



**THE ECONOMIC
FOOTPRINT OF THE
PHARMACEUTICAL
INDUSTRY**

**REGIONAL BREAKDOWN
AND DIFFERENTIATION
BETWEEN ORIGINATORS
AND GENERICS**

DR. DENNIS A. OSTWALD
KATHARINA ZUBRZYCKI, M.SC.
DIPL.-WIRTSCH.-ING. JULIAN KNIPPEL

IMPRINT

Version

February 2015

Publishers

WifOR Darmstadt
Rheinstraße 22
D-64283 Darmstadt
Tel.: +49 6151 50155-0
e-Mail: dennis.ostwald@wifor.de

WifOR Berlin
c/o TU Berlin
Steinplatz 2
D-10623 Berlin
Tel.: +49 30 314-75768

Authors

Dr. Dennis A. Ostwald
Katharina Zubrzycki
Julian Knippel

Acknowledgement

This project was undertaken with the financial support of the International Federation of Pharmaceutical Manufacturers and Associations (IFPMA).

TABLE OF CONTENTS

ABSTRACT	5
1. AIM AND STRUCTURE OF THE STUDY	7
2. UPDATE OF THE ECONOMIC FOOTPRINT'S DIRECT EFFECTS.....	9
2.1. Database for the Macroeconomic Evaluation of the Pharmaceutical Industry	10
2.1.1. Macroeconomic Indicators to Assess the Economic Footprint	10
2.1.2. Data Availability	11
2.2. Results of the Updated Economic Footprint.....	13
2.2.1. Growth and Employment Stimuli of the Pharmaceutical Industry.....	13
2.2.2. Assessment of Production Value and Employee Compensation	15
2.3. Interim Conclusion: The Pharmaceutical Industry's Contribution to Economic Growth and Job Creation	16
3. REGIONAL BREAKDOWN OF THE ECONOMIC FOOTPRINT	18
3.1. Methodology to Quantify Regional Economic Effects	19
3.1.1. Classification of the Geographical Regions	19
3.1.2. Database and Methodology to Quantify the Regional Gross Value Added and Employment Effects	19
3.1.3. Shortcomings of the Regional Evaluation – Influence of Exchange Rates.....	20
3.2. Results of the Regional Breakdown.....	21
3.2.1. Regional Gross Value Added of the Pharmaceutical Industry	22
3.2.2. Regional Employment Effects of the Pharmaceutical Industry.....	23
3.2.3. Regional Apparent Labour Productivity of the Pharmaceutical Industry	24
3.3. Interim Conclusion: The Pharmaceutical Industry's Regional Development.....	25
4. FEASIBILITY CHECK – DIFFERENTIATION BETWEEN ORIGINATORS AND GENERICS	26
4.1. Definitions: Originators vs. Generics	27
4.1.1. Originator Pharmaceutical Product	28
4.1.2. Generic Pharmaceutical Product.....	28
4.1.3. Other Pharmaceutical Product.....	28
4.1.4. Pharmerging, Developed and Rest of the World Countries	28
4.2. Available Data to Differentiate between Originators and Generics	29
4.3. Methodology to Quantify the Economic Effects by Originators and Generics	32
4.4. Results of the Differentiation between Originators and Generics	34
4.4.1. Gross Value Added Effects.....	34
4.4.2. Employment Effects	35
4.5. Interim conclusion: Feasibility check – Differentiation between Originators and Generics.....	36
5. SUMMARY AND CONCLUSION	37
6. ANNEX	40
6.1. Visualization of the Regional Breakdown	41
6.2. Geographical Regions and Categorization of the Countries in Developed, Pharmerging and Rest of the World Countries.....	42
7. BIBLIOGRAPHY.....	50

LIST OF DIAGRAMS

Diagram 1:	Development of the gross value added in USD billions and the annual growth rate (blue line) in comparison to the worldwide GDP (red line)	13
Diagram 2:	Development of employment and the annual growth rate (blue line)	14
Diagram 3:	Structure of the medicines market	27
Diagram 4:	Global value sales market shares in % USD of originators and generics from 2006 to 2011	31
Diagram 5:	Global volume sales market shares in % total prescriptions of originators and generics from 2006 to 2011	31
Diagram 6:	Value shares (key factors) of originators, generics and remaining drugs for categorized countries in 2012	32
Diagram 7:	Global gross value added in USD billion and shares of originators, generics and other drugs in 2012	34
Diagram 8:	Employment (headcount in thousands) and shares of originators, generics and other drugs in 2012	35
Diagram 9:	Visualization of the regional gross value added effects	41
Diagram 10:	Visualization of the regional employment effects	41

LIST OF TABLES

Table 1:	Variation between the SNA 2014 and the SNA 2013 concerning the global gross value added of the manufacturing sector	12
Table 2:	Gross value added in the pharmaceutical industry in USD billion.....	14
Table 3:	Employment in the pharmaceutical industry (headcount in thousands).....	15
Table 4:	Production value of the pharmaceutical industry in USD billion.....	15
Table 5:	Employee compensation in the pharmaceutical industry in USD billion	16
Table 6:	The gross value added in Europe from 2010 to 2012	21
Table 7:	Regional breakdown of the gross value added in USD billion	22
Table 8:	Regional shares of the pharmaceutical industry's gross value added.....	22
Table 9:	Regional breakdown of the employment (headcount in thousands).....	23
Table 10:	Regional shares of the pharmaceutical industry's employment effects.....	24
Table 11:	Apparent labour productivity in the pharmaceutical industry (Gross value added per person employed in USD)	24
Table 12:	Studies concerning the differentiation between originators and generics in the pharmaceutical market	29
Table 13:	Geographical region and composition of each region according to the United Nations Statistics Division and categorization of the countries in developed, pharmerging and rest of the world countries according to IMS Health.....	42

LIST OF ABBREVIATIONS

CAGR	Compound annual growth rate
ESA	The European System of National and Regional Accounts
EUR	Euro
GDP	Gross domestic product
GPhA	Generic Pharmaceutical Association
GVA	Gross value added
ILO	International Labour Organization
ILOSTAT	ILO Database of Labour Statistics
INDSTAT	Industrial Statistics Database
ISIC	Industrial Classification of All Economic Activities
OECD	Organization for Economic Co-operation and Development
R&D	Research and development
SNA	System of National Accounts
STAN	Database for Structural Analysis
SU	Standard units
UN	United Nations
UNIDO	United Nations Industrial Development Organization
UNSD	United Nations Statistics Division
USD	United States Dollar
WHO	World Health Organization

ABSTRACT

With the present research project the pharmaceutical industry's direct economic effects are enhanced by a regional breakdown and a differentiation between economic effects by originators and generics. For this purpose the global economic effects are divided into the continental effects for Africa, Latin and Northern America, Asia, Europe and Oceania according to the geographical regions of the UN. Therefore the global economic effects have been updated in a first step as well. Additionally to the regional quantification an initial assessment of the economic effects differentiated by originators and generics in the pharmaceutical industry is given.

The update of the pharmaceutical industry's economic effects and the regional breakdown are based on statistics of official organizations such as the UNSD, the OECD and Eurostat. The available data was the limiting factor for the differentiation between originators and generics: available data displays primarily figures like the production volume and sales for generics and originators. Since the assessment of the economic effects is based on macroeconomic indicators, assumptions had to be made in order to use the available information for a first estimation of the economic effects differentiated by originators and generics. As main findings the following may be noted:

- The pharmaceutical industry was able to increase its contribution to value added for the global GDP by 6.0 percent on an annual basis from the years 2006 to 2012, thus reaching a total of USD 437 billion.
- More than 4.4 million people worldwide are employed in the pharmaceutical industry.
- The global economic power of the sector roughly corresponds to the economic performance of Argentina, and there are almost as many people employed in the sector as are employed in Belgium as a whole.
- Asia has the highest share of the global direct gross value added with approximately USD 163.3 billion, followed by Europe with USD 134.8 billion and Northern America with USD 105.3 billion.
- Over 3 million people are working in the pharmaceutical industry in Asia. In Europe around 750,000 employees are working in the pharmaceutical industry. This is almost three times higher than in Northern America with more than 270,000 employees.

- The average labour productivity for the global pharmaceutical industry amounted to USD 98,300 in 2012. In comparison, the apparent labour productivity in an industrialized country like Germany was USD 75,500 in 2012.
- The originators in the pharmaceutical industry are responsible for 60 percent of the global gross value added and 42 percent of the employment effects.

1. AIM AND STRUCTURE OF THE STUDY



With the initial project “Measuring the Economic Footprint of the Pharmaceutical Industry – Feasibility Study” in 2013 the global economic importance of the pharmaceutical industry was examined for the first time.¹ In calculating the economic footprint the focus is placed on the quantification of global growth and job-creation entailed by the economic activities of the global pharmaceutical industry. The respective economic effects relate to the categories of the System of National Accounts (SNA). The results helped to reinforce a change in perspective: the pharmaceutical industry – from a cost driver to a motor for value added and innovation.

The research results of the follow-up project, presented in this report, will enrich the public discussions about the pharmaceutical industry by yielding new information and data concerning economic impulses coming from the pharmaceutical industry. The additional analyses of the regional breakdown of the economic effects and the differentiation between originators and generics will, therefore, provide further insights.

The research approach for the project consisted of three steps: an update of the direct effects of the economic footprint, a regional breakdown and a feasibility check concerning the differentiation between generics and originators:

STEP I: Update of the economic footprint’s direct effects

- Update of the industry’s key data for the year 2012, based on the United Nations System of National Accounts (Chapter 2).

STEP II: Regional breakdown of the economic footprint

- Quantification of the economic impact by different continents with a focus on value added and employment effects (Chapter 3).

STEP III: Feasibility check – Differentiation between originators and generics

- Review of available data and potential methods to differentiate between originators and generics. Based on the feasibility check, a calculation of an initial estimation was undertaken (Chapter 4).

Thus new information about the economic influence of the global pharmaceutical industry’s business activities will deliver an additional source of information with valuable content.

1 Cf. Ostwald / Knippel (2013). The research project can be downloaded at <http://www.wifor.de/ifpma.pdf>

2. UPDATE OF THE ECONOMIC FOOTPRINT'S DIRECT EFFECTS

The research project “Measuring the Economic Footprint of the Pharmaceutical Industry” presented a feasibility study for establishing the economic footprint of the pharmaceutical industry on the basis of the System of National Accounts.² The project included an initial assessment of the economic effects of the global pharmaceutical industry. Since the SNA contains only information on a one-digit level, i.e. for the manufacturing industry, other statistics were used to determine the gross value added of the pharmaceutical industry. In order to disaggregate SNA data to the required degree of detail, various basis statistics – such as INDSTAT, STAN and the ESA – had to be employed. The global direct economic effects of the pharmaceutical industry are measured by means of the value added approach. First valid results have shown the industry’s direct economic effects in the period from 2006 to 2011. In particular this includes the value added, employment, compensation of employees and production value effects worldwide.

In the following chapter the industry’s key data will be updated for the year 2012. For this purpose, the data availability for the updated direct economic effects will be discussed in section 2.1. The revised and updated direct economic effects will be presented in section 2.2 in a time series from the years 2006 to 2012.

2.1. DATABASE FOR THE MACROECONOMIC EVALUATION OF THE PHARMACEUTICAL INDUSTRY

This section addresses the database of the pharmaceutical industry’s economic footprint. Therefore the main macroeconomic indicators will be discussed, as well as the changes in the existing databases since the initial project in 2013.

2.1.1. MACROECONOMIC INDICATORS TO ASSESS THE ECONOMIC FOOTPRINT

In general, when it comes to assessing economic importance, the growth and job-creating effects of economic units are determined in particular. In order to shed light on the contribution to economic growth, the macroeconomic value of the industry under consideration must be evaluated. Relevant macroeconomic indicators include:

- gross value added
- production value
- job creation
- compensation of employees

² Cf. Ostwald / Knippel (2013). The term “economic footprint” subsumes the economically relevant key performance indicators of economic units in order to draw a comprehensive picture of the economic importance of the economic unit as such.

The gross domestic product (GDP) represents the most important economic indicator. The gross domestic product serves as a measure of the economic performance of a national economy and is derived from the sum of the gross value added (GVA) of all domestic economic units (plus taxes and less subsidies). The gross value added shows the value of the products manufactured less the purchased materials and services used by an economic unit. The gross value added thus reflects the increase in value engendered by the production process.

The contribution of an industry to the gross domestic product can be shown by means of the gross value added. This figure also serves as an economic indicator to compare the industry-specific development with the growth of the respective economy, i.e. the growth rates of the GDP.³ The gross value added is derived from the production value less purchased materials and services. The production value represents an aggregate of all manufactured goods and services in one economic unit. The production value generated in one economic unit is exploited within the economic analysis of sectors and often serves as a preliminary calculation step to determine the gross value added.

Even more frequently than the gross value added and the production value, the job-creating effects are pointed out as a key figure, when it comes to assessing the economic footprint.⁴ In addition to the total employment (headcount) the compensation of employees can be taken into consideration.

2.1.2. DATA AVAILABILITY

The most important databases for assessing the pharmaceutical industry's direct effects are the System of National Accounts, the Industrial Statistics Database (INDSTAT) and the European System of Accounts (ESA). The System of National Accounts, published by the United Nations Statistics Division (UNSD), is the highest level of national accounts. It relies on data collected by the UNSD from the national statistical offices using an annual questionnaire. The National Accounts Main Aggregates Database contains key economic figures starting from the year 1970 for all of the countries recognized by the UN and thus allow for analysis of the development of the global economy. For the update of the direct effects the SNA provides new data concerning the global gross value added in the manufacturing sector for the year 2012. Furthermore the SNA also contains revised data for the previous years. Table 1 shows the variation in the SNA 2014 compared to last year's data.

3 Cf. UN Statistics Division (2013a).

4 Cf. Ostwald / Knippel (2013), p. 14-16.

TABLE 1: VARIATION BETWEEN THE SNA 2014 AND THE SNA 2013 CONCERNING THE GLOBAL GROSS VALUE ADDED OF THE MANUFACTURING SECTOR

	2006	2007	2008	2009	2010	2011
Gross value added – SNA 2014 (in USD billion)	8,056.2	9,070.0	9,743.9	8,945.7	10,168.4	11,284.3
Gross value added – SNA 2013 (in USD billion)	7,988.2	9,028.1	9,735.2	8,929.6	10,203.7	11,316.5
Variation (in %)	0.85%	0.46%	0.09%	0.18%	-0.35%	-0.28%

Source: SNA.

The SNA 2014 includes revised data for the years from 2006 till 2011. The revised data shows differences between 0.9 percent in 2006 and -0.4 percent in 2010 concerning the global gross value added of the manufacturing sector. These variations influence the pharmaceutical industry's gross value added, since the SNA data is the basic database for the calculations.

The share of the pharmaceutical industry in the national manufacturing sector figures of the SNA was quantified by adopting the value added approach. Therefore databases are needed that publish figures concerning the pharmaceutical industry, e.g. the European System of Accounts and INDSTAT. The European System of Accounts is published by Eurostat on a double-digit level; accordingly, Eurostat provides key figures about the pharmaceutical industry. Apart from the gross value added, statistics are maintained on production value, employment and compensation of employees. For the update of the key figures ESA provides new data until the year 2012. Apart from the National Accounts, industry statistics provide the essential database for determining the economic footprint of the pharmaceutical industry. Industry statistics serve as the starting point for the preparation of National Accounts on the one hand, but also to answer questions specific to the industry on the other hand. Compared to the SNA, the statistics are available at a more detailed level (four-digit level) and thus show additional ratios. The Industrial Statistics Database from the United Nations Industrial Development Organization (UNIDO) is available in two versions, INDSTAT2 and INDSTAT4. Both databases contain key figures for employment, production value, value added and wages and salaries of the manufacturing sector. The designation INDSTAT4 makes it clear that the database contains ratios on a four-digit level of the Industrial Classification of All Economic Activities (ISIC) Rev. 3, while INDSTAT2 has data available on a two-digit level. INDSTAT4 is useful in particular for calculating the economic effects of the pharmaceutical industry since, in accordance with the classification ISIC Rev. 3, data with regard to the pharmaceutical industry was only collected on a four-digit level. Since a number of statistics already published data using ISIC Rev. 4, a better data availability will be ensured in the future after a conversion phase. Concerning the update, INDSTAT4 contains new data for the year 2011.

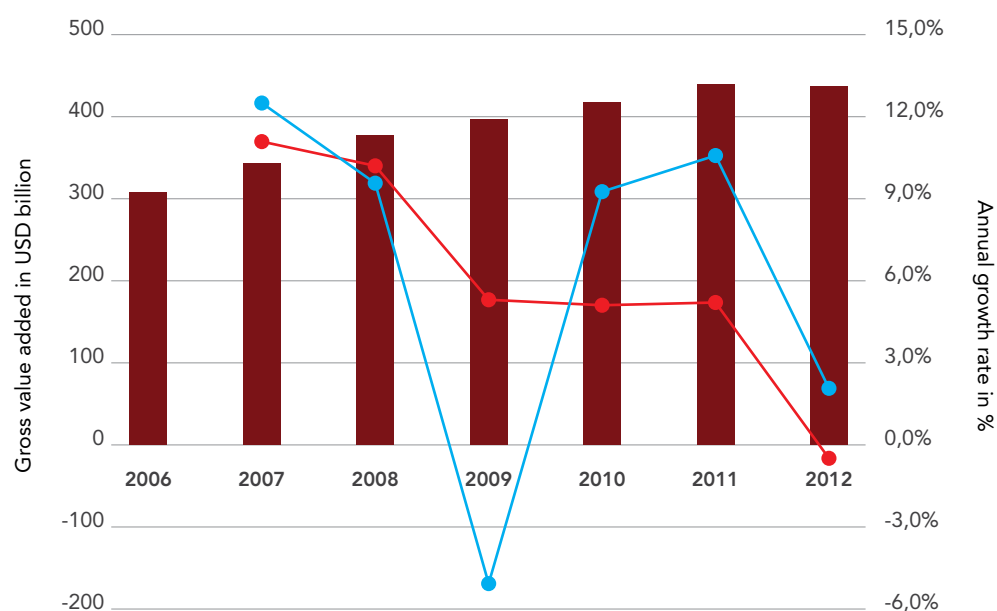
2.2. RESULTS OF THE UPDATED ECONOMIC FOOTPRINT

The following section shows the updated direct economic effects of the pharmaceutical industry.

2.2.1. GROWTH AND EMPLOYMENT STIMULI OF THE PHARMACEUTICAL INDUSTRY

Diagram 1 represents the development of the gross value added and the annual growth rate of the gross value added over time.

DIAGRAM 1: DEVELOPMENT OF THE GROSS VALUE ADDED IN USD BILLIONS AND THE ANNUAL GROWTH RATE (RED LINE) IN COMPARISON TO THE WORLDWIDE GDP (BLUE LINE)



Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

In the years from 2006 to 2012 the gross value added increased by USD 128.6 billion to reach a total of USD 436.8 billion. This corresponds to an average annual growth rate of 6.0 percent. Thus the pharmaceutical industry grew on average by 0.3 percent less than the worldwide gross domestic product (6.3 percent). The diagram indicates that the sector experienced strongly increased rates of growth in the worldwide value added with a respective 11.1 and 10.2 percent particularly in the years 2007 and 2008. In the year 2009 the sector grew by 5.3 percent, stabilizing the worldwide economy during the global recession. In the years 2010 and 2011 the growth rate remained around 5 percent, before the industry faced a recession in 2012. The findings confirm that the sector was able to provide positive growth stimuli worldwide during a long period of time. The recent downturn may be a sign that the industry is struggling under global cost reduction efforts. The most important findings are listed in Table 2.

TABLE 2: GROSS VALUE ADDED IN THE PHARMACEUTICAL INDUSTRY IN USD BILLION

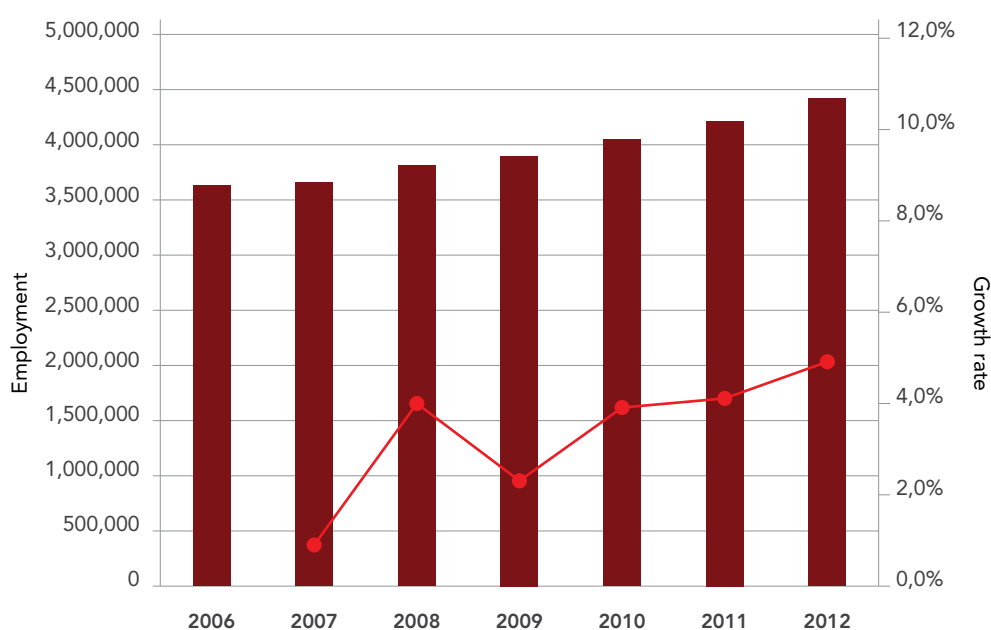
	2006	2007	2008	2009	2010	2011	2012
Gross value added (USD billion)	308.2	342.5	377.3	397.3	417.6	439.2	436.8
Growth rate		11.1%	10.2%	5.3%	5.1%	5.2%	-0.5%
Global share	0.61%	0.60%	0.61%	0.67%	0.65%	0.62%	0.60%

Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

The pharmaceutical industry generated a 0.6 percent share of the worldwide gross value added in the year 2012. In relation to the gross value added of the global manufacturing sector the pharmaceutical industry accounted for 3.8 percent. In the year 2012 the economic strength of the sector roughly corresponded to the gross value added of Argentina, with USD 434.7 billion.⁵

Diagram 2 shows the development of the employment in the pharmaceutical industry as well as the annual rates of change.

DIAGRAM 2: DEVELOPMENT OF EMPLOYMENT AND THE ANNUAL GROWTH RATE (RED LINE)



Source: INDSTAT4, ILOSTAT, ESA, STAN Database, own calculation.

The pharmaceutical industry employs approximately 4.44 million people worldwide. The number of people employed increased by 790,000 since 2006. This corresponds to an average annual employment increase of 3.3 percent. The detailed data can be seen in Table 3.

5 Cf. UN Statistics Division (2013b).

TABLE 3: EMPLOYMENT IN THE PHARMACEUTICAL INDUSTRY (HEADCOUNT IN THOUSANDS)

	2006	2007	2008	2009	2010	2011	2012
Employment	3,649	3,680	3,829	3,919	4,070	4,237	4,443
Growth rate		0.9%	4.0%	2.3%	3.9%	4.1%	4.9%

Source: INDSTAT4, ILOSTAT, ESA, STAN Database, own calculation.

It becomes clear that the annual employment growth rates are positive throughout, but are quite different over time. The largest increase in employment took place in the year 2012 with a growth rate of 4.9 percent. Since no global statistics are available with regard to gainful employment, no comparison with global growth rates can be made.

The number of people employed in the global pharmaceutical industry corresponds, for instance, to the national employment figure for Belgium. In Belgium approximately 4.5 million persons were employed in the year 2012.⁶

2.2.2. ASSESSMENT OF PRODUCTION VALUE AND EMPLOYEE COMPENSATION

Apart from measurement of the growth and job-creating effects of the pharmaceutical industry the sector-specific production value and compensation of employees was calculated on the basis of the gross value added. Table 4 shows the development of the production value of the pharmaceutical industry.

TABLE 4: PRODUCTION VALUE OF THE PHARMACEUTICAL INDUSTRY IN USD BILLION

	2006	2007	2008	2009	2010	2011	2012
Production value (USD billion)	651.4	728.8	822.8	844.4	899.0	964.6	966.1
Growth rate		11.9%	12.9%	2.6%	6.5%	7.3%	0.2%
Value added rate	47.3%	47.0%	45.9%	47.1%	46.5%	45.5%	45.2%

Source: INDSTAT4, ESA, STAN Database, own calculation.

The production value of the pharmaceutical industry increased by an annual average of 6.8 percent, or by USD 314.6 billion in the years from 2006 to 2012. In the year 2012 the production value amounted to USD 966.1 billion. The value added rate, i.e. the value added, in relation to the production value, fell by 2.1 percentage points to 45.2 percent since 2006. On average there was a value added rate of 46.3 percent.

⁶ Cf. Eurostat (2014).

Table 5 lists the results for employee compensation directly paid worldwide, the annual rates of change, employee compensation per capita and the related rates of change.

TABLE 5: EMPLOYEE COMPENSATION IN THE PHARMACEUTICAL INDUSTRY IN USD BILLION

	2006	2007	2008	2009	2010	2011	2012
Wages & salaries (USD billion)	64.3	71.4	81.3	79.3	84.1	91.9	91.3
Growth rate		11.0%	13.9%	-2.5%	6.1%	9.3%	-0.7%
Wages & salaries per employee	17,600	19,400	21,200	20,200	20,700	21,700	20,600
Growth rate		10.1%	9.5%	-4.8%	2.2%	5.0%	-5.3%

Source: INDSTAT4, ESA, STAN Database, own calculation.

In the year 2012 the pharmaceutical industry paid wages and salaries in the total amount of USD 91.3 billion. It becomes clear that the compensation rose by 6.0 percent per year on average. However, the decrease in the compensation of employees in 2009 and 2012 are worthy of comment. Moreover, it should be noted that employee compensation increased by more than the number of the employed people. This can also be confirmed by the increase in employee compensation per gainfully employed individual. This figure increased by USD 3,000 to USD 20,600 between the years 2006 and 2012. This corresponds to an increase of 16.6 percent in the period under review.

2.3. INTERIM CONCLUSION: THE PHARMACEUTICAL INDUSTRY'S CONTRIBUTION TO ECONOMIC GROWTH AND JOB CREATION

The direct economic effects of the global pharmaceutical industry for the year 2012 were measured by means of official and publicly available statistics in conjunction with the value added approach. The most important results are summarized and represented in the following:

- With USD 437 billion the direct gross value added of the pharmaceutical sector roughly corresponds to the economic strength of Argentina; it rose by nearly 42 percent in the years 2006 to 2012 and thus 6.0 percent per year on average.
- The production value amounted to USD 966 billion in the year 2012.
- In the year 2012 there were more than 4.4 million people employed in the pharmaceutical industry worldwide. Since the year 2006 almost 800,000 new employment relationships were created; this equates to an annual increase in employment of 3.3 percent.

- The global compensation of employees in the pharmaceutical industry amounts to USD 91.3 billion. This figure increased by 41.9 percent in the period under review. In relation to the workforce this represents an average per capita employee compensation of USD 20,600. This value has increased by 16.6 percent since the year 2006.

These findings represent an estimate of the direct economic effects of the sector on a global scale and highlight the economic contribution of the industry to economic growth and job creation.

3. REGIONAL BREAKDOWN OF THE ECONOMIC FOOTPRINT

Chapter 3 consists of a breakdown of the pharmaceutical industry's direct effects in different continents. According to the geographical regions of the UN the economic effects in Africa, Northern America, Latin America, Asia, Europe and Oceania will be shown. The focus lies on the quantification of the regional value added and employment effects. In section 3.1 the methodology for the regional breakdown will be addressed, followed by a discussion of the results in section 3.2.

3.1. METHODOLOGY TO QUANTIFY REGIONAL ECONOMIC EFFECTS

In order to accomplish a regional analysis of the pharmaceutical industry's economic contribution the relevant sub-regions have to be chosen first. To achieve this, the classification of geographical regions of the UN will be introduced, followed by a description representing the used methodology to quantify the regional effects. This section ends with a discussion of possible challenges with the interpretation of the regional gross value added through the influence of exchange rates.

3.1.1. CLASSIFICATION OF THE GEOGRAPHICAL REGIONS

The regional breakdown is based on the geographical regions of the UN (see Table 13).⁷ Since the United Nations SNA is the basis for the economic footprint calculations, the composition of geographical regions used by the Statistics Division in its publications and databases serves as a template for the used regional breakdown as well. In the UN scheme the macro geographical regions are arranged to the extent possible according to continents. Within these groupings more detailed geographical regions are shown, e.g. Europe can be divided into four sub-regions: Eastern Europe, Northern Europe, Southern Europe and Western Europe.⁸ In accordance with the UN scheme the regional economic effects in Africa, Northern America, Latin America, Asia, Europe and Oceania will be quantified.

3.1.2. DATABASE AND METHODOLOGY TO QUANTIFY THE REGIONAL GROSS VALUE ADDED AND EMPLOYMENT EFFECTS

In order to determine the regional gross value added and employment effects within the analysis for the pharmaceutical industry the value added approach was chosen. Applying the value added approach disaggregation factors for each country can be calculated to quantify the direct effects of the sector.

7 Cf. For a detailed regional breakdown see Table 13 in the annex; UN Statistics Division (2013c).

8 Cf. UN Statistics Division (2013c).

The worldwide gross value added of the manufacturing industry is shown in the System of National Accounts. With the help of the value added approach national disaggregation factors of the pharmaceutical industry as part of the manufacturing industry are determined from basic statistics. INDSTAT4, STAN Database and ESA form the basic statistics for the analysis. With these statistics the share values of the pharmaceutical industry in the manufacturing industry were determined for 73 countries altogether. These 73 countries account for 93.5 percent of the worldwide value added in the manufacturing sector in the year 2012. Hence, a high accuracy of the quantified effects is given. The disaggregation factors of the countries for which no basic statistics were available had to be determined by means of an appropriate assumption. To this end the annual median of the known disaggregation factors of a particular region was employed. The regional median of the disaggregation factors was determined in accordance with the geographical regions of the UN.

However, global statistics are not available for the job-creating effects. The System of National Accounts does not maintain any data with regard to gainful employment and thus is not suitable for the calculation of job-creating effects. Within the United Nations the International Labour Organization (ILO) is responsible for job market statistics. But there are also no ratios available in these statistics when it comes to global job-creating effects. Thus another approach must be selected for calculation as no global employment data are available. The top-down approach selected for the gross value added using the value added approach will therefore be replaced by a bottom-up method using the basic statistics available. For this purpose the information on employment in the pharmaceutical industry that is available at the national level must be collected. Afterwards an estimate of the global effects on employment can be performed using this bottom-up approach. In order to measure gainful employment all of the basic statistics were used that provide ratios on employment in the pharmaceutical industry, i.e. INDSTAT, ILOSTAT, STAN Database and ESA. Through evaluation of the statistics the employment figures of the pharmaceutical industry in 78 countries could be collected. For all of the remaining countries employment was determined based on calculation of the gross value added. For this the relationship between employment and gross value added was formed on the basis of regional medians. This factor was multiplied by the gross value added of the respective country in order to determine the worldwide job-creating effects.

3.1.3. SHORTCOMINGS OF THE REGIONAL EVALUATION – INFLUENCE OF EXCHANGE RATES

The economic effects of the pharmaceutical industry are calculated in current prices in USD. The SNA is using the same currency. In order to convert the data from current prices in national currency into data in current prices in USD the

annual period-average exchange rate has been used.⁹ Hence, changes in the average exchange rates influence the figures of the global footprint. The influence of the exchange rates on the economic footprint is shown via the gross value added in Europe between 2010 and 2012 in Table 6.

TABLE 6: THE GROSS VALUE ADDED IN EUROPE FROM 2010 TO 2012

	2010	2011	2012	CAGR
WifOR – Europe (USD billion)	135.1	146.0	134.8	
Growth rate		8.1%	-7.7%	-0.1%
Eurostat – EU28 (EUR billion)	84.1	85.5	83.6	
Growth rate		1.6%	-2.2%	-0.3%
Exchange rate: EUR in USD	1.33	1.39	1.28	
Growth rate		5.0%	-7.7%	-1.6%

Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

In 2010 and 2012 the gross value added in Europe amounts to around USD 135 billion. In 2011 the data shows a rise from 2010 to USD 146 billion, i.e. 8.1 percent. In comparison the table shows the gross value added of EU28 in EUR. According to the Eurostat data for the EU 28 there was only a rise of 1.6 percent in 2011. The reason for that difference, next to the difference between the geographical sub-regions,¹⁰ is the exchange rate. In 2011 the annual period-average exchange rate between EUR and USD was 5.0 percent higher than in 2010. From 2011 to 2012 the exchange rate fell by 7.7% percent. The gross value added in USD in Europe shows exactly the same development in 2012. This points out that the industry has approximately the same gross value added in 2011 and 2012 in EUR. The example shows that variations of the exchange rate essentially complicate the time series analysis of the continental figures.

3.2. RESULTS OF THE REGIONAL BREAKDOWN

In the following chapter the regional gross value added and employment effects will be shown. The regional breakdown explores the economic effects of the pharmaceutical industry in Africa, Northern America, Latin America, Asia, Europe and Oceania.

⁹ UN Statistics Division (2013d).

¹⁰ The sub-region EU28 doesn't consist of the same countries as the UN classification of Europe. The figures shall only be a reference for the development of the industry in Europe.

3.2.1. REGIONAL GROSS VALUE ADDED OF THE PHARMACEUTICAL INDUSTRY

The regional breakdown of the gross value added in Table 7 shows that Asia, Europe and Northern America are the most important producers of pharmaceuticals.

TABLE 7: REGIONAL BREAKDOWN OF THE GROSS VALUE ADDED IN USD BILLION

	2006	2007	2008	2009	2010	2011	2012	CAGR
Asia	85.1	94.9	119.9	131.1	148.7	157.2	163.3	11.5%
Europe	104.3	120.9	135.1	130.5	135.1	146.0	134.8	4.4%
Northern America	95.4	100.4	94.2	110.5	104.9	102.6	105.3	1.7%
Latin America	18.5	20.8	22.7	18.4	20.4	25.2	24.9	5.1%
Africa	3.1	3.4	3.3	4.4	5.0	5.0	5.1	8.8%
Oceania	1.8	2.2	2.1	2.4	3.5	3.2	3.3	11.0%
Worldwide pharmaceutical industry	308.2	342.5	377.3	397.3	417.6	439.2	436.8	6.0%

Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

The gross value added in Asia amounts to USD 163.3 billion in 2012, i.e. nearly twice as large as in 2006. The pharmaceutical industry in Europe creates a gross value added of USD 134.8 billion. In Northern America the gross value added amounts to USD 105.3 billion. The CAGR shows a strong growth of the industry in Asia, Oceania and Africa. The gross value added in Asia showed a CAGR of 11.5 percent. In comparison, the CAGR in Europe is 4.4 percent and in Northern America 1.7 percent. Table 8 shows the regional shares of the global gross value added.

TABLE 8: REGIONAL SHARES OF THE PHARMACEUTICAL INDUSTRY'S GROSS VALUE ADDED

	2006	2007	2008	2009	2010	2011	2012
Asia	27.6%	27.7%	31.8%	33.0%	35.6%	35.8%	37.4%
Europe	33.9%	35.3%	35.8%	32.8%	32.4%	33.3%	30.9%
Northern America	30.9%	29.3%	25.0%	27.8%	25.1%	23.4%	24.1%
Latin America	6.0%	6.1%	6.0%	4.6%	4.9%	5.7%	5.7%
Africa	1.0%	1.0%	0.9%	1.1%	1.2%	1.1%	1.2%
Oceania	0.6%	0.6%	0.6%	0.6%	0.8%	0.7%	0.8%

Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

The pharmaceutical industry's gross value added in Asia of USD 163.3 billion equals 37.4 percent of the global gross value added in 2012. Europe has a share of 30.9 percent and Northern America has a share of 24.1 percent of the global

gross value added. Asia gained 9.8 percentage points of the global share since 2006. In 2006 Europe had the biggest share of the global gross value added, followed by Northern America and Asia. Since 2006 Europe lost 3.0 percentage points of the global share, Northern America even lost 6.8 percentage points owing to the low level of annual growth. The share of the global gross value added in Latin America, Africa and Oceania remained almost at the same level.

3.2.2. REGIONAL EMPLOYMENT EFFECTS OF THE PHARMACEUTICAL INDUSTRY

The regional breakdown of the employment effects in the pharmaceutical industry is shown in the following table.

TABLE 9: REGIONAL BREAKDOWN OF THE EMPLOYMENT (HEADCOUNT IN THOUSANDS)

	2006	2007	2008	2009	2010	2011	2012	CAGR
Asia	2,153	2,197	2,369	2,507	2,662	2,820	3,003	5.7%
Europe	737	741	734	716	728	738	749	0.3%
Northern America	310	307	302	283	281	276	271	-2.2%
Latin America	232	231	239	240	236	242	259	1.8%
Africa	199	187	169	156	146	143	142	-5.6%
Oceania	17	17	17	18	17	18	18	1.2%
Worldwide pharmaceutical industry	3,649	3,680	3,829	3,919	4,070	4,237	4,443	3.3%

Source: INDSTAT4, ILOSTAT, ESA, STAN Database, own calculation.

TABLE 10: REGIONAL SHARES OF THE PHARMACEUTICAL INDUSTRY'S EMPLOYMENT EFFECTS

	2006	2007	2008	2009	2010	2011	2012
Asia	59.0%	59.7%	61.9%	64.0%	65.4%	66.6%	67.6%
Europe	20.2%	20.1%	19.2%	18.3%	17.9%	17.4%	16.9%
Northern America	8.5%	8.3%	7.9%	7.2%	6.9%	6.5%	6.1%
Latin America	6.4%	6.3%	6.2%	6.1%	5.8%	5.7%	5.8%
Africa	5.5%	5.1%	4.4%	4.0%	3.6%	3.4%	3.2%
Oceania	0.5%	0.5%	0.4%	0.5%	0.4%	0.4%	0.4%

Source: INDSTAT4, ILOSTAT, ESA, STAN Database, own calculation.

In Asia 67.6 percent of the global employment takes place, followed by Europe with 16.9 percent. Around 6 percent of the employees in the pharmaceutical industry are working in Northern America. In Latin America the share of the global employment amounts to 5.8 percent.

3.2.3. REGIONAL APPARENT LABOUR PRODUCTIVITY OF THE PHARMACEUTICAL INDUSTRY

The ratio between the gross value added and the persons employed is called the apparent labour productivity and is shown in Table 11.

TABLE 11: APPARENT LABOUR PRODUCTIVITY IN THE PHARMACEUTICAL INDUSTRY (GROSS VALUE ADDED PER PERSON EMPLOYED IN USD)

	2006	2007	2008	2009	2010	2011	2012
Asia	39,500	43,200	50,600	52,300	55,900	55,700	54,400
Europe	141,500	163,000	184,000	182,400	185,600	197,800	179,900
Northern America	307,300	327,000	312,500	390,600	373,700	372,000	387,800
Latin America	79,900	89,900	95,200	76,600	86,400	103,900	96,400
Africa	15,500	18,200	19,300	28,200	34,000	35,000	36,300
Oceania	104,500	125,400	123,200	131,900	207,100	173,300	181,500
Worldwide pharmaceutical industry	84,500	93,100	98,500	101,400	102,600	103,700	98,300

Source: INDSTAT4, ILOSTAT, ESA, STAN Database, own calculation.

The values in the last row of Table 11 show the average apparent labour productivity in the pharmaceutical industry. The average gross value added per person employed amounts to USD 98,300 in 2012. The industry has by far the highest apparent labour productivity in Northern America with USD 387,800.

Europe has the third highest labour productivity with USD 179,900. The industry in Asia, with the biggest share of gross value added and employment, has the second lowest apparent labour productivity with USD 54,400. In comparison, the apparent labour productivity in an industrialized country like Germany was USD 75,500 in 2012. The labour productivity is expected to be higher when it is driven by productive inputs like skilled work force, investments or research and development expenditures. Comparing the resulting values for labour productivity on a regional level then Northern America, Oceania and Europe are in the leading positions. These countries represent by far a highly capital intensive and technology-supported regional pharmaceutical industry.¹¹

3.3. INTERIM CONCLUSION: THE PHARMACEUTICAL INDUSTRY'S REGIONAL DEVELOPMENT

The regional breakdown, in accordance with the UN scheme, shows the regional gross value added and employment effects. The most important results for the year 2012 are summarized in the following:

- Asia has the highest share of the global direct gross value added of the pharmaceutical sector with approximately USD 163.3 billion, followed by Europe with USD 134.8 billion and Northern America with USD 105.3 billion.
- The highest annual gross value added growth at 11.5 percent takes place in Asia. Oceania had a growth rate of 11.0 percent and Africa of 8.8 percent. In Northern America the industry showed the smallest annual growth at 1.7 percent.
- The regional employment breakdown displayed that over 3 million people are working in the pharmaceutical industry in Asia. In Europe around 750,000 employees are working in this sector. This is almost three times as many employees as in Northern America with more than 270,000 employees.
- The average labour productivity for the global pharmaceutical industry amounts to USD 98,300 in 2012. The industry has by far the highest apparent labour productivity in Northern America with USD 387,800. In comparison, the apparent labour productivity in an industrialized country like Germany was USD 75,500 in 2012.

The findings shed a first light on the regional development of the gross value and job creation effects of the pharmaceutical industry.

11 Cf. ARCS and WIFO (1999).

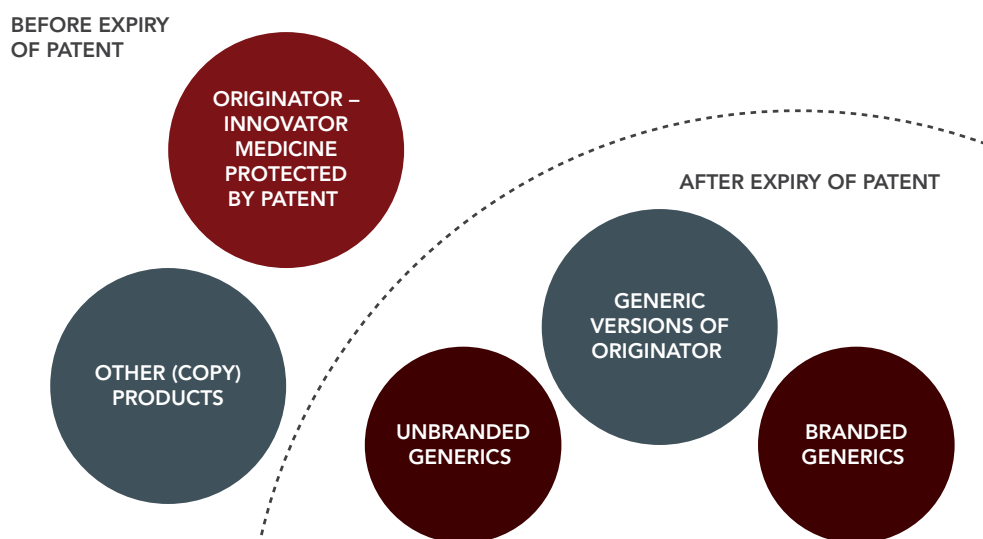
4. FEASIBILITY CHECK – DIFFERENTIATION BETWEEN ORIGINATORS AND GENERICS

The last step of the research project consists of a feasibility check in order to differentiate the economic effects between originators and generics. Therefore a definition of originators and generics in the pharmaceutical industry is given in section 4.1. Section 4.2 provides an overview of the database used for the feasibility analysis. Based on the available data a method will be introduced to differentiate between the economic effects by originators and generics. The methodological approach is explained in section 4.3. The analysis is then concluded in section 4.4 with a first estimation of the respective differentiated global direct economic effects of originators and generics.

4.1. DEFINITIONS: ORIGINATORS VS. GENERICS

According to a definition specified by the World Health Organization (WHO), the medicine market consists of several major components, which can be distinguished in sub-markets. One major component describes the originator pharmaceutical product market and represents, therefore, the innovator medicines. These are drugs, which are protected by patent and constitute a single source medicine until the corresponding patent expires. The market components definition further distinguishes between medicines with expired or still valid patent protection other than originators. The component which covers medicine with still valid patent protection includes copy versions of drugs, the legality of which depends on patent jurisdiction. As can be seen in Diagram 3 the third market component contains generic versions of the originator. This generics versions market may be divided in two sub-markets: the unbranded and branded generics.¹²

DIAGRAM 3: STRUCTURE OF THE MEDICINES MARKET



Source: WHO (2004), IMS Health (2006).

¹² Cf. WHO (2004), p. 34.

The following sub-chapters illustrate a brief overview of the most important technical terms of the feasibility analysis in order to maintain an unburdened handling of the applied terms.

4.1.1. ORIGINATOR PHARMACEUTICAL PRODUCT

An originator pharmaceutical product is a patented medicine that was internationally accredited according to the requirements of the authorized authorities (based on its efficacy, safety and quality). Each product is identified by a brand name. This brand name may vary between countries.¹³

4.1.2. GENERIC PHARMACEUTICAL PRODUCT

A generic medicine is a medical product, which displays the same qualitative and quantitative composition in active substances as well as the same pharmaceutical form as a reference medicine (originator pharmaceutical product). The bioequivalence with the reference product has to be demonstrated in accordance with current guidelines of the authorized authorities.¹⁴ The generic pharmaceutical product market distinguishes two sub-markets: Unbranded and branded generics. The unbranded generic is a product marketed under the generic name of its molecule ingredient(s). The branded generic sub-market can be divided in original (marketed by the originator), licensed (marketed by a company with a license) or other brands (residual suppliers).¹⁵

4.1.3. OTHER PHARMACEUTICAL PRODUCT

Within the analysis a further definition is necessary, the definition of the so called other products.¹⁶ The other products include OTC, diagnostics and non-therapeutics.¹⁷

4.1.4. PHARMERGING, DEVELOPED AND REST OF THE WORLD COUNTRIES

Next to the definition of the medicines market, the geographical regions of the UN had to be classified in pharmerging, developed and rest of the world countries. This classification was necessary to allow for the calculation of the economic effects differentiated by originators and generics. The

13 Cf. WHO (2008), p. 235.

14 Cf. European Commission (2009), p. 7.

15 Cf. IMS Health (2005), p. 2.

16 Cf. IMS Health (2006), p. 3.

17 Cf. IMS Health (2012), p. 17.

categorization of the regional breakdown into pharmerging countries and developed countries is based on an IMS Health study. The study divides the global economy into developed and emerging regions, using a gross domestic product limitation of USD 25,000 per capita. The countries, which did not exceed this limit, were categorized as emerging countries. These countries have been divided once again into pharmerging and rest of the world countries, using calculus depending on GDP, macroeconomic figures and an IMS Market Prognosis. Subsequently the pharmerging countries have been chosen based on their minimum expected value creation to the global pharmaceutical market between 2008 and 2013.¹⁸ The defined pharmerging countries can be found in the annex (see Table 13).

4.2. AVAILABLE DATA TO DIFFERENTIATE BETWEEN ORIGINATORS AND GENERICS

The feasibility check analysis had one limiting factor: available data, which displays the global or regional gross value added or output figures for generics and originators. The recent research analyzes primarily the volume and value sales for generics and originators (compare Table 12).¹⁹

TABLE 12: STUDIES CONCERNING THE DIFFERENTIATION BETWEEN ORIGINATORS AND GENERICS IN THE PHARMACEUTICAL MARKET

Authors and Year	Title	Key data	Geographic focus
OECD, 2013	Health at a Glance 2013, OECD INDICATORS	Share of generics in the total pharmaceutical market; trend in share of generics in selected markets	Global and regional
IMS Institute of Healthcare Informatics, 2013	A robust generic market: difficulties and complexities	Generic volume sales; expected global spendings on generics; generics market shares of several countries; generic volume penetration for chosen countries	Global and regional
IMS Institute of Healthcare Informatics, 2013	The Global Use of Medicines: Outlook through 2017	Volume and value sales for originators, unbranded and branded generics	Global and regional
EFPIA, European Federation of Pharmaceutical Industries and Associations, 2012	The Pharmaceutical Industry in Figures – Key Data 2013	Market share for generics in pharmaceutical market sales value	Regional (Europe)

¹⁸ Cf. IMS Health (2010), p. 2.

¹⁹ This information is available worldwide and on a regional level.

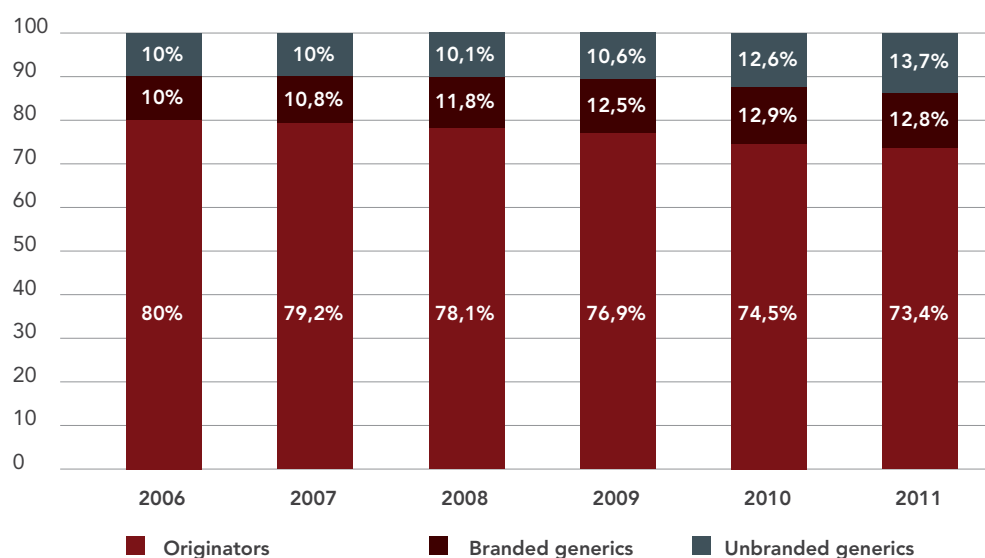
Authors and Year	Title	Key data	Geographic focus
IMS Institute of Healthcare Informatics, 2012	Global Pharmaceutical Market and Generics, IGPA Kyoto December 2012	Generics value sales and growth; leading generic market share by sales and growth contribution; generic market size; global volume and value sales for originators, unbranded and branded generics	Global and regional (for North America, Europe, Brazil, China, India, Russia and rest of the world)
Generic Pharmaceutical Association, 2011	Generic Pharmaceutical Association Report, 2011 a year of progress	Dispensed generics Rx by leading companies; volume and value sales for originators, unbranded and branded generics; prescription growth of medicines; global generic sales and growth; Top 10 generics market sales and growth	Global and regional
IMS Institute of Healthcare Informatics, 2011	Generic Medicines – Where are the opportunities and what role will they play?	Generic value sales and growth; generic market share of total retail market; generic penetration in several countries	Global and regional
IMS Institute of Healthcare Informatics, 2011	Generic medicines: Essential contributors to the long term health of society. Sector sustainability challenges in Europe	Utilization of generic medicines within the unprotected markets in several countries; generic medicines volume penetration in key countries; volume sales and value sales	Regional (Europe)

The volume of pharmaceuticals is represented in standard units (SU). This is a measure of the number of pills, capsules, vials and ampules of active medicinal substances in the applied drug. The value sales display the total value of pharmaceutical sales.²⁰

The Generic Pharmaceutical Association published figures of the global volume and value sales in 2011 in their annual report, showing the high discrepancy between those two parameters. The generics reach a global prescription volume of almost 80 percent in 2011, but merely 27 percent of value sales (see Diagram 4 and Diagram 5).

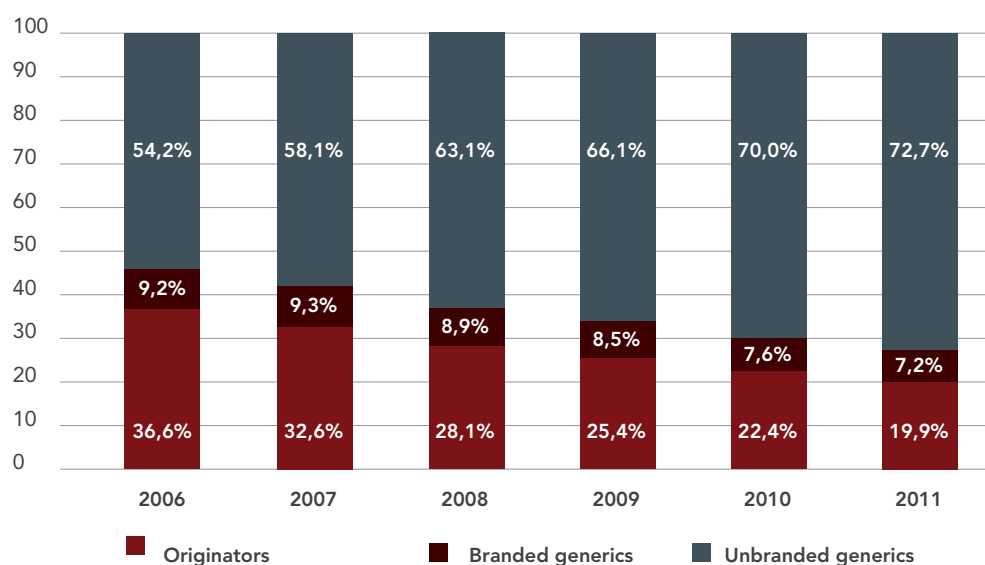
20 Cf. IMS Health (2011b), p. 7.

DIAGRAM 4: GLOBAL VALUE SALES MARKET SHARES IN % USD OF ORIGINATORS AND GENERICS FROM 2006 TO 2011



Source: GPhA (2011).

DIAGRAM 5: GLOBAL VOLUME SALES MARKET SHARES IN % TOTAL PRESCRIPTIONS OF ORIGINATORS AND GENERICS FROM 2006 TO 2011



Source: GPhA (2011).

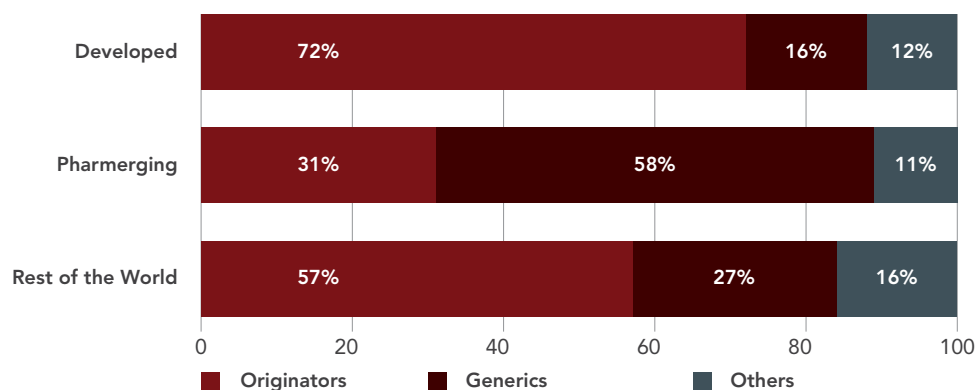
Other research done supports this result. The IMS Health presentation “A robust generic market: difficulties and complexities” held in Athens describes similar developments of the global generic volume sales.²¹ The literature research of several studies supported the described observations.

Only a few studies are suitable for a national breakdown of the generic market, which would be best to analyze the economic contribution of originators and

21 Cf. IMS Health (2013b), p. 3.

generics. IMS Health conducted a research study to estimate the global use of medicines and derived value sales shares for originators, generics and other drugs for three country types.²² The report distinguishes between developed countries, pharmerging countries and the rest of the world. Based upon this data the feasibility check obtains nine key factors (value shares), which will be used for the differentiation of the originators and generics on a national basis (see Diagram 6). Hence, this data is one core element of the calculus.²³

DIAGRAM 6: VALUE SHARES (KEY FACTORS) OF ORIGINATORS, GENERICS AND REMAINING DRUGS FOR CATEGORIZED COUNTRIES IN 2012



Source: IMS Health (2013a), p. 23.

The IMS health research indicates that the generic industry has the biggest market share of sales in pharmerging countries with 58 percent. In the developed countries the originators generate the most sales with 72 percent. Other pharmaceutical products remain at a relatively low level in all countries between 11 and 16 percent of the market share.

4.3. METHODOLOGY TO QUANTIFY THE ECONOMIC EFFECTS BY ORIGINATORS AND GENERICS

The available data for the calculation refers to a different parameter than needed in order to answer the research question. The IMS Health data used displays nine key factors, which refer to the resulting value sales shares in the market. The economic footprint analysis itself is using other categories than sales, since the economic contribution of an industry is based on macroeconomic figures as the gross value added. An accurate estimation of the gross value added share could not be made without making additional assumptions. To achieve a satisfactory theoretical approach it may be assumed that the value sales shares in the relevant markets equal the gross value added shares. Hence, the value

²² Cf. IMS Health (2013a).

²³ An accurate estimation of the gross value added share could not be made without making additional assumptions, which will be presented in section 4.3 Methodology.

creation process is identical for originators, generics and the remaining drugs. The differences within the production process of originators and generics lead, under real conditions, to differences within the creation of value added. Furthermore the foreign trade is influencing the value sales, while the gross value added is independent from foreign trade. It is also assumed that the regional values shares are equal to the employment shares. The calculated country-specific labour productivity rates for the pharmaceutical industry were assumed as identical for each industry (originators, generics and remaining drugs). The differences in labour productivity for each sector should lead to distinctions in labour productivity.

These existing distinctions could not yet be implemented in the methodology, due to the poor data availability. There are several parameters known influencing the gross value adding process, i.e. compensation of employees, research and development expenditures, consumption on fixed capital, mark-up's, etc. Further research should focus on these parameters and try to improve the accuracy of the estimation. This undertaking will not find its limits in the theoretical ideas, but in the future availability of data.

For the initial assessment of the economic effects by originators and generics the regional breakdown of the global pharmaceutical industry was disaggregated into 212 further countries. The resulting figures display the pharmaceutical gross value added of 212 countries. These countries have been categorized into developed, pharmerging and rest of the world countries by applying the IMS Health definition. To each country category belongs a matching set of key factors (value shares) depending on the originators, generics or others industry proportion (compare with Diagram 6).²⁴ That means, for example, that China was categorized as a pharmerging country and thus possesses a market value share for originators of 31 percent, for generics of 58 percent and for all remaining drugs of 11 percent.²⁵ In order to derive the gross value added amount of China contributed through the production of originators the factor 0.31 was multiplied with the derived country-specific pharmaceutical gross value added. This applies vice versa for the generics with the factor 0.58 and the other drugs with the factor 0.11.

The calculation approach for the employment figures is similar to the approach explained for the gross value added differentiation. The regional breakdown of the employment values of the global pharmaceutical industry was disaggregated into 212 further countries. The resulting figures display the employment of 212 countries grouped into developed, pharmerging and rest of the world countries. To those country categories belongs the same matching set of key factors (value shares), as in the analysis above described and depends therefore

²⁴ Compare with section 4.2 Data, which highlighted and explains the differences.

²⁵ This accounts to every country categorized as pharmerging country (compare section 4.2 Data).

on the originators, generics or others industry proportion (compare with Diagram 6). That means, for example, that the United States were categorized as a developed country and thus possesses a market value share for originators of 72 percent, for generics of 16 percent and for all remaining drugs of 12 percent. In order to derive the employment value of the United States generated through the production of originators the factor 0.72 was multiplied with the derived country-specific pharmaceutical employment. This applies vice versa for the generics with the factor 0.16 and the other drugs with the factor 0.12.

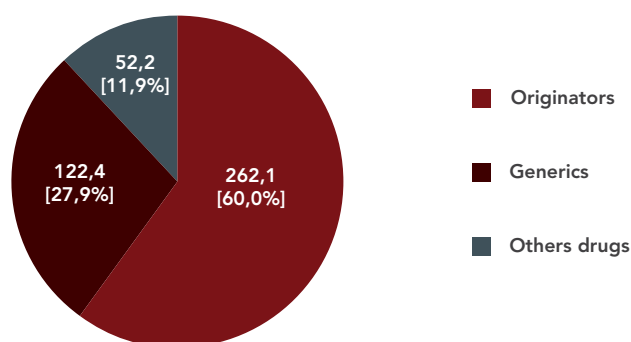
4.4. RESULTS OF THE DIFFERENTIATION BETWEEN ORIGINATORS AND GENERICS

The initial estimation of the direct economic effects differentiated between originators and generics shows the gross value added and employment effects in 2012.

4.4.1. GROSS VALUE ADDED EFFECTS

The gross value added displays the value of products manufactured by a company less the value of its purchased materials and services. Hence, this performance figure reflects the additional value generated solely by the pharmaceutical industry. The feasibility check contains a representation of findings for the year 2012 in USD (compare Diagram 7).

DIAGRAM 7: GLOBAL GROSS VALUE ADDED IN USD BILLION AND SHARES OF ORIGINATORS, GENERICS AND OTHER DRUGS IN 2012²⁶



Source: Own calculation, IMS Health (2013a).

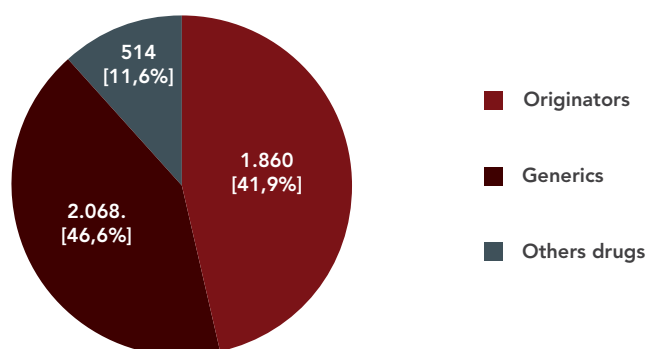
The gross value added of the originators industry amounts to USD 262.2 billion in 2012 and thus represents a share of 60.0 percent of the global pharmaceutical gross value added. The generics industry reaches a gross value added of USD 122.4 billion, which refers to 27.9 percent of the global value added share.

²⁶ Initial assessment assumed that the value sales shares in the relevant markets equal the gross value added shares.

4.4.2. EMPLOYMENT EFFECTS

The global pharmaceutical industry employed approximately 4.4 million people in 2012.²⁷ The employment figures for the generics industry adopts with 46.6 percent or approximately 2.1 million people the leading position in terms of headcount (compare Diagram 8).

DIAGRAM 8: EMPLOYMENT (HEADCOUNT IN THOUSANDS) AND SHARES OF ORIGINATORS, GENERICS AND OTHER DRUGS IN 2012²⁸



Source: Own calculation, IMS Health (2013a).

The originators' industry represents, with approximately 1.9 million employed people, a proportion of 41.9 percent in the global market. Even though the gross value added share of the originators' industry is twice as high as in the generics industry, the employment value is higher in the generics industry.

These results indicate that the pharmerging countries are more labour intensive than the developed countries. Hence, the labour productivity in the production process for generics is lower. In measurable terms: the labour productivity of the originators' industry amounts approximately to USD 140,900 and the labour productivity of the generics industry amounts to approximately USD 59,100. One additional insight, which might underline the findings, is the high discrepancy between value and volume sales in the market shown in Chapter 4.2. The share of generics on volume sales was 80 percent. Hence, almost three times higher than the value sales with 27 percent of the market (compare Diagram 4 and Diagram 5). The high generics output sold in the market should substantially influence the workforce behind producing this level of quantity. The pharmerging countries belong to the countries with low labour costs. Therefore the primary input factor within the production process is the employees.

²⁷ Compare with the results in Chapter 3 of the study.

²⁸ Initial assessment assumed that the value sales shares in the relevant markets equal the employment shares.

4.5. INTERIM CONCLUSION: FEASIBILITY CHECK – DIFFERENTIATION BETWEEN ORIGINATORS AND GENERICS

The aim of the feasibility check was the differentiation of the direct global economic effects between originators and generics. The feasibility check analysis had one limiting factor: available data, which displays the global or regional gross value added or production value figures for generics and originators. The recent research analyzes primarily the volume and value sales for generics and originators. In order to be able to use that data for the estimation of the macroeconomic effects additional assumptions had to be made. The chosen methodology allowed for an initial assessment of the economic effects by originators and generics. The most important results are summarized in the following bullet points:

- The gross value added of the originators' industry amounts to USD 262.2 billion in 2012 and thus represents a share of 60.0 percent of the global pharmaceutical gross value added.
- The generics industry reaches a gross value added of USD 122.4 billion, which refers to 27.9 percent of the global value added share.
- The originators' industry represents, with approximately 1.9 million employed people, a proportion of 41.9 percent in the global market.
- The employment figures for the generics industry adopts, with 46.6 percent or approximately 2.1 million people, the leading position in terms of headcount.

5. SUMMARY AND CONCLUSION



Within the scope of the research project the measurement of the economic footprint of the global pharmaceutical industry was enhanced with regional economic effects and a differentiation between originators and generics. With the aid of publicly available and official statistics in conjunction with the value added approach, an update of the calculation of the pharmaceutical industry's direct economic effects and the regional breakdown was performed. Based on the result a feasibility check was conducted in order to differentiate the economic effects between originators and generics. The most important results are summarized and represented in the following:

- With approximately USD 437 billion the direct gross value added of the pharmaceutical sector roughly corresponds to the economic strength of Argentina; it rose by nearly 42 percent in the years 2006 to 2012 and thus 6.0 percent per year on average.
- Asia has the highest share of worldwide direct gross value added of the pharmaceutical sector with approximately USD 163.3 billion, followed by Europe with USD 134.8 billion and Northern America with USD 105.3 billion.
- The highest annual gross value added growth with 11.5 percent also takes place in Asia. Oceania had a growth rate of 11.0 percent and Africa of 8.8 percent. In Northern America the industry showed the smallest annual growth with 1.7 percent.
- The production value amounts to roughly USD 966 billion in the year 2012.
- In the year 2012 there were more than 4.4 million persons employed worldwide in the pharmaceutical industry. Since the year 2006 more than 790,000 new employment relationships were created; this equates to a 3.3 percent annual increase in employment.
- The regional employment breakdown shows that over 3 million people are working in the pharmaceutical industry in Asia. In Europe around 750,000 employees are working in this sector. This is almost three times as many as in Northern America with more than 270,000 employees.
- Worldwide employee compensation in the pharmaceutical industry amounts to USD 91.3 billion. This figure increased by 41.9 percent in the period under review. In relation to the workforce this represents an average per capita employee compensation of USD 20,600. This value has increased by 16.6 percent since the year 2006.

- The labour productivity is expected to be higher when it is driven by productive inputs like skilled work force, investments or research and development expenditures. Comparing the resulting values for labour productivity on a regional level then Northern America, Oceania and Europe are in the leading positions. These countries represent a highly capital intensive and technology-supported regional pharmaceutical industry.
- The average labour productivity for the global pharmaceutical industry amounts to USD 98,300 in 2012. In comparison, the apparent labour productivity in an industrialized country like Germany was USD 75,500 in 2012.
- The gross value added of the originators' industry amounts to USD 262.2 billion in 2012 and thus represents a share of 60.0 percent of the global pharmaceutical gross value added.
- The generics industry reaches a gross value added of USD 122.4 billion, which refers to 27.9 percent of the global value added share.
- The originators' industry represents, with approximately 1.9 million employed people, a proportion of 41.9 percent in the global market.
- The employment figures for the generics industry adopts, with 46.6 percent or approximately 2.1 million people, the leading position in terms of headcount.

Following the initial approximation of the worldwide economic effects of the pharmaceutical industry in 2013 the updated study delivers specified figures for the regional breakdown and differentiation between originators and generics. In future the completion of the economic footprint with indirect and induced effects would make it possible to illustrate the complete value added chain of the pharmaceutical industry.

6. ANNEX



6.1. VISUALIZATION OF THE REGIONAL BREAKDOWN

DIAGRAM 9: VISUALIZATION OF THE REGIONAL GROSS VALUE ADDED EFFECTS (absolute values in USD billion, global share in % and the CAGR is shown via the color of the continents)

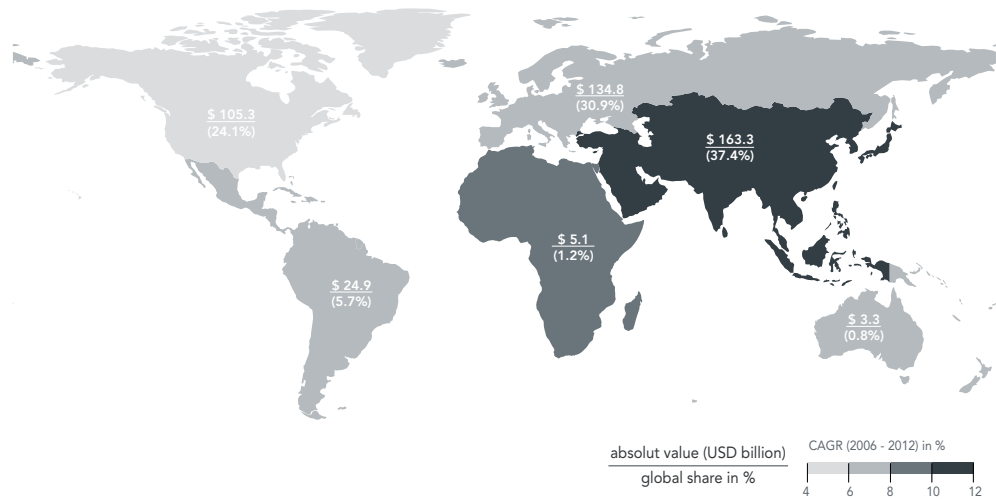
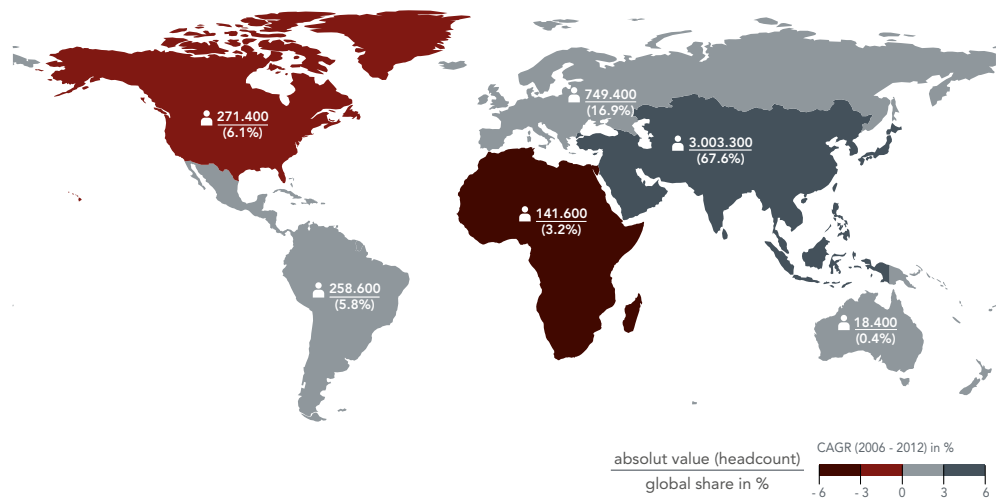


DIAGRAM 10: VISUALIZATION OF THE REGIONAL EMPLOYMENT EFFECTS (absolute values (headcount), global share in % and the CAGR is shown via the color of the continents)



Numerical code	Geographical region and composition of each region	Category
015	Northern Africa	
012	Algeria	R
818	Egypt	P
434	Libya	R
504	Morocco	R
729	Sudan	R
788	Tunisia	R
732	Western Sahara	R
018	Southern Africa	
072	Botswana	R
426	Lesotho	R
516	Namibia	R
710	South Africa	P
748	Swaziland	R
011	Western Africa	
204	Benin	R
854	Burkina Faso	R
132	Cabo Verde	R
384	Côte d'Ivoire	R
270	Gambia	R
288	Ghana	R
324	Guinea	R
624	Guinea-Bissau	R
430	Liberia	R
466	Mali	R
478	Mauritania	R
562	Niger	R
566	Nigeria	R
654	Saint Helena	R
686	Senegal	R
694	Sierra Leone	R
768	Togo	R
019	America	
419	Latin America and the Caribbean	
029	Caribbean	
660	Anguilla	R
028	Antigua and Barbuda	R
533	Aruba	R
	Pharmerging Countries	Developed Countries
		Rest of the World

Numerical code	Geographical region and composition of each region	Category
044	Bahamas	R
052	Barbados	R
535	Bonaire, Saint Eustatius and Saba	R
092	British Virgin Islands	R
136	Cayman Islands	R
192	Cuba	R
531	Curaçao	R
212	Dominica	R
214	Dominican Republic	R
308	Grenada	R
312	Guadeloupe	R
332	Haiti	R
388	Jamaica	R
474	Martinique	R
500	Montserrat	R
630	Puerto Rico	R
652	Saint-Barthélemy	R
659	Saint Kitts and Nevis	R
662	Saint Lucia	R
663	Saint Martin (French part)	R
670	Saint Vincent and the Grenadines	R
534	Sint Maarten (Dutch part)	R
780	Trinidad and Tobago	R
796	Turks and Caicos Islands	R
850	United States Virgin Islands	R
013	Central America	
084	Belize	R
188	Costa Rica	R
222	El Salvador	R
320	Guatemala	R
340	Honduras	R
484	Mexico	P
558	Nicaragua	R
591	Panama	R
005	South America	
032	Argentina	P
068	Bolivia (Plurinational State of)	R
076	Brazil	P
152	Chile	R
170	Colombia	R
218	Ecuador	R
Pharmerging Countries	Developed Countries	Rest of the World

Numerical code	Geographical region and composition of each region	Category
238	Falkland Islands (Malvinas)	R
254	French Guiana	R
328	Guyana	R
600	Paraguay	R
604	Peru	R
740	Suriname	R
858	Uruguay	R
862	Venezuela (Bolivarian Republic of)	P
021	Northern America	
060	Bermuda	R
124	Canada	D
304	Greenland	R
666	Saint Pierre and Miquelon	R
840	United States of America	D
142	Asia	
143	Central Asia	
398	Kazakhstan	R
417	Kyrgyzstan	R
762	Tajikistan	R
795	Turkmenistan	R
860	Uzbekistan	R
030	Eastern Asia	
156	China	P
344	China, Hong Kong Special Administrative Region	D
446	China, Macao Special Administrative Region	R
408	Democratic People's Republic of Korea	R
392	Japan	D
496	Mongolia	R
410	Republic of Korea	D
034	Southern Asia	
004	Afghanistan	R
050	Bangladesh	R
064	Bhutan	R
356	India	P
364	Iran (Islamic Republic of)	R
462	Maldives	R
524	Nepal	R
	Pharmerging Countries	
	Developed Countries	
	Rest of the World	

Numerical code	Geographical region and composition of each region	Category
586	Pakistan	P
144	Sri Lanka	R
035	South-Eastern Asia	
096	Brunei Darussalam	R
116	Cambodia	R
360	Indonesia	P
418	Lao People's Democratic Republic	R
458	Malaysia	R
104	Myanmar	R
608	Philippines	R
702	Singapore	R
764	Thailand	P
626	Timor-Leste	R
704	Viet Nam	P
145	Western Asia	
051	Armenia	R
031	Azerbaijan	R
048	Bahrain	R
196	Cyprus	R
268	Georgia	R
368	Iraq	R
376	Israel	D
400	Jordan	R
414	Kuwait	R
422	Lebanon	R
512	Oman	R
634	Qatar	R
682	Saudi Arabia	R
275	State of Palestine	R
760	Syrian Arab Republic	R
792	Turkey	D/P
784	United Arab Emirates	R
887	Yemen	R
150	Europe	
151	Eastern Europe	
112	Belarus	R
100	Bulgaria	R
203	Czech Republic	D
348	Hungary	D
Pharmerging Countries		
Developed Countries		
Rest of the World		

Numerical code	Geographical region and composition of each region	Category
616	Poland	D/P
498	Republic of Moldova	R
642	Romania	P
643	Russian Federation	P
703	Slovakia	D
804	Ukraine	P
154	Northern Europe	
248	Åland Islands	R
830	Channel Islands	R
208	Denmark	D
233	Estonia	D
234	Faeroe Islands	R
246	Finland	D
831	Guernsey	R
352	Iceland	D
372	Ireland	D
833	Isle of Man	R
832	Jersey	R
428	Latvia	R
440	Lithuania	D
578	Norway	D
680	Sark	R
744	Svalbard and Jan Mayen Islands	R
752	Sweden	D
826	United Kingdom of Great Britain and Northern Ireland	D
039	Southern Europe	
008	Albania	R
020	Andorra	D
070	Bosnia and Herzegovina	R
191	Croatia	R
292	Gibraltar	R
300	Greece	D
336	Holy See	R
380	Italy	D
470	Malta	R
499	Montenegro	R
620	Portugal	D
674	San Marino	D
688	Serbia	R
705	Slovenia	D
724	Spain	D
807	The Former Yugoslav Republic of Macedonia	R
Pharmerging Countries	Developed Countries	Rest of the World

Numerical code	Geographical region and composition of each region	Category
155	Western Europe	
040	Austria	D
056	Belgium	D
250	France	D
276	Germany	D
438	Liechtenstein	R
442	Luxembourg	D
492	Monaco	R
528	Netherlands	D
756	Switzerland	D
009	Oceania	
053	Australia and New Zealand	
036	Australia	D
554	New Zealand	D
574	Norfolk Island	R
054	Melanesia	
242	Fiji	R
540	New Caledonia	R
598	Papua New Guinea	R
090	Solomon Islands	R
548	Vanuatu	R
057	Micronesia	
316	Guam	R
296	Kiribati	R
584	Marshall Islands	R
583	Micronesia (Federated States)	R
520	Nauru	R
580	Northern Mariana Islands	R
585	Palau	R
061	Polynesia	
016	American Samoa	R
184	Cook Islands	R
258	French Polynesia	R
570	Niue	R
612	Pitcairn	R
882	Samoa	R
772	Tokelau	R
	Pharmerging Countries	
	Developed Countries	
	Rest of the World	

Numerical code	Geographical region and composition of each region	Category
776	Tonga	R
798	Tuvalu	R
876	Wallis and Futuna Islands	R

Pharmerging Countries	Developed Countries	Rest of the World
-----------------------	---------------------	-------------------

Source: UN Statistics Division (2013c), IMS Health (2010).

7. BIBLIOGRAPHY

- ARCS and WIFO (1999): Austrian Report on Technology 1999. An Initiative of the Federal Ministry of Economic Affairs and the Federal Ministry of Science and Transport, 1999.
- EFPIA (2012): The Pharmaceutical Industry in Figures – Key Data 2013.
- European Commission (2009): Pharmaceutical Sector Inquiry. Final Report of the European Commission Competition DG, Adaption Date: 8 July 2009.
- Eurostat (2014): European System of Accounts. Available online at: http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database, last checked on October 10, 2014.
- GPhA (2011): 2011 a year of progress. Generic Pharmaceutical Association Annual Report, 2011.
- IMS Health (2005): IMS Generics Market Prognosis 05-09 Canada. Report by IMS the Institute of Healthcare Informatics, 2005.
- IMS Health (2006): IMS MIDAS Market Segmentation, Clarity and Conference in a complex world. Report by the IMS Institute of Healthcare Informatics, 2006.
- IMS Health (2010): Pharmedging shake-up, New Imperatives in a Redefined World. Report by IMS Institute of Healthcare Informatics, 2010.
- IMS Health (2011a): Generic medicines: Essential contributors to the long-term health of society. Sector sustainability challenges in Europe. Report by the IMS Institute of Healthcare Informatics, 2011.
- IMS Health (2011b): The Use of Medicines in the United States: Review of 2010. Report by the IMS Institute of Healthcare Informatics, April 2011.
- IMS Health (2012): Global Pharmaceutical Market and Generics. Report by the IMS Institute of Healthcare Informatics, IGPA Kyoto December 2012.
- IMS Health (2013a): The Global Use of Medicines: Outlook through 2017. Report by the IMS Institute of Healthcare Informatics, 2013.
- IMS Health (2013b): A robust generic market: difficulties and complexities. Report by the IMS Institute of Healthcare Informatics, 6th March of 2013.
- OECD (2013): Health at a Glance 2013, OECD Indicators. Report by the OECD, 2013.
- Ostwald, D. A. / Knippel, J. (2013): Measuring the economic footprint of the pharmaceutical industry – Feasibility study. Berlin, 2013.

- UN Statistics Division (2013a): National Accounts Main Aggregates Database: Glossary. Available online at: <http://unstats.un.org/unsd/snaama/glossary.asp>, last checked on October 10, 2014.
- UN Statistics Division (2013b): National Accounts Main Aggregates Database: Downloads. Available online at: <http://unstats.un.org/unsd/snaama/dn-llist.asp>, last checked on October 10, 2014.
- UN Statistics Division (2013c): Standard Country or Area Codes for Statistical Use. Available online at: <http://unstats.un.org/unsd/methods/m49/m49.htm>, last checked on October 10, 2014.
- UN Statistics Division (2013d): National Accounts Main Aggregates Database: Conversions and formulas. Available online at: <http://unstats.un.org/unsd/snaama/formulas.asp>, last checked on October 10, 2014.
- WHO (2004): The World Medicines Situation. Report of the World Health Organization, WHO/EDM/PAR/2004.5.
- WHO (2008): Measuring medicine prices, availability, affordability and price components. 2nd EDITION, Report of the World Health Organization and Health Action International, WHO/PSM/PAS/2008.3.



WifOR GmbH, Rheinstraße 22, 64283
Darmstadt, Germany
Phone +49 6151 50155-0, www.wifor.de

ISBN 978-2-940498-41-3

