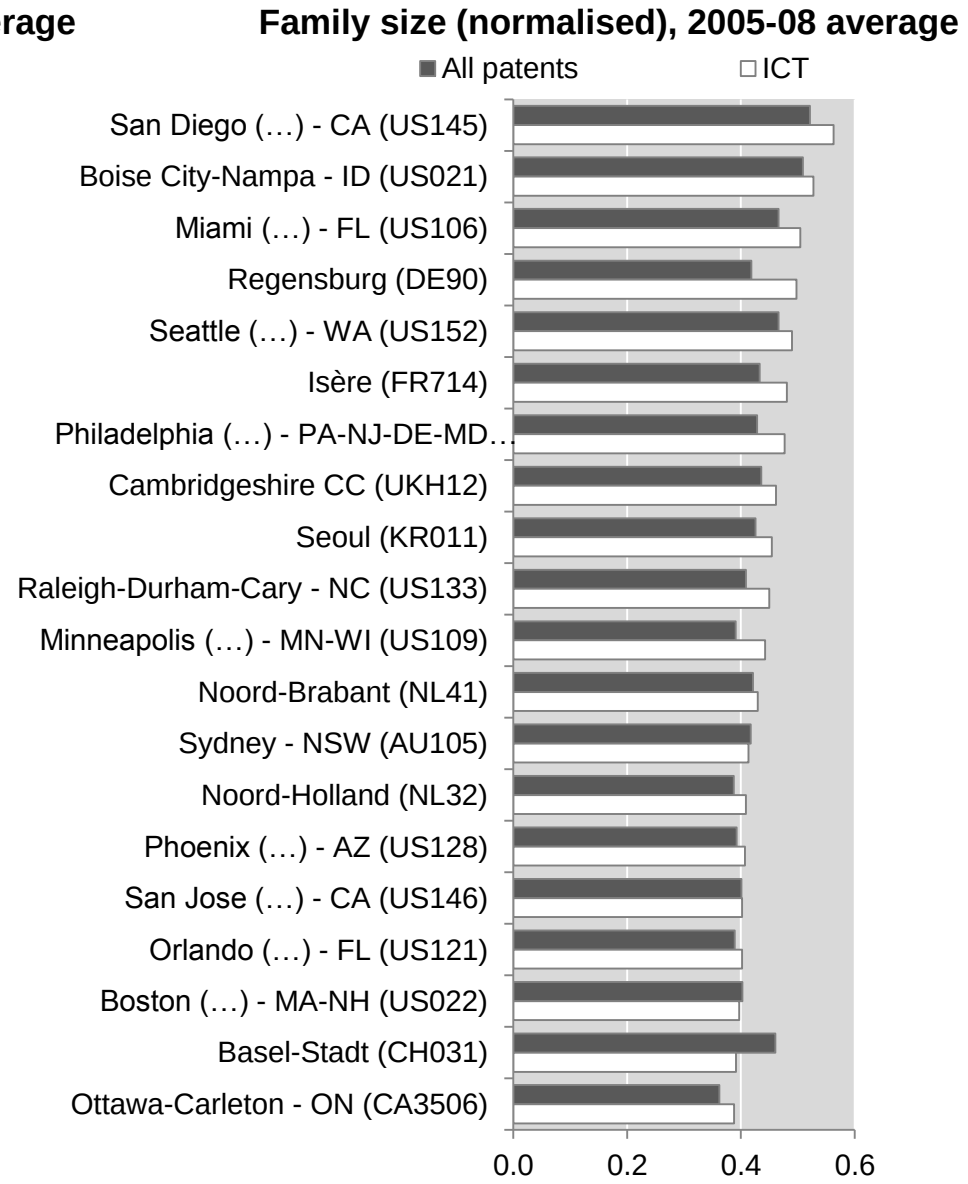
Top 30 regions in ICT-related patents



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Insights at the regional level (top 20 regions)

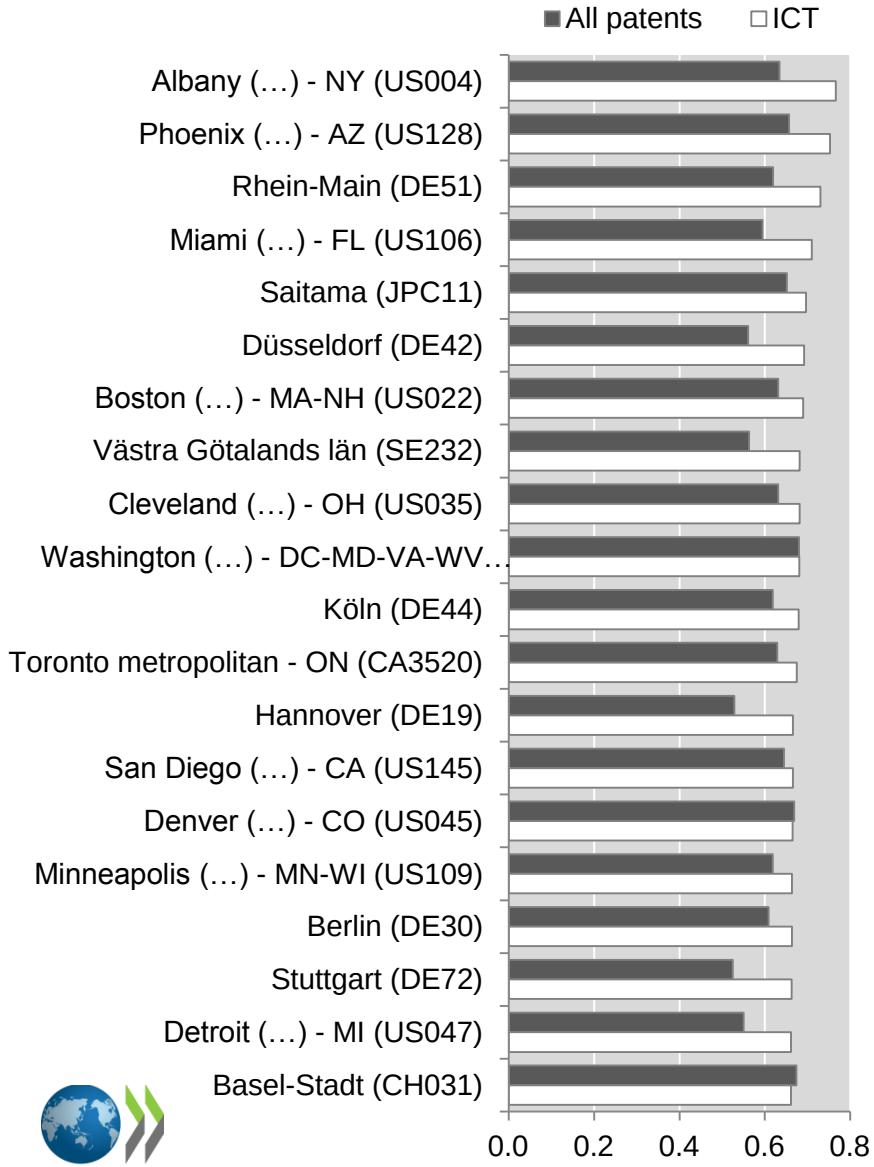




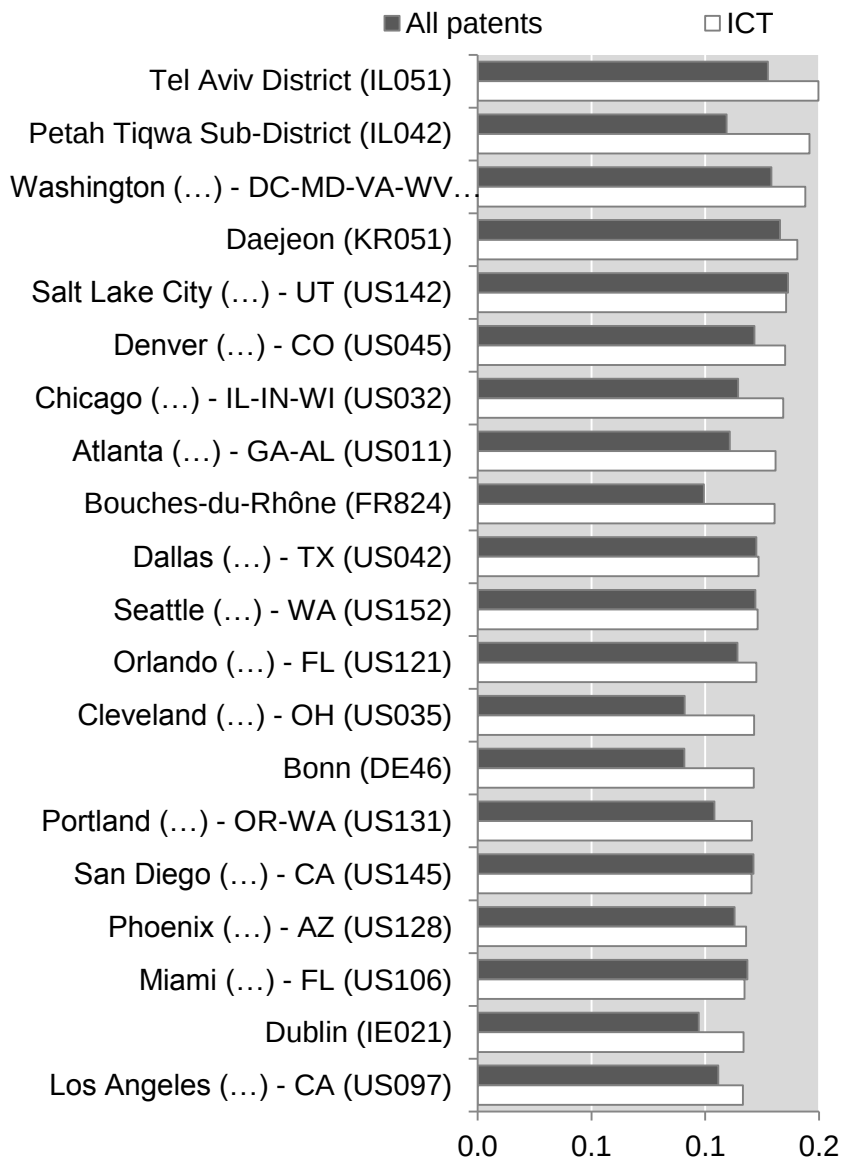
Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Insights at the regional level (top 20)

Generality index (weighted), 2000-04 average

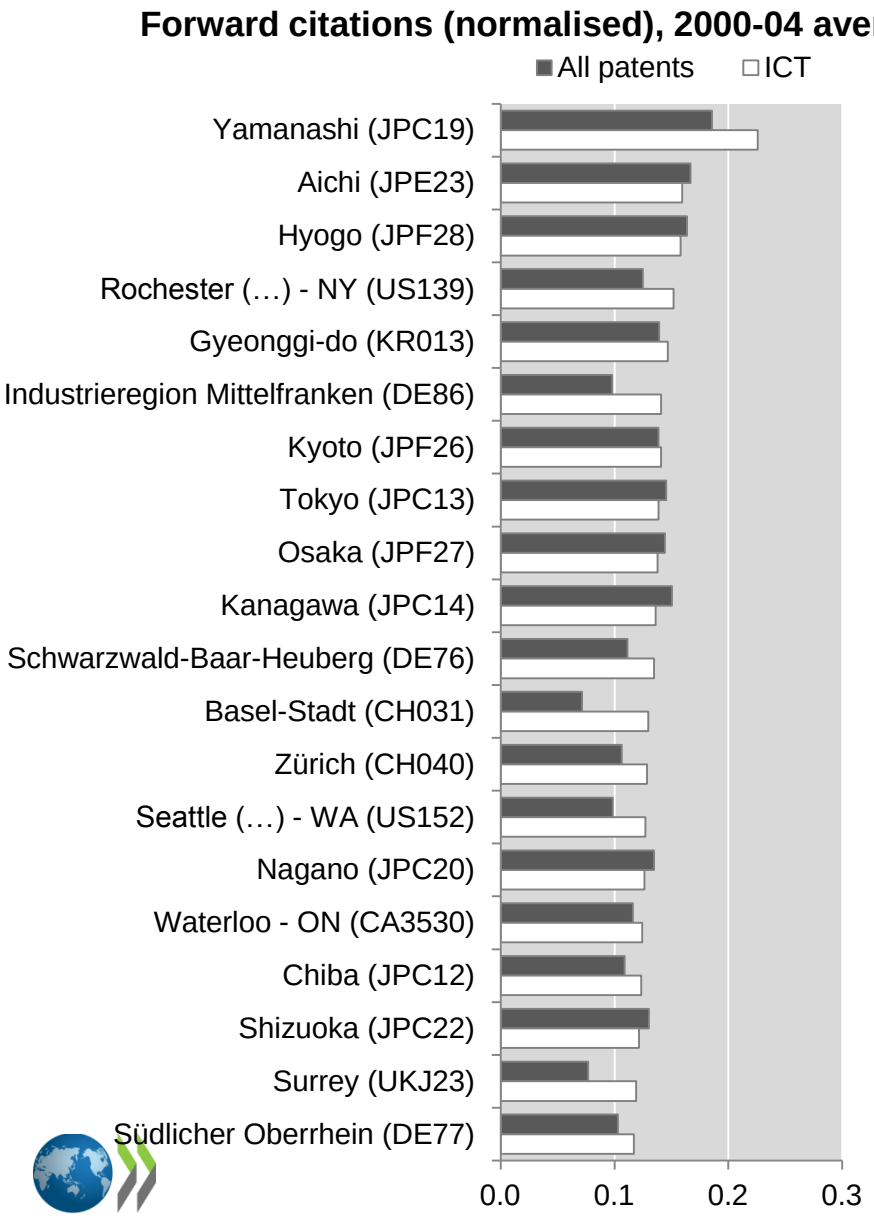


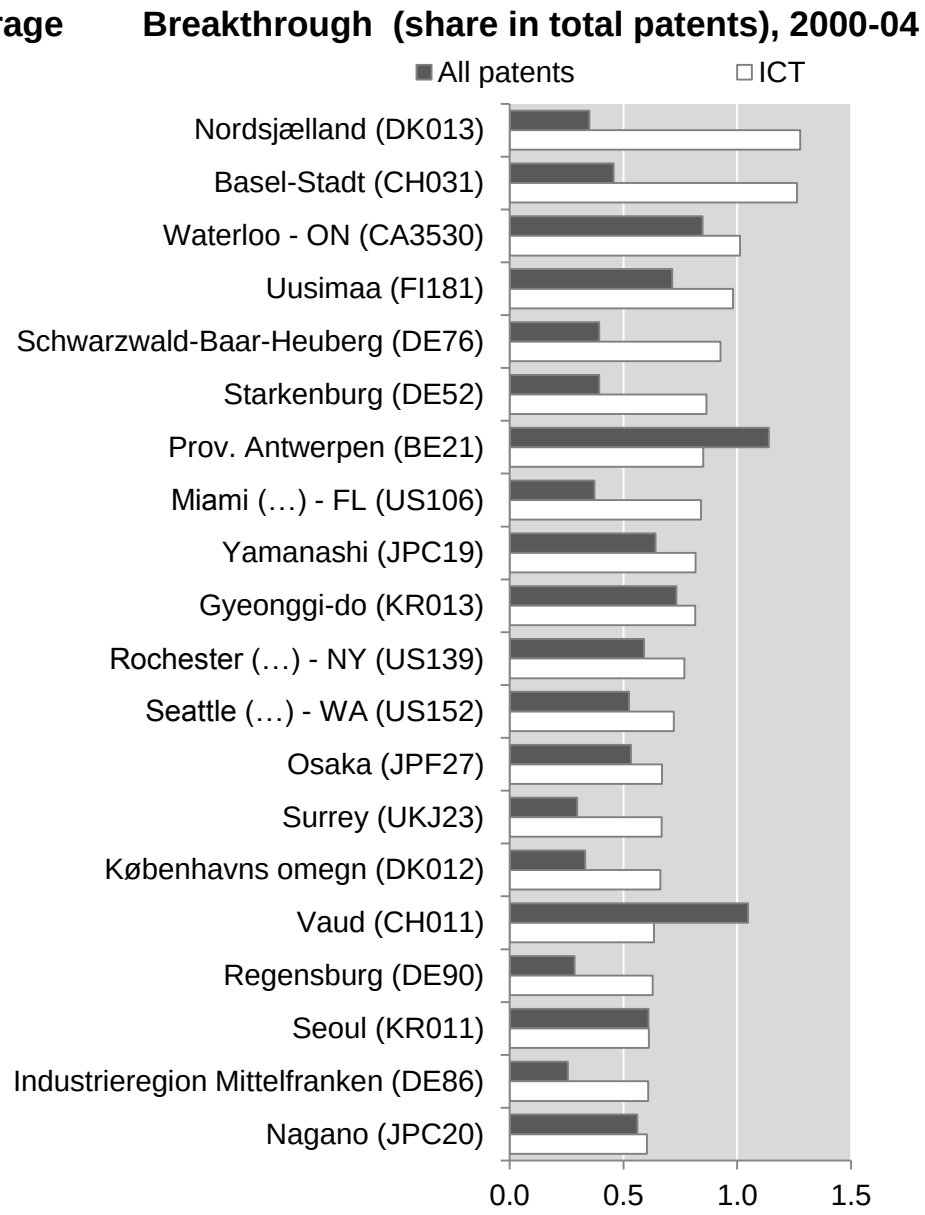
Radicalness / originality, 2005-08 average



Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Insights at the regional level (top 20)





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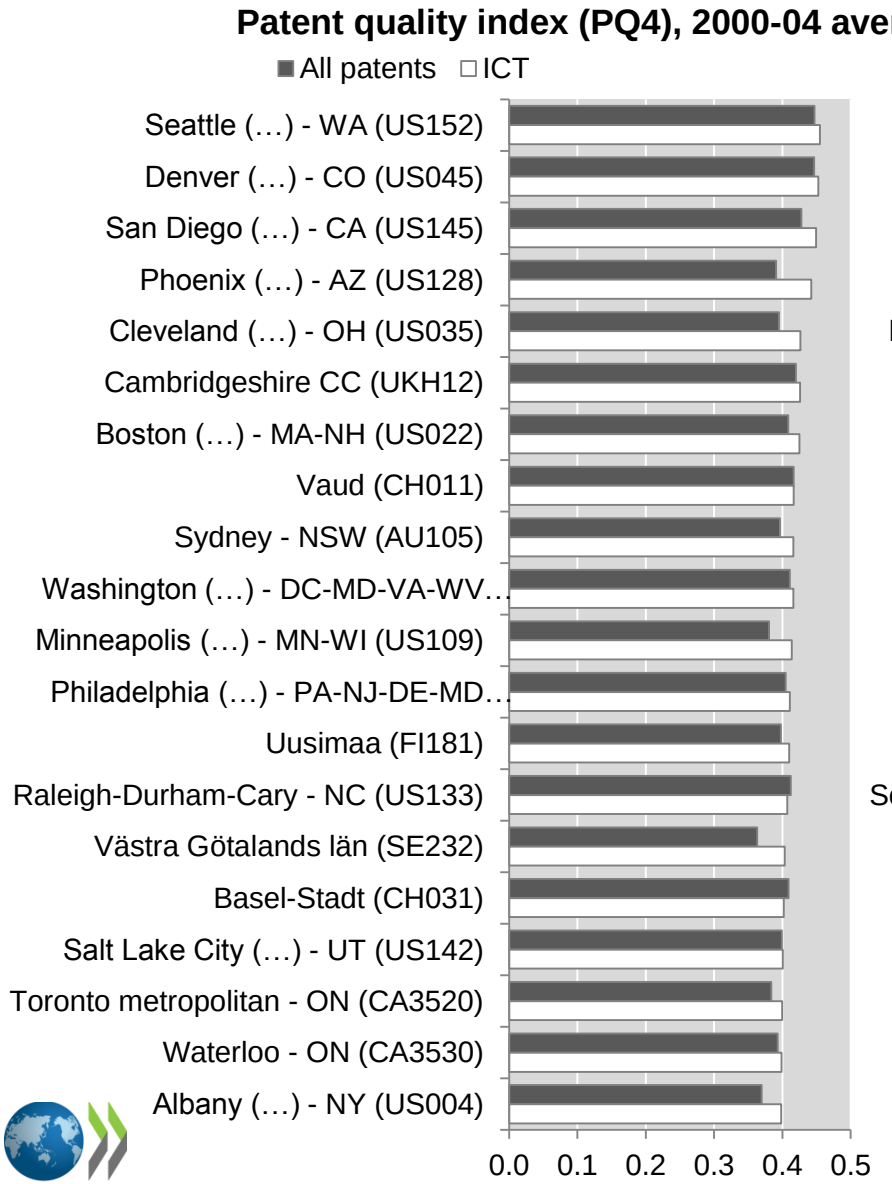

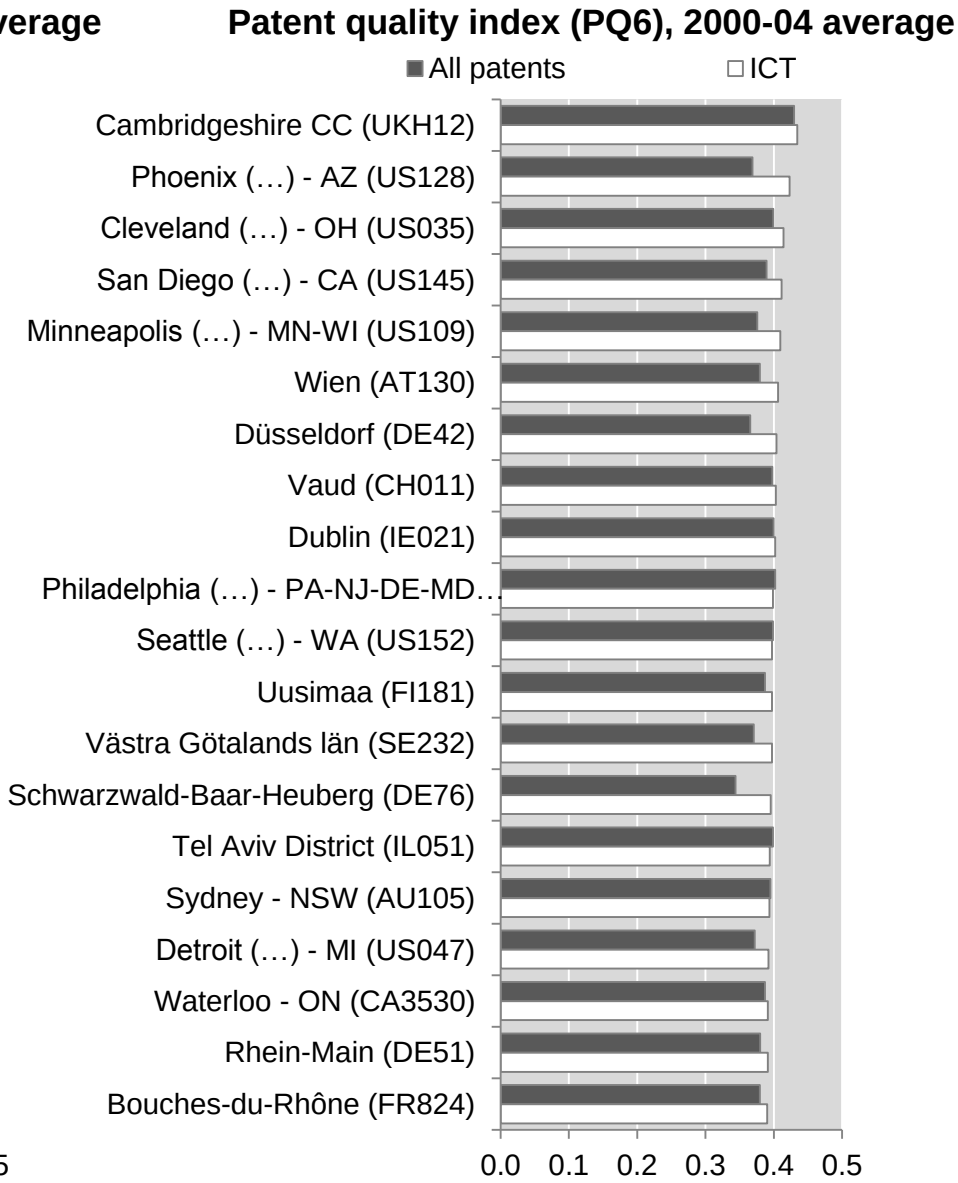

Source: OECD, calculations based on PATSTAT, EPO, April 2011.

Future developments

Ongoing OECD work:

- ➔ Refine and validate indicators (further econometric analysis)
- ➔ Extend the compilation to other IP offices
- ➔ Analyse patent portfolio of firms (e.g. determinants of entrepreneurship, high growth firms, etc.)

Thank you!

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Announcement

2012 conference organised by the EPO and OECD

Further information at:

www.oecd.org/sti/patents

Submissions up to :

30 June 2012

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