August 2016

What specific technology represents a certain country?

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Watches are made in Switzerland, robots in Japan, software in the US-silicon-valley and the Netherlands is the bicycles-country. Is it that simple? Is there a certain technology-field that a certain country represents more than all others? What are "typical markets" in certain countries?

Within a worldwide patent evaluation study this question was investigated and indeed there are technologies where in certain countries almost 90% of all patents worldwide are granted. These markets are very country-specific. And for these markets these technologies seem to play a very important role, which means from a patent point of view that inventions addressing these technologies must be granted in these countries in order to have covered the most relevant markets.

Methodology

The basis for the study were all patents including 159[1] countries.

All patents have been sorted by applications and granted patents. This was done for different time intervals, each containing one calendar year. Then for all these patents the international patent classification (IPC) was analysed in order to find a certain classification level[2] that would make sense to analyse. In order to be able to determine a significant amount of patents - some IPC classes are covering a very specific technological field – the variation of patents within a year inside each

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CI, CL, CM, CN, CO, CR, CU, CY, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ER, ES, ET, FI, FR, GA, GB, GD, GE, GI, GM, GN, GQ, GR, GT, HK, HN, HR, HU, ID, IE, IL, IN, IR, IS, IT, JM, JO, JP, KE, KG, KP, KR, KZ, LB, LI, LK, LR, LS, LT, LU, LV, MA, MC, MD, ME, MG, MK, ML, MN, MP, MR, MT, MU, MW, MX, MY, NA, NE, NG, NI, NL, NO, NP, NR, NZ, OM, PA, PE, PG, PH, PK, PL, PT, RO, RS, RU, RW, SA, SB, SC, SD, SE, SG, SI, SK, SL, SM, SN, SO, SR, ST, SU, SV, SY, SZ, TH, TJ, TL, TM, TN, TP, TR, TS, TT, TW, TZ, UA, US, UY, UZ, VA, VE, VN, YU, ZA, ZM, ZW

[2] According to the European Patent Office the "IPC classification symbols are made up of a letter denoting the IPC section (e.g. A), followed by a number (two digits) denoting the IPC class (e.g. A63), then a letter denoting the IPC subclass (e.g. A63B). A number (variable, 1-4 digits) denotes the IPC main group (e.g. A63B49). This is followed by a forward slash "/" and a number (variable, 2-6 digits) denoting the IPC subgroup (e.g. A63B49/02)" https://worldwide.espacenet.com/help?locale=en_EP&topic=ipc&method=handleHelpTopic.

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[1] The following countris have been analysed in terms of their patents (2 digit ISO 3166 country-code): AD, AE, AF, AL, AM, AN, AO, AR, AT, AU, AZ, BA, BB, BD, BE, BG, BO, BR, BS, BW, BY, CA, CG, CH,

IPC-level was analysed. The result was that in IPC level 3 (i.e. H01L) the highest significance for all classification fields could be determined.

On this level all IPC class sizes for all countries were determined. Afterwards the share of each IPC class compared to the total size of all patents was determined, on a worldwide level and on country level. These two ratios were compared. Also the ratio of a country's IPC class to the total worldwide amount of patents in this class was built.

From a procedural state point of view it was important to exclude senseless applications that i.e. document the state of the art or those that were done in order to pretend patent activity (strategic applications) or defensive publications. For this reason only the granted patents were taken into account.

Results

The results were quite amazing. It is obvious that technologies are not equally distributed in each country and that this distribution is also different to the worldwide average according to the fact that i.e. the industrialization level and economic structure is different. The study shows impressively that certain technologies are extremely dominant in different countries - compared with the global average.

What is this information used for? Within patent valuation it is always important to have a look on the technology itself and the markets that were addressed with it. Here is one essential question: Is this technology a trend, in growth, descending or a niche? And of cause how relevant is it for a certain market? In terms of valuing a patent this is essential. It is clear that technologies with high relevance, where many patents are applied are of higher value than those where just few patents are applied. And of cause this is country-specific. This means that a patent that is filed in a certain country and describing a technology that has a strong relevance in this country must be of higher value than a patent that is filed in the same country but of low technical relevance for this country.

Most granted patents per country and technology field

The first results were the shares of a country's IPC Class size in relation to the total IPC Class size. The problem: By building the ratio, the total sizes of the IPC class sections are getting lost. Especially by analysing only the granted patents the total amount of patents in IPC Classes even on level 3 varied strongly. So the biggest class size contained 521,608 and the smallest only 15 granted patents[3], the average size was 14,484 patents per IPC class.

So the result of this analysis was named "big fish in a small tank". Surprisingly there were even some countries having more than 10% of all granted patents worldwide where the total size of IPC classes was even bigger than the average. Here the technologies were indeed meaningful and significant for a country. In order to make the analysis even more meaningful, not only the biggest IPC Class section per country was shown but the top 4 sections.

The top 10 countries with the biggest (in average) and most remarkable shares will be described below:

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[3] New IPC classes that were published in latest IPC revisions like i.e. B33Y that was announced in 2015 have not been considered – taking a publication phase of 18 months into account, this would have resulted misleading figures.

USA (top 4):

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1	**89%** of all worldwide granted patents (this was the biggest number in the first part of the study) in the class **H04K** are granted in the US. H04K is described as "**SECRET COMMUNICATION; JAMMING OF COMMUNICATION**" – the class is comparably small but there are after all 4019 granted patents filed worldwide – 3577 in the US
2	**83%** of all granted patents in the class **G06G "ANALOGUE COMPUTERS"**, the class contained 3106 granted patents
3	**81%** of all granted patents in the class **G06E "OPTICAL COMPUTING DEVICES"** – containing 528 patents in total, a very small class
4	**75%** of all granted patents in the class **G06J "HYBRID COMPUTING ARRANGEMENTS"** – containing 59 Patents in total, a very, very small class
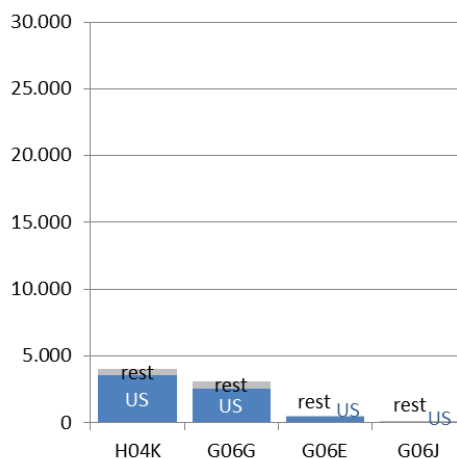
Japan (top 4):

1	**72%** of all granted patents in the class A63F "**CARD, BOARD, OR ROULETTE GAMES; INDOOR GAMES USING SMALL MOVING PLAYING BODIES; VIDEO GAMES; GAMES NOT OTHERWISE PROVIDED FOR**", with 69,628 more than the average amount of patents in the class
2	**64%** of all granted patents in the class G07G "**REGISTERING THE RECEIPT OF CASH, VALUABLES, OR TOKENS**", with 2,940 patents in the class
3	**55%** of all granted patents in the class F16T "**STEAM TRAPS OR LIKE APPARATUS FOR DRAINING-OFF LIQUIDS FROM ENCLOSURES PREDOMINANTLY CONTAINING GASES OR VAPOURS**", with 535 patents in the class
4	**79%** of all granted patents in the class G10B "**ORGANS; HARMONIUMS OR LIKE WIND-ACTUATED MUSICAL INSTRUMENTS**", with 434 patents in the class in total
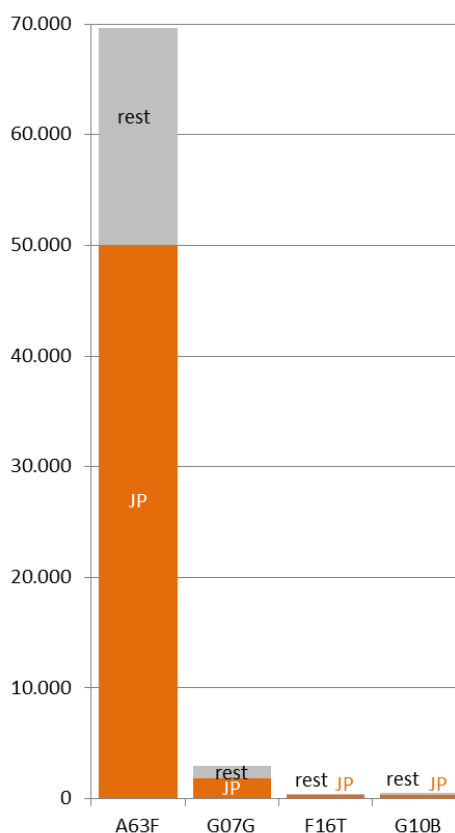
China (top 3):

|	
1	**83%** of all granted patents in the class C05G "**MIXTURES OF FERTILISERS COVERED INDIVIDUALLY BY DIFFERENT SUBCLASSES OF CLASS**", with 4,382 patents in the class
2	**64%** of all granted patents in the class C12J "**VINEGAR; ITS PREPARATION**", with 529 patents in the class
3	**66%** of all granted patents in the class D01C "**CHEMICAL TREATMENT OF NATURAL FILAMENTARY OR FIBROUS MATERIAL TO OBTAIN FILAMENTS OR FIBRES FOR SPINNING; CARBONISING RAGS TO RECOVER ANIMAL FIBRES**", with 308 patents in the class
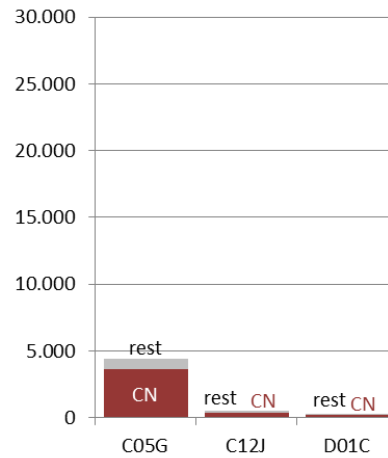
Korea (south) (top 4)

1	**46%** of all granted patents in the class B82B "**NANO-STRUCTURES FORMED BY MANIPULATION OF INDIVIDUAL ATOMS, MOLECULES, OR LIMITED COLLECTIONS OF ATOMS OR MOLECULES AS DISCRETE UNITS;MANUFACTURE OR TREATMENT THEREOF**", with 4,242 patents in total in the class
2	**55%** of all granted patents in the class H02S "**GENERATION OF ELECTRIC POWER BY CONVERSION OF INFRA-RED RADIATION, VISIBLE LIGHT OR ULTRAVIOLET LIGHT, e.g. USING PHOTOVOLTAIC [PV] MODULES**", with 1,691 patents in total in the class
3	**41%** of all granted patents in the class B63J "**AUXILIARIES ON VESSELS**", with 527 patents in total in the class
4	**52%** of all granted patents in the class D06Q "**DECORATING TEXTILES**", with 230 patents in total in the class

The axis-values of the diagram had to be rescaled in order to make the shares visible:

Russia (biggest 3)

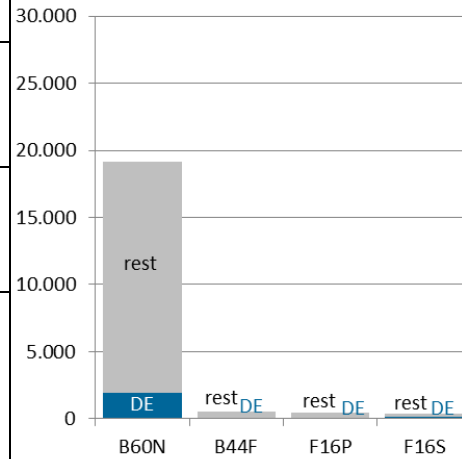| 1	**52%** of all granted patents in the class A21D "TREATMENT, e.g. PRESERVATION, OF FLOUR OR DOUGH, e.g. BY ADDITION OF MATERIALS; BAKING; BAKERY PRODUCTS; PRESERVATION THEREOF", with 8,128 patents in total in the class
2	**50%** of all granted patents in the class A24B "MANUFACTURE OR PREPARATION OF TOBACCO FOR SMOKING OR CHEWING;TOBACCO; SNUFF", with 5673 patents in total in the class
3	**43%** of all granted patents in the class C12C "BREWING OF BEER", with 1,962 patents in total in the class
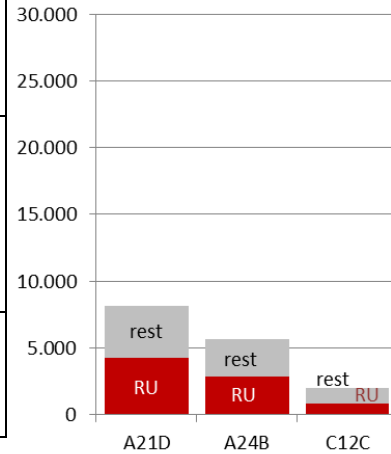
Australia (top4)

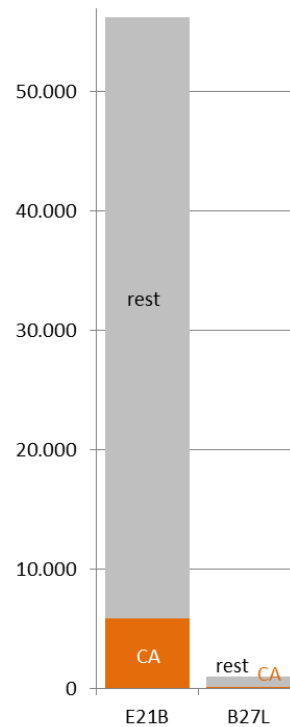| 1	**13%** of all granted patents in the class C07K "PEPTIDES", with 33,703 patents in total in the class over average sized
2	**14%** of all granted patents in the class A61P "SPECIFIC THERAPEUTIC ACTIVITY OF CHEMICAL COMPOUNDS OR MEDICINAL PREPARATIONS", with 12,399 patents in total in the class
3	**19%** of all granted patents in the class A01P "BIOCIDAL, PEST REPELLANT, PEST ATTRACTANT OR PLANT GROWTH REGULATORY ACTIVITY OF CHEMICAL COMPOUNDS OR PREPARATIONS", with 189 patents in total in the class
4	**17%** of all granted patents in the class H05C "ELECTRIC CIRCUITS OR APPARATUS SPECIALLY DESIGNED FOR USE IN EQUIPMENT FOR KILLING, STUNNING, OR GUIDING LIVING BEINGS", with 94 patents in total in the class
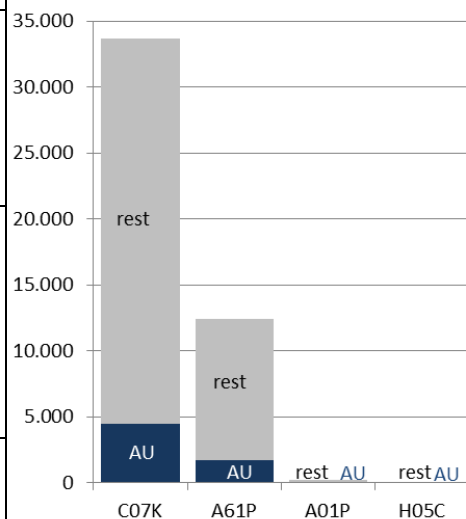
Germany (top 4)

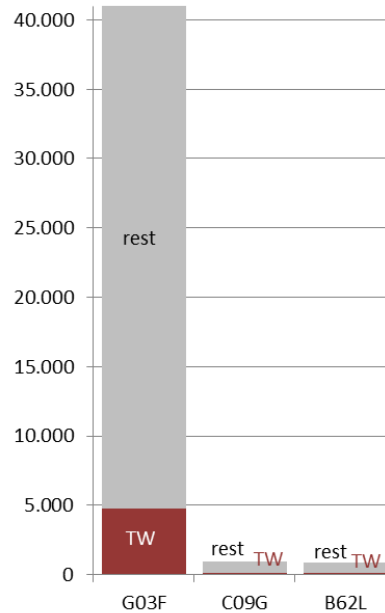|	
1	**10%** of all granted patents in the class B60N "**VEHICLE PASSENGER ACCOMMODATION NOT OTHERWISE PROVIDED FOR**", with 19,137 over average sized
2	12% of all granted patents in the class B44F "**SPECIAL DESIGNS OR PICTURES**", with 563 patents in total in the class
3	**17%** of all granted patents in the class F16P "**SAFETY DEVICES IN GENERAL**", with 484 patents in total in the class
4	**25%** of all granted patents in the class F16S "**CONSTRUCTIONAL ELEMENTS IN GENERAL; STRUCTURES BUILT-UP FROM SUCH ELEMENTS, IN GENERAL**", with 407 patents in total in the class

Canada (biggest 2)

|	
1	**10%** of all granted patents in the class E21B "**EARTH DRILLING, e.g. DEEP DRILLING**", with 56,207 patents in total in the class
2	**8%** of all granted patents in the class B27L "**REMOVING BARK OR VESTIGES OF BRANCHES; SPLITTING WOOD;MANUFACTURE OF VENEER, WOODEN STICKS, WOOD SHAVINGS, WOOD FIBRES OR WOOD POWDER**", with 1,002 patents in total in the class

Taiwan (biggest 3)

1	**12%** of all granted patents in the class G03F "**PHOTOMECHANICAL PRODUCTION OF TEXTURED OR PATTERNED SURFACES, e.g. FOR PRINTING, FOR PROCESSING OF SEMICONDUCTOR DEVICES; MATERIALS THEREFOR;ORIGINALS THEREFOR; APPARATUS SPECIALLY ADAPTED THEREFOR**", with 41,519 over average sized
2	**11%** of all granted patents in the class C09G "**POLISHING COMPOSITIONS OTHER THAN FRENCH POLISH; SKI WAXES**", with 972 patents in total in the class
3	**17%** of all granted patents in the class B62L "**BRAKES SPECIALLY ADAPTED FOR CYCLES**", with 847 patents in total in the class

Italy (biggest 3)

1	**17%** of all granted patents in the class C14B "**MECHANICAL TREATMENT OR PROCESSING OF SKINS, HIDES OR LEATHER IN GENERAL;PELT-SHEARING MACHINES; INTESTINE-SPLITTING MACHINES**", with 460 patents in total in the class
2	**20%** of all granted patents in the class D06G "**MECHANICAL OR PRESSURE CLEANING OF CARPETS, RUGS, SACKS, HIDES OR OTHER SKIN OR TEXTILE ARTICLES OR FABRICS; TURNING INSIDE-OUT FLEXIBLE TUBULAR OR OTHER HOLLOW ARTICLES**", with 30 patents in total in the class, a very, very small class
3	**32%** of all granted patents in the class B41D "**APPARATUS FOR THE MECHANICAL REPRODUCTION OF PRINTING SURFACES FOR STEREOTYPE PRINTING; SHAPING ELASTIC OR DEFORMABLE MATERIAL TO FORM PRINTING SURFACES**", with 28 patents in total in the class, a very, very small class

The axis-values of the diagram had to be rescaled in order to make the shares visible:
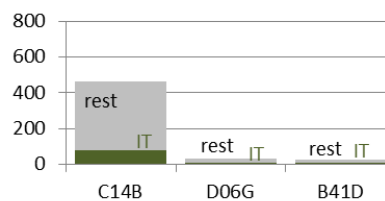
Granted patents in the most relevant technology fields

For the second analysis the ratio of the first analysis was multiplied with the relative size[4] of the IPC class. By this method the total size of an IPC class was taken into account too. The result shows the total strength of countries in big technology fields.

It represents the "big fish in a big tank". The top 10 countries with the biggest shares in these big technology fields will be described below. In the diagrams there is a much bigger scaling used because the sizes and thus the meaning of the IPC classes are much bigger:
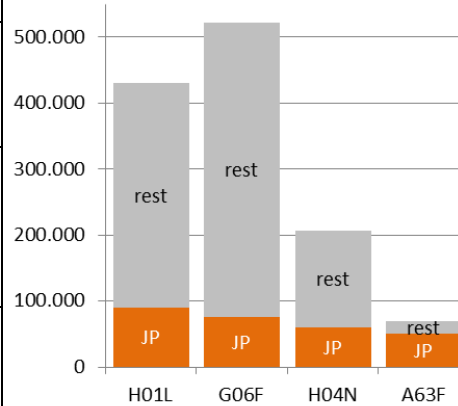
USA (top 4):

1	**56%** of all granted patents in the class G06F "**ELECTRICAL DIGITAL DATA PROCESSING**", with 521,608 patents in total in the class, this is the biggest IPC class in total. This shows that the US are also in the most attractive markets most present
2	**39%** of all granted patents in the class H01L "**SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR**", with 430893 patents in total in the class
3	**32%** of all granted patents in the class H04L "**TRANSMISSION OF DIGITAL INFORMATION, e.g. TELEGRAPHIC COMMUNICATION**", with 217,676 patents in total in the class
4	**22%** of all granted patents in the class A61K "**PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES**", with 286,883 patents in total in the class

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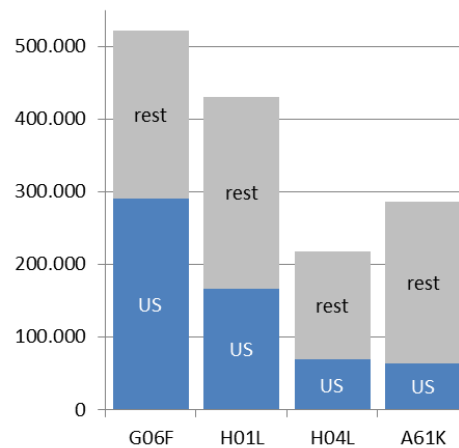
[4] The relative size is the total size of a IPC class worldwide related to the total amount of patents granted worldwide.

Japan (top 4):

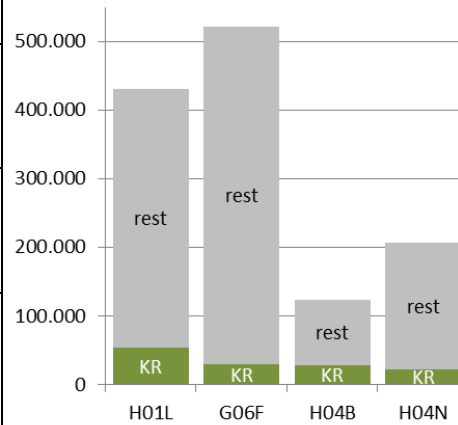|	
1	**21%** of all granted patents in the class H01L "**SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR**", with 430,893 patents in total in the class
2	**15%** of all granted patents in the class G06F "**ELECTRICAL DIGITAL DATA PROCESSING**", with 521608 patents in total in the class
3	**29%** of all granted patents in the class H04N "**PICTORIAL COMMUNICATION, e.g. TELEVISION**", with 207,070 patents in total in the class
4	**72%** of all granted patents in the class A63F "**CARD, BOARD, OR ROULETTE GAMES; INDOOR GAMES USING SMALL MOVING PLAYING BODIES; VIDEO GAMES; GAMES NOT OTHERWISE PROVIDED FOR**", with 69,628 patents in total in the class

China (top 4):

1	**24%** of all granted patents in the class A61K "**PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES**", with 286,883 patents in total in the class
2	**12%** of all granted patents in the class G06F "**ELECTRICAL DIGITAL DATA PROCESSING**", with 521,608 patents in total in the class
3	**28%** of all granted patents in the class H04L "**TRANSMISSION OF DIGITAL INFORMATION, e.g. TELEGRAPHIC COMMUNICATION**", with 217,676 patents in total in the class
4	**13%** of all granted patents in the class H01L "**SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR**", with 430,893 patents in total in the class
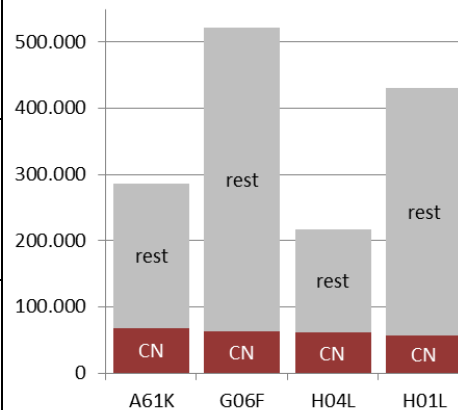
Korea (south) (top 4):

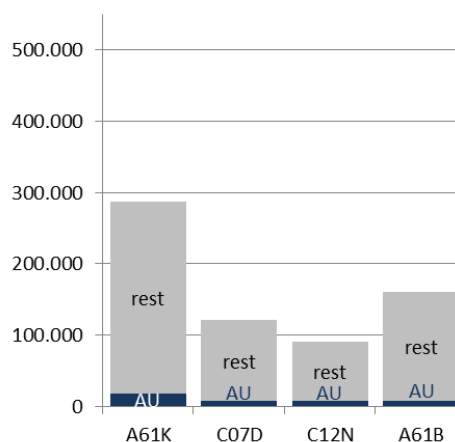| 1 | **13%** of all granted patents in the class H01L "**SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR**", with 430,893 patents in total in the class |
2	**6%** of all granted patents in the class G06F "**ELECTRICAL DIGITAL DATA PROCESSING**", with 521,608 patents in total in the class
3	**23%** of all granted patents in the class H04B "**TRANSMISSION**", with 124,341 patents in total in the class
4	**11%** of all granted patents in the class H04N "**PICTORIAL COMMUNICATION, e.g. TELEVISION**", with 207,070 patents in total in the class

Russia (top 4):

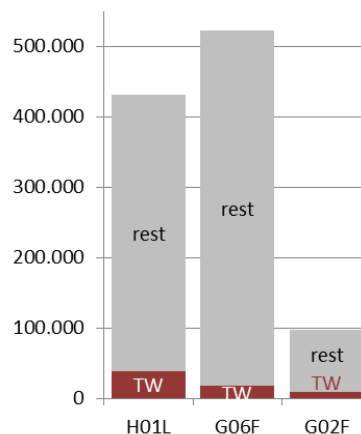| 1 | **28%** of all granted patents in the class A23L "**FOODS, FOODSTUFFS, OR NON-ALCOHOLIC BEVERAGES , NOT COVERED BY SUBCLASSES ; A21D; OR A23B-A23J; THEIR PREPARATION OR TREATMENT, e.g. COOKING, MODIFICATION OF NUTRITIVE QUALITIES, PHYSICAL TREATMENT**", with 65,035 patents in total in the class |
2	**4%** of all granted patents in the class A61K "**PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES**", with 286,883 patents in total in the class
3	**4%** of all granted patents in the class G01N "**INVESTIGATING OR ANALYSING MATERIALS BY DETERMINING THEIR CHEMICAL OR PHYSICAL PROPERTIES**", with 173,251 patents in total in the class
4	**4%** of all granted patents in the class A61B "**DIAGNOSIS; SURGERY; IDENTIFICATION**", with 161,315 patents in total in the class

Australia (top 4):

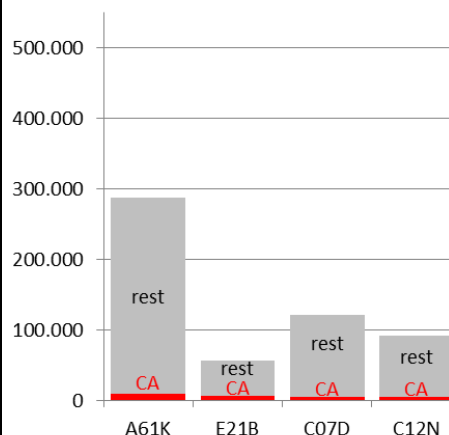| 1 | **7%** of all granted patents in the class A61K "**PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES**", with 286,883 patents in total in the class |
2	**7%** of all granted patents in the class C07D "**HETEROCYCLIC COMPOUNDS**" , with 120,740 patents in total in the class
3	**9%** of all granted patents in the class C12N "**MICRO-ORGANISMS OR ENZYMES; COMPOSITIONS THEREOF**", with 91,451 patents in total in the class
4	**5%** of all granted patents in the class A61B "**DIAGNOSIS; SURGERY; IDENTIFICATION**", with 161,315 patents in total in the class

Taiwan (top 4):

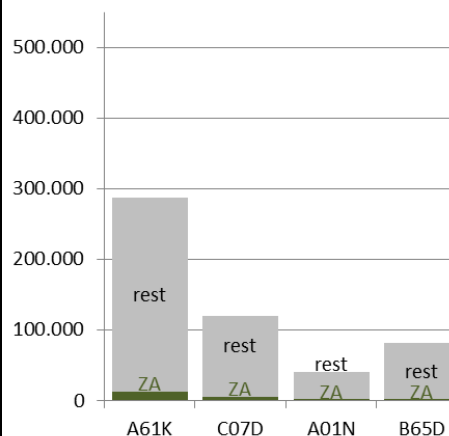| 1 | **9%** of all granted patents in the class H01L "**SEMICONDUCTOR DEVICES; ELECTRIC SOLID STATE DEVICES NOT OTHERWISE PROVIDED FOR**", with 430,893 patents in total in the class |
2	**3%** of all granted patents in the class G06F "**ELECTRICAL DIGITAL DATA PROCESSING**" , with 521,608 patents in total in the class
3	**8%** of all granted patents in the class G02F "**DEVICES OR ARRANGEMENTS, THE OPTICAL OPERATION OF WHICH IS MODIFIED BY CHANGING THE OPTICAL PROPERTIES OF THE MEDIUM OF THE DEVICES OR ARRANGEMENTS FOR THE CONTROL OF THE INTENSITY, COLOUR, PHASE, POLARISATION OR DIRECTION OF LIGHT, e.g. SWITCHING, GATING, MODULATING OR DEMODULATING; TECHNIQUES OR PROCEDURES FOR THE OPERATION THEREOF;FREQUENCY-CHANGING; NON-LINEAR OPTICS; OPTICAL LOGIC ELEMENTS; OPTICAL ANALOGUE/DIGITAL CONVERTERS**", with 96,983 patents in total in the class
4	**3%** of all granted patents in the class H04L "**TRANSMISSION OF DIGITAL INFORMATION, e.g. TELEGRAPHIC COMMUNICATION**", with 217,676 patents in total in the class

Canada (top 4):

| 1	**3%** of all granted patents in the class A61K "**PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES**", with 286,883 patents in total in the class
2	**10%** of all granted patents in the class E21B "**EARTH DRILLING, e.g. DEEP DRILLING**", with 56,207 patents in total in the class
3	**4%** of all granted patents in the class C07D "**HETEROCYCLIC COMPOUNDS**", with 120,740 patents in total in the class
4	**4%** of all granted patents in the class C12N "**MICRO-ORGANISMS OR ENZYMES; COMPOSITIONS THEREOF**", with 91,451 patents in total in the class

South Africa (top 4):

1	**5%** of all granted patents in the class A61K "**PREPARATIONS FOR MEDICAL, DENTAL, OR TOILET PURPOSES**", with 286,883 patents in total in the class
2	**4%** of all granted patents in the class C07D "**HETEROCYCLIC COMPOUNDS**", with 120,740 patents in total in the class
3	**5%** of all granted patents in the class A01N "**PRESERVATION OF BODIES OF HUMANS OR ANIMALS OR PLANTS OR PARTS THEREOF;BIOCIDES, e.g. AS DISINFECTANTS, AS PESTICIDES, AS HERBICIDES**", with 41,365 patents in total in the class
4	**2%** of all granted patents in the class B65D "**CONTAINERS FOR STORAGE OR TRANSPORT OF ARTICLES OR MATERIALS, e.g. BAGS, BARRELS, BOTTLES, BOXES, CANS, CARTONS, CRATES, DRUMS, JARS, TANKS, HOPPERS, FORWARDING CONTAINERS; ACCESSORIES, CLOSURES, OR FITTINGS THEREFOR; PACKAGING ELEMENTS; PACKAGES**", with 82,437 patents in total in the class

Switzerland (top 3):

1	**8%** of all granted patents in the class G04B "**MECHANICALLY-DRIVEN CLOCKS OR WATCHES; MECHANICAL PARTS OF CLOCKS OR WATCHES IN GENERAL; TIME PIECES USING THE POSITION OF THE SUN, MOON OR STARS**", with 5,509 patents in total in the class
2	5% of all granted patents in the class D01G "**PRELIMINARY TREATMENT OF FIBRES, e.g. FOR SPINNING**", with 1,869 patents in total in the class
3	2% of all granted patents in the class A44C "**JEWELLERY; BRACELETS; OTHER PERSONAL ADORNMENTS; COINS**", with 3,416 patents in total in the class

The axis-values of the diagram had to be rescaled in order to make the shares visible:
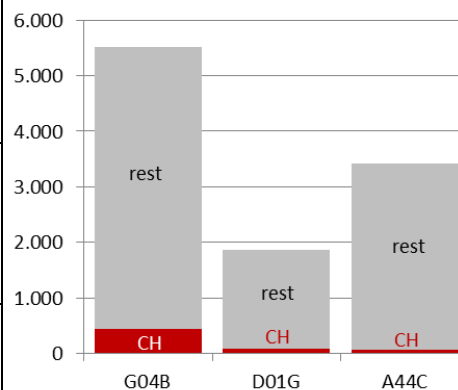
Conclusion

The initial thesis that a country has at least one country-specific market for a certain technology, could be proved for a set of countries. In most cases these are very specific and small niche-technologies where only few patents are applied and granted worldwide.

So this analysis might be misleading because certain technology fields could be that small that i.e. a share of 80% could mean 4 of 5 granted patents. That is why the total amount of patents that were granted in the specific technology field, were always mentioned. Indeed, the smallest technology field that was taken into account is the B41D - "APPARATUS FOR THE MECHANICAL REPRODUCTION OF PRINTING SURFACES FOR STEREOTYPE PRINTING; SHAPING ELASTIC OR DEFORMABLE MATERIAL TO FORM PRINTING SURFACES", where 32% of them are granted in Italy.

A very small market, not really relevant, even not for Italy. That is why in the second part only the bigger sized technology fields have been analysed. The biggest class in total is the G06F "ELECTRICAL DIGITAL DATA PROCESSING". Most patents are granted in this class worldwide. More than the half of them (56%) in USA, this seems to be the most attractive market for these technologies.

The main use of this analysis is to find out how important certain technologies are for different countries. For patent valuation this is i.e. essential to see if a certain technology is granted in the most relevant markets. That there are niche technologies as well as big technology fields that represent the market of a certain country could be shown within the analysis.

The result of the investigation also shows if an existing patent family is applied in the correct geographical regions, where the most relevant target groups seem to be. Besides the fact where a company has regionally spoken a market access, e.g. by sales facilities or sales agents it is a question of general relevance: in which geographical regions is potentially the highest market pull for a certain technology /formulation.

Since the study has been carried out for all IPC classifications, it is possible to recommend a set of countries where the intended technology (as long as they are classified so far) plays the most important role in order to decide to where the patent family has to be extended.

About the Author

Dr. Dierk-Oliver Kiehne is CEO of the Stuttgart based InTraCoM GmbH (Germany) and internationally recognized patent valuation expert. He was participating in the first standard for patent valuation and is doing research in patent valuation for more than 16 years.

InTraCoM GmbH is a patent valuation boutique with a long list of patent valuation customers. InTraCoM GmbH is performing patent valuations for M&A, patent transactions, licensing value determination, internal balancing purposes, sale and lease back, transfer pricing and many more

valuation scopes. Their customers are international big blue chip companies, SMEs, banks, official authorities, universities as well as big research organisations and single inventors.

InTraCoM Group is supported by different international partners offering patent valuation-specific data and business information. Within these partnerships also software and patent valuation-specific data can be offered based the InTraCoM-patent valuation methodology. With all these approaches, patent values can be determined within unbeatable precision, time and cost.

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