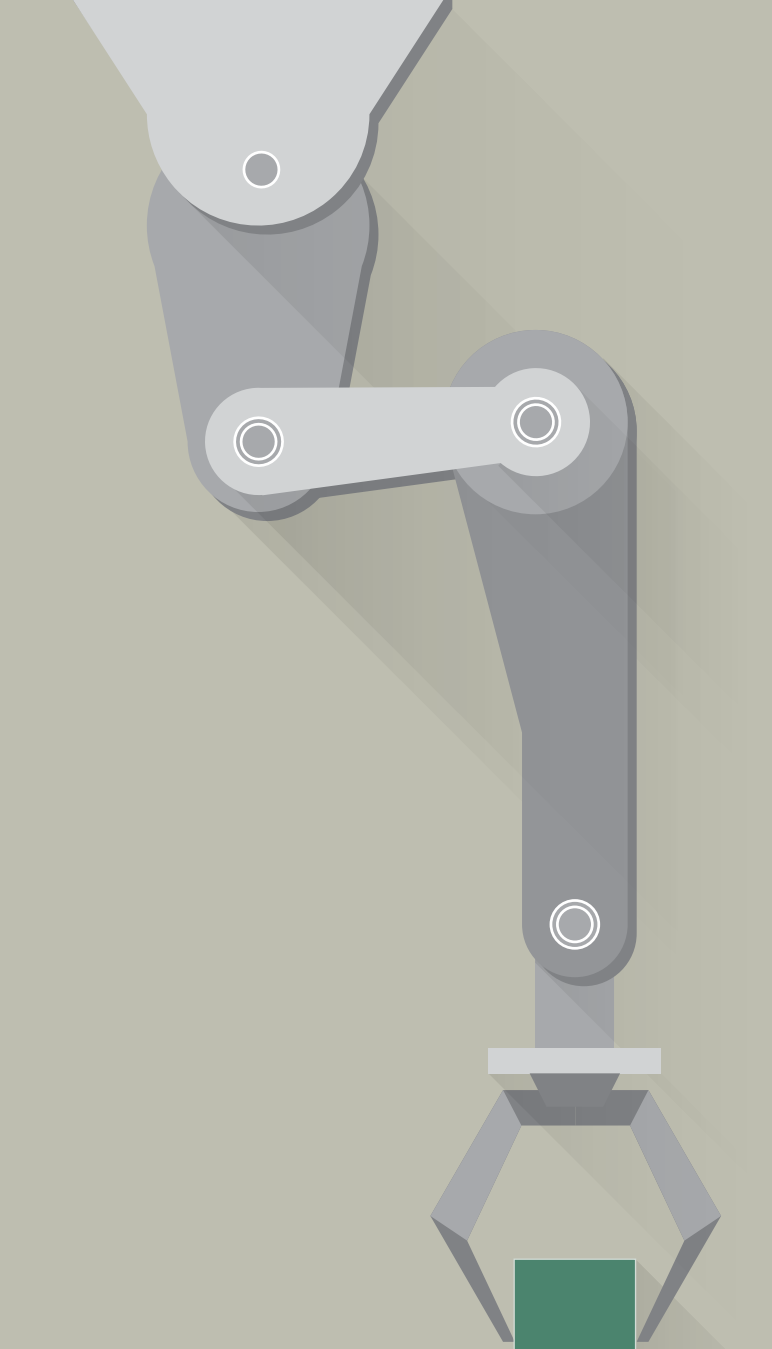

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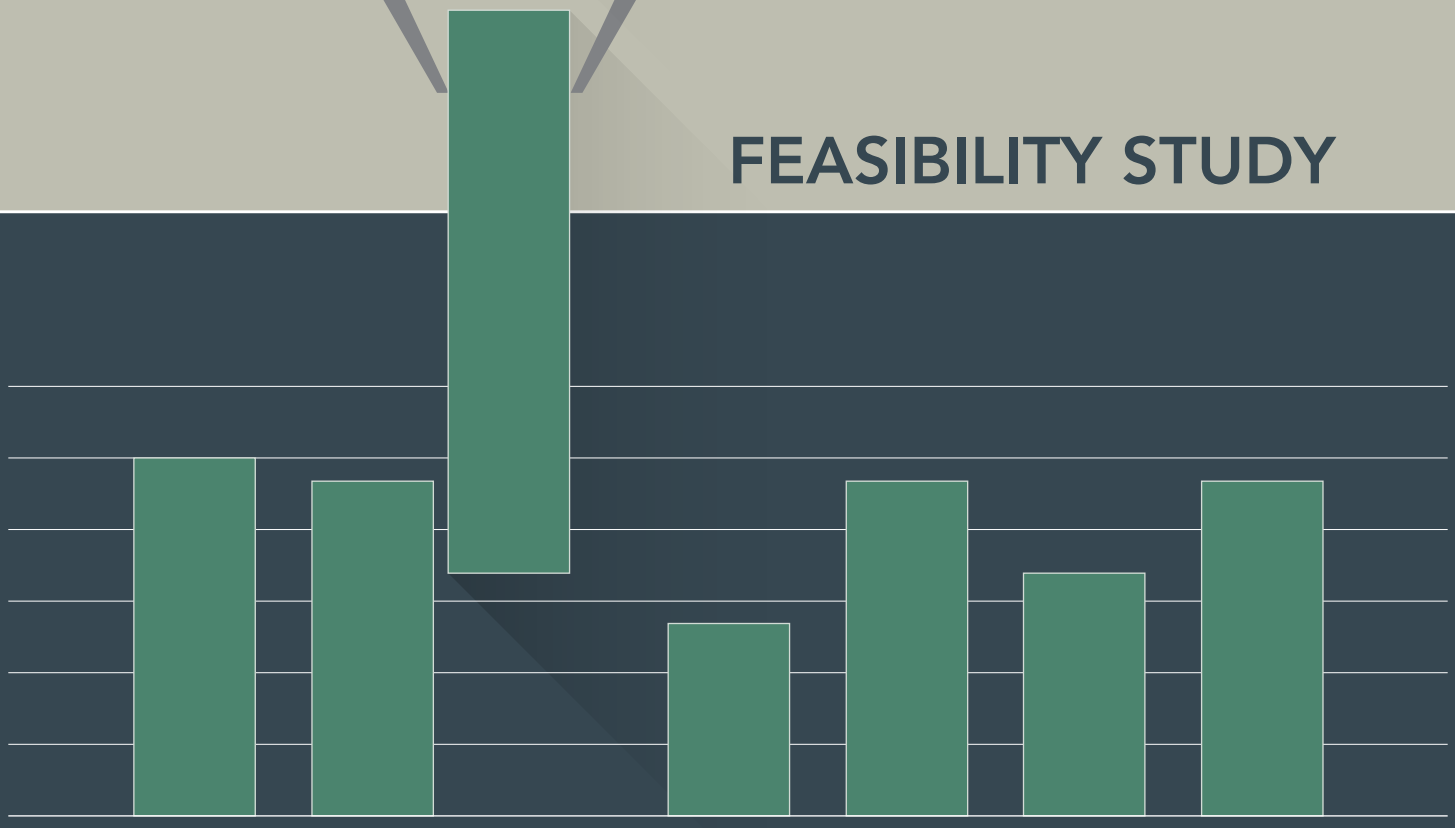
MEASURING THE ECONOMIC FOOTPRINT OF THE PHARMACEUTICAL INDUSTRY

DR. DENNIS A. OSTWALD
DIPL.-WIRTSCH.-ING. JULIAN KNIPPEL

NOVEMBER 2013

FEASIBILITY STUDY



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LIST OF ABBREVIATIONS

BDI	Federation of German Industry
CPC	Central Product Classification
ESA	The European System of National and Regional Accounts
GDP	Gross domestic product
GVA	Gross value added
HS	Harmonized Commodity Description and Coding System
ILO	International Labour Organization
ILOSTAT	Statistical Indicators Database
IMF	International Monetary Fund
INDSTAT	Industrial Statistics Database
IO	Input-Output
ISIC	Industrial Classification of All Economic Activities
OECD	Organization for Economic Co-operation and Development
Prodcom	Production Communautaire
R&D	Research and development
SBS	Structural business statistics
SITC	Standard International Trade Classification
SNA	System of National Accounts
STAN	Database for Structural Analysis
UN	United Nations
UNSD	United Nations Statistics Division
USD	United States Dollar
WHO	World Health Organization
WTTC	World Travel & Tourism Council

ABSTRACT

With the present research project the feasibility of quantifying the global economical importance, hence the economic footprint of the pharmaceutical industry[1] is examined for the first time ever. For this purpose an analysis is made of the extent to which global growth and job-creating effects on the part of the pharmaceutical industry can be calculated with the aid of the System of National Accounts (SNA). The results should help to reinforce a change in perspective – from that of a cost driver to a motor for value added and innovation.

The study is based on an overview of studies and statistics that have been published with regard to the economic importance of companies and sectors. This overview explains which different methods, ratios and databases are employed in order to measure economic importance. In order to quantify the economic impact, official organizations such as the UNSD, the OECD and Eurostat make a wealth of statistics and information available. Nevertheless, information gaps occur in the compilation of this global data. Thus on this basis an outline of how the global importance of the pharmaceutical industry can be measured with the aid of existing methods and assumptions shall be provided. For example – when it comes to the ratio of gross value added – the available statistics for the pharmaceutical industry cover approximately ninety percent of the global economy. This means that the economic importance of the pharmaceutical industry in the remaining ten percent of the global economy must be determined on the basis of suitable methods and assumptions. Finally, an initial assessment of the direct economic effects of the global pharmaceutical industry shall be undertaken.

As a result it may be noted that the pharmaceutical industry

- was able to increase its contribution to value added for the global GDP by 7.5 percent on an annual basis from the years 2006 to 2011, thus reaching a total of USD 441 billion and

- it employed more than 4.2 million persons worldwide in the year 2011.

Thus the global economic power of the sector roughly corresponds to the economic performance of Argentina, and there are as many persons employed in the sector as are employed in Austria as a whole.

1 This report considers the pharmaceutical industry in its entirety, i.e., including both research-based and generic companies.

1. AIM AND STRUCTURE OF THE STUDY

The pharmaceutical industry is increasingly regarded as a driver of growth, employment and innovation, and thus as a value-adding industrial sector.[2] In light of a society in the midst of worldwide growth and aging as well as the associated increasing demand for health benefits, there will not only be the necessity for innovative pharmaceutical products in the future, but also huge growth potential for the pharmaceutical industry as well.[3]

The aim of the present research project is a first time examination of the feasibility of global measurement of the economic importance of the pharmaceutical industry on the basis of economic ratios. The pharmaceutical industry is considered in its entirety, i.e., including both research-based and generic companies. Existing research work is often based on business ratios such as sales or profit. However, more recent studies on the economic importance of enterprises and sectors confirm that business parameters allow for only limited conclusions with regard to the importance of enterprises and sectors for the economy as a whole.[4] Thus within the scope of this feasibility study an analysis will be made of the extent to which global growth and job-creating effects on the part of the pharmaceutical industry can be calculated with the aid of the System of National Accounts. These results are to help to underscore a change in perspective – from that of a cost driver to a value-adding, innovative and labor-intensive sector. Thus the public and political debate may be provided new stimuli.

The study is structured as follows: In the first step (Chapter 2) an overview is provided with regard to the studies published on the economic importance, i.e. the economic footprint[5], of enterprises and sectors. What is examined here in particular are the various ratios and methods of evaluation that exist for measuring economic importance. The second step (Chapter 3) consists in a feasibility study for establishing the economic footprint of the pharmaceutical industry on the basis of the System of National Accounts. On the basis of the knowledge thus acquired an assessment of the direct effects of the global pharmaceutical industry on the economy as a whole is then provided in the third and last step (Chapter 4).

2 Cf. BDI (2013); Earl-Slater, A. (1998); EFPIA (2013).

3 Cf. IMS Health (2012a).

4 Cf. Ostwald, D.A. (2009); Henke, K.-D. / Neumann, K. / Schneider, M. et al. (2010); Heeger, D. (2013); BMWi (2012).

5 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.

2. REVIEW OF THE LITERATURE MEASURING ECONOMIC IMPORTANCE

This chapter takes a look at the literature that is concerned with calculation of the economic footprint of enterprises and sectors.[6] The aim is to provide an overview of the state of research involving measurement of the importance of economic units for the economy as a whole. For this purpose the review of the literature takes studies of all branches of industry into consideration and draws a comprehensive picture with regard to the possible approaches available in order to determine economic importance. In several of the studies the term economic footprint – which is also adopted by the authors in Chapter 3 – is already used. Furthermore, the data available thus far on the economic importance of the pharmaceutical industry are also indicated.

The chapter begins by defining the most important technical terms in the study (Chapter 2.1). The defining characteristics when it comes to the analysis of economic importance are then compiled on the basis of selected studies (Chapter 2.2). Chapter 2.3 describes a best practice example for global analysis of economic importance; the extensive possibilities provided by global industry analysis can be impressively elucidated on the basis of reporting for the tourism industry. Finally, in Chapter 2.4 those studies are analyzed that are concerned with the health industry and the pharmaceutical industry in particular.

2.1. DEFINITIONS

The most important terms of the present feasibility study are defined in the following. These include:

- gross value added,
- economic footprint,
- direct economic effects and
- indirect and induced effects (spillover effects).

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. With the aid of the gross value added the contribution of an industry to the gross domestic product can be shown and the development of individual economic units can be compared with the growth of the respective economy, i.e. the growth rates of the GDP.[7]

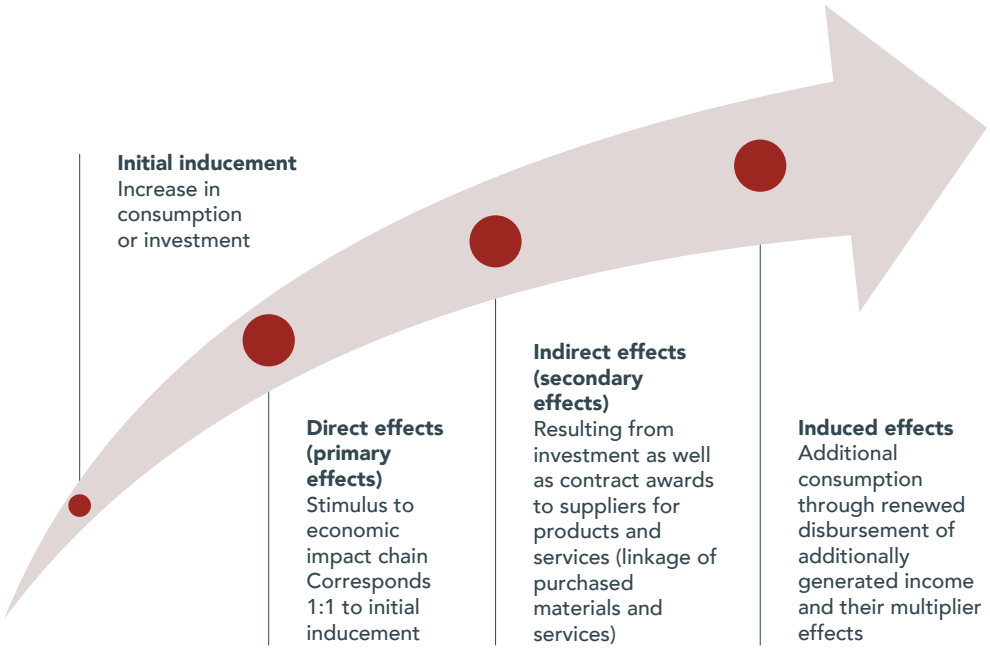
6 In the present study enterprises and industries are subsumed under the term economic unit.

7 Cf. UN Statistics Division (2013a).

Apart from the direct effects, the spillover effects are, as a rule, subsumed under the economic importance of a branch or industry. The sum of all these effects is designated by the authors of the study as the economic footprint.

The following diagram provides a schematic representation of the various effects.

DIAGRAM 1: ECONOMIC EFFECTS



Source: Own research.

Economically significant and informative ratios of economic units are grouped under the term **economic footprint**. Relevant economical ratios include, among other things, the production value, gross value added, compensation of employees as well as job-creating and fiscal effects. Analysis of the economic footprint can also serve to answer special questions by measuring the effects of an economic unit on economic or social factors.

Direct economic effects refer to the direct effects of an economic unit on an economy as a whole. In addition to the gross value added of an enterprise or a branch of industry these also include, for example, the workforce directly employed in a company and their compensation.

Spillover effects, on the other hand, are triggered indirectly by the business activity of the economic unit and manifest themselves through other economic units in the national economy. The most important spillover effects are the indirect and induced effects.

Indirect effects develop within the chain of purchased materials and services of the relevant economic entity. Materials and services purchased by the

economic unit, e.g. raw materials and supplies, trigger production processes in other economic units. Thus order placement results in a direct increase in demand, which in turn leads to an increase in business activity among the commissioned economic units. The suppliers of purchased materials and services likewise purchase materials and services which in turn stimulate production, so that the demand stimulus triggers economic effects and tax payments along the entire value added chain.[8] These effects, which are based on the demand for purchased materials and services, are grouped under the term indirect effects.

Induced effects are understood as the economic effects caused by renewed spending of those incomes generated through direct and indirect effects. Thus the compensation for employees paid directly by the economic unit and the compensation for employees that results from the indirect impact of the company, are spent again in part on consumer goods and thus in turn lead to production, income and fiscal revenues.[9]

2.2. CHARACTERISTICS DERIVED FROM STUDIES ON THE MEASUREMENT OF ECONOMIC IMPORTANCE

Within the scope of preparing the review of the literature more than 100 published pieces of research concerning the economic importance were examined. On the basis of this research a total of 36 studies were selected and evaluated in detail. These studies are concerned with various enterprises and industries in different sectors; this ensures an overview of the current state of research that is independent of a particular sector. On the basis of the review of the literature the following categories were formed in order to enhance the comparability of the respective studies. Altogether four distinguishing features may be roughly differentiated:

- Methodological approach
- economic indicators
- database employed
- geographic focus

Table 1 represents an extract of the studies examined, arranged in accordance with the four distinguishing features.

8 Cf. Holub, H.-W. / Schnabl, H. (1994), p. 102ff.

9 Cf. Pischner, R. / Stäglin, R. (1976), p. 346; Heeger, D. (2013), p. 243.

TABLE 1: EXTRACT – STUDIES ON THE ECONOMIC FOOTPRINT AND THEIR CHARACTERISTICS

Authors	Title	Methodological approach	Economic indicators	Database employed	Geographic focus
WTTC (2013)	Travel & Tourism: Economic Impact 2013.	IO-Analysis, Forecast	GVA, employment, capital expenditures	Official data	Worldwide, international and national
ATAG (2012)	Aviation: Benefits beyond borders – Providing employment, trade links, tourism and support for sustainable development through air travel.	Multiplier-Analysis, Forecast, Case studies	GVA, employment, R&D expenditures, capital expenditures	n.s.	Worldwide, international and national
Oxford Economics (2009)	The Impact of the Express Delivery Industry on the Global Economy.	IO-Analysis, Forecast, Case studies	GVA, employment	Survey, association´s data	Worldwide
WifOR (2013)	Die ökonomische Bedeutung des Zuckersegments der Südzucker-Gruppe in Deutschland und Europa	IO-Analysis	GVA, output, employment, wages & salaries, R&D expenditures, capital expenditures, tax payments	Official data, company data	International (Europe), national and local
London Economics (2011)	McDonald´s economic footprint in Europe.	Multiplier-Analysis, Case studies	GVA, output, employment, wages & salaries, capital expenditures	Company data	International (Europe)
BMWi (2012)	Monitoring of Selected Economic Key Data on Culture and Creative Industries 2010	Direct effects	GVA, output, employment	Official data	National (Germany)
WifOR (2012)	Quantifizierung der volkswirtschaftlichen Bedeutung der Sicherheits- und Verteidigungsindustrie für den deutschen Wirtschaftsstandort	IO-Analysis	GVA, output, employment, wages & salaries, R&D expenditures	Official data, survey	National (Germany)
Deloitte (2010)	Impact of the Canadian Aerospace Industry.	IO-Analysis, Forecast, Case studies	GVA, output, employment, wages & salaries, capital expenditures, tax payments	Official data, survey, association´s data	National and regional (Canada)
Prognos AG (2007)	Regionalökonomische Auswirkungen des Steinkohlenbergbaus in Nordrhein-Westfalen	IO-Analysis, Case studies	GVA, output, employment, tax payments	Company data	Regional and local

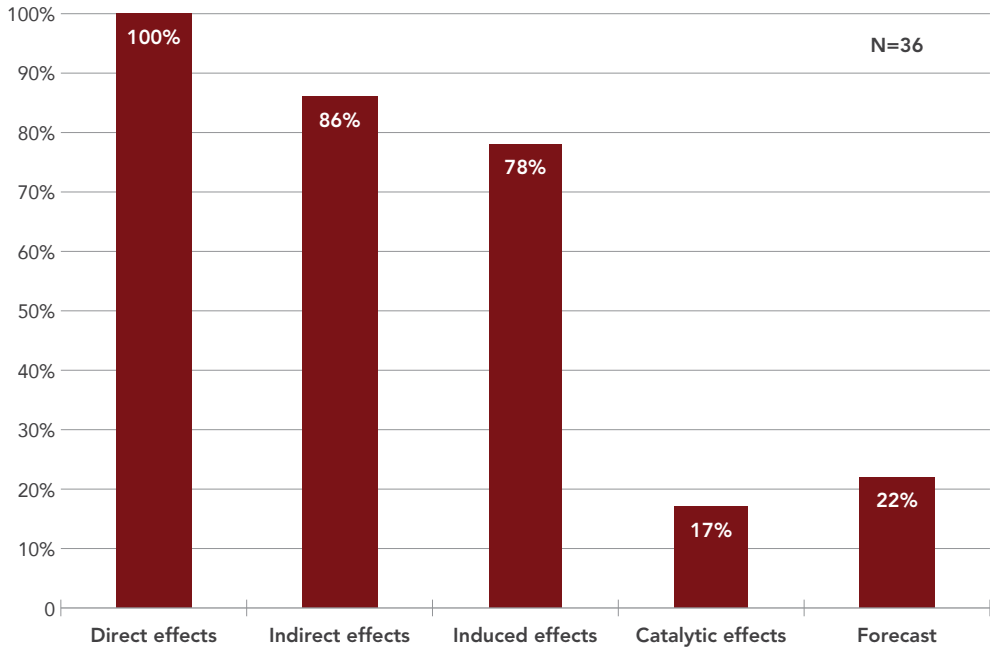
Source: Own research.

On the basis of the distinguishing features the information required in order to determine the economic importance of various sectors and economic units thus becomes clear. In the following the individual characteristics are discussed in order to subsequently present a best practice example – using the tourism sector – for a global measurement of the economic importance of a sector.

2.2.1. METHODOLOGICAL APPROACHES

Various methods of empirical analysis are used in order to measure economic importance. It becomes clear that beyond assessment of the direct effects, a number of studies also calculate indirect and induced effects. On a proportionate basis Diagram 2 represents the economic effects that were calculated and ascertained in the studies examined.

DIAGRAM 2: FREQUENCY OF THE ECONOMIC EFFECTS ASCERTAINED IN THE RESPECTIVE STUDIES



Source: Own calculation.

The economic effects of an economic unit are only rarely evaluated on the basis of the associated direct effects alone. On the contrary, the resulting spillover effects are calculated by means of multiplier analyses. The indirect effects that result from purchased materials and services and transacted investments are quantified in 86 percent of the respective studies. Induced effects, triggered by renewed spending of generated incomes, are determined in 78 percent of the studies. The multipliers for determining spillover effects were determined through input-output analysis in 84 percent of the cases.[10] This clearly indicates the position of reference accorded to input-output analysis when it comes to determination of the multipliers.

In addition to indirect and induced spillover effects, catalyst effects are also indicated in 17 percent of the studies. Catalyst effects amount to the positive effects that an economic unit has on the further economic units of a national

10 Of the analyzed studies a total of 31 of them determine spillover effects. Of these another 26 explicitly indicate that they were quantified by means of IO-analysis.

economy. A customary example of this is provided by the aviation industry which, through its own services, promotes and makes tourism possible in many regions. These catalyst effects are often described in both qualitative and quantitative terms.[11]

Apart from consideration of the status quo as well as development of the economic unit in the past, a forecast of future development is also provided in 22 percent of the studies. This may take place through annual updating of the most important key data or by means of a forecast of economic importance at a fixed point in time in the future. When it comes to the forecast scenario, analyses are also performed in order to outline a possible framework of development for the respective economic unit. Scenario analyses often serve to answer future questions, e.g. development of the economic unit in light of political decisions.[12]

2.2.2. ECONOMIC INDICATORS CONSIDERED

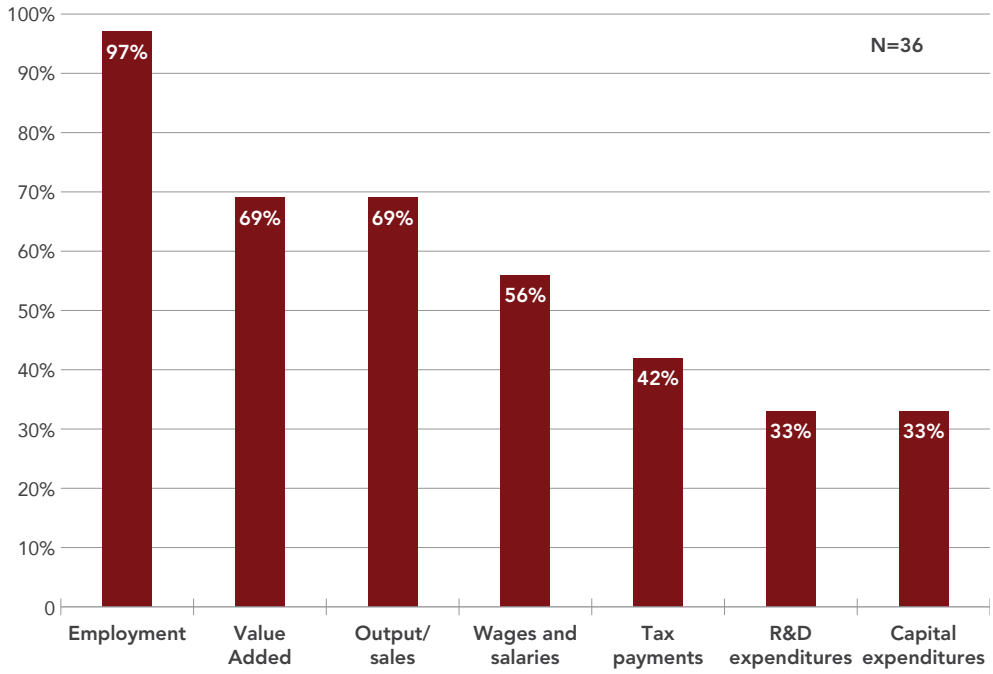
The selected ratios of the respective studies stand in close relationship to the selected methodology and desired effects. In order to determine economic importance, the business parameters of an economic unit, such as sales and earnings ratios, do not suffice. On the contrary, review of the literature suggests that macroeconomic data, similar to the gross domestic product, are required.

Diagram 3 provides an overview of the most important ratios used in the existing literature. The percentage figures indicate the frequency of use of the respective ratios in the studies considered when it comes to determination of economic importance.

11 Cf. ATAG (2012); Deloitte (2010); Oxford Economics (2009); Oxford Economics (2012).

12 Cf. WTTC (2013); Oxford Economics (2009); Deloitte (2010); Airbus (2012); O'Toole, K. et al. (2008).

DIAGRAM 3: FREQUENCY OF THE RATIOS USED IN THE STUDIES FOR MEASURING ECONOMIC IMPORTANCE



Source: Own calculation.

In general, when it comes to determining economic importance, the growth and job-creating effects of economic units are determined in particular. In order to shed light on this contribution to economic growth the macroeconomic value of the economic unit under consideration must be determined. Research in the literature indicates that this takes place via ratios such as sales and production value on the one hand, but also the gross value added on the other.

The production value represents the value of all of the manufactured goods and services of an economic unit. As a rule the production value is used in the analysis of sectors and often determined as the preliminary stage when calculating the gross value added. The gross value added is derived from the production value less purchased materials and services. In analyzing companies sales serve as an indicator of economic importance. However, ratios such as sales and production value also contain the materials and services purchased from other industries that are used in the production process.

In order to demonstrate the direct economic effects of one economic unit alone, the raw materials and supplies, the consumed energy and other purchased materials and services employed in the production process have to be accounted for and separately shown as spillover effects. The gross value added only represents these direct economic effects. Furthermore, this ratio makes it possible to make relative share and growth comparisons with the GDP. By means of these comparisons the manner in which economic units develop in comparison with their environments and thus whether they act as growth drivers becomes evident.

Even more frequently than the ratios of value added and sales, the job-creating effects are pointed out in the studies analyzed. In fact they are determined in 97 percent of all of the studies examined. In several studies additional data is also analyzed in order to expand the measurement of economic importance. A total of 56 percent of the studies take the compensation for employees into consideration. Fiscal effects in the form of tax payments are specified in 42 percent of the studies. As a rule the two latter ratios also include social security payments; however, they are only shown separately in 25 percent of the same studies. In a third of the studies expenditures for investment as well as research and development are determined.

Through quantification of the investments a statement may be made as to whether the economic activity of a particular industry is conducted in a sustainable manner. This is the case if gross investments counterbalance or even exceed depreciation. Thus the efforts carried out by an industry in order to increase and preserve its capital stock and concomitantly its competitiveness become clear. The expenditures for research and development provide information about a sector's efforts with regard to innovation. Apart from the ratios already discussed, sector-specific ratios are often employed and determined in order to answer certain questions as a function of the intention involved in determining economic importance. An example of this is provided by consumer spending on the part of tourists when it comes to measuring the economic effects of the tourism sector.[13]

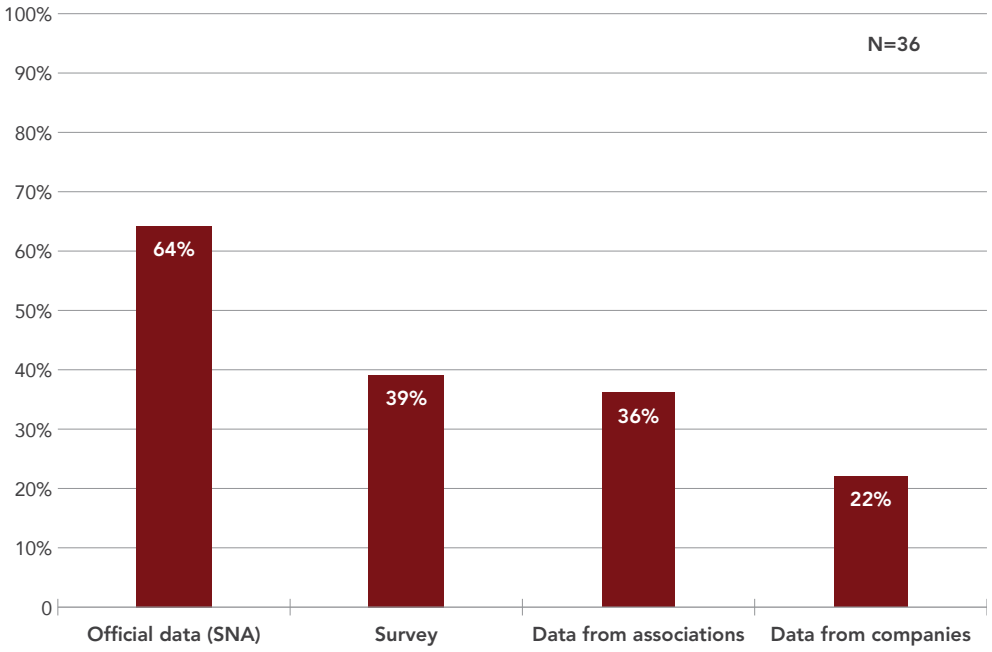
2.2.3. DATABASE EMPLOYED

The third constituent element of the evaluated studies may be derived from the methodological approaches and desired ratios. This consists in the database employed. Again various characteristics become recognizable.

Diagram 4 shows how often various databases are employed in order to determine economic importance.

13 Cf. WTTC (2013).

DIAGRAM 4: FREQUENCY OF THE DATABASES USED IN THE STUDIES, MULTIPLE REFERENCES POSSIBLE



Source: Own calculation.

Studies commissioned by individual companies are able to employ the business data of the respective enterprise and then transfer them into economic categories. This applies to 22 percent of the studies examined. However, research and analysis of the literature indicates that most studies are based on official databases. In 39 percent of the studies surveys were used in order to collect data. The database of associations was used in 36 percent of the studies.

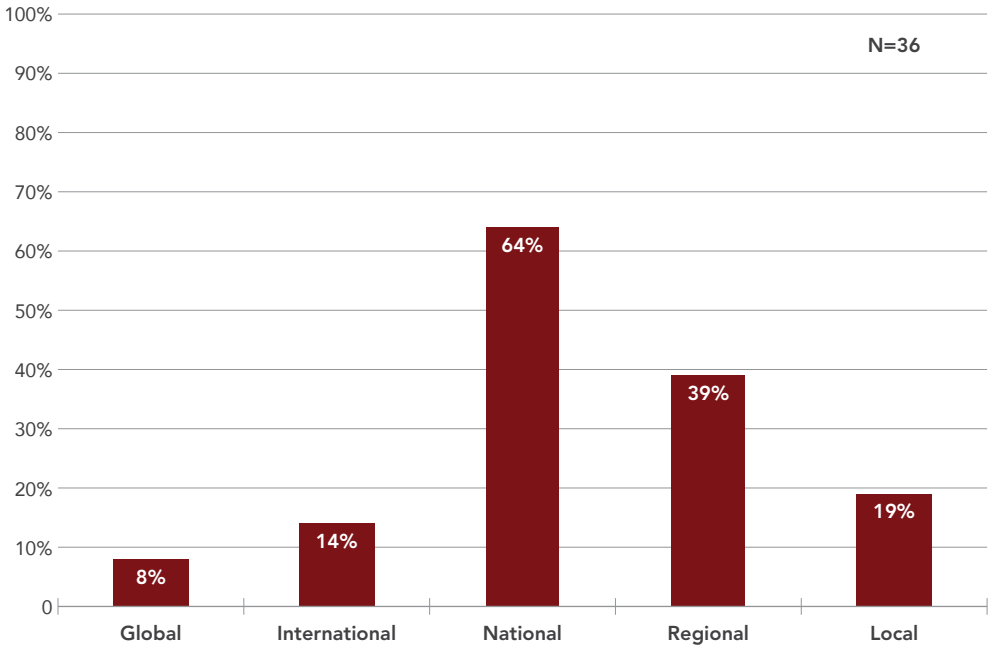
Official statistics provide for the greatest comparability, since they are compiled in accordance with international guidelines such as the System of National Accounts 2008 (2008 SNA). These statistics are often freely available from the national statistical offices and other institutions like the United Nations, Eurostat and the OECD. Moreover, the input-output tables of the official statistical offices are essential in order to determine the spillover effects of the economic unit under consideration. Thus for the analysis of economic importance it makes sense to take advantage of official statistics. Statistics garnered from surveys or associations offer the possibility of addressing special questions and of attaining information that is either not collected by the respective statistical offices or not with the required degree of detail.

2.2.4. GEOGRAPHIC FOCUS OF THE SELECTED STUDIES

The geographical focus clearly delimits the available statistics and concomitantly application of the respective methods and the derivable ratios; whereby a greater number of comparative data are available at the national than at the

international level. In the studies analyzed the geographical focus ranges from global consideration of the economic effects to a localized analysis. The latter measures the economic importance of economic units at the administrative district level. The following diagram shows the relative distribution of the geographical focus within the scope of the studies considered.

DIAGRAM 5: GEOGRAPHIC FOCUS OF THE STUDIES, MULTIPLE REFERENCES POSSIBLE



Source: Own calculation.

The evaluation shows that a majority of the studies examines economic importance at the national or regional level. This may be due to the fact that both companies and sectors have their economic focus in individual countries and locations and are thus particularly motivated when it comes to emphasizing their contribution to growth and employment locally. A further factor consists in the availability of data; as a rule, the national statistical offices offer a wealth of information as well as comparable ratios of other economic units. On the other hand, the availability of data at the international level is less comprehensive. At the global[14] and international level a respective eight and fourteen percent of the studies consider the economic effects of the economic unit examined.[15] This underscores the innovative character of this feasibility study.

Now that essential studies and literature extracts across sectors and characteristics have been evaluated and analyzed, a best practice example shall be

14 Cf. WTTC (2013); ATAG (2012); Oxford Economics (2009).

15 In light of the commissioned study, studies with a global and/or international focus were investigated in particular. This makes it clear that studies with an international focus are not the rule.

presented in the following section with the tourism industry and how industry reporting may be structured in the future.

2.3. BEST PRACTICE EXAMPLE: THE TOURISM INDUSTRY

The description of the essential distinguishing features of the selected literature with regard to the economic importance of economic units provides an overview of the analyzable dimensions of observation for various sectors. The leading industry when it comes to the calculation and reporting of economic importance is the tourism sector.[16] It provides a best practice example for the analysis of economic units on a global scale. On the basis of the annual publication of the World Travel & Tourism Council (WTTC), "Travel & Tourism: Economic Impact", the distinguishing features discussed may be understood by using the tourism sector as an example. The indicators of the global report illustrate the fact that nine percent of the global GDPs – this corresponds to a gross value added of USD 6.6 trillion – and more than 260 million jobs were dependent on the industry in the year 2012 in either a direct, indirect or induced manner. The reporting of the tourism sector also includes a ten-year forecast. By the year 2023 the industry expects to see an annual growth rate of 4.4 percent. Thus in the next 10 years its share of the global gross domestic product will increase to 10 percent with employment totaling 338 million jobs.[17]

The publication cited is concerned with the economic effects at the global, regional and national level. Thus the WTTC also compiles international reports for regions such as Europe, America, Africa etc. as well as for political regions such as the G20, the OECD, the Commonwealth, etc. Furthermore, the economic importance of the tourism sector is published along with domestic data in more than 180 country reports. This comprehensive quantification of the sector is possible because of the fact that the UN Statistics Division adopted a standard for data collection – the Tourism Satellite Account - Methodological Framework (TSA: RMF 2008).[18] On the basis of this standard numerous national statistical offices developed a national tourism satellite system and collect industry-specific data, with which it became possible for the WTTC to generate such comprehensive reporting on the basis of official statistics.

An overview of the preliminary findings with regard to the economic importance of the pharmaceutical industry is provided in the following.

16 The reporting of the WTTC on the economic importance of the tourism industry may be found on the following Internet page: http://www.wttc.org/research/economic-impact-research/.

17 Cf. WTTC (2013).

18 Cf. UN Statistics Division (2008).

2.4. STUDIES ON THE ECONOMIC IMPACT OF THE PHARMACEUTICAL INDUSTRY

In statistical terms the healthcare industry in general and the pharmaceutical industry in particular were for a long time almost exclusively regarded under spending and cost criteria. This is shown by publications such as the series "Health at a glance" from the OECD,[19] in which the economic dimension is limited to a representation of the expenditures for health and the financing of health services. In contrast to this the aim at the national level is to supplement the picture with the overall economic effects and contributions on the part of the sector. Thus a change in paradigm is currently taking place in several industrialized countries: More strongly than before the health and the pharmaceutical sectors are perceived as economic units that make their contribution to economic growth and employment – not least of all in order to restore society to proper health. In order to be able to discuss this new understanding on an empirical basis, more and more ratios with which the economic impact of the pharmaceutical industry can be measured are being determined. In Germany, for example, such efforts were advanced with the health satellite account and a draft system of economic health accounts.[20] Thus the direct economic effects and the spillover effects of the healthcare sector as well as those of the pharmaceutical industry can be shown for the first time. On the basis of the ratios production value, gross value added, persons employed, employee compensation and foreign trade, the economic importance of the sector in Germany thus becomes clear within the scope of the system of accounts for health. According to the system of accounts for health the direct gross value added by the pharmaceutical industry amounted to a total of EUR 9.8 billion in the year 2009.[21]

Efforts to establish satellite systems for health similar to the German system of accounts for health exist in numerous countries and they are supported with, among other things, instructions for creating systems of accounts for health by the OECD, Eurostat and the WHO.[22]

2.4.1. GLOBAL STUDIES ON THE ECONOMIC IMPACT OF THE PHARMACEUTICAL INDUSTRY

As a result of the complicated and less than clear situation when it comes to data, there is currently only very limited knowledge with regard to the economic impact of the pharmaceutical sector at the international level; this is shown by the following overview.

19 Cf. OECD (2012).

20 Cf. Ostwald, D.-A. / Henke, K.-D. / Kim, Z.-G. (2013); Henke, K.-D. / Ostwald, D.A. (2012); Henke, K.-D. / Neumann, K. / Schneider, M. et al. (2010).

21 The pharmaceutical industry of the health satellite account only includes the parts that are relevant for human medicine; thus veterinary preparations were excluded (cf. Ostwald, D.A. / Henke, K.-D. / Kim, Z.-G. (2013)).

22 Cf. OECD / Eurostat / WHO (2011), pp. 415-442.

An example of a global view of economic ratios is represented by the annual publication "The Pharmaceutical Industry in Figures" from the European Federation of Pharmaceutical Industries and Associations (EFPIA). Apart from an evaluation of European data, it also presents several ratios for the pharmaceutical industry worldwide. The study is based on statistics which the EFPIA collects from its member associations and which are enriched with data from Eurostat and further sources. In this study the production value of the European pharmaceutical industry is put at EUR 210 billion for the year 2012, the foreign trade surplus at EUR 80 billion, the number of persons employed at 700,000 and expenditures for research and development are indicated as EUR 30 billion.[23] The global pharmaceutical market at the cost of manufacture in the same year was put at EUR 667.7 billion or USD 857.8 billion.[24] A similar publication, "The Pharmaceutical Industry and Global Health: Facts and Figures 2012", is published by the International Federation of Pharmaceutical Manufacturers & Associations (IFPMA). In this report the worldwide expenditures for pharmaceutical products, in accordance with IMS ratios, are put at USD 956 billion in the year 2011 with an anticipated increase to USD 1.2 trillion by 2016.[25] Table 2 shows the development of worldwide sales in the pharmaceutical sector according to IMS Health.

TABLE 2: GLOBAL PHARMACEUTICAL MARKET

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total World market (USD in billions[1])	503	565	611	658	729	800	833	881	956
Total World market (Constant USD in billions[2])	567	611	656	702	752	800	858	896	942
Growth Over Previous year (Constant US$ Growth[2])	9.0%	7.8%	7.4%	7.0%	7.1%	6.4%	7.3%	4.5%	5.1%

Source: IMS Health (2012a).
[1] US$ uses actual quarterly exchange rates
[2] Constant $ uses Q411 average exchange rates

IMS specifies that worldwide sales with pharmaceutical products amounted to USD 956 billion in the year 2011. Since the year 2003 sales increased by USD 453 billion; this corresponds to an increase of 90.0 percent. Moreover, IMS forecasts the development of the pharmaceutical market from the years 2012 to 2016.

23 Cf. EFPIA (2013), p. 3.
24 Cf. EFPIA (2013), p. 14.
25 Cf. IFPMA (2012), p. 51; IMS Health (2012a).

TABLE 3: GLOBAL PHARMACEUTICAL MARKET FORECAST BY REGION

	2011			2010	2007- 2011	2012	2012 - 2016
	Market Size US$Bn[1]	Market Size Const. US$[2]	% Growth Const. US$[2]	% Growth Const. US$[2]	CAGR Const. US$[2]	Forecast % Growth Const. US$[2]	CAGR % Const. US$[2]
Total unaudited and audited global market							
Total World market (USD in billions[1])	995.5	942.2	5.1%	4.5%	6.1%	3 - 4%	3 - 6%
Total unaudited and audited global market by region							
North America	347.1	346.2	3.0%	2.2%	3.5%	1 - 2%	1 - 4%
Europe	265.4	255.1	2.4%	2.9%	4.9%	0 - 1%	0 - 3%
Asia / Africa / Australia	165.2	163.1	13.1%	14.0%	15.5%	10 - 11%	10 - 13%
Japan	111.2	114.7	5.6%	0.1%	3.9%	0 - 1%	1 - 4%
Latin America	66.7	62.9	8.9%	12.7%	12.3%	13 - 14%	10 - 13%

Source: IMS Health (2012b).
[1] US$ uses actual quarterly exchange rates
[2] Constant $ uses Q411 average exchange rates

IMS predicts an annual increase in the growth rate of between three and six percent for global sales with pharmaceutical products by the year 2016. Particularly high sales growth rates will be exhibited in Asia, Africa, Australia and South America. An annual increase of between 10 to 13 percent is forecast for these countries.

The WHO published ratios that strongly deviate from those of IMS. They indicate a value of USD 300 billion for the global pharmaceutical market without specifying a concrete year of reference.[26]

This overview shows that the published ratios of the individual institutions strongly deviate from one another. Depending on the source, there is up to a USD 656 billion difference between the highest and lowest value indicated for the global pharmaceutical market. And the underlying methodology for calculating the individual values is also not uniform and in part unclear. Furthermore, the past view of the global pharmaceutical market was based on an evaluation and extrapolation of sales or production values, whereby not only the value added of the pharmaceutical industry, but rather all of the stages of the value added chain all the way through to retail sales are taken into consideration. Thus the described ratios are only conditionally suited for an evaluation of the economic importance of the global pharmaceutical industry.

26 Cf. WHO (2013).

2.4.2. NATIONAL AND REGIONAL STUDIES ON THE ECONOMIC IMPACT OF THE PHARMACEUTICAL INDUSTRY

Apart from the existing global ratios, there are a number of approaches with which to determine the economic footprint of the pharmaceutical industry at a deeper national or regional level of observation. Apart from the direct effects, the studies nearly all include indirect and induced effects as well. In addition, all of the studies provide information on both the production value and the number of persons employed. Moreover, many of them specify the expenditures for research and development, gross value added and employee compensation as key indicators of the overall economic importance.[27] Apart from an analysis of the entire industry, there are also efforts at the national level by individual companies in the pharmaceutical industry to stress their own influence on the domestic economy.[28] In Germany, for example, seven pharmaceutical companies did so in a study conducted by the Federation of German Industry (BDI), similarly to the aforementioned approach of the system of health economic accounts. The study illustrates the effect of the German pharmaceutical industry as a driver of growth and innovation. The study was able to demonstrate that the direct gross value added in the years from 2005 to 2010 increased by nearly 40 percent and thus three times as much as the gross value added for the economy as a whole. Furthermore, it was also shown that with a total of 9.1 percent the intensity of research and development in the year 2009 was just as high as in aeronautics.[29]

Studies on the economic footprint at the regional level find an audience particularly among political decision-makers and often address current issues. The eligibility of research and development for government funding may be noted as an example of such an issue where the overall potential for economic benefit is juxtaposed to government spending by pointing out all of the possible effects within the economically interdependent structures.[30]

However, the national and regional studies also exhibit several weaknesses. Thus, for example, the size of the market is partly used as an indicator for the economic performance of the sector. Apart from the materials and services purchased from other industries, this indicator is also affected by the foreign trade balance. Depending on the sector's foreign trade balance, domestic production may be higher or lower than the market volume; thus this ratio only allows for limited conclusions with regard to the national and regional economic effects of a sector.

27 Among other things, cf. Fraunhofer ISI / A.T. Kearney (2005); PricewaterhouseCoopers (2011); Earl-Slater, A. (1998); Sharma, A. (1999); DeVol, R. et al. (2004); Hevesi, A.G. / Bleiwas, K.B. (2005); BDI (2013).

28 Cf. Fraunhofer ISI / A.T. Kearney (2005); PricewaterhouseCoopers (2011); BDI (2013).

29 Cf. BDI (2013).

30 Cf. Hevesi, A.G. / Bleiwas, K.B. (2005).

2.4.3. INTERIM CONCLUSION

Research of the literature indicates that there are no uniform and complete data available with regard to the global economic impact of the pharmaceutical industry. Thus far no study has examined the direct, indirect and induced effects exercised by the pharmaceutical industry on the global economy. There are only initial studies with the aim of analyzing the economic importance of the pharmaceutical industry at the national or continental level. A comprehensive concept for analysis of the global economic footprint has yet to be compiled.

Moreover, the calculation of certain ratios is not coherent. If one considers the various ratios for the global pharmaceutical market it becomes clear that different authors use different approaches and therefore the ratios indicated cannot be compared. For the aim of the study, measurement of the economic importance of the global pharmaceutical industry, it is necessary that all of the determinable ratios have an equivalent in the calculations of the official statistical offices because otherwise no comparability can be established.

3. MEASUREMENT OF THE GLOBAL FOOTPRINT OF THE PHARMACEUTICAL INDUSTRY

The preceding review of the literature provided diverse knowledge with regard to the most important characteristics and possible approaches for determination of the economic footprint. Within the scope of this feasibility study value added and job-creating effects will initially be at the forefront of this chapter when it comes to an analysis of the economic footprint. The aim is to present a methodological approach with which the direct economic effects of the economic footprint of the global pharmaceutical industry can be calculated.

In this chapter important data suppliers and their statistics will be presented first (Chapter 3.1). The relevant statistics shall be derived from this (Chapter 3.2). The focus shall be placed on data with regard to production value, gross value added, employment, compensation for employees, capital expenditures in tangible assets and the research and development expenditures of the pharmaceutical industry. In Chapter 3.3 the procedure for measurement of the economic footprint is discussed. With the value added approach a methodology for closing existing data gaps is introduced. The chapter concludes with a description of the methodology for assessing the direct effects of the pharmaceutical industry which are discussed in Chapter 4.

3.1. OVERVIEW OF THE DATA SUPPLIERS AND STATISTICS

With regard to publicly available statistics a distinction may be made between the individual institutional facilities that make the statistics available and the functional purpose for collection of the relevant statistics. In institutional terms the statistical offices may be divided into three groups:

- international / intergovernmental organizations,
- national statistical offices and
- non-governmental organizations.[31]

The most important **international organization** when it comes to supplying global data is the United Nations Statistics Division (UNSD), the official statistics department of the United Nations. The UNSD collects and aggregates the data of the national statistical offices and in large part makes them available free of charge. Moreover, it defines guidelines for the collection of official statistics and supports national efforts to establish statistical offices. With regard to economic ratios the United Nations System of National Accounts (SNA) and industry statistics are of particular interest. The United Nations Industrial Development Organization (UNIDO) is concerned with industrial development and thus industry statistics. The statistics are maintained in order to illustrate

31 Extensive listings of official statistical organizations may be found, among other things, at the following Internet sites: http://www.unece.org/stats/links.html#NGO; http://unstats.un.org/unsd/methods/inter-natlinks/sd_intstat.htm; http://www.bls.gov/bls/other.htm; https://www.destatis.de/DE/ZahlenFakten/LaenderRegionen/Internationales/Institutionen/Institutionen.html.

and monitor global industrial trends. The UNIDO Industrial Statistics Database (INDSTAT) is of particular interest for the present study. Other international statistics are supplied, for example, by the World Health Organization (WHO), the World Bank and the International Monetary Fund (IMF).

Apart from the UN, **intergovernmental organizations** such as the Organisation for Economic Co-operation and Development (OECD) also make extensive economic statistics available. The Database for Structural Analysis (STAN) should be mentioned in particular when it comes to the analysis of industries in the OECD member countries. With STAN Industry, STAN Indicators and STAN Input-Output, it makes various statistics available that are suitable for studies of the economic footprint of diverse sectors. Eurostat, the statistical office of the European Union, also offers comparable statistics for calculating the economic performance of the 28 member states. Apart from preparation of the data, Eurostat provides guidelines for coherent methods of collection so that a high level of statistical comparability is ensured. The European System of National Accounts as well as other statistics (structural business statistics, Prodcom) provide an important basis for calculating the economic effects of the pharmaceutical industry.

On the basis of international guidelines the **national statistical offices** provide the data basis for international statistics that can be compared the world over. To this end data are collected from domestic economic units by the respective national offices. Structural, production and investment data as well as information on materials and incoming goods count, for example, among the most important data collected. They shed light on the economic development within the individual branches of industry, provide information about the goods produced in manufacturing and give some indication about interdependencies based on the intermediate consumption within the scope of a national economy.

A number of private-sector facilities are subsumed under **non-governmental organizations**. IMS Health should be mentioned in particular for the pharmaceutical industry.[32]

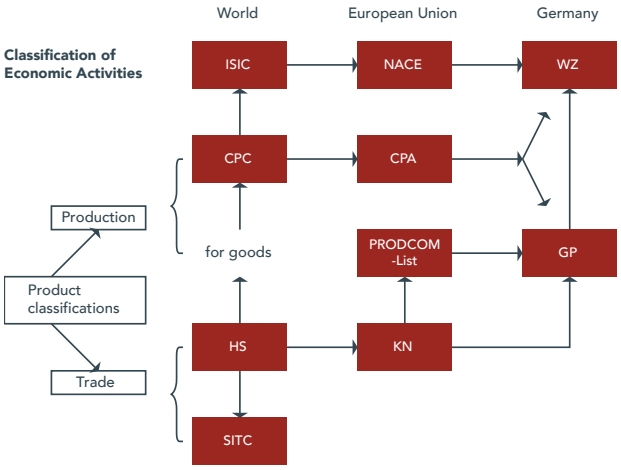
What is decisive when it comes to the functional purpose of collection is that the statistics are gathered in order to make statements about different sectors or even different product categories. Accordingly, a distinction can be made between statistics collected based on

- product classifications or
- industrial classifications.

32 Cf. Chapter 2.4.1.

Diagram 6 illustrates the connection between international classifications and the related multinational and national classifications. The multinational level is represented using the classifications of the European Union as an example and the German classifications can be seen at the national level.

DIAGRAM 6: INTERNATIONAL SYSTEM OF CLASSIFICATIONS OF ECONOMIC ACTIVITIES AND PRODUCTS



Source: Greulich (2009), p. 37.

The reference classifications stem from the International Family of Economic and Social Classifications. Branches of industry are classified according to the Industrial Classification of All Economic Activities (ISIC) and goods according to the Central Product Classification (CPC) and the Harmonized Commodity Description and Coding System (HS).[33]

The starting point of the international system of economic classifications is formed by the Harmonized Commodity Description and Coding System (HS), which is used for the purpose of customs and foreign trade statistics. The positions of the HS prescribe the subdivision of the Standard International Trade Classification (SITC) of the United Nations, which in turn provides the definitional basis for product classifications according to production statistics, such as the Central Product Classification (CPC). The classification of industrial branches is based on the typical products of the respective industry. The CPC thus provides the basis for the International Standard Industrial Classification (ISIC).[34] National and multinational classifications have developed on the basis of the described international classifications.

Pharmaceutical goods are recorded in Group 352, "Pharmaceutical products", in the **product classification** CPC Ver. 2. This group is in turn subdivided into eight subclasses. Table 4 shows an extract from the classification.

33 Cf. UN Statistical Commission (1999).

34 Cf. Greulich (2009), p. 37 f.; Eurostat (2008), p. 13f.

TABLE 4: EXTRACT FROM CLASSIFICATION CPC VERS. 2

CPC VERS. 2 (CENTRAL PRODUCT CLASSIFICATION)
0 - Agriculture, forestry and fishery products
01 - Products of agriculture, horticulture and market gardening
02 - Live animals and animal products (excluding meat)
…
1 - Ores and minerals; electricity, gas and water
11 - Coal and lignite; peat
12 - Crude petroleum and natural gas
…
2 - Food products, beverages and tobacco; textiles, apparel and leather products
21 - Meat, fish, fruit, vegetables, oils and fats
22 - Dairy products and egg products
…
3 - Other transportable goods, except metal products, machinery and equipment
31 - Products of wood, cork, straw and plaiting materials
32 - Pulp, paper and paper products; printed matter and related articles
…
35 - Other chemical products; man-made fibres
352 - Pharmaceutical products
3521 - Salicylic acid and its salts and esters
3522 - Lysine and its esters and salts thereof; glutamic acid and its salts; quaternary ammonium salts and hydroxides; lecithins and other phosphoaminolipids; acyclic amides and their derivatives and salts thereof;cyclic amides (except ureines) and their derivatives and salts
3523 - Lactones n.e.c., heterocyclic compounds with nitrogen hetero-atom(s) only, containing an unfused pyrazole ring, a pyrimidine ring, a piperazine ring, an unfused triazine ring or a phenothiazine ring system not further fused; hydantoin and its derivatives; sulphonamides
3524 - Sugars, chemically pure n.e.c.; sugar ethers and sugar esters and their salts n.e.c.
3525 - Provitamins, vitamins and hormones; glycosides and vegetable alkaloids and their salts, ethers, esters and other derivatives; antibiotics
3526 - Medicaments, for therapeutic or prophylactic uses
3527 - Other pharmaceutical products
3529 - Other articles for medical or surgical purposes
…
39 - Wastes or scraps
…

Source: UN Statistics Division (2013b).

With this deep breakdown of the products detailed statements can be made about the development of the produced quantities based on product classes. The product classifications are, in accordance with the designation, less relevant for determination of the entire economic effects of a sector than the industrial classifications. Nevertheless, the reporting in individual countries may be partly based on these classifications and the statistics on the basis of the product classifications may exhibit a higher quality. In order to make more detailed statements about the structure of the pharmaceutical industry and its most

important goods categories, statistics that are based on product classifications thus represent a useful source of information.

With the International Standard Industrial Classification of All Economic Activities (ISIC) the United Nations makes a standardized global classification of economic activity (**industrial classification**) available. With the conversion from ISIC Rev. 3.1 to ISIC Rev. 4 in the year 2006 the increasing importance of the pharmaceutical industry was taken account of by recording the manufacture of pharmaceutical products in its own section at the double-digit level. The following table provides an extract from classification ISIC Rev. 4.

TABLE 5: EXTRACT FROM CLASSIFICATION ISIC REV. 4

ISIC REV. 4 (INTERNATIONAL STANDARD INDUSTRIAL CLASSIFICATION OF ALL ECONOMIC ACTIVITIES)
A - Agriculture, forestry and fishery products
01 - Crop and animal production, hunting and related service activities
02 - Forestry and logging
…
B - Mining and quarrying
05 - Mining of coal and lignite
06 - Extraction of crude petroleum and natural gas
…
C - Manufacturing
10 - Manufacture of food products
11 - Manufacture of beverages
…
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations
210 - Manufacture of pharmaceuticals, medicinal chemical and botanical products
…
33 - Repair and installation of machinery and equipment
…

Source: UN Statistics Division (2013b).

In accordance with ISIC Rev. 3.1 the "Manufacture of pharmaceutical products" was only recorded as a subclass of the "Manufacture of chemical products", i.e. at a four-digit level in Class 2423, the "Manufacture of pharmaceuticals, medicinal chemicals and botanical products." In the course of the revision the manufacture of pharmaceutical products will now be recorded at the double-digit level in Department 21 "Manufacture of basic pharmaceutical products and pharmaceutical preparations." This classification covers all companies that produce basic pharmaceutical products and specialties as well as other pharmaceutical products. Since a number of statistics only publish data at a double-digit level, much better data availability will be ensured in the future after a conversion phase.

3.2. DERIVATION OF RELEVANT STATISTICS FOR DETERMINING THE ECONOMIC FOOTPRINT OF THE PHARMACEUTICAL INDUSTRY

In the following illustration the most important statistics are clearly represented according to institutions and functions. The following should be employed in particular as relevant statistics for quantification of the economic footprint:

- systems of national accounts,
- industry statistics and
- production statistics.

The two first statistics are based on the industry classification ISIC. The production statistics are based on product classification CPC. The matrix in Diagram 7 is derived by applying functional and institutional segregation of the statistics.

DIAGRAM 7: FUNCTIONAL AND INSTITUTIONAL OUTLINE OF THE RELEVANT STATISTICS

INSTITUTIONAL	FUNCTIONAL: National Accounts	Industry statistics	Production statistics
United Nations	SYSTEM OF NATIONAL ACCOUNTS (SNA) • Key data: GDP / GVA • Limitations: one-digit level, no Input-Output tables	INDUSTRIAL STATISTICS DATABASE (INDSTAT) • Key data: GVA / Output / Employment / W&S / Capital expenditures • Limitations: Not available for all countries (166 countries)	COMMODITY PRODUCTION STATISTICS • Key data: Output-Value / Output-Volume • Limitations: Not available for all countries
Eurostat	EUROPEAN SYSTEM OF ACCOUNTS 1995 (ESA 95) • Key data: GDP/ GVA / Employment / Wages and salaries (W&S) • Limitations: Only EU27	STRUCTURAL BUSINESS STATISTICS (SBS) • Key data: GVA / Output / Employment / W&S / Capital expenditures • Limitations: Only EU27	MANUFACTURED GOODS (PRODCOM) • Key data: Output-Value / Output-Volume • Limitations: Only EU27
National offices	NATIONAL ACCOUNTS • Data Source: primary data collection • Key data: GDP / GVA / Employment / W&S	COST STRUCTURE OF ENTERPRISES • Data Source: primary data collection • Key data: GVA / Output / Employment / W&S / Capital expenditures	PRODUCTION OF ENTERPRISES • Data Source: primary data collection • Key data: Output-Value / Output-Volume

Source: Own research.

The statistics in the diagram will be introduced in the following. In this case the focus is placed on the statistics of the United Nations. Apart from the organizations listed in the diagram, the OECD also provides data resources on

the national accounts as well as the industry statistics of its member states.[35] The statistics of the national offices will not be dealt with in greater detail in the following. Nevertheless, they are of great importance as they are employed for primary data collection and all superordinate international statistics avail themselves of the data stock of the national offices.

3.2.1. NATIONAL ACCOUNTS AS BASIS STATISTICS

An international standardized guideline for the preparation of national accounts is provided by the **System of National Accounts 2008 (2008 SNA)**. The standards of the guideline provide, among other things, the basis for measurement of the gross domestic product, the most widely employed indicator of economic performance.[36]

The highest level of national accounts, the **System of National Accounts (SNA)**, of the UNSD is also based on this guideline. 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. However, the data are limited to economic sections and thus only provide ratios on a one-digit level. As far as relevant ratios for the economic footprint is concerned, the SNA only indicates the gross value added and capital expenditures in intangible assets. Moreover, the SNA does not contain any input-output tables and thus does not shed any light on the interdependencies between the pharmaceutical industry and other production sectors. For this reason it is not possible to calculate any multipliers with regard to the spillover effects of the sector using the SNA.

Compared with the System of National Accounts of the United Nations the **European System of Accounts (ESA)** is published by Eurostat on a double-digit level; accordingly, Eurostat provides ratios about the pharmaceutical industry. Apart from the gross value added, statistics are maintained on production value, employment and employee compensation. Nonetheless, there are also gaps in this database as the data for each year are not available for all European nations. In contrast to the data offered by the United Nations Eurostat also provides the supply, use and input-output tables of the Member States. In addition to the national tables Eurostat provides a respective aggregated table for the Euro Area and the European Union. Following successful conversion of the international classification to ISIC Rev. 4 the tables will include pharmaceutical products as a production sector. Thus the database provides comprehensive information with regard to the sector's intermediate consumption

35 The following Internet page provides an overview with regard to the relevant statistics of the OECD: http://www.oecd.org/std/.

36 Cf. United Nations et al. (2009).

structures and thereby makes it possible to also assess the multipliers and the spillover effects of the sector.

The **World Input-Output Database (WIOD)**, the project aimed at compiling global input-output tables, was also subsidized by the European Union. It was concluded in May 2012. The new database provides the national supply, use and input-output tables of 40 countries in the period from 1995 to 2009. In addition to the national tables, a global input-output table was prepared as well. However, the tables of the WIOD were provided on a higher level of aggregation for only 35 branches of industry. The classification ISIC Rev. 4 on the other hand classifies 88 branches of industry. Through higher aggregation of the industries the manufacture of pharmaceutical products is not shown as an individual industry, but rather integrated into the manufacture of chemical products as an industry. Thus the global database for input-output tables does not provide any more accurate information with regard to materials and services purchased. However, using the ESA and other national systems of accounts, a satellite account of the sector can be created in the worldwide IO-table with information about interdependencies based on the intermediate consumption in the pharmaceutical industry. On the basis of this satellite account the spillover effects of the sector worldwide can thus be determined.[37]

3.2.2. INDUSTRY STATISTICS

Apart from the System of 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 preparation of the SNA on the one hand, but also to answer questions specific to the industry. Compared with the SNA the statistics are available at a deeper level (four-digit level) and show additional ratios.

The **Industrial Statistics Database (INDSTAT)** from UNIDO is available in two versions, INDSTAT2 and INDSTAT4. Both databases contain key figures for employment, production, value added, wages and salaries as well as gross capital expenditures in manufacturing. INDSTAT2 provides data for 166 countries for a period as of 1963. INDSTAT4 covers a period as of 1990 for a total of 135 countries. The designation INDSTAT4 makes it clear that the database contains ratios on a four-digit level of the ISIC classification Rev. 3, while INDSTAT2 makes 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.

37 Additional information on determination of the spillover effects by means of satellite accounts can be found in the following sources: Holub H.-W. / Schnabl H. (1994), p. 83ff.; Brümmerhoff, D. (2007), p. 283ff.; Henke, K.-D. / Neumann, K. / Schneider, M. et al. (2010), pp. 87-91; Schwarz, N. (2005); Ahlert, G. (2003); Statistisches Bundesamt (2011); Ostwald, D.A. / Henke, K.-D. / Kim, Z.-G. (2013); Heeger, D. (2013).

However, it must be noted that the availability of data strongly varies from country to country since UNIDO is dependent on the respective national statistical offices and does not collect its own data. For example, only data for 67 of 135 countries are available for the gross value added in the period under review. A further problem affecting the database consists in the type of data collection; thus ratios such as production value and gross value added are calculated differently in the various countries and are not adjusted by UNIDO – thus the database contains, for example, values on manufacturer's prices and factor prices in the respective national currency. Only the statistics of the last five years are freely available. There is a charge for data queries as of 1970.[38]

Within Europe the **Structural Business Statistics (SBS)** from Eurostat represent the counterpart to INDSTAT. The SBS data are similarly available on a four-digit level. Due to the comprehensive data provided by the ESA, use of the SBS will be dispensed with for initial measurement of the economic footprint.

3.2.3. PRODUCTION STATISTICS

In addition to the statistics based on industrial classifications the production statistics based on product classifications represent a further important source of data for a more thorough analysis of the pharmaceutical industry.

The production statistics, **Commodity Production Statistics**, of the United Nations take the output volumes and output values of individual industrial goods into consideration. Accordingly, no data with regard to the economic importance of the pharmaceutical industry are collected; however, the statistics can provide information about which pharmaceutical goods are produced in individual countries. However, it must be noted that although it gathers production data in more than 200 countries, the database contains much less information for a number of goods. Thus, as a rule, data are only available for individual industrial goods in less than 20 countries.

Eurostat also makes an extensive database available with regard to goods production. **Prodcom**, which is derived from "PRODuction COMmunautaire" (community production), contains production statistics from more than 3,900 product categories. The economic image of a sector can be expanded using this deeply subdivided listing of goods and statements can be made about the share of individual goods in overall production. The data basis is provided in turn by national surveys, such as the production survey in Germany.

38 Further information may be obtained from the Internet site of UNIDO at the following address: http://www.unido.org/resources/statistics/statistical-databases.html.

3.2.4. EXCURSUS: STATISTICS ON RESEARCH AND DEVELOPMENT EXPENDITURES

Except for research and development expenditures the statistics discussed in the previous section cover all of the ratios for determining the sector's economic footprint. For information with regard to the research and development expenditures of the pharmaceutical industry specialized science and technology statistics must be taken into consideration Diagram 8.

DIAGRAM 8: RELEVANT STATISTICS WITH REGARD TO THE R&D EXPENDITURES

United Nations	UNESCO INSTITUTE FOR STATISTICS • Key data: Employment, R&D Expenditure in USD and as a percentage of GDP • Limitations: 147 countries, No industry specific data
OECD	STRUCTURAL ANALYSIS (STAN) DATABASE • Key data: R&D expenditures in Industry (ISIC Rev. 3), R&D intensity using value added / production • Limitations: Only OECD countries
Eurostat	SCIENCE, TECHNOLOGY AND INNOVATION STATISTICS • Key data: Employment, Business enterprise R&D expenditure by economic activity (ISIC Rev. 4) • Limitations: Only EU27
National offices (ZEW)	COMMUNITY INNOVATION SURVEYS (CIS) • Data Source: primary data collection • Key data: Employment, Business enterprise R&D expenditure by economic activity (ISIC Rev. 4)

Source: Own research.

Statistics on worldwide research and development efforts are maintained by the UN through the **UNESCO Institute for Statistics**. The statistics contains data for 147 countries. The focus is placed on employment data and financial expenditures for research and development. Industry-specific data are not available, which is why the database does not make it possible to draw any conclusions with regard to research and development expenditures for the pharmaceutical industry.

Industry-specific data are contained in the **Structural Analysis (STAN) Database** of the OECD. The subordinated statistics, STAN Indicators Database, show research and development expenditures in relation to gross value added and production value. Thus the research and development intensity of the pharmaceutical industry in the OECD member states is calculated. The statistics are still based on the classification ISIC Rev. 3 and are available for the period from 1995 to 2009.[39] With the Frascati Manual the OECD is also responsible for the worldwide guideline with regard to collecting statistics on research and development.[40]

39 Further information about the STAN database may be obtained from the Internet site of the OECD under the following address: http://www.oecd.org/industry/ind/stanstructuralanalysisdatabase.htm.

40 Cf. OECD (2002).

At the European level Eurostat makes data available on research and development expenditures within the scope of **science, technology and innovation statistics** and employment according to industries. The basis of the statistics discussed is formed by the data collected at the national level within the scope of the Community Innovation Survey (CIS) in accordance with the Frascati Manual.[41]

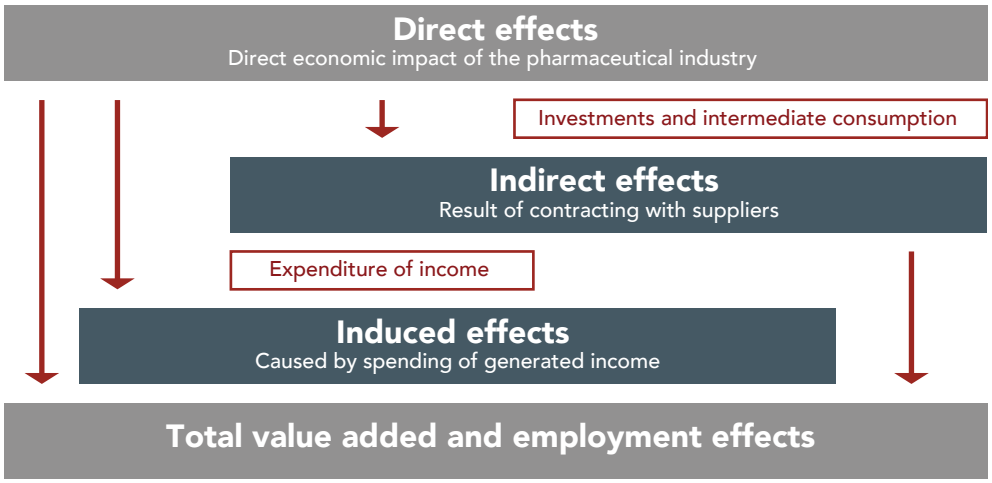
3.3. PROCEDURE FOR DETERMINING THE ECONOMIC FOOTPRINT

After both the characteristics of the economic footprint as well as the relevant statistics have been discussed, the procedure for determining the economic footprint of the pharmaceutical industry shall now be described in the following.

3.3.1. STEPS FOR MEASUREMENT OF THE ECONOMIC FOOTPRINT

The individual components of the economic footprint are graphically represented in the following:

DIAGRAM 9: EFFECTS OF THE ECONOMIC FOOTPRINT



Source: Own research.

In order to measure the economic footprint of the pharmaceutical industry the direct effects of the sector must be determined in an initial step. As a result of the incomplete situation with regard to data, it makes sense to initially focus such calculation on the growth and job-creating effects; cf. Section 3.3.2.

As became clear in the review of the literature, determination of the direct effects alone does not suffice. Therefore the spillover effects of the pharmaceutical industry on other industries must be taken into consideration in a second

41 Further information may be obtained from the Internet site of Eurostat at the following address: http://epp.eurostat.ec.europa.eu/portal/page/portal/microdata/cis.

step. The IO-tables from Eurostat may be used in order to determine the multipliers that are required for this purpose. They indicate the interdependencies based on the intermediate consumption that are specific to the sector. On the basis of this knowledge a satellite account of the sector can be created in the worldwide IO-table of the WIOD. Through integration of the spillover effects not only would the direct effects of the sector become clear. The indirect and induced effects could also be quantified, so that the entire economic impact of the sector would become evident. However, the calculations described do not form the subject of the present feasibility study.

3.3.2. VALUE ADDED APPROACH AS THE BASIS FOR CALCULATION OF DIRECT ECONOMIC EFFECTS

The preceding sections have shown which statistics and information are available for quantification of the global footprint. The overview of the statistical offices and the relevant statistics makes clear that a wealth of data is already available with regard to the pharmaceutical industry. This availability will continue to improve in the future since the sector was accorded more importance with its own double-digit within the scope of ISIC Revision 4 in the year 2008. However, it could also be demonstrated that the various statistics do not all show the necessary ratios completely and entirely without gaps over time. Thus all countries do not keep the necessary statistics and the survey frequency also deviates between the statistics of the individual countries. Since they provide the data basis for international statistics, there must be a search for solutions in order to close the data gaps.

Complete global data on economic development often provide more highly aggregated statistics, such as the System of National Accounts of the United Nations. By means of the value added approach[42] the values of aggregated statistics can be disaggregated to the required degree of detail.[43] In order to quantify the ratios on a deeper level it is necessary to determine disaggregation factors that are specific to the industry. To this end basis statistics that collect the ratios in disaggregated fashion have to be employed. By means of these statistics the proportionate share of the pharmaceutical industry can be determined. The share values are then multiplied by the official ratios of the aggregated statistics, so that the data can be disaggregated to a 2- to 4-digit level. In formal terms the following relationship is derived:

$$X_{2\text{-}digit} = X_{1\text{-}digit} * DISC_{2\text{-}digit}$$

X = ratio

DISC = disaggregation factor

42 Cf. Ranscht, A. (2009); Ostwald, D.A. (2009); Frie, B. / Muno, K. / Speich, W.-D. (2011).

43 Cf. Ostwald, D.A. (2009), p. 75ff.

In order to ensure agreement with the superordinate statistics only the disaggregation factors are calculated from the various basic statistics. Their sum must result in one. This guarantees that ratios of a superordinate level are completed divided among the subordinate level, e.g. from the one-digit level to the subordinated two-digit level, etc.[44]

An example for determination of the disaggregation factors is represented by calculation of the gross value added on the basis of the System of National Accounts. In the System of National Accounts the data are provided only on the one-digit level; accordingly, the statistics only provide data on the manufacturing sector. In order to disaggregate the ratios on the two-digit level and thus determine data with regard to the pharmaceutical industry, various basis statistics – such as INDSTAT, STAN and the ESA – also have to be employed. Since the basic statistics show the gross value added of both the manufacturing (one-digit) and the pharmaceutical industry (two-digit), the proportionate share accounted for by the pharmaceutical industry in manufacturing can be determined. The share values are then multiplied by the official ratios of the SNA, so that the data can be disaggregated to a 2- to 4-digit level.

The existing data gaps can be closed through resolute application of the value added approach in the individual countries and over time.

3.3.3. METHOD FOR MEASURING THE DIRECT EFFECTS OF THE ECONOMIC FOOTPRINT

In the following initial methodical approaches toward quantification of the direct economic impact of the pharmaceutical industry shall be described before the results in Chapter 4 are presented.

GROSS VALUE ADDED AS A BASIC QUANTITY

In the preceding section it was briefly described how the gross value added of the pharmaceutical industry can be determined from the official statistics by means of the value added approach. To this end the relevant ratios are gleaned from the SNA. Using the value added approach and the determined disaggregation factors the direct effects of the sector can be determined with regard to gross value added.

The worldwide gross value added is shown in the System of National Accounts. The database includes development of the gross value added from the years 1970 to 2011; however, it makes this information available only on a one-digit level. Accordingly, no data are available with regard to the pharmaceutical

44 Cf. Ostwald, D.A. (2009), pp. 84-86.

industry; but the statistics contain information for the manufacturing industry. Since only the SNA provides global ratios with regard to gross value added and the gross domestic product, the statistics represent the basis for consideration of the global economic footprint. Within these statistics the ratios are also separately shown at the national level, so that the gross value added of the manufacturing industry is available for all of the countries in the world.

In order to determine the gross value added of the pharmaceutical industry from the SNA the value added approach must be used. With the help of the value added approach the national disaggregation factors of the pharmaceutical industry as part of the manufacturing industry are determined from basic statistics. INDSTAT4, STAN Database and the ESA form the basic statistics for the analysis. Since INDSTAT4 is available only for the years from 2006 to 2010, most of the disaggregation factors could be determined for this period. The share values of the pharmaceutical industry in the manufacturing industry were determined for 68 countries altogether. These 68 countries account for 89.9 percent of the worldwide gross value added and 92.3 percent of the value added in manufacturing in the year 2011. However, here it should be pointed out that the disaggregation factors of the 68 countries could not be determined for all countries in the entire period under review; which is why the share values had to be updated in part.

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. Compared with the average value the median has the advantage that it is more robust in relation to extremely deviating values. Moreover, evaluation of the median and average value showed that the median is usually below the average values. Thus use of the median ensures a conservative estimate of the gross value added. The regional median of the disaggregation factors was determined in accordance with the geographical regions of the UN.[45] For the sake of better comprehension the approach used for calculating the share values in Eastern Europe is described in the following. For the countries with the gray, shaded backgrounds in the table – the Czech Republic, Hungary, Poland, Romania, Russia and Slovakia – the pharmaceutical industry's share could be determined from basic statistics, whereas an assumption has to be made for the countries where basic statistics are unavailable – Belarus, Bulgaria, the Republic of Moldavia and the Ukraine. To this end the median of the share values of the Eastern European countries was formed (blue row). This value was adopted as the assumption for the countries without basic statistics. For determination of the global gross value added the share values were finally multiplied by the gross value added of the manufacturing industry from the SNA in the respective country.

45 Cf. UN Statistics Division (2013c).

TABLE 6: SHARE OF THE PHARMACEUTICAL INDUSTRY IN THE MANUFACTURING INDUSTRY

QUANTIFICATION OF THE PHARMACEUTICAL INDUSTRY'S SHARE IN THE MANUFACTURING INDUSTRY						
	2006	2007	2008	2009	2010	2011
Czech Republic	1.76%	1.59%	1.53%	1.72%	1.89%	1.69%
Hungary	5.80%	5.28%	5.05%	6.07%	6.63%	6.60%
Poland	1.29%	1.97%	1.97%	1.98%	2.00%	1.76%
Romania	1.19%	1.08%	0.98%	1.45%	0.25%	-0.02%
Russian Federation	0.74%	0.74%	0.74%	1.12%	1.21%	0.91%
Slovakia	0.84%	0.77%	0.86%	1.48%	1.31%	1.19%
Eastern Europe (Median)	1.24%	1.33%	1.26%	1.60%	1.60%	1.44%
Belarus	1.24%	1.33%	1.26%	1.60%	1.60%	1.44%
Bulgaria	1.24%	1.33%	1.26%	1.60%	1.60%	1.44%
Republic of Moldova	1.24%	1.33%	1.26%	1.60%	1.60%	1.44%
Ukraine	1.24%	1.33%	1.26%	1.60%	1.60%	1.44%

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

JOB-CREATING EFFECTS AS A FURTHER BASIC QUANTITY

However, global statistics are not available for all ratios. 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, and thus 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 the ESA. Through evaluation of the statistics the employment figures of the pharmaceutical industry in 73 countries could be collected. However, here too the values had to be partly updated in the period under review. 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 INDSTAT4 regional medians. This factor was multiplied by the gross value added of the respective country in order to determine the worldwide job-creating effects.

PRODUCTION VALUES AND EMPLOYEE COMPENSATION AS DERIVED QUANTITIES

As in the case of employment no global statistics exist with regard to production value and employee compensation. In order to provide for an initial assessment of these indicators nevertheless, the gross value added shall be employed as a basic quantity. By using the data from the INDSTAT4 statistics the respective ratio can be shown in relation to the gross value added.

In order to extrapolate the production value its relationship to the gross value added was determined by means of INDSTAT 4 for 65 countries. In turn the regional median could be determined for the known ratios. Insofar as this regional median was also transferred as an assumption to all countries without a data basis, the relationship between gross value added and production value can be measured for all regions. Multiplication of the share values with the determined national gross value added allows for initial extrapolation of the global production value. Employee compensation was extrapolated using the same method. INDSTAT 4 makes it possible to determine the ratios for 64 countries; for all other countries the regional median of the ratios was adopted as an assumption.

CAPITAL INVESTMENTS AND RESEARCH AND DEVELOPMENT EXPENDITURES AS DERIVED QUANTITIES

Capital investments are recorded as a ratio within the scope of the System of National Accounts. However, in contrast to the gross value added, the ratio is shown only for the economy as a whole and not on a one-digit level. In order to be able to say anything about the capital expenditures of the pharmaceutical industry, disaggregation factors from the economy as a whole would thus have to be determined on a two-digit level. But since INDSTAT only provides data with regard to the manufacturing industry, the statistics cannot be used to this end. Freely accessible statistics with regard to the capital expenditures of the sector may be obtained from the STAN Database and the ESA. These data stocks in turn make it possible to calculate disaggregation factors. Thus worldwide investments could be estimated with the value added approach for a comprehensive calculation of the economic footprint.

However, a pure view of the absolute capital expenditures of a sector is not particularly conclusive. Rather a sector's expenditure on investments as well as research and development becomes clear through the calculation of ratio indices. This is underscored by the following circumstance: In the year 2010 the German pharmaceutical industry invested a total of EUR 1.6 billion in property, plant and equipment and the mechanical engineering industry EUR 5.6 billion. These figures suggest that the capital expenditures in mechanical engineering exceed the efforts in the pharmaceutical industry by a factor of 3.5. If, however, the investments in relation to the value added, i.e. the regional economic strength of a sector, are determined then the sector-specific significance increases. The

relationship between investments and gross value added is referred to as investment intensity. Thus the gross value added of the pharmaceutical industry in Germany amounts to EUR 16.6 billion in the year 2010 compared with EUR 73.8 billion in machine construction. As a result it may be noted that with a total of 9.9 percent the investment intensity in the pharmaceutical industry clearly exceeds the investment intensity in the mechanical engineering industry (7.5 percent).[46] Accordingly, the investment intensity must be taken into consideration for meaningful evaluation of the capital expenditures for investments in property, plant and equipment.

The research and development intensity is formed from the relationship of the expenditures for research and development to the sector's gross value added. As already shown in Section 3.2.4 the expenditures for research and development may only be derived from specialized science and technology statistics. The majority of data with regard to the research and development expenditures of the pharmaceutical industry can be found in the STAN Indicators statistics of the OECD and the science, technology and innovation statistics from Eurostat. However, with this stock of data global extrapolations may only be performed to a limited degree. Apart from the growth and job-creating effects, the available information on investment in tangible assets as well as the research and development intensity of the pharmaceutical industry will be presented in the following analysis of the direct effects of the pharmaceutical industry.

46 Cf. German Federal Statistical Office (2012).

4. ASSESSMENT OF THE DIRECT ECONOMIC EFFECTS OF THE PHARMACEUTICAL INDUSTRY

The concluding step of the research project consists in an initial assessment of the economic effects of the global pharmaceutical industry. It provides important information with regard to the global economic footprint of the pharmaceutical industry. Within the scope of the feasibility study the calculation is limited to the direct effects. With the aid of the method presented the following questions may be answered by way of example:

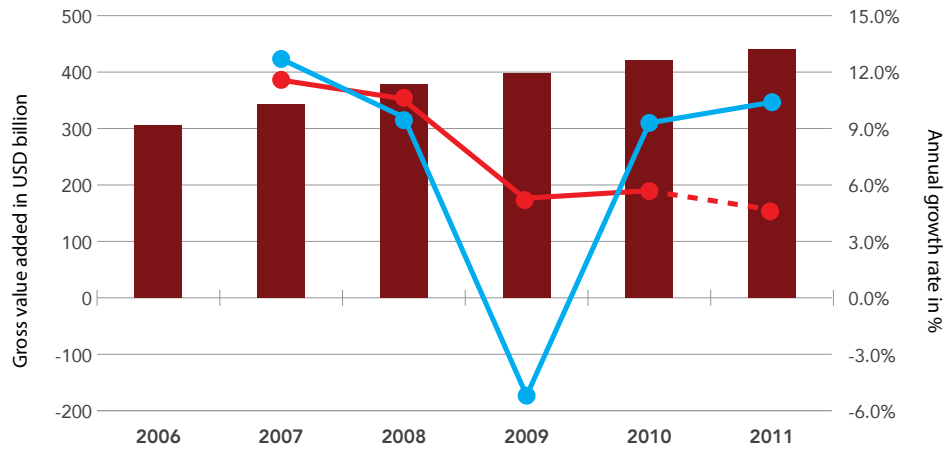
- How high is the global gross value added of the pharmaceutical industry? How important is the sector for the worldwide economy? (Section 4.1)
- How many jobs does the pharmaceutical industry account for worldwide? How has hiring behavior changed over the period under review? (Section 4.1)
- How high is employee compensation in the global pharmaceutical industry? How high is the average employee compensation per capita? (Section 4.2)
- How has the production value of the global pharmaceutical industry changed over the period under review? (Section 4.2)
- What investments and expenditures are made by the pharmaceutical industry for research and development? (Section 4.3)

In the following economic ratios are represented and analyzed in a time series from 2006 to 2011.

4.1. GROWTH AND EMPLOYMENT STIMULI OF THE PHARMACEUTICAL INDUSTRY

Diagram 10 represents the development of the gross value added and the annual growth rate of the gross value added over time.

DIAGRAM 10: DEVELOPMENT OF THE GROSS VALUE ADDED IN BILLION USD AND THE ANNUAL GROWTH RATE (RED LINE) IN COMPARISON TO THE WORLDWIDE GDP (BLUE LINE)

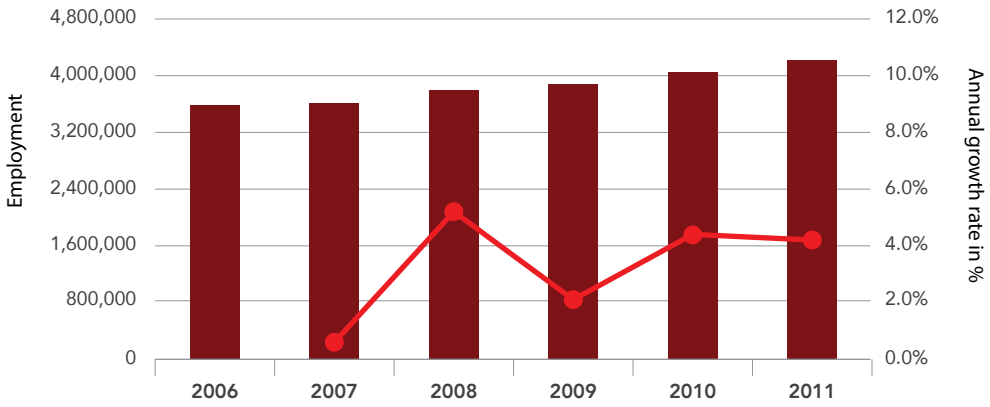


Source: SNA, INDSTAT4, ESA, STAN Database, own calculation.

In the years from 2006 to 2011 the gross value added increased by USD 134.5 billion to reach a total of USD 441.0 billion. This corresponds to an average annual growth rate of 7.5 percent. Thus the pharmaceutical industry grew on the average by 0.3 percent more than the worldwide gross domestic product (7.2 percent). In the year 2011 the pharmaceutical industry accounted for 3.9 percent of the gross value added in manufacturing worldwide. In the year 2011 the economic strength of the sector roughly corresponded to the gross domestic product of Argentina, with USD 448.2 billion.[47] The pharmaceutical industry generated a 0.6 percent share of the worldwide gross value added. The diagram indicates that the sector experienced strongly increased rates of growth in worldwide value added with a respective 11.6 and 10.5 percent particularly in the years 2007 and 2008. As of the year 2009 the sector grew by an annual 5.2 percent on the average, thus confirming the findings that the sector was able to provide positive growth stimuli worldwide during the period under review.

The following diagram shows the development of the employment relationships for the pharmaceutical industry as well as the annual rates of change.

DIAGRAM 11: DEVELOPMENT OF EMPLOYMENT AND THE ANNUAL GROWTH RATE



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

The pharmaceutical industry employs approximately 4.23 million people worldwide. The number of the employed persons increased by 630,000 in the years from 2006 to 2011. This corresponds to an average annual employment increase of 3.3 percent. Thus it becomes clear that the annual employment growth rates are positive throughout, but are quite different over time. Thus the growth rates in the year 2007 amount to 0.6 percent and 2.1 percent in the year 2009. The largest increase in employment took place in the year 2008 with a growth rate of 5.2 percent. Since no global statistics are available with regard to gainful employment, no comparison with global growth rates can be made.

47 Cf. UN Statistics Division (2013d).

A comparison of the number of persons employed in the sector with other countries is worthy of remark. Thus the number of persons employed worldwide in the pharmaceutical industry corresponds, for instance, to the employment figure for Austria. In Austria approximately 4.1 million persons were employed in the year 2011.[48]

In sum the most important findings are listed in the following table:

TABLE 7: GROSS VALUE ADDED IN THE PHARMACEUTICAL INDUSTRY IN USD BILLION

	2006	2007	2008	2009	2010	2011
Gross value added (USD billion)	306.5	342.1	378.3	398.5	421.1	441.0
Growth rate		11.6%	10.6%	5.3%	5.7%	4.7%
Global share	0.62%	0.61%	0.62%	0.68%	0.66%	0.63%

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

TABLE 8: EMPLOYMENT IN THE PHARMACEUTICAL INDUSTRY

	2006	2007	2008	2009	2010	2011
Employment	3,600,000	3,620,000	3,810,000	3,890,000	4,060,000	4,230,000
Growth rate		0.6%	5.2%	2.1%	4.4%	4.2%

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

4.2. ASSESSMENT OF PRODUCTION VALUE AND EMPLOYEE COMPENSATION

Apart from measurement of the growth and job-creating effects of the pharmaceutical industry an initial projection of the sector-specific production value and compensation for employees was effected on the basis of the gross value added. The production value of the pharmaceutical industry was determined on the basis of an initial estimate. The approach is described in Chapter 3.4.3. Table 9 shows the development of the production value of the pharmaceutical industry.

48 Cf. Eurostat (2013).

TABLE 9: PRODUCTION VALUE OF THE PHARMACEUTICAL INDUSTRY IN USD BILLION

	2006	2007	2008	2009	2010	2011
Output (USD billion)	634.2	718.7	793.5	831.9	884.4	940.8
Growth rate		13.3%	10.4%	4.8%	6.3%	6.4%
Value added rate	48.3%	47.6%	47.7%	47.9%	47.6%	46.9%

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

The production value of the pharmaceutical industry increased by an annual average of 8.2 percent or by more than USD 300 billion in the years from 2006 to 2011. In the year 2011 the production value amounted to USD 940.8 billion. Thus the value is comparable with the most ratios from IMS Health. According to IMS Health the market volume amounted to approximately USD 956 billion in the year 2011.[49]

The value added rate, i.e. the value added in relation to the production value fell by 1.4 percentage points to 46.9 percent from the year 2006 to 2011. On the average there was a value added rate of 47.7 percent.

Table 10 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 10: EMPLOYEE COMPENSATION IN THE PHARMACEUTICAL INDUSTRY IN USD BILLION

	2006	2007	2008	2009	2010	2011
Wages & salaries (USD billion)	67.4	75.9	82.9	80.4	85.7	93.3
Growth rate		12.7%	9.3%	-3.1%	6.6%	8.9%
Wages & salaries per employee	18,700	21,000	21,800	20,700	21,100	22,100
Growth rate		12.3%	3.8%	-5.0%	1.9%	4.7%

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

In the year 2011 the pharmaceutical industry paid wages and salaries in the total amount of USD 93.3 billion. It becomes clear that such compensation rose by 6.7 percent per year on the average. However, the decrease in employee compensation in the year 2009 is worthy of remark. Moreover, it should be noted that employee compensation increased much more strongly than the number

49 Cf. Chapter 2.4.1.

of the employed persons. This can also be confirmed with the increase in employee compensation per gainfully employed individual. This figure increased by USD 3,400 to USD 22,100 between the years 2006 and 2011. This corresponds to an increase of 18.2 percent in the period under review.

4.3. INVESTMENT ACTIVITY AND EXPENDITURES FOR RESEARCH AND DEVELOPMENT IN THE PHARMACEUTICAL INDUSTRY

In addition to the ratios already presented the capital expenditures are of special interest when it comes to placing the economic footprint of the pharmaceutical industry into perspective. They provide important information with regard to the capital intensity of the sector. Ratio indices are often used for better classification in the scientific discussion with regard to these ratios. In the following investment intensity is shown as a ratio of capital expenditures to the gross value added of the pharmaceutical industry. The table shows the results for selected countries for which information is contained in the Database of the OECD. However, it also becomes clear that this information is not included in the database for all countries over the entire period under review.

TABLE 11: INVESTMENT INTENSITY OF THE PHARMACEUTICAL INDUSTRY

Country	2006	2007	2008	2009	2010	2011	"Ø (2006-2009)"
Austria	9.7%	12.8%	13.0%	10.9%	9.3%	10.1%	11.6%
Belgium	20.7%	26.9%	25.5%	22.8%	17.0%	20.2%	24.0%
Czech Republic	18.9%	24.8%	18.6%	18.6%	14.0%	24.6%	20.2%
Denmark	22.2%	18.6%	20.8%	12.4%	9.2%	9.8%	18.5%
Finland	5.4%	5.1%	4.9%	7.0%	5.3%	4.2%	5.6%
Germany	13.0%	12.9%	11.2%	10.6%	9.9%		11.9%
Hungary	27.3%	21.5%	23.1%	28.6%	20.1%		25.1%
Italy	17.1%	18.5%	18.7%	19.5%	21.2%	23.4%	18.4%
Netherlands	24.3%	18.6%	18.3%	17.8%			19.7%
Slovenia	19.3%	24.5%	25.9%	21.7%			22.8%
United States	8.0%	9.1%	7.6%	6.1%			7.7%
Median - Pharmaceutical Industry (11 countries)	18.9%	18.6%	18.6%	17.8%			18.5%
Median - Manufacturing (11 countries)	16.4%	17.4%	18.9%	17.1%			17.4%
Median - Total Economy (11 countries)	23.5%	24.3%	24.4%	22.7%			23.7%
World (SNA)	23.4%	23.8%	23.9%	22.9%	22.9%	23.5%	23.5%

Source: OECD, SNA, own calculation.

There is a clear difference in investment intensity both over time and from country to country. Thus, for example, with a total of 25.1 percent on the average the investment intensity in Hungary in the years from 2006 to 2009 ranks as the highest. In the USA, however, this figures amounts to only 7.7 percent. An investment intensity of 25.1 percent in Hungary means that every fourth U.S. dollar of value added is reinvested again. When all eleven countries are taken into consideration a median of 18.5 percent on the average is derived in the years from 2006 to 2009. In the same period the average investment intensity in the manufacturing industry amounts to 17.4 percent, based on the countries specified in the table. If all sectors are taken into account, then an average investment intensity of 23.7 percent is derived for the countries considered. According to the System of National Accounts this amounts to 23.5 percent on the average worldwide. These ratios make it clear that when viewed across sectors the pharmaceutical industry cannot be ranked among the capital-intensive sectors. With pure observation of the manufacturing industry that of the pharmaceutical industry, however, exceeds the average investment intensity by 1.1 percentage points. The financial and economic crisis and the associated declining investments also become clear when investment intensity is taken into consideration. Thus a 0.8 percentage point decrease in investment intensity resulted in a total of 17.8 percent in the year 2009.

Future questions should also address the net investments of the sector. Net investments correspond to gross investments less depreciation. If gross investments correspond precisely to depreciation, then the industry invests in a sustainable manner. In the case of positive net investments the gross investments exceed depreciation, then the sector increases its production potential. Negative net investments indicate a decrease in substance. Accordingly, net investments provide information about the efforts undertaken by an industry in order to preserve and enhance its production potential and thus its ability to compete. Net investment intensity can be considered as a measure of modernization and process optimization in the various sectors.

In order to be able to draw any conclusions about the innovative strength of the global pharmaceutical industry the relationship between research and development expenditures and the gross value added is often pointed out. The ratio index provides information about the sector's research and development intensity. The ratio indices are shown in Table 12. Only those countries for which information is available from the STAN Indicators database of the OECD are taken into consideration.

TABLE 12: RESEARCH AND DEVELOPMENT INTENSITY OF THE PHARMACEUTICAL INDUSTRY

Country	2006	2007	2008	2009
Austria	19.7%	16.1%		
Belgium	30.9%	31.9%		
Canada	26.1%			
Czech Republic	40.0%	10.7%		
Denmark	44.5%			
Finland	37.5%	40.7%		
France	33.0%			
Germany	23.7%	19.8%		
Greece	3.9%	4.2%		
Hungary	19.0%	17.0%		
Italy	4.8%	5.8%		
Japan	35.5%	46.1%	52.7%	
Korea	7.9%	9.7%	9.5%	9.3%
Mexico	1.4%	1.6%		
Netherlands	30.0%	26.4%		
Norway	11.5%	10.9%		
Poland	5.1%			
Slovak Republic		7.9%		
Slovenia	16.5%			
Spain	17.5%	18.4%		
Sweden	20.9%	26.6%		
United Kingdom	48.5%			
United States	48.3%	56.0%	56.8%	
Median - Pharmaceutical Industry (23 countries)	22.3%	17.0%		
Median - Manufacturing (23 countries)	6.6%	6.2%		
Median - Total Economy (23 countries)	1.2%	1.3%		

Source: OECD, own calculation.

Consideration of the research and development intensity in the sector clearly reveals that a large part of the value added flows into the research and development of new innovative products. The average research and development intensity in the USA amounted to 53.7 percent from the years 2006 to 2008 and 44.8 percent in Japan. This means that approximately half of the value added generated in the companies in these countries benefits the research and development of new medicines. In Germany the average research and development intensity amounted to 21.8 percent in the years 2006 and 2007, where more than every fifth euro flowed into research and development.

With an average research and development intensity of 19.7 percent in the years 2006 and 2007 the sector far exceeds the expenditures for research and development in other sectors of the economy. This is made clear by a comparison with the research and development intensity of the manufacturing industry and the overall economy of the countries listed in the table. Thus the research and development intensity of the manufacturing industry in these countries amounts to 6.4 percent and in the overall economy 1.2 percent on the average. Consideration of the research and development expenditures supports the view of the pharmaceutical industry as a driver of innovation. The approximately fifteen times greater expenditures for research and development in comparison to the overall economy makes this amply clear.

5. CONCLUSION AND FURTHER NEED FOR RESEARCH

Within the scope of this feasibility study a method for measurement of the economic footprint of the global pharmaceutical industry was presented for the first time based on a comprehensive review of the literature on existing sector studies with regard to the economic importance of economic units and an underlying compilation of important worldwide statistics.

With the aid of publicly available and official statistics in conjunction with the value added approach of Ostwald and Ranscht, an approximate calculation of the direct economic effects of the pharmaceutical industry can be performed. The most important results are summarized and represented in the following:

- With approximately USD 441 billion the direct gross value added of the pharmaceutical sector roughly corresponds to the economic strength of Argentina; it rose by nearly 44 percent in the years 2006 to 2011 and thus 7.5 percent per year on the average.

- The production value amounted to roughly USD 941 billion in the year 2011.

- In the year 2011 there were more than 4.2 million persons employed worldwide in the pharmaceutical industry. Since the year 2006 more than 600,000 new employment relationships were created; this equates to a 3.3 percent annual increase in employment.

- Worldwide employee compensation in the pharmaceutical industry amounts to USD 93.3 billion. This figure increased by 38.4 percent in the period under review. In relation to the workforce this represents an average per capita employee compensation of USD 22,100. This value has increased by 18.2 percent since the year 2006.

- Investment intensity, i.e. investments in relation to GVA, was considered for eleven countries on the basis of the statistics of the OECD. It amounted to 18.5 percent on average in the years 2006 to 2009. Thus nearly every fifth USD of value added was reinvested.

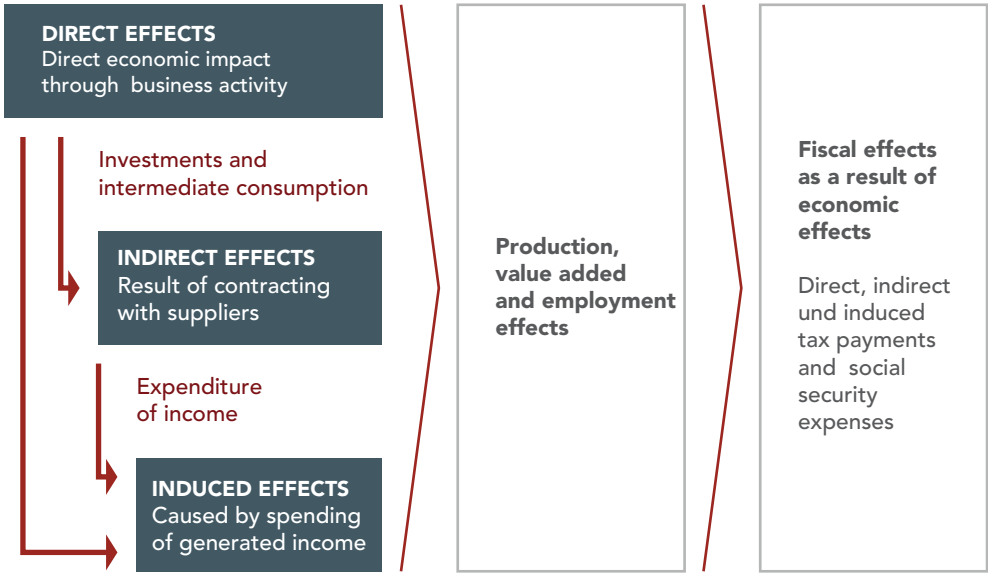
- The research and development intensity in the years 2006 and 2007 amounted to 19.7 percent for 23 selected OECD countries.

For the sake of clarification the submitted study breaks new scientific ground with an initial approximation of the worldwide economic effects of the pharmaceutical industry. The findings represent an initial estimate of the direct economic effects of the sector on a global scale; the specified figures must be regarded as approximate values. In future the concern will be with further development and completion of the methodological approach presented in order to take better account of the economic dimensions of the sector. The following list provides an overview of the need for research in the future:

- Validation of past results
- Bottom-up calculation of the production values and employee compensation
- Global view of capital expenditures, research and development expenditures
- Completion of the economic footprint with indirect and induced effects
- Regional analyses for continents and individual countries

The economic footprint can be completely measured with this additional research project. The components of the worldwide economic footprint are schematically represented once again in the following diagram.

DIAGRAM 12: DIMENSIONS OF THE ECONOMIC FOOTPRINT



Source: Own research.

This comprehensive empirical analysis would it make possible to illustrate the complete value added chain of the pharmaceutical industry. By working out regional differences in particular important sector characteristics can be empirically verified and suitable recommendations for action articulated. The long-term aim would be to create a database similar to the one available as best practice for the tourism industry.

ANNEX:
PHARMACEUTICAL INDUSTRY INDICATORS AS IN INDSTAT

TABLE 13: GROSS VALUE ADDED IN THE PHARMACEUTICAL INDUSTRY ACCORDING TO INDSTAT

Country or Area	Currency	2006	2007	2008	2009	2010
A						
Australia	Dollars	2,015,873,535	1,925,000,000	2,032,000,000	2,528,000,000	2,844,000,000
Austria	Euros	1,243,000,000	1,427,000,000	1,182,000,000	1,334,000,000	
Azerbaijan	Manat	273,000	250,000	215,000	315,000	404,000
B						
Belgium	Euros	4,535,000,000	4,574,000,000	5,182,000,000	3,648,000,000	
Brazil	Reais			17,055,253,000	17,529,738,000	18,947,081,000
Bulgaria	Leva	197,000,000	206,000,000		217,000,000	
C						
Canada	Dollars	5,963,920,000	4,661,095,000	3,875,747,000	1,637,989,000	1,710,526,000
China	Yuan	180,807,000,000	228,660,000,000			
Cyprus	Euros	44,473,000	44,393,000	50,828,000	50,183,000	57,284,000
Czech Republic	Koruny	11,000,000,000	10,670,000,000			
D						
Denmark	Kroner	17,583,000,000	18,133,000,000	20,975,960,000	21,090,000,000	
E						
Ecuador	US Dollars	56,661,000	103,768,000	147,136,000		
Egypt	Pounds	3,007,703,000				5,690,904,000
Eritrea	Nakfa	4,179,000	11,416,000	3,983,000	2,140,000	22,063,000
Estonia	Euros			10,289,775	8,097,606	9,158,654
Ethiopia	Birr	64,320,000	101,829,000	86,600,000	203,567,000	
F						
Finland	Euros	558,000,000	559,000,000	661,000,000	197,000,000	
France	Euros	13,714,000,000	13,215,000,000	11,815,000,000	8,728,000,000	
G						
Georgia	Lari	10,316,100	18,491,400	22,458,400	34,824,700	41,975,100
Germany	Euros	14,244,000,000	15,589,000,000	16,630,000,000	15,273,000,000	
Greece	Euros	297,000,000	333,000,000			
H						
Hungary	Forints	282,177,000,000	253,914,000,000	244,996,000,000	271,219,000,000	
I						
India	Rupees	230,912,400,000	250,417,600,000	350,764,500,000	383,139,700,000	
Indonesia	Rupiahs	10,504,684,000,000	16,024,923,000,000	58,056,497,035,000	73,103,888,538,000	
Iran	Rials	4,662,991,000,000	6,121,264,000,000	8,417,436,000,000	10,867,621,000,000	
Ireland	Euros	2,443,000,000	3,492,000,000	4,902,000,000	13,075,000,000	
Italy	Euros	6,472,000,000	6,829,000,000	7,168,000,000	7,232,000,000	
J						
Japan	Yen	4,230,000,000,000	4,196,000,000,000	4,127,716,000,000	4,105,821,000,000	4,042,902,000,000
Jordan	Dinars	119,162,000	172,449,000	186,111,000	225,855,000	301,172,000
K						
Kyrgyzstan	Soms	30,535,900	24,141,000	-16,156,500	69,576,300	80,625,600
L						
Latvia	Lats	31,813,800	38,552,000			
Lebanon	US Dollars		22,350,000			
Lithuania	Litas	44,673,000	54,922,000	48,318,000	86,545,000	91,089,000
M						
Malawi	Kwacha	178,300,401	302,474,000	359,669,000	385,157,000	
Malaysia	Ringgits	517,500,000	589,300,000	623,800,000	745,582,200	884,760,600

Country or Area	Currency	2006	2007	2008	2009	2010
Malta	Euros	88,052,830	115,087,496	128,834,319		
Mexico	Pesos	55,407,000,000	58,561,000,000	60,012,119,000	54,523,187,000	54,922,501,000
Morocco	Dirhams	2,366,000,000	2,506,626,000	3,199,775,500	3,610,283,000	4,799,345,000
N						
Nepal	Rupees	1,076,765,000		62,094,000		
Netherlands	Euros	1,414,000,000	1,392,000,000	1,668,000,000		
Norway	Kroner	4,959,000,000	4,705,000,000	3,895,000,000		
O						
Oman	Rials	5,137,858	14,304,865	13,163,256	10,132,658	7,866,928
P						
Pakistan	Rupees	33,310,362,000				
Peru	New Soles	847,324,000	980,351,000	1,112,049,000	1,145,528,000	1,091,808,000
Philippines	Pesos	16,980,000,000		10,461,000,000		
Poland	Zlotys	4,265,000,000	4,385,000,000	4,933,000,000	4,728,000,000	
Portugal	Euros	375,000,000	460,000,000	478,000,000		
R						
Republic of Korea	Won	5,949,000,000,000	6,629,000,000,000	7,282,000,000,000		
Romania	Lei	689,800,000	699,000,000	802,300,000	836,100,000	1,255,400,000
Russian Federation	Roubles	31,755,000,000	37,209,000,000	45,864,000,000	54,944,191,299	70,784,948,180
S						
Senegal	CFA Francs	6,408,382,980	6,252,907,723	6,126,679,419	6,638,006,725	7,586,510,764
Singapore	Dollars				9,015,566,000	8,597,917,000
Slovakia	Euros	51,000,000	56,000,000	61,000,000		
Slovenia	Euros	640,000,000		734,000,000	621,000,000	640,000,000
Spain	Euros	3,563,000,000	3,642,000,000	4,403,000,000	3,907,000,000	
Sri Lanka	Rupees	8,535,098,541				
State of Palestine	US Dollars	22,057,321	9,795,967	17,477,251	33,617,000	
Sweden	Kronor	42,721,000,000	37,930,000,000	34,593,000,000	54,464,000,000	
T						
Thailand	Baht	8,531,394,900				
The Former Yugoslav Republic of Macedonia	Denars	1,973,283,002	2,754,849,963	2,844,420,785	2,936,769,277	3,091,520,441
Trinidad and Tobago	Dollars	4,700,000				
Turkey	Liras				2,639,286,000	
U						
United Kingdom	Pounds	7,483,000,000	8,149,000,000	7,787,000,000	7,792,000,000	
United Republic of Tanzania: Mainland	Shillings			25,268,112,000	55,332,823,000	53,573,976,434
United States of America	US Dollars	137,928,312,500	143,263,656,250	141,574,000,000		
Uruguay	Pesos		2,291,410,000			
V						
Viet Nam	Dongs	2,873,547,264,500	3,673,216,756,000	4,492,471,500,000	5,453,981,120,500	7,142,708,111,000

Source: UNdata - INDSTAT.

TABLE 14: EMPLOYMENT FIGURES IN THE PHARMACEUTICAL INDUSTRY ACCORDING TO INDSTAT

Country or Area	2006	2007	2008	2009	2010
A					
Australia				14,970	15,074
Austria	9,843	10,513	10,558	10,683	
Azerbaijan	204	178	141	130	140
B					
Belgium	22,081	21,973	23,414	18,614	
Brazil			94,096	93,352	97,677
Bulgaria	8,196	7,948			7,200
C					
Canada	28,016	27,465	28,338	18,186	18,452
China	1,302,800	1,373,500	1,507,600	1,604,800	1,731,600
Croatia	3,882	4,155	4,953	4,533	3,919
Cyprus	1,110	1,144	1,108	1,109	1,122
Czech Republic	9,846	10,110			
D					
Denmark	16,682	17,193	16,949	17,368	
E					
Ecuador	2,976	3,176	2,856		
Egypt	37,494				42,314
Eritrea	152	167	189	175	277
Estonia			200	200	300
Ethiopia	1,091	1,177	1,286	1,437	
F					
Finland	4,022		4,485	1,371	
France	104,947	103,157	96,103	78,745	
G					
Georgia	826	1,189	1,638	2,362	2,401
Germany	127,625	132,635	129,412	115,141	
Greece	5,789	6,294			
H					
Hungary	15,685	16,144	16,070	15,756	
I					
India	335,623	353,117	378,413	414,025	
Indonesia	55,968	55,614	57,128	58,875	
Iran	18,551	19,287	21,221	22,225	
Ireland	11,610	11,126	11,149	16,570	
Italy	69,022	69,234	68,257	65,117	
J					
Japan	85,755	85,576	86,738	90,206	90,469
Jordan	5,360	5,654	5,737	5,215	5,430
K					
Kyrgyzstan	385	360	357	343	290
L					
Latvia	1,953	2,004	1,990	1,748	1,713
Lebanon		699			
Lesotho	313	89			
Lithuania	800	797	777	732	674

Country or Area	2006	2007	2008	2009	2010
M					
Malawi	268	300	287	300	
Malaysia	8,388	9,563	9,894	10,634	10,275
Malta	619	622	622		
Mexico			48,611	50,073	49,435
Morocco	6,309	6,386	7,175	7,648	8,224
Myanmar	1,667	1,620	1,803	1,885	1,733
N					
Nepal	3,967		107		
Netherlands	17,283	17,318	16,382		
New Zealand	2,350	2,180	2,050	1,950	
Norway	3,080	3,017	3,028		
O					
Oman	604	481	841	909	666
P					
Pakistan	36,336				
Philippines	15,436		14,013		
Poland	24,366	25,920	25,266	24,835	
Portugal	6,234	6,282	6,459		
R					
Republic of Korea	27,039	26,403	26,035		
Romania	9,323	9,946	9,416	9,008	8,836
Russian Federation	90,586	84,832	83,965	70,923	71,024
S					
Singapore				4,856	5,363
Slovakia	2,758	2,705	2,603		
Slovenia	5,314		5,778	5,945	6,233
Spain	38,749	39,753	40,871	38,983	
Sri Lanka	11,654				
State of Palestine	930	645	469	871	
Sweden	19,296	18,321	17,001	16,883	
T					
Thailand	27,080				
The Former Yugoslav Republic of Macedonia	1,538	1,492	1,517	1,511	1,366
Turkey				29,230	
U					
Ukraine	20,405	21,099	20,058	19,295	20,488
United Kingdom	70,514	66,203		39,910	
United Republic of Tanzania: Mainland	1,226	1,237	1,135	988	1,119
United States of America	233,460	249,891	245,900		
Uruguay		3,102			
V					
Viet Nam				34,541	35,525

Source: UNdata - INDSTAT.

TABLE 15: EMPLOYEE COMPENSATION IN THE PHARMACEUTICAL INDUSTRY ACCORDING TO INDSTAT

Country or Area	Currency	2006	2007	2008	2009	2010
A						
Australia	Dollars		1,009,000,000	1,074,000,000	1,158,000,000	1,309,000,000
Austria	Euros	426,000,000	475,000,000	472,000,000	489,000,000	
Azerbaijan	Manat	99,000	161,000	189,000	198,000	319,000
B						
Belgium	Euros	1,166,000,000	1,259,000,000	1,384,000,000	1,126,000,000	
Brazil	Reais			4,049,320,000	4,415,829,000	4,734,950,000
Bulgaria	Leva	55,967,000	60,762,000	65,598,000		71,008,000
C						
Canada	Dollars	1,694,499,000	1,678,309,000	1,725,936,000	811,552,000	816,651,000
China	Yuan	25,436,000,000	31,536,000,000	43,952,000,000	62,410,000,000	72,446,000,000
Croatia	Kunas					575,905,000
Cyprus	Euros	20,008,000	21,812,000	22,422,000	24,563,000	25,334,000
Czech Republic	Koruny	3,180,000,000	3,385,000,000			
D						
Denmark	Kroner	8,383,000,000	8,667,000,000	9,003,120,000	10,060,000,000	
E						
Ecuador	US Dollars	19,381,000	24,366,000	29,488,000		
Egypt	Pounds	799,369,000				1,562,096,000
Eritrea	Nakfa	2,575,000	3,819,000	3,779,000	4,750,000	5,245,000
Estonia	Euros			3,700,484	3,943,349	4,697,954
Ethiopia	Birr	17,907,000	25,297,000	29,908,000	13,800,000	
F						
Finland	Euros	146,000,000	156,000,000	171,000,000	60,000,000	
France	Euros	4,591,000,000	4,628,000,000	4,443,000,000	3,527,000,000	
G						
Georgia	Lari	2,736,400	5,361,100	9,566,000	14,861,500	16,041,300
Germany	Euros	6,517,000,000	7,104,000,000	6,794,000,000	6,184,000,000	
Greece	Euros	154,000,000	174,000,000			
H						
Hungary	Forints	74,257,000,000	79,477,000,000	83,853,000,000	89,033,000,000	
I						
India	Rupees	46,459,200,000	49,870,500,000	61,208,400,000	76,638,900,000	
Indonesia	Rupiahs	1,534,164,000,000	1,333,850,000,000	2,605,049,380,000	1,746,533,930,000	
Iran	Rials	1,214,033,000,000	1,641,085,000,000	1,934,327,982,144	2,410,746,596,229	
Ireland	Euros	505,000,000	542,000,000	548,000,000	982,000,000	
Italy	Euros	2,848,000,000	3,076,000,000	3,104,000,000	2,932,000,000	
J						
Japan	Yen	466,000,000,000	462,000,000,000	447,589,000,000	454,920,000,000	458,961,000,000
Jordan	Dinars	37,169,000	45,159,000	53,682,000	48,869,000	72,146,000
Kyrgyzstan	Soms	8,644,000	9,677,000	11,599,800	15,066,000	15,001,300
L						
Latvia	Lats	11,252,600	16,406,000			
Lebanon	US Dollars		7,299,000			
Lesotho	Maloti	5,796,000	1,321,000			
Lithuania	Litas	20,135,000	25,775,000	29,547,000	26,343,000	26,312,000

Country or Area	Currency	2006	2007	2008	2009	2010
M						
Malawi	Kwacha	69,691,170	74,989,000	73,640,000	125,448,000	
Malaysia	Ringgits	150,200,000	193,300,000	218,600,000	241,186,800	247,904,100
Malta	Euros	12,418,362	15,994,044	20,614,493		
Mexico	Pesos			11,874,093,000	10,909,903,000	11,544,587,000
Morocco	Dirhams		1,225,989,000	1,439,778,000	1,648,369,000	1,831,664,000
N						
Nepal	Rupees	299,141,000		5,386,000		
Netherlands	Euros	714,000,000	771,000,000	753,000,000		
Norway	Kroner	1,480,000,000	1,513,000,000	1,428,000,000		
O						
Oman	Rials	1,601,248	2,239,105	2,819,552	3,389,378	2,013,119
P						
Pakistan	Rupees	8,613,934,000				
Philippines	Pesos	6,973,000,000		5,469,000,000		
Poland	Zlotys	1,309,000,000	1,380,000,000	1,497,000,000	1,561,000,000	
Portugal	Euros	156,000,000	160,000,000	170,000,000		
R						
Republic of Korea	Won	766,000,000,000	788,000,000,000	830,000,000,000		
Romania	Lei	278,800,000	343,900,000	343,200,000	296,600,000	314,300,000
Russian Federation	Roubles	11,115,989,232	14,044,107,264	17,149,011,600	15,873,000,000	18,378,000,000
S						
Singapore	Dollars				424,898,000	486,456,000
Slovakia	Euros	23,000,000	27,000,000	29,000,000		
Slovenia	Euros	219,000,000		247,000,000	251,000,000	243,000,000
Spain	Euros	1,585,000,000	1,676,000,000	1,807,000,000	1,729,000,000	
Sri Lanka	Rupees	1,565,317,467				
State of Palestine	US Dollars	7,306,428	5,910,360	4,911,337	9,889,000	
Sweden	Kronor	7,587,000,000	8,269,000,000	7,885,000,000	8,060,000,000	
T						
Thailand	Baht	2,924,497,700				
The f. Yugosl. Rep of Macedonia	Denars	937,443,660	1,070,320,987	1,058,534,745	1,121,268,729	1,099,111,068
Trinidad and Tobago	Dollars	3,200,000				
Turkey	Liras				1,461,356,000	
U						
Ukraine	Hryvnias	337,907,000	452,194,000	562,266,000	636,040,000	809,358,000
United Kingdom	Pounds	2,453,000,000	2,539,000,000	2,473,000,000	2,202,000,000	
United Republic of Tanzania	Shillings			3,175,890,000	3,580,469,000	4,051,397,589
United States of America	US Dollars	16,108,375,000	16,909,714,844	18,425,100,000		
Uruguay	Pesos		1,256,807,000			
V						
Viet Nam	Dongs	1,019,462,000,000	1,257,737,000,000	1,478,830,000,000	1,858,148,000,000	2,169,239,000,000

Source: UNdata - INDSTAT.

TABLE 16: PRODUCTION VALUE IN THE PHARMACEUTICAL INDUSTRY ACCORDING TO INDSTAT

Country or Area	Currency	2006	2007	2008	2009	2010
A						
Armenia	Drams	2,318,000,000	2,396,000,000	2,338,000,000	2,558,000,000	0
Australia	Dollars	6,648,051,758	7,179,000,000	7,953,000,000	8,668,000,000	10,021,000,000
Austria	Euros	2,490,000,000	2,791,000,000	2,753,000,000	3,047,000,000	
Azerbaijan	Manat	1,169,000	742,000	656,000	737,000	1,013,000
B						
Belgium	Euros	10,351,000,000	10,745,000,000	11,535,000,000	7,947,000,000	
Brazil	Reais			27,003,118,000	28,504,447,000	29,512,118,000
Bulgaria	Leva	504,000,000	545,000,000			
C						
Canada	Dollars	9,491,609,000	8,047,021,000	7,439,057,000	2,758,007,000	2,831,073,000
China	Yuan	501,894,000,000	636,189,000,000	787,496,000,000	944,330,000,000	1,174,131,000,000
Cyprus	Euros	111,616,000	117,883,000	127,489,000	117,594,000	144,770,000
Czech Republic	Koruny	28,115,000,000	29,765,000,000			
Denmark		44,701,000,000	46,365,000,000	47,360,510,000	48,767,000,000	
Denmark	Kroner	44,701,000,000	46,365,000,000	47,360,510,000	48,767,000,000	
E						
Ecuador	US Dollars	185,246,000	234,093,000	340,208,000		
Egypt	Pounds	8,244,382,000				12,176,474,000
Eritrea	Nakfa	27,825,000	35,603,000	36,216,000	42,916,000	57,541,000
Estonia	Euros			25,711,656	23,628,136	30,462,605
Ethiopia	Birr	216,395,000	257,064,000	311,711,000	498,749,000	
F						
Finland	Euros	961,000,000	971,000,000	1,140,000,000	500,000,000	
France	Euros	40,740,000,000	38,800,000,000	29,756,000,000	28,374,000,000	
G						
Georgia	Lari	22,092,200	37,937,200	49,574,700	71,381,700	90,247,700
Germany	Euros	34,744,000,000	39,734,000,000	39,640,000,000	35,875,000,000	
Greece	Euros	864,000,000	934,000,000			
H						
Hungary	Forints	549,872,000,000	523,361,000,000	558,151,000,000	620,118,000,000	
I						
India	Rupees	709,914,900,000	750,981,300,000	1,020,003,400,000	1,116,285,800,000	
Indonesia	Rupiahs	24,494,019,000,000	28,201,398,000,000	109,271,695,078,000	159,660,177,658,000	
Iran	Rials	11,817,472,000,000	15,505,109,000,000	20,192,345,000,000	24,368,946,000,000	
Ireland	Euros	7,016,000,000	10,532,000,000	12,159,000,000	34,649,000,000	
Italy	Euros	21,782,000,000	22,639,000,000	25,183,000,000	22,837,000,000	
J						
Japan	Yen	6,943,000,000,000	6,960,000,000,000	6,963,804,000,000	7,235,648,000,000	7,177,351,000,000
Jordan	Dinars	268,529,000	369,966,000	403,727,000	442,200,000	591,352,000
K						
Kazakhstan	Tenge	8,765,000,000	10,947,408,000			
Kyrgyzstan	Soms	84,194,300	83,078,100	89,702,800	178,041,600	158,420,200
L						
Latvia	Lats	60,585,000	92,108,200			
Lebanon	US Dollars		52,074,000			
Lithuania	Litas	116,459,000	145,880,000	131,855,000	185,430,000	223,565,000

Country or Area	Currency	2006	2007	2008	2009	2010
M						
Malawi	Kwacha	740,988,115	986,962,000	1,014,316,000	1,022,273,000	
Malaysia	Ringgits	1,269,000,000	1,418,100,000	1,738,500,000	2,022,333,600	2,719,875,500
Malta	Euros	147,328,050	181,467,275	203,297,801		
Mexico	Pesos	111,828,000,000	119,858,000,000	124,755,731,000	118,193,145,000	118,754,560,000
Morocco	Dirhams	4,728,000,000	5,025,480,000	6,336,754,000	6,452,220,000	8,528,084,000
N						
Nepal	Rupees	2,993,586,000		190,136,000		
Netherlands	Euros	5,317,000,000	5,810,000,000	5,543,000,000		
Norway	Kroner	8,614,000,000	8,396,000,000	7,749,000,000		
O						
Oman	Rials	18,897,002	30,453,143	30,569,917	30,619,401	24,364,886
P						
Pakistan	Rupees	90,145,972,000				
Peru	New Soles	1,789,799,000	2,070,995,000	2,387,306,000	2,459,179,000	2,345,543,000
Philippines	Pesos	53,962,000,000		41,909,000,000		
Poland	Zlotys	9,099,000,000	9,749,000,000	11,052,000,000	11,492,000,000	
Portugal	Euros	990,000,000	1,105,000,000	1,158,000,000		
R						
Republic of Korea	Won	9,381,000,000,000	10,494,000,000,000	11,713,000,000,000		
Republic of Moldova	Lei	93,731,000	105,528,000	141,412,000	252,672,000	341,644,000
Romania	Lei	1,640,100,000	1,769,200,000	1,855,500,000	2,348,400,000	2,967,900,000
Russian Federation	Roubles	76,966,000,000	94,604,000,000	111,071,000,000	130,993,504,090	185,397,454,178
S						
Senegal	CFA Francs	23,061,637,566	25,689,215,624	25,621,742,107	24,836,265,404	27,933,822,725
Singapore	Dollars				17,821,527,000	18,956,205,000
Slovakia	Euros	203,000,000	232,000,000	257,000,000		
Slovenia	Euros	1,166,000,000		1,495,000,000	1,330,000,000	1,425,000,000
Spain	Euros	11,041,000,000	11,895,000,000	13,278,000,000	12,875,000,000	
Sri Lanka	Rupees	17,071,766,961				
State of Palestine	US Dollars	38,912,438	21,262,925	26,025,370	52,702,000	
Sweden	Kronor	81,740,000,000	76,281,000,000	71,402,000,000	92,519,000,000	
T						
Thailand	Baht	35,460,548,100				
The f. Yugosl. Rep of Macedonia	Denars	4,170,865,627	4,858,314,712	5,263,078,380	5,017,501,775	5,296,902,654
Trinidad and Tobago	Dollars	21,900,000				
Turkey	Liras				8,074,547,000	
U						
Ukraine	Hryvnias	3,013,900,000	3,765,500,000	4,318,400,000	6,184,200,000	7,839,100,000
United Kingdom	Pounds	14,360,000,000	14,842,000,000	15,256,000,000	14,882,000,000	
United Republic of Tanzania	Shillings			68,945,227,000	63,951,653,000	67,130,219,515
United States of America	US Dollars	184,636,234,375	188,171,390,625	192,998,000,000		
Uruguay	Pesos		5,773,155,000			

Source: UNdata - INDSTAT.

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