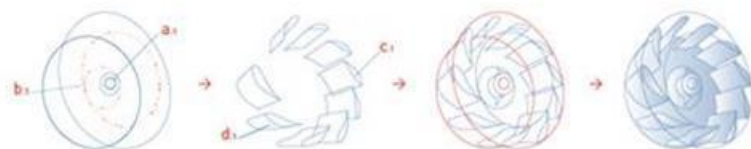


> Regional Initiative

PATENTS FOR DEVELOPMENT

Indicators of Technological Innovation by Regions

2015



Indicators of Technological Innovation by Regions. 2015
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PRESENTATION

CAF identified the need to promote the generation of patentable innovative technologies that could be exportable. Latin America and the Caribbean have the potential to generate advanced technologies that may contribute to the sustainable development of the region and other regions around the world. To release this potential, we have started the Technological Patents Regional Initiative¹. CAF's initiative intends to establish a regional platform for the generation of patentable technological concepts through international patent applications originating in Latin America and the Caribbean with the purpose of contributing to increase the exports of high technology from the region.

In the framework of this program, CAF is pleased to present the document 2015 *Technological Innovation Indicators by Regions*. This document compiles the main data and indicators that will be used throughout the implementation of CAF's initiative. The methodology used for the indicators is accepted and used internationally, based on previous works by the OECD and the World Bank.

The text is divided into 3 parts. The first describes the methodology and indicators that will be presented, as well as the primary data sources. In the second section we find all the data in tables, organized by subject, and separated between those aimed at presenting an analysis and those that will be used as a baseline for the initiative's evaluation. The third section shows comparative graphs prepared from the data found in the second section, over which part of the analysis regarding technological innovation in the region will be constructed.

We expect this study to fulfill its fundamental objective of offering readers of different backgrounds the necessary data and figures for the evaluation of the status of technological innovation in CAF's member countries in Latin America and

www.caf.com/patentes

the Caribbean, and increase interest regarding CAF's Patents for Development Regional Initiative.

EXECUTIVE SUMMARY

The following study is one of the results of CAF's Technological Patents for Development Initiative carried out between 2013 and 2015. Among the main objectives of this Initiative is the development of a preliminary evaluation of the status of technological innovation in the Latin American and Caribbean region. The objectives are twofold: the first is to present to readers, independently of their background or profession, an easy to understand material that reflects, with empirical data, the technological status in the region through indicators defined by CAF. The second objective is to prepare a baseline for the initiative's impact evaluation, which will allow CAF and its partner institutions to evaluate its importance in the region. In the first phase, this evaluation will be carried out through its outputs, that is, an improvement in the countries' performance both in the generation of invention patent applications, as well as the concessions of patents through these applications. In a second phase, in the medium and long term, the initiative's impact evaluation will be carried out through its outcomes, that is, the generation of resources originating in royalties, licensing and sale of intellectual property in international markets in the short term, and an increase of high technology exports from the region to other regions in the world in the long term. This baseline will be adapted to include parameters that are more associated to industrial property during its following phases.

ACRONYMS

WB. The World Bank Group

CAF. Development Bank of Latin America

EPO. European Patent Office

IMF. International Monetary Fund

OECD. Organization for Economic Cooperation and Development

WIPO. World Intellectual Property Organization

PCT. Patent Cooperation Treaty

UN COMTRADE. United Nations Commodity Trade Statistics Database

UNSTATS. United Nations Statistics Division

USPTO. United States Patent and Trademark Office

GLOSSARY OF TERMS

Intellectual Property: Intellectual Property Rights refer to all those exclusivity rights over intellectual creations which are recognized by a legal system. Intellectual property rights guarantee the owner of an intangible asset the right to use it, distribute it, and sell it, as well as exclusive licensing. These rights are usually divided into two types: Industrial Property, and Copyright, with the first ones referring to creations that are related to a product or service process (such as patents), and the latter to artist works (musical, literary, etc.) or institutional creations.

Patent: A patent is an exclusive right granted for an invention, that is, a product or procedure which in general contributes to a new way of doing something or a new technical solution for a problem. For it to be patentable, the invention must satisfy the determined requirements: it must be legal, it must have an element of novelty (that there is no similar concept in prior art), to have a practical use (industrial application) and it must not be obvious considering prior art (that the logic of the invention cannot be directly deduced from prior art).

GDP (Nominal Gross Domestic Product): “At a current price, the GDP is the sum of the gross value added of all the products in an economy plus all the taxes on the products, minus any subsidy which is not included in the value of the products.” In the GDP graphs that have been prepared, it will be expressed in billions of USD (1.000.000.000 USD= 1 Billion USD)

Patent Cooperation Treaty (PCT): This is an international treaty managed by the World Intellectual Property Organization (WIPO) and subscribed by more than 148 countries in the Treaty of Paris. The PCT allows the simultaneous application for a patent to protect an invention in a large number of countries by presenting a sole international patent application without the need to present several national or regional patent applications. The competence to grant concession of patents

belongs to national or regional patent offices in what is called the “national phase”.
WIPO Website.

METHODOLOGY

When addressing the subject of technological innovation, CAF will use the terminology *inputs*, *outputs*, and *outcomes* to define the parameters used in the construction of indicators to measure these activities.² The inputs define the resources allocated to innovation activities which come from different sources (public or private), and have different classifications. The outputs are the specific result (material or immaterial) of the innovation process over which an evaluation process is generated to compare with the estimated results. At the same time, the outcomes describe the final effects targeted during the planning process; the global result expected from the implementation of the Initiative. For the purpose of the Initiative we will only define the indicators of inputs and outcomes:

i) **Output Indicators:** The parameters used to establish a baseline to evaluate the starting phase of the Initiative will be the following: *patent applications via PCT, USPTO applications and concessions, and EPO patent applications and concessions*. These parameters will be compared with the nominal GDP by millions of inhabitants of the country of residence of the applicants for the construction of technological performance indicators.

ii) **Outcome Indicators:** Different performance parameters will be used for these indicators, which will help construct an image of the status of the technological innovation in the region. Among the parameters used are *High technology exports* and *Royalties from the use of intellectual property*. As with the aforementioned, indicators will be constructed based on these parameters in order to facilitate the understanding of the subject.

² This definition was partially taken from NYCEDC *Innovation Index, New York City Economic Development Corporation 2011*, and http://www.huffingtonpost.com/steven-strauss/managing-innovation_b_3375149.html

OUTPUT INDICATORS

Patent Applications via PCT: The application process of a patent via PCT (Patent Cooperation Treaty) has two main phases: the international phase and the national phase. In this case the applications via PCT will be used as a reference in the international phase. These applications are only considered as a petition, and they do not guarantee the granting of the patent in the national phase. However, it has been proven that there is a relationship between the increases of patent applications via PCT as a reference of the performance of technological innovation in a country. The indicators defined by CAF for this parameter are: *i)* Patent Applications via PCT/million inhabitants; and *ii)* patent applications via PCT/GDP. The first one establishes a relationship between technological innovation measured in numbers of patent applications via PCT and the population related with innovation activities, while the second reveals the importance of the patent applications via PCT in comparison with the dynamics of the national economies. As CAF's Technological Patent Regional Initiative has among its main objective to generate patent applications via PCT, these will be one of the output indicators.

Concessions of USPTO patents: The United States Patent and Trademark Office (USPTO) is the federal entity in charge of granting invention patents in that country, in compliance with the four basic requirements: be legal, new, useful, and not obvious. The USPTO is one of the main intellectual property offices in absolute terms in the world, and the concession of invention patents by this office implies the protection of high technology products exported to one of the main commercial markets in the world. The indicators defined by CAF for this parameter are the following: *i)* concession of USPTO patents/million inhabitants; *ii)* concession of USPTO/GDP patents; and *iii)* patent applications via USPTO/concession of USPTO patents. The first one reveals the share of USPTO concessions by inhabitants, which shows the capacity for technological innovation in the applicant country. The second indicator relates the level of economic activity of each country

with the technological innovation patented in the United States, and the third reveals the rate of mortality of applications via USPTO.³

EPO Applications and Patent Concessions: European patents may be obtained for all the countries that signed the European Patent Convention by presenting a sole regional application before any European patent office (EPO) in any of the three official languages (English, French, or German). The EPO concessions are considered regional patents as they force all national office where a concession is presented, to grant a national patent. This process may only be conditioned to a translation to the official language of the country which is a member of the EPO. The indicators defined by CAF for this parameter are the following: i) EPO patent concessions/million inhabitants, and ii) Patent applications via EPO/EPO patent concessions. The first shows the relative importance of the technological innovation patented in Europe considering the total number of inhabitants, and the second shows the rate of mortality of the applications via EPO.⁴

OUTCOME INDICATORS

Exports of High Technology Products: The data used for the calculation of high technology products was obtained from the statistics of the World Bank Group. They are based on a methodology developed by the OECD and Eurostat to define what high technology exports are. Using a “goods approach”, the importance of expenditures on R&D on the total value of sales is measured to establish a classification (high, medium, low technology). Examples of these sectors include the aeronautical industry, information technology, scientific instruments, and pharmaceutical industry, among others. The indicators defined by CAF for this parameter are the following: i) high technology exports/total value of exports; and ii) high technology exports/inhabitants. The first indicator reveals the relationship

³ To determine the mortality rate of USPTO and EPO applications, the total number of patents granted was divided

⁴ Ibid.

between the high technology sector and the total export guideline, which has implications in the external insertion of the countries. The second indicator reveals the importance of high technology sectors in terms of the total population of the countries.

Royalties from the Use of Intellectual Property: Royalties and licensing rates are payments and charges between residents and non-residents for the authorized use of intangible assets, non-financial, not-manufactured, and intellectual property rights (such as patents, copyrights, registered trademarks, industrial processes, and franchises). In the beginning, work will be carried out with the World Bank Group data, which encompasses all the incomes derived from any form of intellectual property, taken from data from the balance of payments of each country, in USD at current prices. Further on, it is expected that this disaggregated data will be presented discriminating between the receipts for the use of patents of other types of intellectual property. The indicator defined by CAF for this parameter is royalties/million inhabitants that reveals the share of the royalties for intellectual property with respect to the total.

DEFINITION OF THE REGIONS

LATIN AMERICA AND THE CARIBBEAN

Antigua and Barbuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Ecuador, El Salvador, Granada, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Trinidad and Tobago, Uruguay, and Venezuela.

ASIA

China, South Korea, Philippines, Hong Kong, India, Indonesia, Japan, Macao, Malaysia, Singapore, Thailand, and Vietnam.

EUROPE

Germany, Andorra, Austria, Belgium, Bosnia and Herzegovina, Croatia, Denmark, Slovakia, Slovenia, Spain, Estonia, Finland, France, Greece, Ireland, Iceland, Italy, Latvia, Liechtenstein, Lithuania, Luxemburg, Norway, Netherlands, Poland, Portugal, United Kingdom, Check Republic, Serbia, Sweden, and Switzerland.

NORTH AMERICA

Canada and the United States.

DATA TABLES

OUTCOMES INDICATORS TABLES

Table 1. Exports of high technology products (Millions of US\$). 2004-2012

Countries/Years	2004	2005	2006	2007	2008	2009	2010	2011	2012
LAC	41.327	44.999	49.480	48.367	50.044	44.035	51.754	60.523	59.570
Asia	571.377	651.419	752.652	764.753	795.430	713.026	907.111	967.904	1.012.633
Europe	513.625	568.022	641.913	573.216	605.171	533.742	596.266	678.253	665.263
North America	197.808	216.089	245.761	244.426	247.796	155.617	169.461	170.290	172.811

Own preparation. Source: World Bank (March 2015)

Table 2. Total Exports (Millions of US\$ at current prices). 2004-2013

Countries/Years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
LAC	468.172	565.991	670.289	752.075	867.188	678.573	860.706	1.072.535	1.090.000	1.064.339
Asia	2.316.521	2.677.006	3.138.638	3.645.648	4.149.779	3.444.611	4.463.371	5.248.472	5.400.640	5.591.377
Europe	3.810.303	4.125.252	4.686.368	5.436.047	6.049.607	4.669.207	5.247.412	6.137.790	5.903.037	6.187.235
North America	1.135.067	1.264.892	1.425.208	1.582.420	1.755.531	1.371.889	1.663.689	1.930.160	1.998.946	2.034.397

Own preparation. Source: United Nations Statistics Division (March 2015)

Table 3. Royalties for the use of intellectual property (Millions of US\$). 2005-2013

Countries/Years	2005	2006	2007	2008	2009	2010	2011	2012	2013
LAC	530	653	915	1.081	1.023	1.048	1.342	1.039	1.096
Asia	21.002	23.288	26.652	30.292	27.195	32.520	36.938	40.130	39.567
Europe	39.084	40.777	47.728	53.964	56.821	61.532	70.777	65.980	70.469
North America	77.321	86.909	101.637	106.256	102.007	110.336	126.681	129.237	132.933

Own preparation. Source: World Bank (March 2015)

OUTPUTS INDICATORS TABLES

Table 4. Patent applications via PCT. 2002-2014

Countries/Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
LAC	562	672	769	804	896	1.146	1.120	1.004	1.007	1.196	1.278	1.385	1.308
Asia	18.515	22.769	26.762	33.265	38.320	41.839	44.691	47.566	56.499	67.992	76.352	80.266	83.784
Europe	42.772	43.561	44.288	47.636	50.335	53.372	56.220	52.839	53.112	54.897	56.663	56.328	57.151
North America	43.577	43.318	45.505	49.202	53.876	56.906	54.574	48.167	47.778	52.124	54.596	60.280	64.165

Own preparation. Source: OMPI (March 2015)

Table 5. Patent applications USPTO. 2002-2013

Countries/Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
LAC	659	750	748	787	884	963	1.105	1.111	1.281	1.356	1.503	1.670
Asia	82.750	88.600	98.669	111.627	126.089	129.331	134.098	137.193	145.298	150.457	140.504	165.145
Europe	53.189	50.166	52.583	54.293	59.248	64.367	68.556	71.676	78.205	79.683	84.502	88.156
North America	191.620	196.691	197.738	216.505	231.436	251.768	241.895	235.221	253.662	259.725	282.342	301.506

Own preparation. Source: USPTO (March 2015)

Table 6. USPTO patent concessions. 2002-2014

Countries/Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
LAC	329	361	302	229	288	247	259	285	405	460	508	633	747
Asia	39.946	40.908	41.427	36.243	44.761	41.892	43.995	47.549	61.565	64.129	71.879	76.504	82.497
Europe	28.668	28.351	26.406	22.314	25.792	23.216	23.201	23.552	32.265	32.527	37.964	43.124	47.333
North America	90.402	91.320	87.644	77.531	93.395	82.844	80.895	86.037	112.643	113.636	126.801	140.140	151.664

Own preparation. Source: USPTO (March 2015)

Table 7. Patent applications EPO. 2004-2014

Countries/Years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
LAC	887	940	1.066	1.288	1.271	1.098	1.144	1.297	1.413	1.482	1.557
Asia	41.251	48.163	53.041	56.513	58.502	58.772	69.547	80.077	88.197	92.077	94.528
Europe	76.475	81.069	84.642	88.987	92.460	86.657	91.761	90.928	92.859	92.449	93.623
North America	56.195	60.254	64.303	67.017	64.847	57.254	64.947	64.288	67.353	70.664	75.279

Own preparation. Source: EPO (March 2015)

Table 8. EPO patent concessions. 2004-2014

Countries/Years	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
LAC	179	247	241	232	220	241	267	304	260	281	192
Asia	11.083	10.237	13.169	11.879	12.641	11.112	12.636	13.830	15.696	15.390	14.508
Europe	31.586	28.179	32.626	28.285	32.096	27.439	30.495	32.361	32.393	33.346	32.787
North America	14.887	13.634	15.623	13.278	13.494	12.010	13.242	14.127	15.579	15.779	15.239

Own preparation. Source: EPO (March 2015)

Table 9. GDP (Billions of US\$). 2002-2013

Countries/Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
LAC	1.892	1.965	2.265	2.753	3.239	3.828	4.450	4.170	5.169	5.808	5.811	5.946
Asia	7.366	8.116	9.069	9.688	10.395	11.706	13.420	14.094	16.346	18.772	19.853	19.988
Europe	9.921	12.067	13.915	14.558	15.534	17.922	19.327	17.321	17.335	18.860	17.827	18.414
North America	11.730	12.398	13.293	14.258	15.167	15.935	16.261	15.790	16.578	17.307	17.996	18.607

Own preparation. Source: United Nations Statistics Division (March 2015)

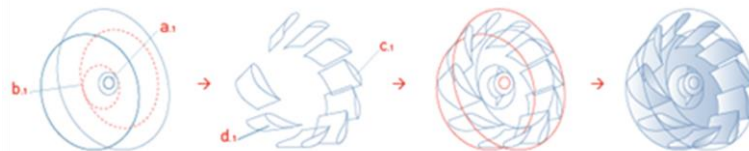
Table 10. Population (Millions of people). 2002-2014

Countries/Years	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
LAC	525,7	532,8	539,7	546,5	553,2	559,8	566,3	572,9	579,4	586,0	592,7	599,4	606,0
Asia	3.007,3	3.039,7	3.071,3	3.102,4	3.132,8	3.162,3	3.191,5	3.220,1	3.248,6	3.277,7	3.306,3	3.334,9	3.367,4
Europe	470,6	472,9	475,3	477,7	479,9	482,3	484,7	486,6	487,7	489,3	489,2	485,2	486,5
North America	319,0	321,8	324,8	327,8	331,0	334,1	337,3	340,4	343,3	345,9	348,6	351,3	354,3

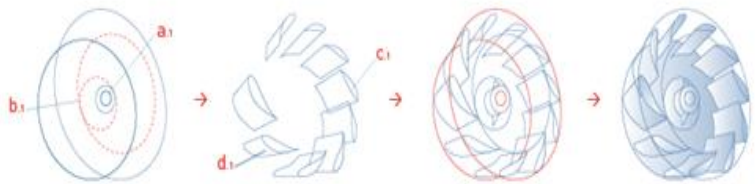
Own preparation. Source: World Bank (March 2015)

STATUS OF THE REGIONAL TECHNOLOGICAL INNOVATION

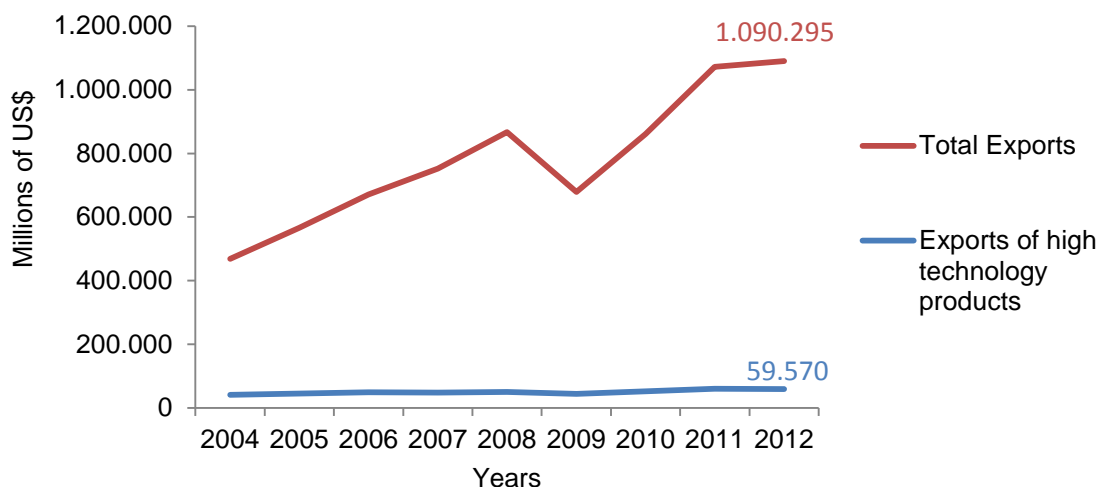
GRAPHS BY REGIONS



TOTAL EXPORTS VS. EXPORTS OF HIGH TECHNOLOGY PRODUCTS

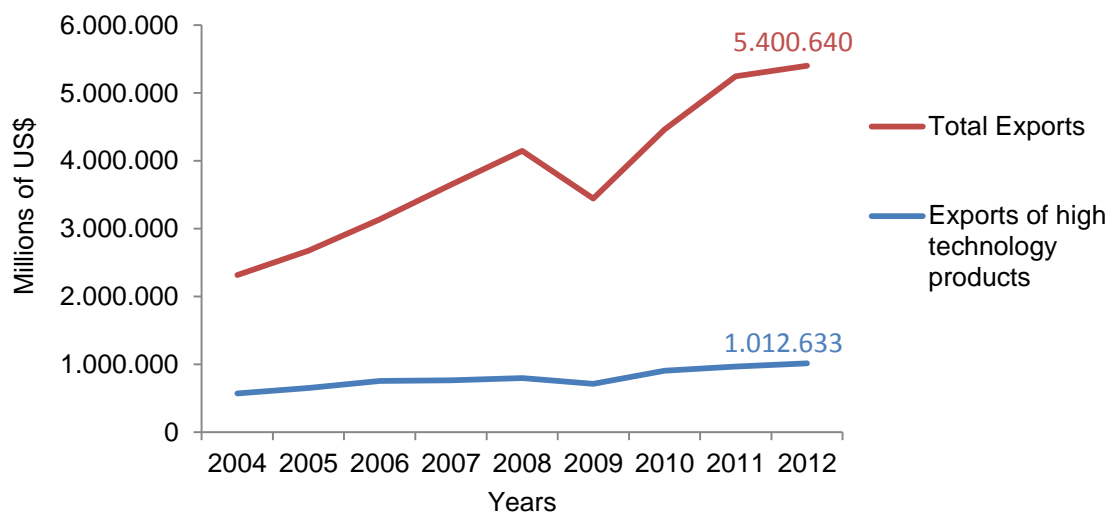


Graphic 1. Total Exports vs. Exports of high technology products - Latin America and the Caribbean



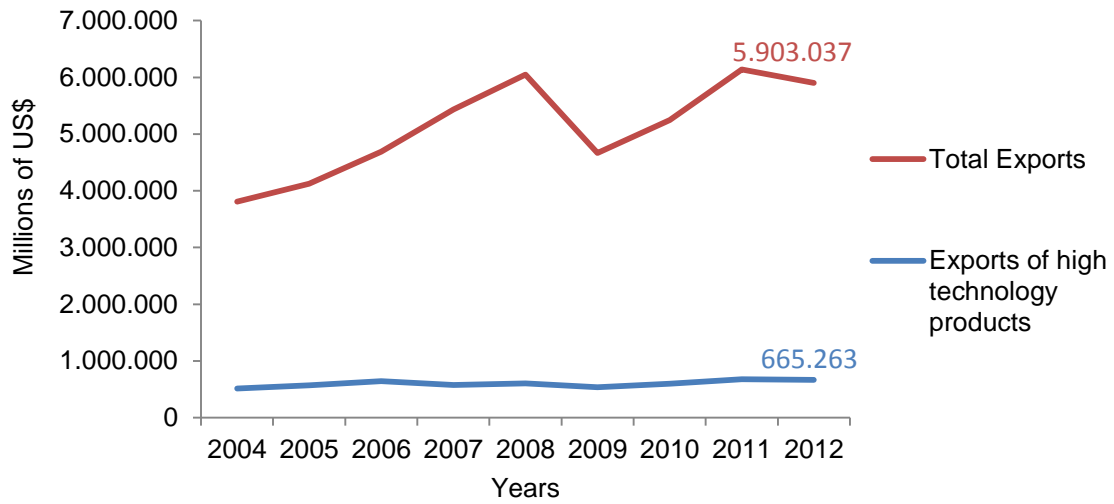
Own preparation. Source: United Nations Statistics Division (March 2015) <http://unstats.un.org/unsd/default.htm> and World Bank (March 2015) <http://datos.bancomundial.org/>

Graphic 2. Total Exports vs. Exports of high technology products - Asia



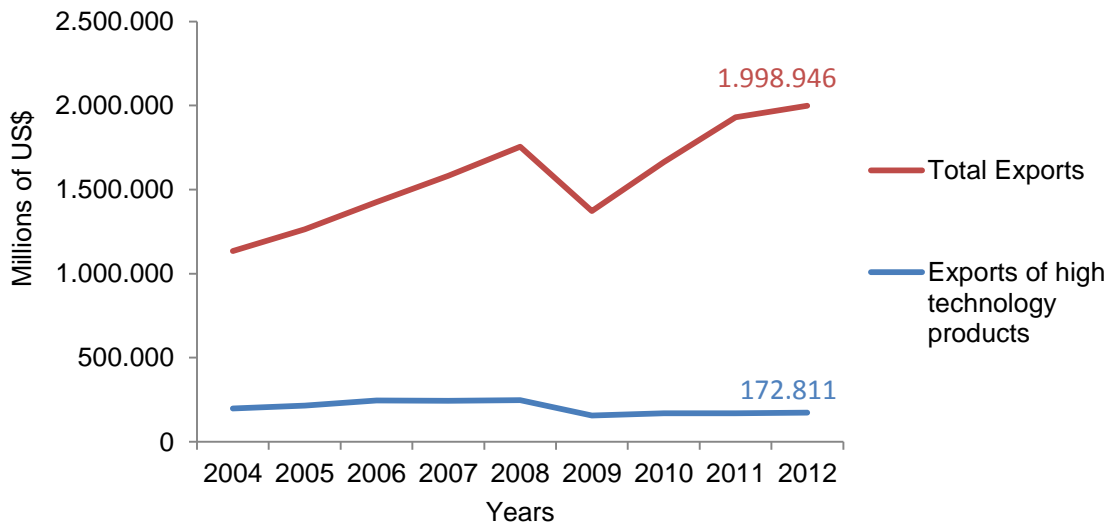
Own preparation. Source: United Nations Statistics Division (March 2015) <http://unstats.un.org/unsd/default.htm> and World Bank (March 2015) <http://datos.bancomundial.org/>

Graphic 3. Total Exports vs. Exports of high technology products - Europe



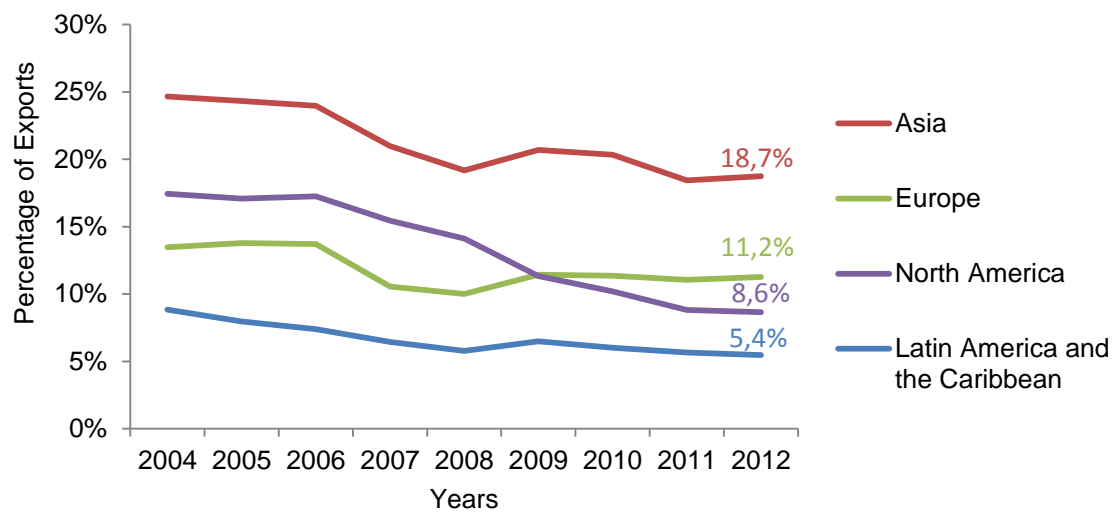
Own preparation. Source: United Nations Statistics Division (March 2015) <http://unstats.un.org/unsd/default.htm> and World Bank (March 2015) <http://datos.bancomundial.org/>

Graphic 4. Total Exports vs. Exports of high technology products - North America



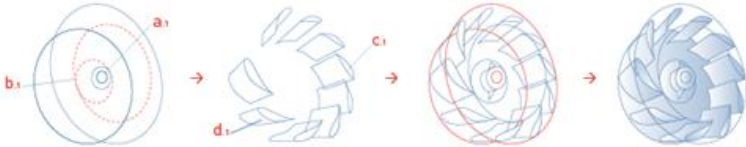
Own preparation. Source: United Nations Statistics Division (March 2015) <http://unstats.un.org/unsd/default.htm> and World Bank (March 2015) <http://datos.bancomundial.org/>

Graphic 5. Percentage of Exports of high technology products on total exports-Regional

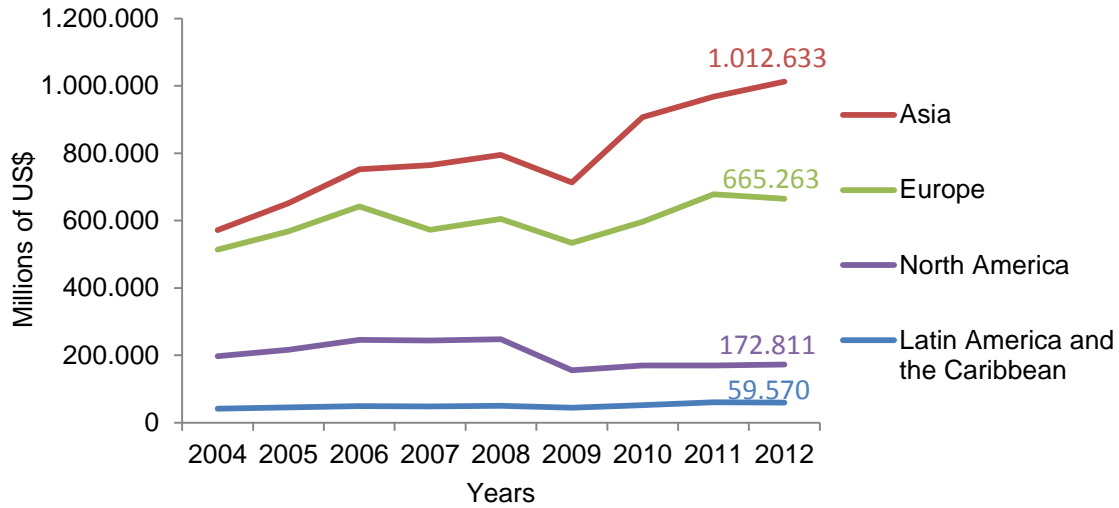


Own preparation. Source: United Nations Statistics Division (March 2015) <http://unstats.un.org/unsd/default.htm> and World Bank (March 2015) <http://datos.bancomundial.org/>

EXPORTS OF HIGH TECHNOLOGY PRODUCTS

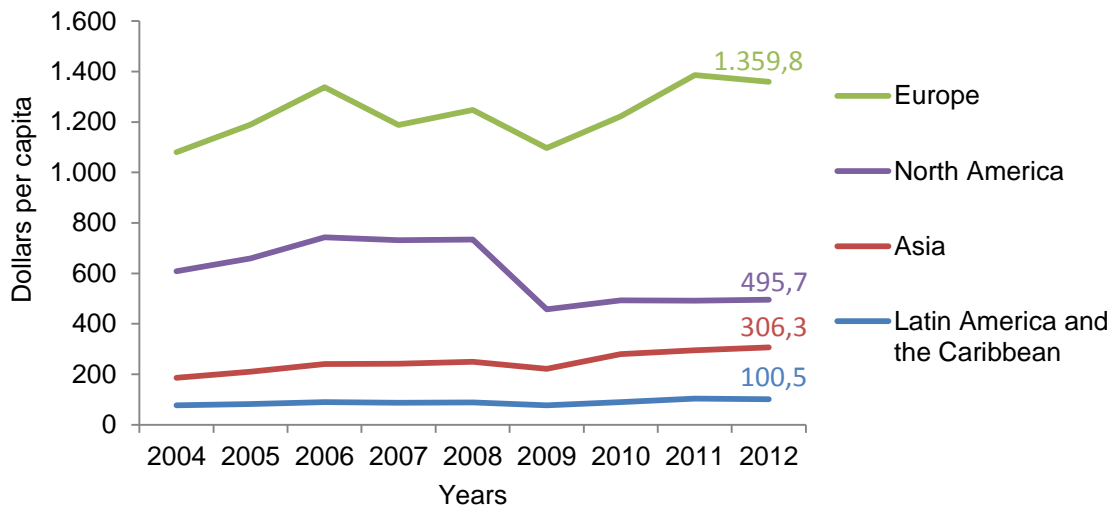


Graphic 6. Exports of high technology products (Millions of dollars) - Regional



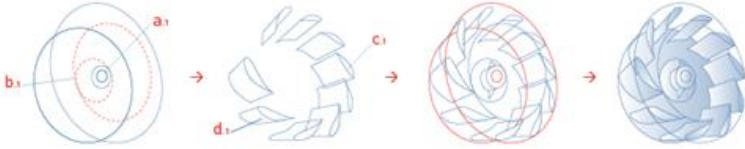
Own preparation. Source: World Bank (March 2015) <http://datos.bancomundial.org/>

Graphic 7. Exports of high technology products per capita - Regional

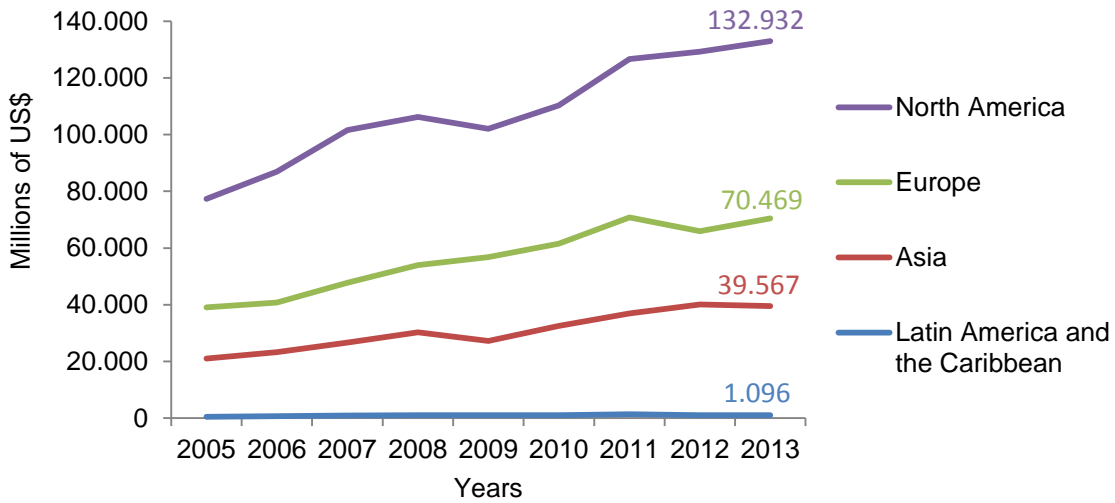


Own preparation. Source: World Bank (March 2015) <http://datos.bancomundial.org/>

ROYALTIES FOR THE USE OF INTELLECTUAL PROPERTY

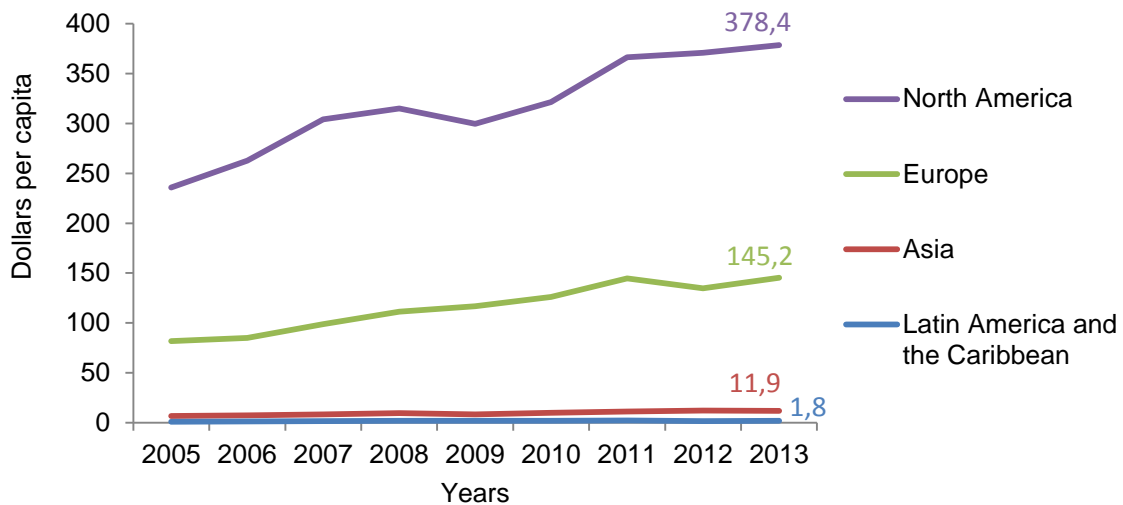


Graphic 8. Royalties for the use of intellectual property - Regional



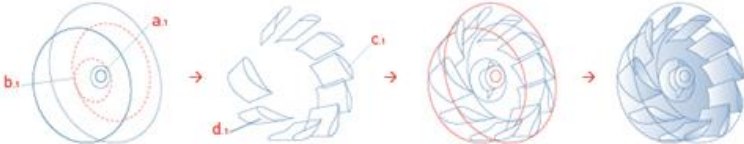
Own preparation. Source: World Bank (March 2015) <http://datos.bancomundial.org/>

Graphic 9. Royalties for the use of intellectual property per capita - Regional

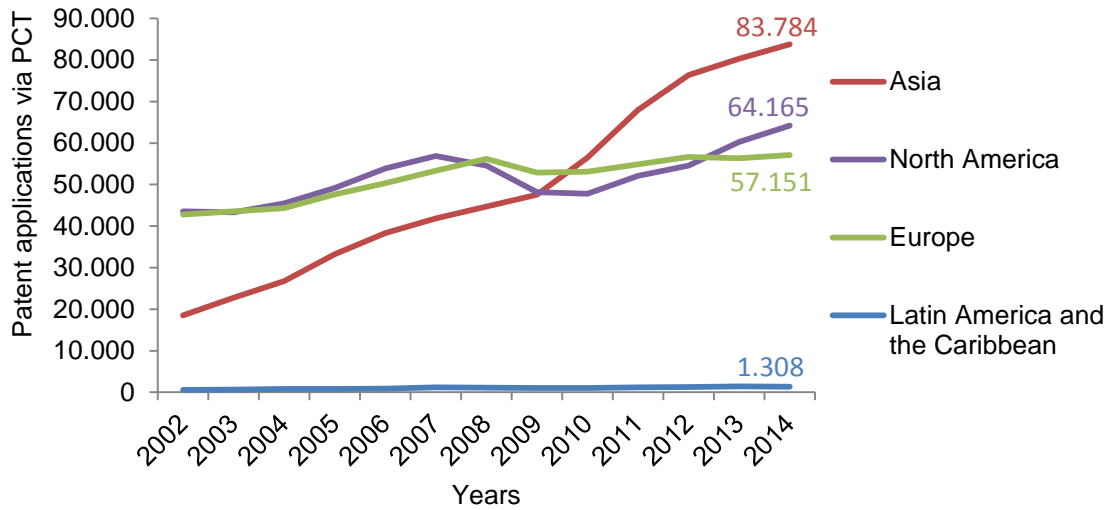


Own preparation. Source: World Bank (March 2015) <http://datos.bancomundial.org/>

PATENT APPLICATIONS VIA PCT

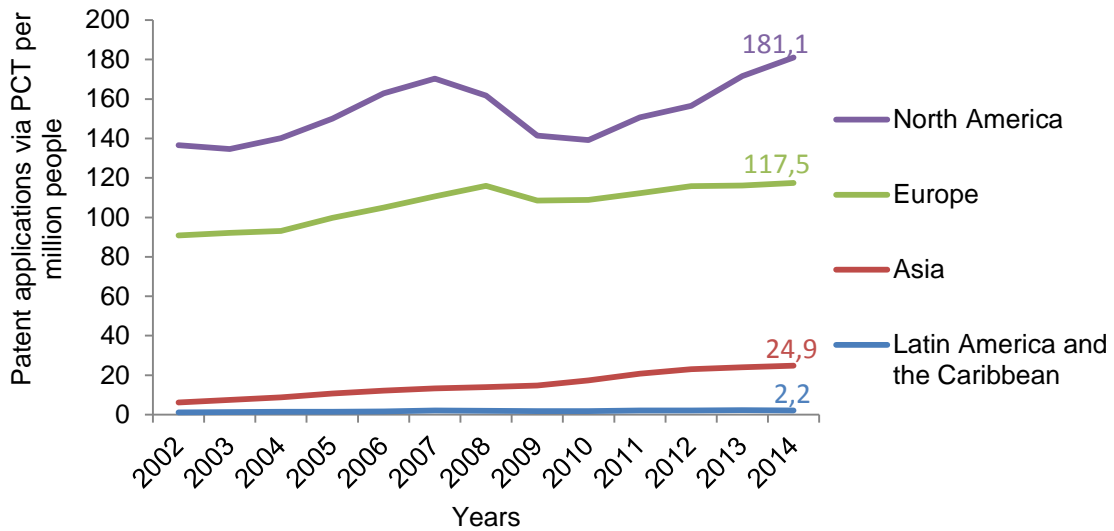


Graphic 10. Patent applications via PCT - Regional



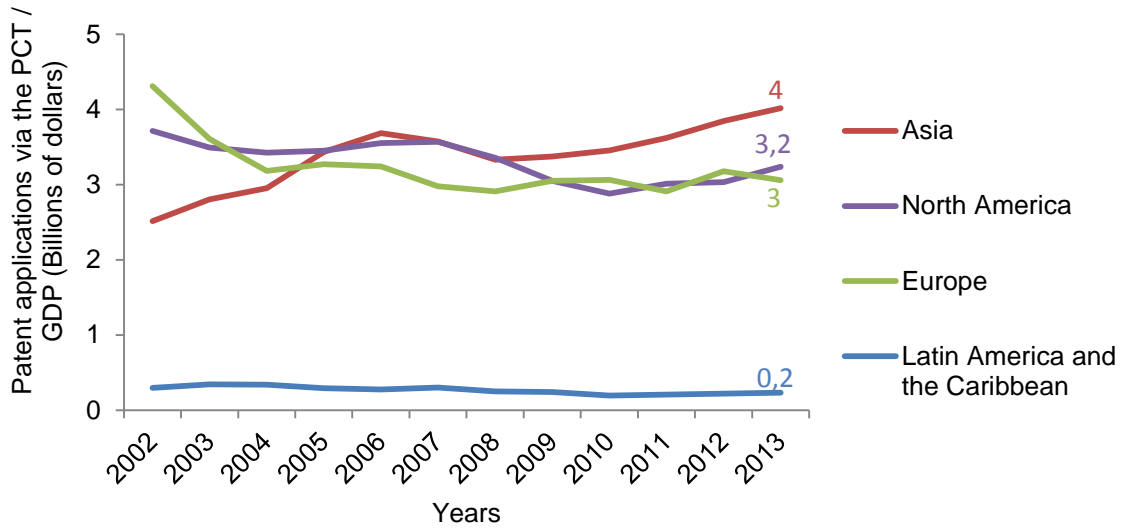
Own preparation. Source: WIPO Website (March 2015) (www.wipo.int)

Graphic 11. Patent applications via PCT per million people - Regional



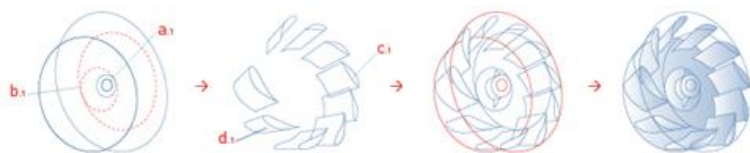
Own preparation. Source: WIPO Website (March 2015) (www.wipo.int) and World Bank (March 2015) (<http://datos.bancomundial.org/>)

Graphic 12. Patent applications via PCT /GDP nominal - Regional

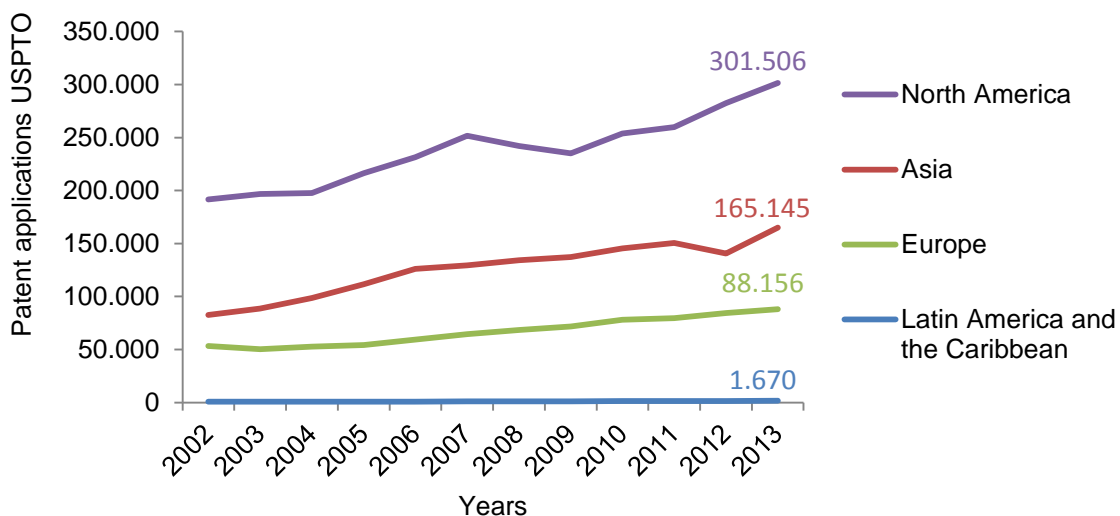


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USPTO APPLICATIONS AND CONCESSION OF PATENTS

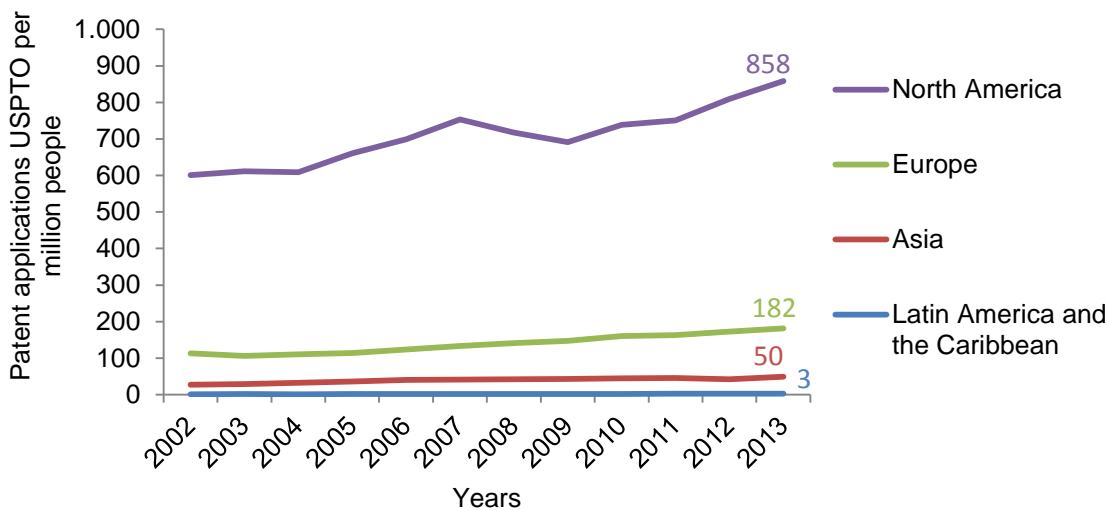


Graphic 13. USPTO patent applications – Regional



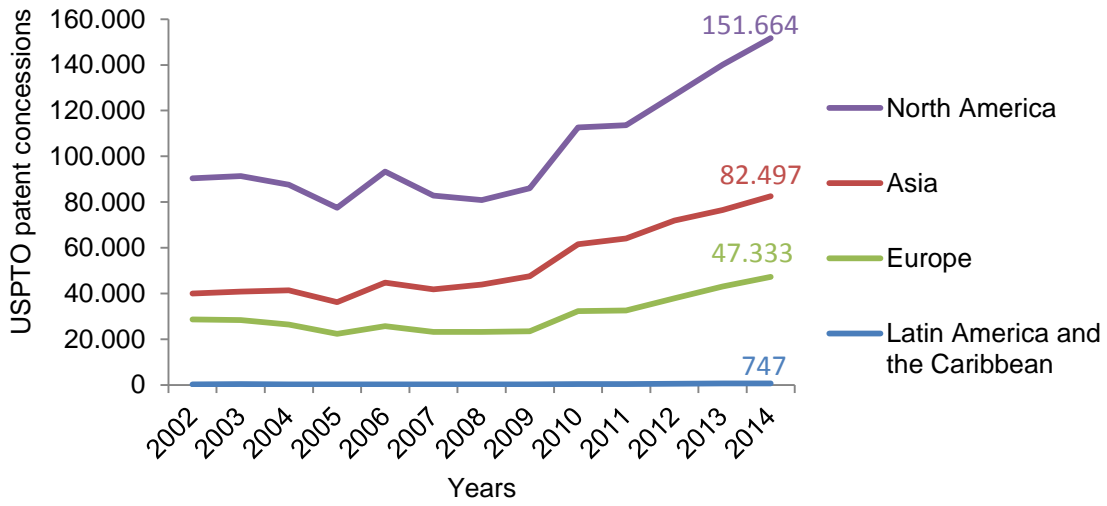
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Graphic 14. USPTO patent concessions per million people – Regional



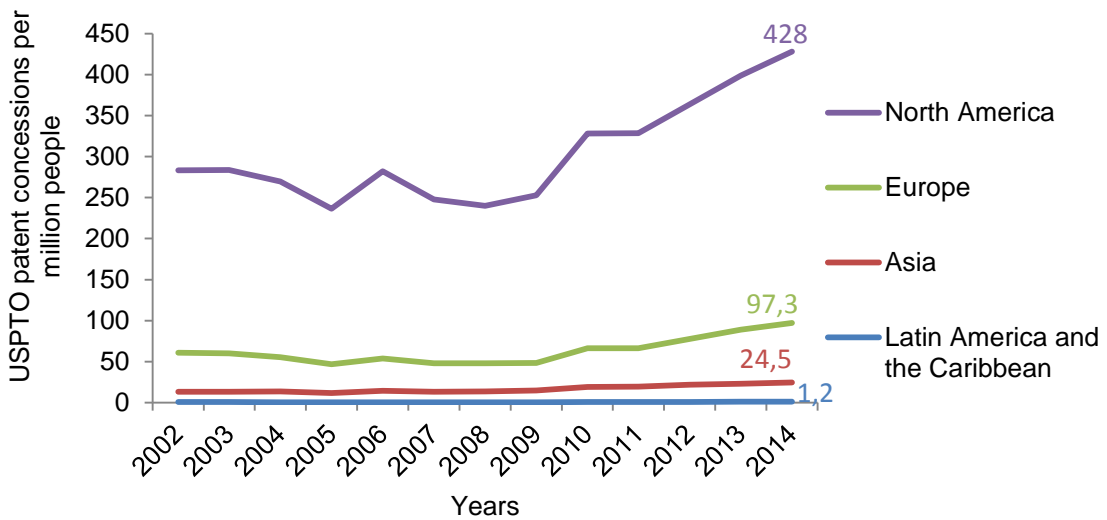
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Graphic 15. USPTO patent concessions - Regional



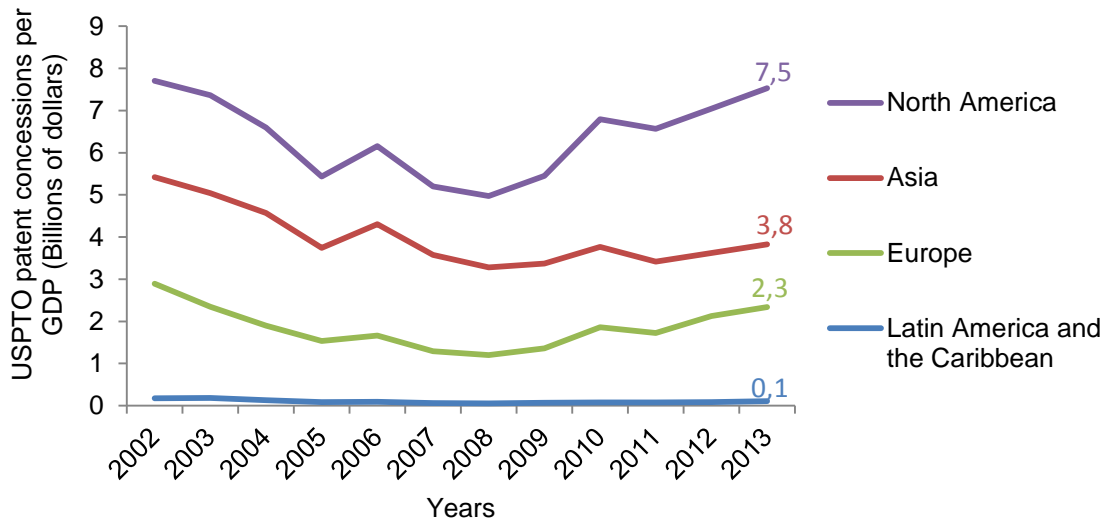
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Graphic 16. USPTO patent concessions per million people - Regional



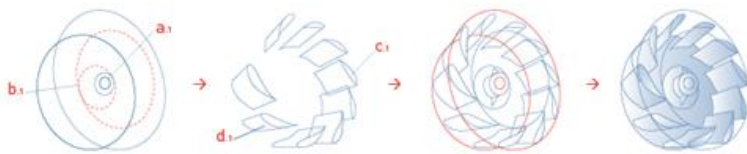
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Graphic 17. USPTO patent concessions per GDP nominal - Regional

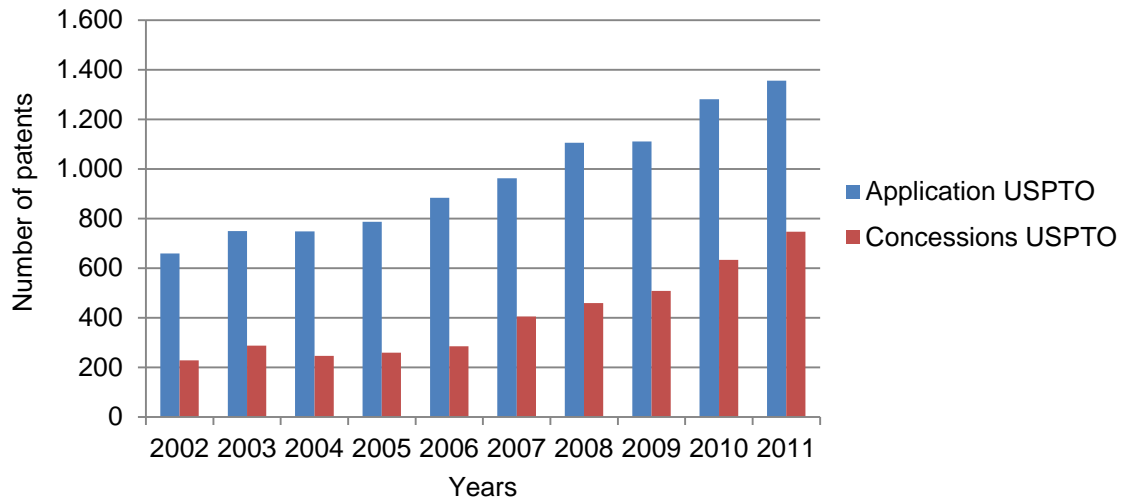


Own preparation. Source: USPTO Website (March 2015) http://www.USPTO.gov/web/offices/ac/ido/oeip/taf/cst_utlh.htm and United Nations Statistics Division (March 2015) <http://unstats.un.org/>

USPTO RATE OF PATENT MORTALITY

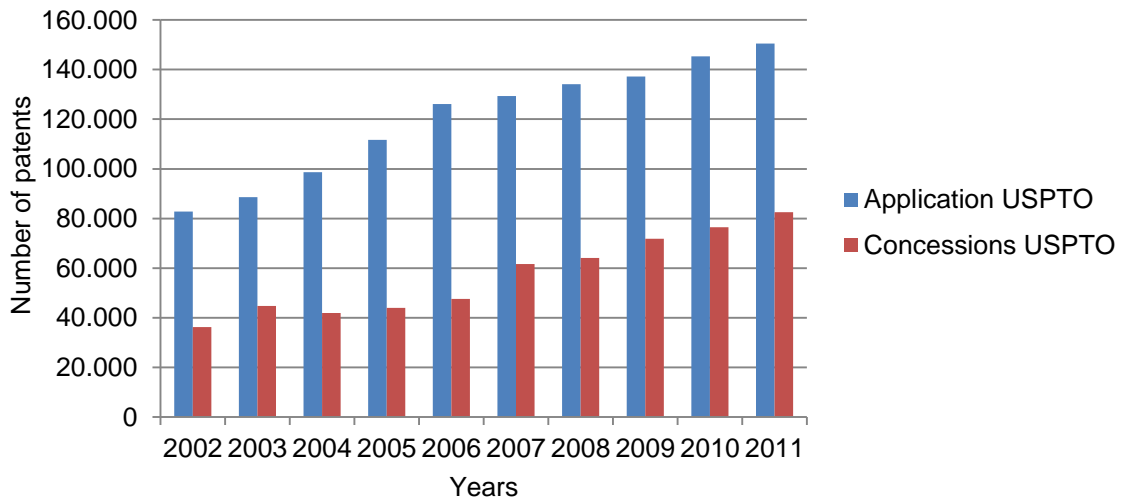


Graphic 18. Application vs. USPTO patent concessions - Latin America and the Caribbean



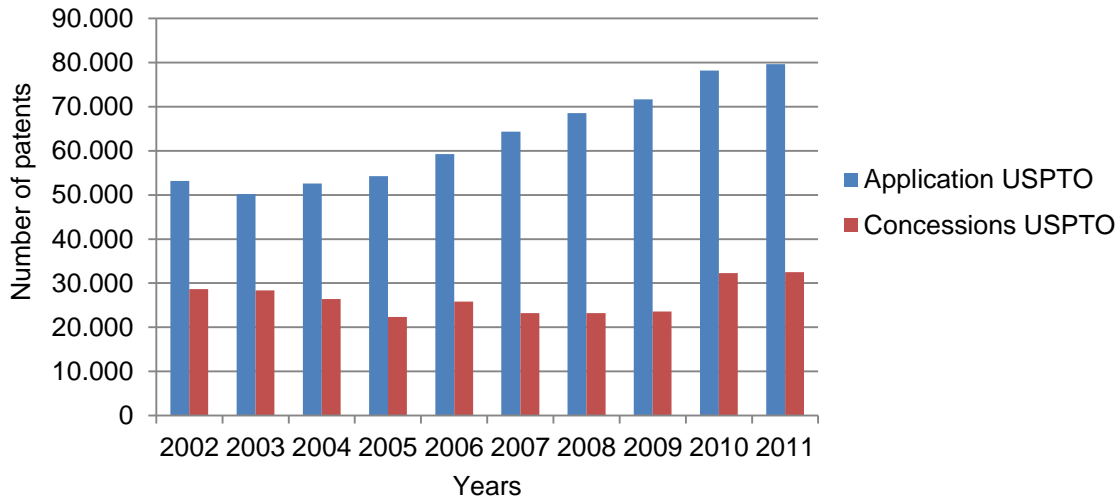
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Graphic 19. Application vs. USPTO patent concessions - Asia



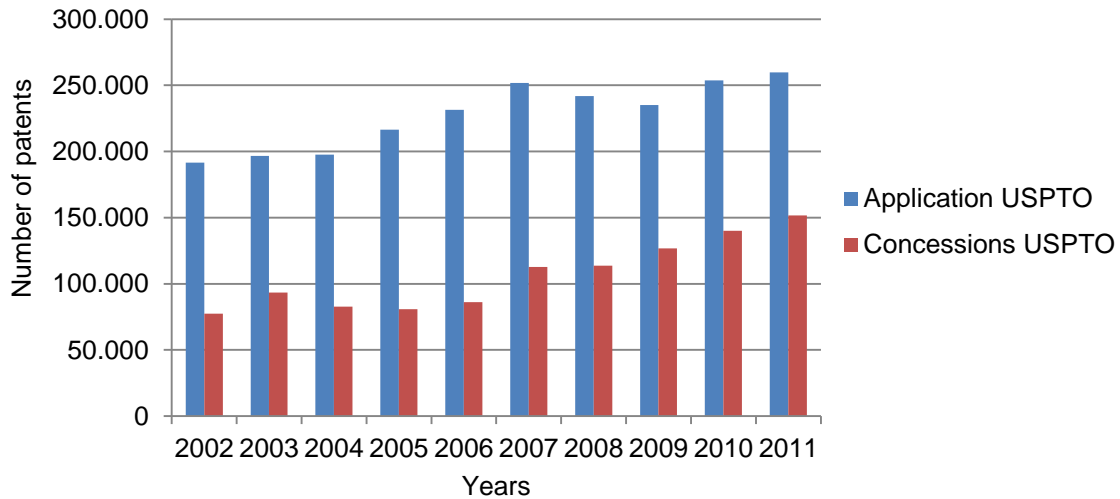
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Graphic 20. Application vs. USPTO patent concessions - Europe



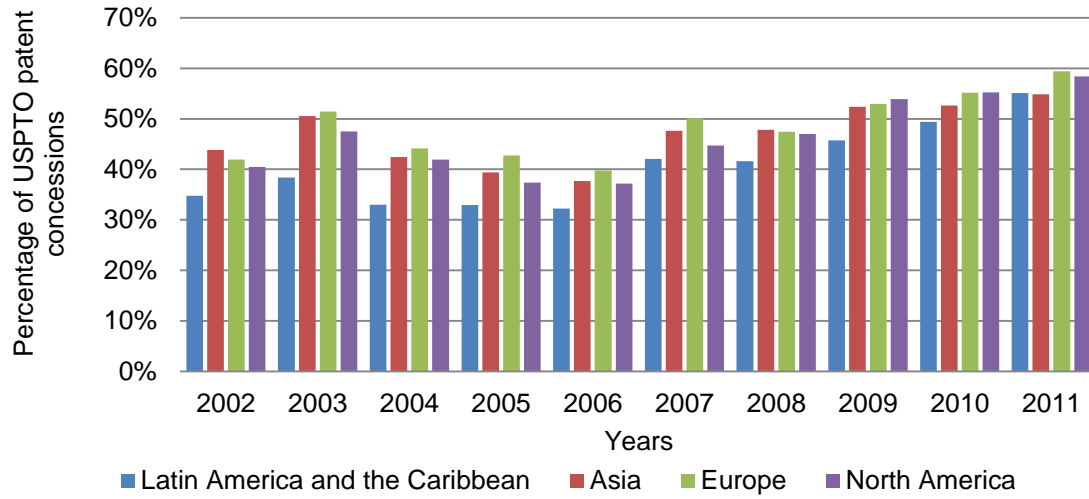
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Graphic 21. Application vs. USPTO patent concessions - North America



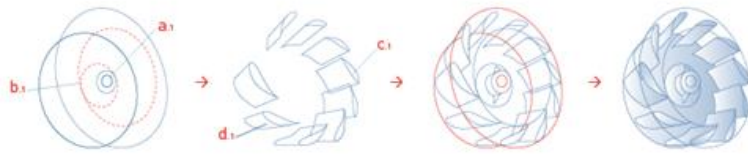
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Graphic 22. Percentage of USPTO patent concessions- Regional

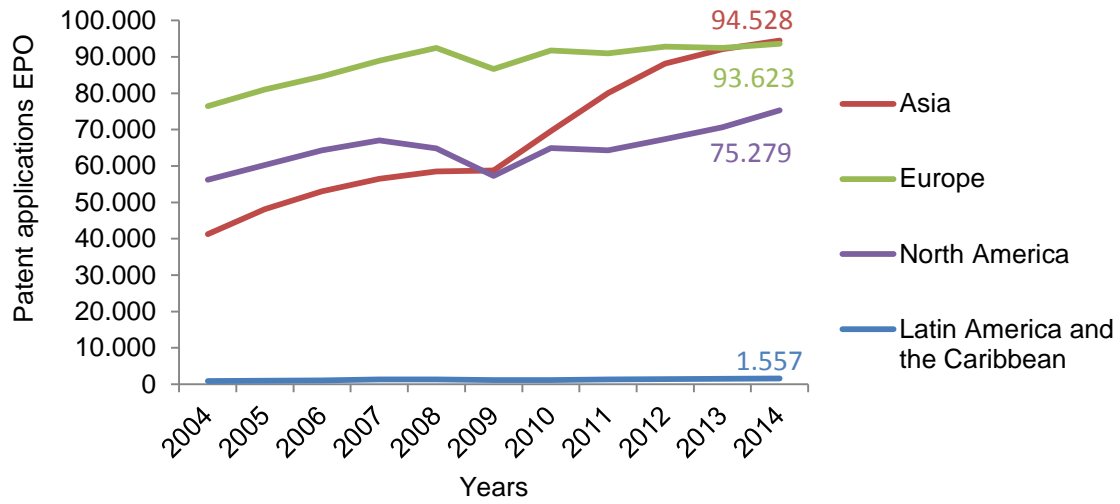


Own preparation. Source: USPTO Website (March 2015) – Concession
http://www.USPTO.gov/web/offices/ac/ido/oeip/taf/cst_utlh.htm and Application
http://www.USPTO.gov/web/offices/ac/ido/oeip/taf/appl_yr.htm

EPO APPLICATIONS AND CONCESSION OF PATENTS

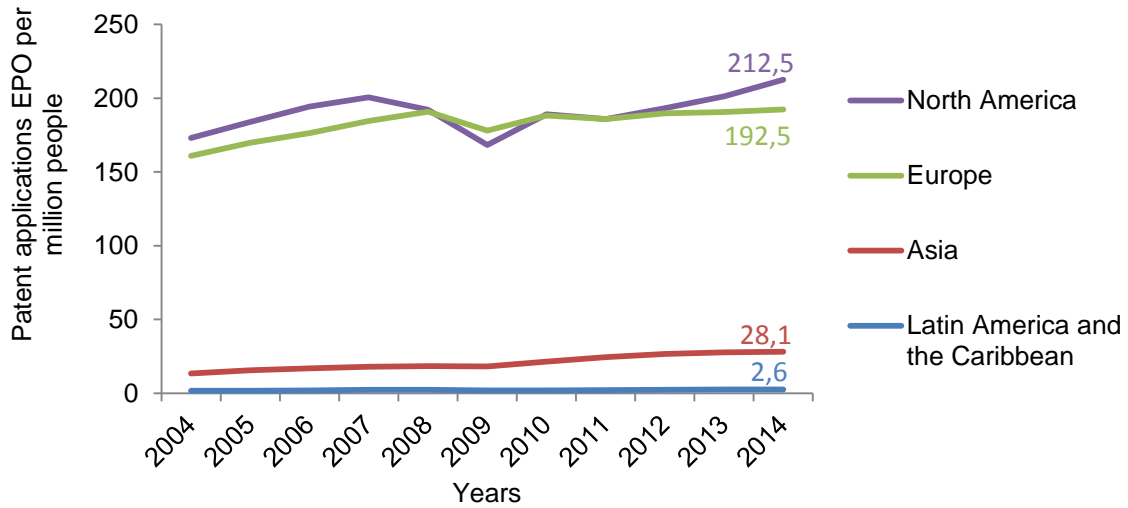


Graphic 23. Patent applications EPO - Regional



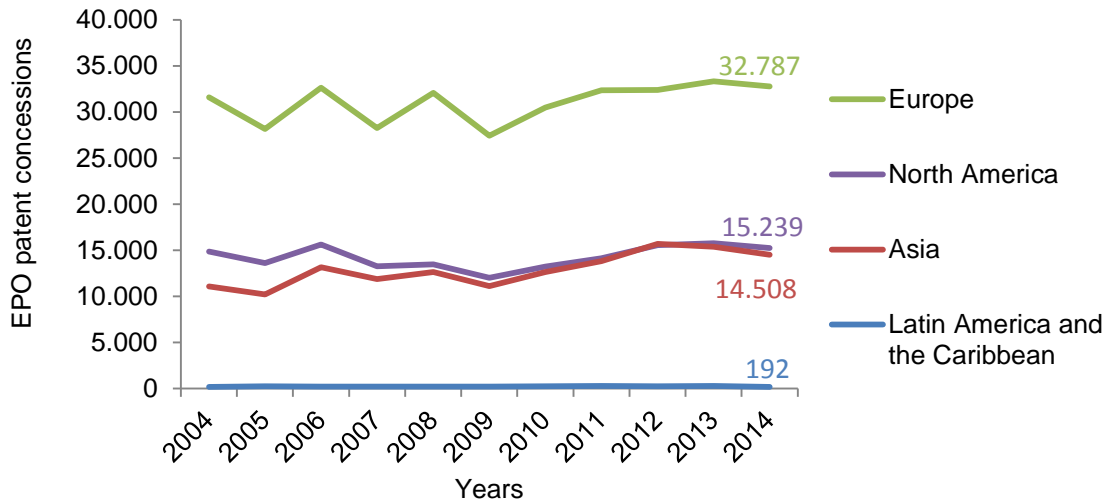
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Graphic 24. Patent applications EPO per million people - Regional



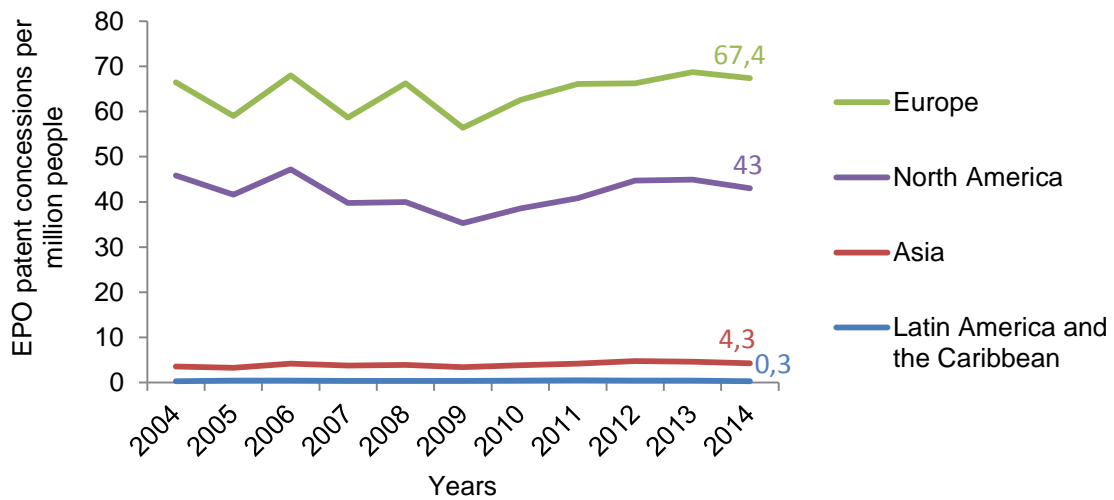
Own preparation. Source: EPO Website (March 2015) <http://www.epo.org/about-us/annual-reports-statistics/statistics.html> and World Bank (March 2015) <http://datos.bancomundial.org/>

Graphic 25. EPO patent concessions - Regional



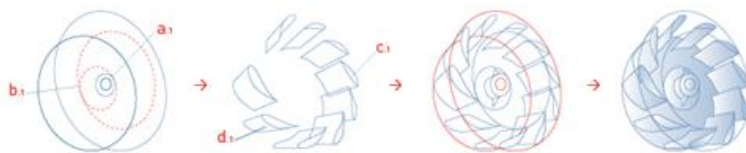
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Graphic 26. EPO patent concessions per million people - Regional

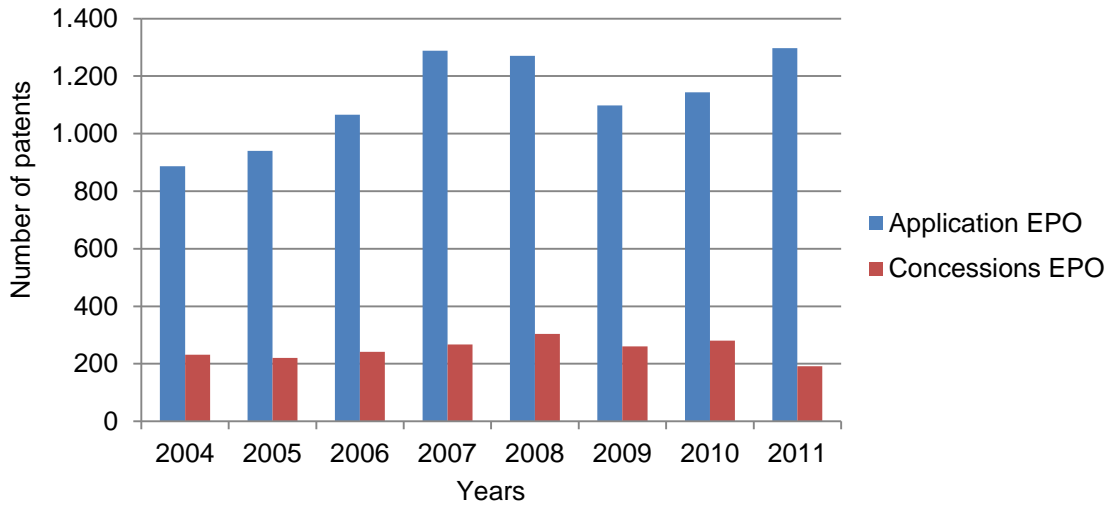


Own preparation. Source: EPO Website (March 2015) <http://www.epo.org/about-us/annual-reports-statistics/statistics.html> and World Bank (March 2015) <http://datos.bancomundial.org/>

RATE OF EPO MORTALITY

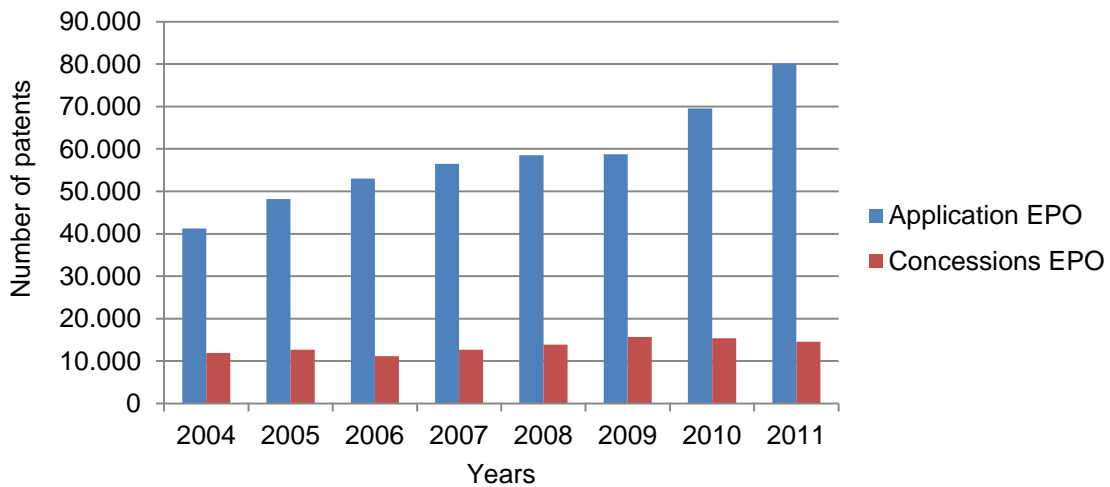


Graphic 27. Application vs. EPO patent concessions - Latin America and the Caribbean



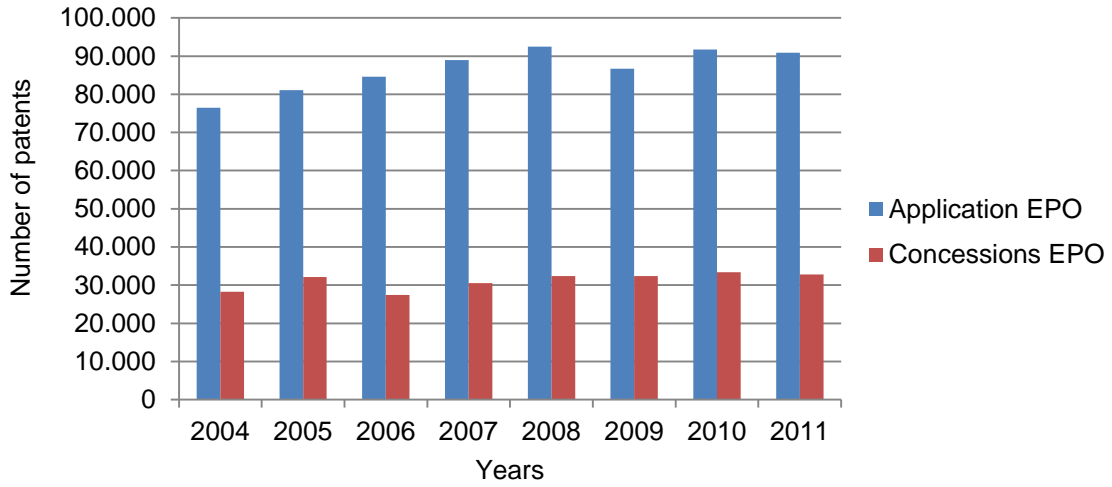
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Graphic 28. Application vs. EPO patent concessions - Asia



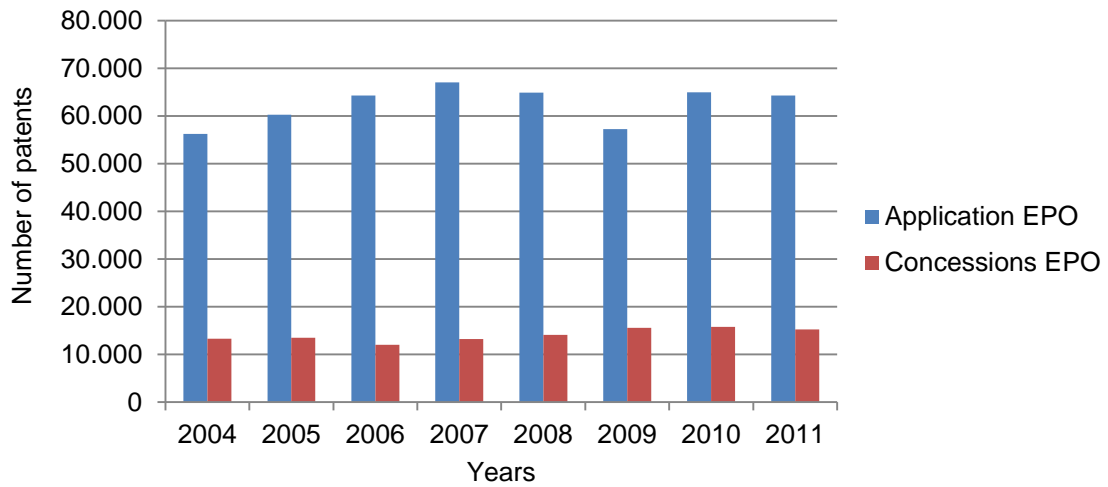
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Graphic 29. Application vs. EPO patent concessions - Europe



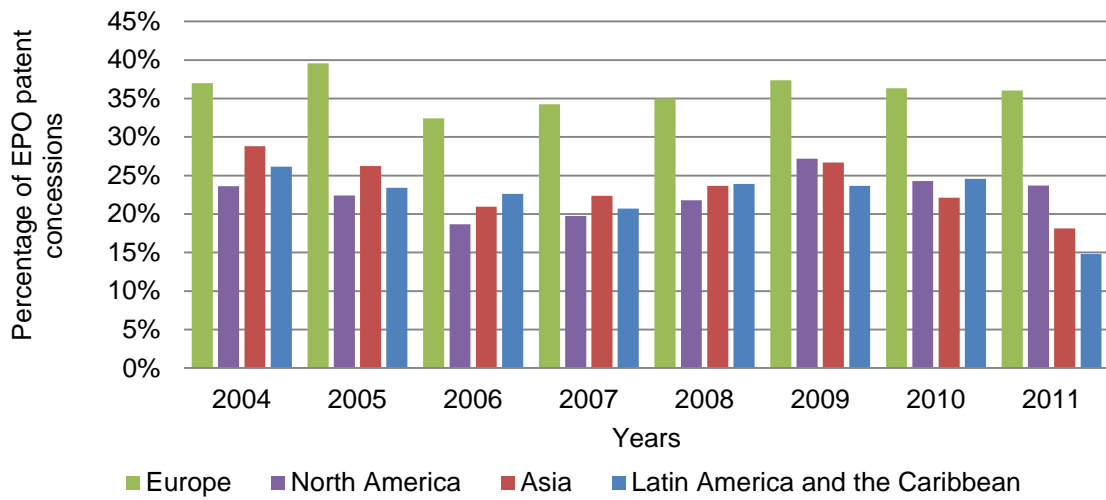
Own preparation. Source: EPO Website (March 2015) <http://www.epo.org/about-us/annual-reports-statistics/statistics.html>

Graphic 30. Application vs. EPO patent concessions - North America



Own preparation. Source: EPO Website (March 2015) <http://www.epo.org/about-us/annual-reports-statistics/statistics.html>

Graphic 31. Percentage of EPO patent concessions - Regional



Own preparation. Source: EPO Website (March 2015) <http://www.epo.org/about-us/annual-reports-statistics/statistics.html>