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Steps to build a National Health Account

Main Findings of two Research Projects commissioned by the Federal Ministry for Economic Affairs and Energy

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List of abbreviations

AAL	Ambient Assisted Living
BA	Federal Employment Agency
BDI	Federation of German Industry
BRIC states	Emerging nations Brazil, Russia, India, China
BMAS	Federal Ministry of Labour and Social Affairs
BMBF	Federal Ministry of Education and Research
BMWi	Federal Ministry for Economic Affairs and Energy
CHS	Core healthcare segment
Destatis	German Statistical Office
EHS	Extended healthcare segment
EQR	European Qualifications Framework
FTE	Full-time equivalent
GDP	Gross domestic product
GKV	Statutory health insurance
GVA	Gross value added
HS	Healthcare sector
HSA	Health Satellite Account
ICT	Information and Communication Technologies
INQA	Initiative New Quality of Labour
KZBV	Federal Association of Dentists of Statutory Health Insurance
MFP	Multifactor productivity
MTP	Medical-technological progress
NA	National Accounts
NHA	National Health Account
OECD	Organisation for Economic Co-operation and Development
ONS	Office for National Statistics
OTC	Over the counter
PIM	Perpetual Inventory Method
QALY	Quality Adjusted Life Years
R&D	Research and Development
RV	Statutory pension insurance
SHA	System of Health Accounts
SME	Small Medium-sized Enterprises
SNA	System of National Accounts
TU	Technical University
UK	United Kingdom
USA	United States of America
WHO	World Health Organization
WP	Working population
ZIM	The Central Innovation Program SME – Zentrales Innovationsprogramm Mittelstand

Background

The initial project on the creation of a satellite account for the healthcare sector in Germany, commissioned by the Federal Ministry for Economic Affairs and Energy in 2009, is the basis of these two follow-up projects.

The objective of the first report is the use and further development of the German Health Satellite Account (HSA) to form a National Health Account (NHA).

What the NHA encompasses is – besides the calculation of the reporting years 2006 through 2009 and the forward projection or forecasting of the key data on the healthcare sector for the years 2010 through 2012 – particularly the following further developments:

- A time series analysis of the most important key data of the healthcare sector
- A method of quantifying spill-over effects
- The model-based calculation of indirect and induced economic effects (spill-over effects)
- The integration of the labor market
  - Calculating full-time equivalents
  - Conducting analyses of specialists

The second study also uses the framework of the Health satellite account.

Six questions are discussed:

- Which indicators are suitable for measuring the productivity of the health economy and their various production activities?
- Does productivity growth differ between the health economy and the total economy? Which differences exist between the "basic" and "voluntary" market of the health economy?
- What are the contributions of the medical-technical progress and other input factors to the productivity growth of the branches of the health economy?
- Do the medical-technical progress and other factors relieve the future need of health manpower and the financial burden of the statutory health and pension insurance?
- Which measures will help stimulate further productivity growth of the health economy?
- Which recommendations are given by for economic policy?

The key findings of these two studies are presented in this documentation.

I. The use and further development of the German Health Satellite Account (HSA) to form a National Health Account (NHA)

1. Overview of findings

Within the scope of this research project, the HSA was effectively updated, extended and modified to enable it to be used as a new and innovative data basis for healthcare sector analyses. Unlike in the initial project, which focused on the development of a healthcare sector data basis for just one reporting year, the focus of the follow-up project is now on the further development, the extension of the period under review and particularly the use of the new data. In this context, other secondary calculations were added to the calculations of the HSA to ultimately develop an NHA. The key findings are summarized below.

Findings on the healthcare sector in total:

- The healthcare sector will contribute approx. EUR 259.2 bn in gross value added in 2012 in accordance with the forecast carried out within the scope of this report. As a result, the healthcare sector's share of German gross domestic product would exceed 11 percent for the first time.
- The share of the German healthcare sector's exports in Germany's total exports was approx. 6.4 percent in 2012, amounting to EUR 84.7 bn. The German healthcare sector's export surplus totaled some EUR 13.6 bn in 2012.
- Consumer spending in the core segment of the healthcare sector rose between 2005 and 2012 (forecast) by around 25.1 percent to total EUR 271.0 bn. The relative growth of the extended segment of the healthcare sector experienced total growth of 34.1 percent, which is 9.0 percentage points higher than growth in the core segment of the healthcare sector.
- At the same time, the secondary healthcare market in the German healthcare sector grew 29.8 percent between the years 2005 and 2012 to total EUR 67.9 bn. At 4.0 percent growth p.a., this equates to around half a percentage point stronger annual growth than in the primary healthcare market, which focuses on reimbursable healthcare services.
- The German healthcare sector is a stabilizing factor of the German economy in respect of economic and growth policy. The annual growth rate in the German healthcare sector on average over the last six years was almost 2.7 percent, which is some 0.6 percentage points above the average annual growth of the economy as a whole. Particularly in the crisis year 2009, the healthcare sector's positive growth rates served to prevent an even worse recession in Germany.
- The concept of healthy aging with the associated products and services (Ambient Assisted Living) is developing into an important future growth field in the healthcare sector. Relevant goods were identified within the scope of the research work. However, the volume of these goods cannot yet be collected in a statistically robust form.
- To complement the existing NAs, we discussed the addition of healthcare-relevant non-market-based activities and examined ways of extending the NHA and, to the extent possible, made available statistical documentation on work in private households and voluntary work. Furthermore, we assembled the indicators that have a healthcare connection but are outside of the NA in a systematic form.

Findings of the labor market analysis:

- In total almost 6.0 million people are employed in the healthcare sector in 2012. The healthcare sector's workforce therefore makes up 14.5 percent of the total workforce (on a per capita basis).[1]
- The healthcare sector has continually increased the number of jobs it provides over recent years. The average annual employment increase in the healthcare sector in the period under review was 1.8 percent, double the rate of employment growth in the economy as a whole. This underlines the employment-driving effect of the German healthcare sector. In the crisis year 2009 the number of people employed in the healthcare sector rose by almost 2.5 percent, compared with just under 0.1 percent in the economy as a whole.

1 NB: On the instruction of the BMWi this report uses both personal pronouns 'he' and 'she'. Both or either of these shall be taken to refer to people of both genders.

- Measured on a full-time equivalent (FTE) basis, around 13.3 percent of the entire working population is employed in the healthcare sector in 2011. Consequently, some 4.5 million full-time equivalents are employed in the healthcare sector.

- The FTE rate in the healthcare sector is 77.6 percent, which is significantly below the FTE rate in the economy as a whole (83.0 percent). This means that the healthcare sector has an above-average level of part-time working compared with the economy as a whole.

- In the future, the greatest shortfall in specialists will be felt in the outpatient and inpatient facilities in the healthcare sector (product groups G7 and G8[2]). In these product groups, the shortfall in specialists will grow from 207,000 full-time equivalents in 2011 to an anticipated 625,000 full-time equivalents in 2030.

Findings of the healthcare sector's spill-over effects for 2009:

- Besides the EUR 229 bn in direct gross value added per year in the healthcare sector, there is an additional EUR 178 bn in indirect and induced gross value added in other industries.

- This total of EUR 407 bn added value per year equates (purely mathematically) to approx. 16 percent of German GDP.

- The value added multiplier in the healthcare sector is 1.77, which means that each euro of gross value added in the healthcare sector leads to indirect and induced effects worth 77 euro cents in upstream and downstream industries.

- Besides the healthcare sector's directly employed workforce, another 3.1 million working people can be assigned in 2009 due to the indirect and induced effects of the healthcare sector.

- In total there are 8.8 million people, in other words 5.7 million people in the direct workforce plus 3.1 million other people, who are associated with the healthcare sector in Germany in 2009 on a direct, indirect and induced basis. This equates (purely mathematically) to approx. 22 percent of the entire working population in Germany.

- The employment multiplier in the healthcare sector is 1.54, which means that every job in the healthcare sector protects half a job in the upstream and downstream industries.

- With the help of empirical data on the medical devices, pharmaceuticals and bio-tech industries, we were able to show that their research activities result in innovation stimulus, particularly of an economic nature. The economic effects (spill-over effects) are present in the form of added value and employment in the same industry, but also therefore in cooperations and supplier relations in other industries.

Findings of the special feature

In the special feature on the efficiency of the German healthcare sector, it becomes evident that the healthcare sector as such cannot yet be subjected to international comparison. The analysis was therefore extended to include efficiency in healthcare systems as such and in the three areas of inpatient, outpatient and integrated provision. Finally, the focus lies on efficiency in outpatient and inpatient care and in three other areas of the healthcare sector and on their efficiency potential. Though the areas selected do enable statements to be made regarding efficiency, it generally remains open as to whether or not program and management efficiency demonstrated on a small scale would also be efficient from a macroeconomic point of view.

2 G7: Services to inpatient facilities; G8: Services to non-inpatient facilities.

2. The economic footprint of the German healthcare sector

In the following chapter we consider some of the economic indicators concerning the healthcare sector as applied in the HSA over time from 2005 through 2012. This analysis is the first within the scope of the NHA to also look at the spill-over effects of the industry on the economic footprint of the healthcare sector.[3]

2.1 Steady growth in the healthcare sector from 2005 through 2012

2.1.1 The German healthcare sector is bucking the crisis

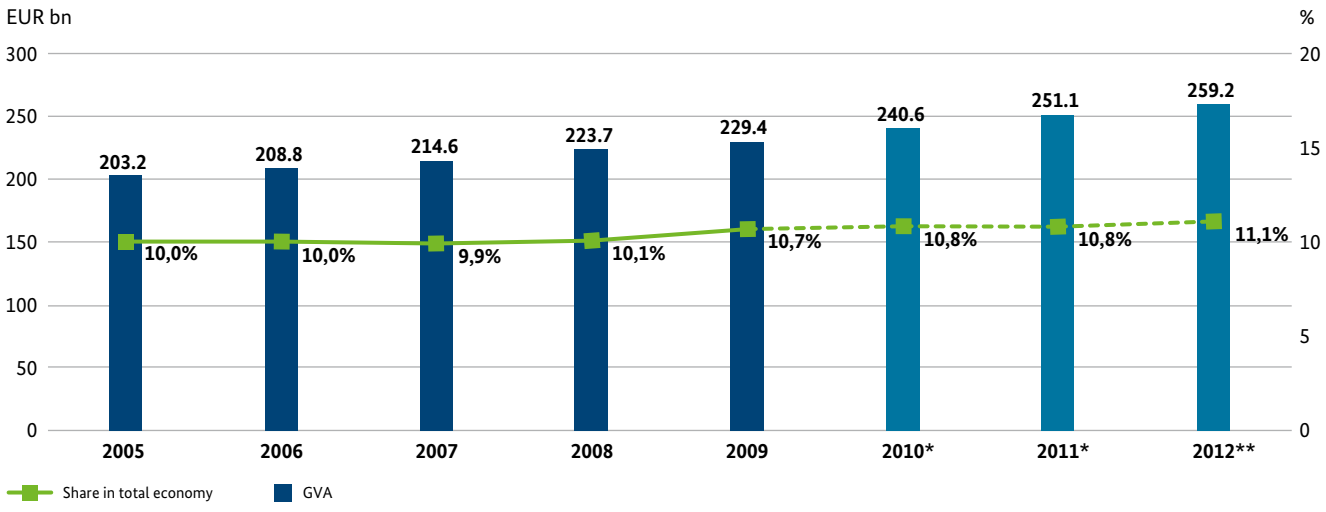
Figure 1 illustrates the development of gross value added in the German healthcare sector over time from 2005 through 2012 (2010 and 2011 forward projection, 2012 forecast) in EUR bn and as a proportion of the German economy as a whole.[4]

According to these figures, the German healthcare sector grew continuously from 2005 through 2012. This is evidence that gross value added (GVA) is developing into an important indicator for the measurement of economic growth. In the 2012 calendar year, added value of EUR 259.2 bn was generated in the healthcare sector: this corresponds to a share of 11.1 percent of gross domestic product (GDP). Therefore, in 2012, almost one in nine euros of Germany's gross value added was produced in the healthcare sector.

Figure 2 depicts the growth rates of gross value added in the healthcare sector against those of the German economy as a whole for the years 2006 through 2012.

The figure emphasizes in a striking manner the stabilizing and growth-driving impact of the healthcare sector in Germany. The average growth rate in the German healthcare sector is 3.5 percent per year, which is around 1.4 percentage points above the average growth of the economy as a whole. From 2008, the healthcare sector recorded consistently higher growth rates than the German economy. Particularly in the crisis year 2009, the healthcare sector with its positive growth rates was able to ward off an even worse recession in Germany.

Figure 1: Development of gross value added in the German healthcare sector, 2005 – 2012



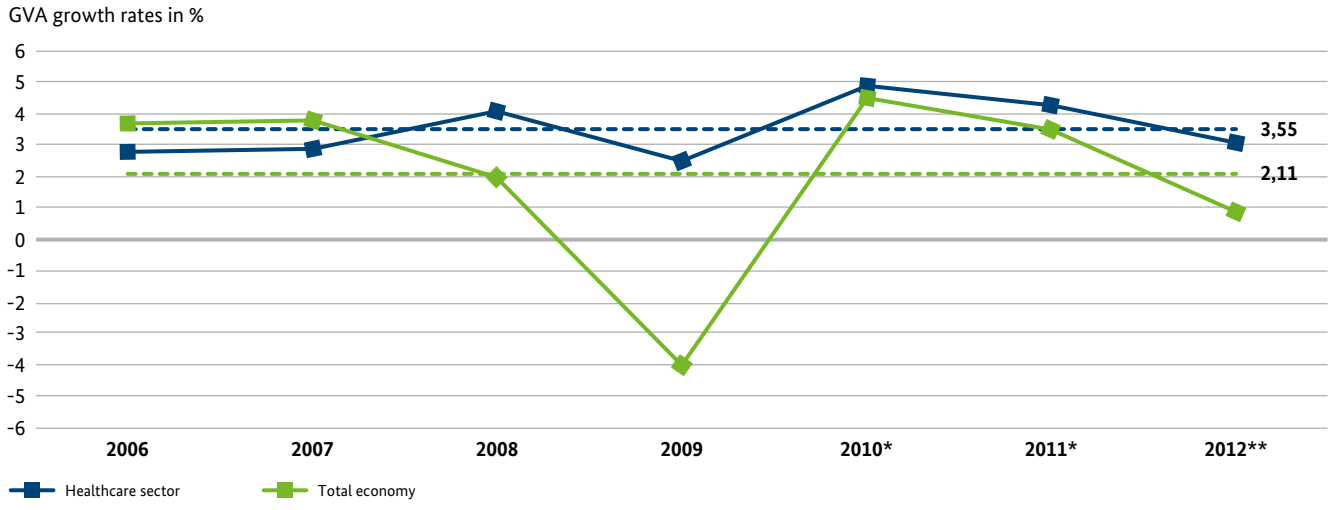
* Forward projection
** Forecast

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

3 The term "economic footprint" is understood, in the NHA, to mean the key economic indicators of the sector. They include both the direct effects and the indirect and induced spill-over effects, e.g. gross value added, employment, income, production value, export and imports.

4 Figures forward projected from 2010 through 2011, forecasted for 2012.

Figure 2: Comparison of growth rates of gross value added in the healthcare sector and the economy as a whole, 2006 – 2012



* Forward projection
** Forecast

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

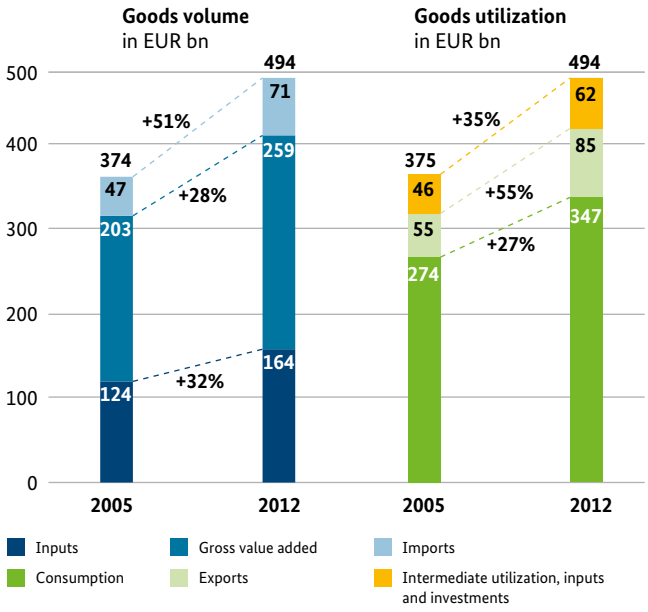
2.1.2 Growth predominantly through higher consumption in the secondary healthcare market

The development of gross value added in the healthcare sector depends greatly on the trend in consumer spending in the primary and secondary healthcare markets. This is also visible in Figure 3, where volumes and utilization are depicted side by side.

From 2005 through 2012, the volume of goods in the healthcare sector rose by EUR 120.0 bn or 32 percent from EUR 374 bn to EUR 494 bn. On the volume side, which can be divided into inputs, gross value added and imports, gross value added recorded the biggest absolute growth, rising 28 percent from EUR 203 bn to EUR 259 bn. Imports rose in the period under review by EUR 24 bn or 51 percent.

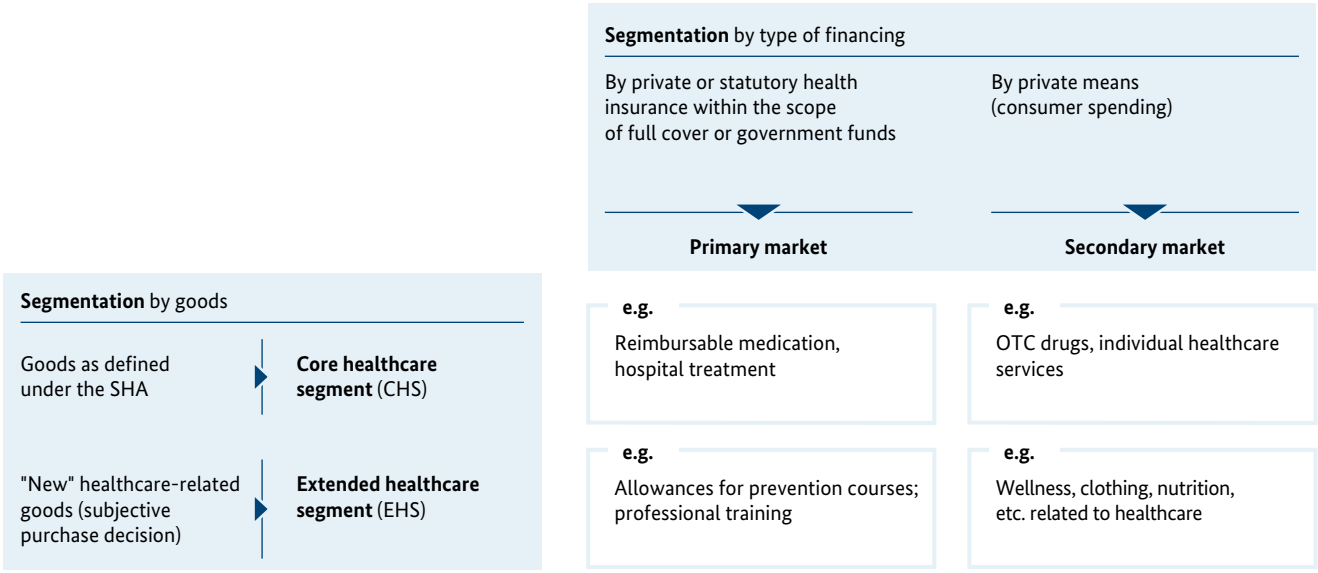
On the utilization side, there is a noticeable increase in the importance of exports, which grew by 55 percent from EUR 55 bn to EUR 85 bn in the period 2005 through 2012. It is also apparent that the majority of the increased volume of goods is a result of the increase in consumer spending.

Figure 3: Volume of goods and utilization of goods in the healthcare sector in the years 2005 and 2012



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Figure 4: The healthcare sector in the 4-quadrant-model



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

The increase in consumer spending can, in accordance with the 4-quadrant-model, be segmented by consumption in the primary and secondary healthcare market and by consumption in the core segment and extended segment of the healthcare sector. Figure 4 shows the four different quadrants in the model and depicts examples of the goods or services in each one.

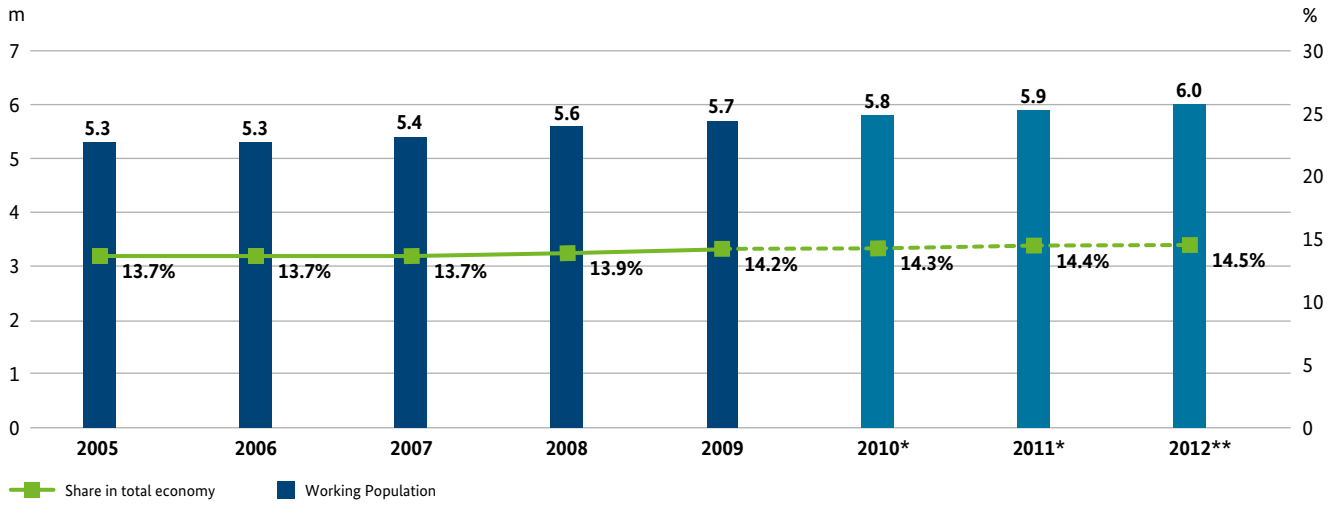
The development of consumer spending between 2005 and 2012 in these four quadrants is depicted in Figure 5 in absolute and relative figures. The comparison shows that in the past years the secondary market experienced around 30 percent stronger growth than the primary market, where growth was around 26 percent. The biggest growth, at 40 percent, was seen in consumer spending in the secondary market of the extended healthcare sector, in other words products and services that have a healthcare connection in the broad sense, such as wellness, sports clothing and healthy eating. This segment records average annual growth of 4.9 percent.

Figure 5: Change in consumer spending in the primary and secondary healthcare market and CHS and EHS, 2005 – 2012 (forecast)

Consumer spending (EUR bn)		**Primary market**		**Secondary market**		**Total**	
Core segment of the healthcare sector (CHS)	2012	244	+ 26%	27	+ 17%	271	+ 25%
	2005	193	(+3.4% p.a.)	23	(+2.2% p.a.)	217	(+3.3% p.a.)
Extended segment of the healthcare sector (EHS)	2012	36	+28%	41	+40%	76	+ 34%
	2005	28	(+3.6% p.a.)	29	(+4.9% p.a.)	57	(+4.3% p.a.)
Total	2012	279	+26%	68	+30%	**347**	+27%
	2005	221	(+3.4% p.a.)	52	(+4.0% p.a.)	**274**	(+3.5% p.a.)

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

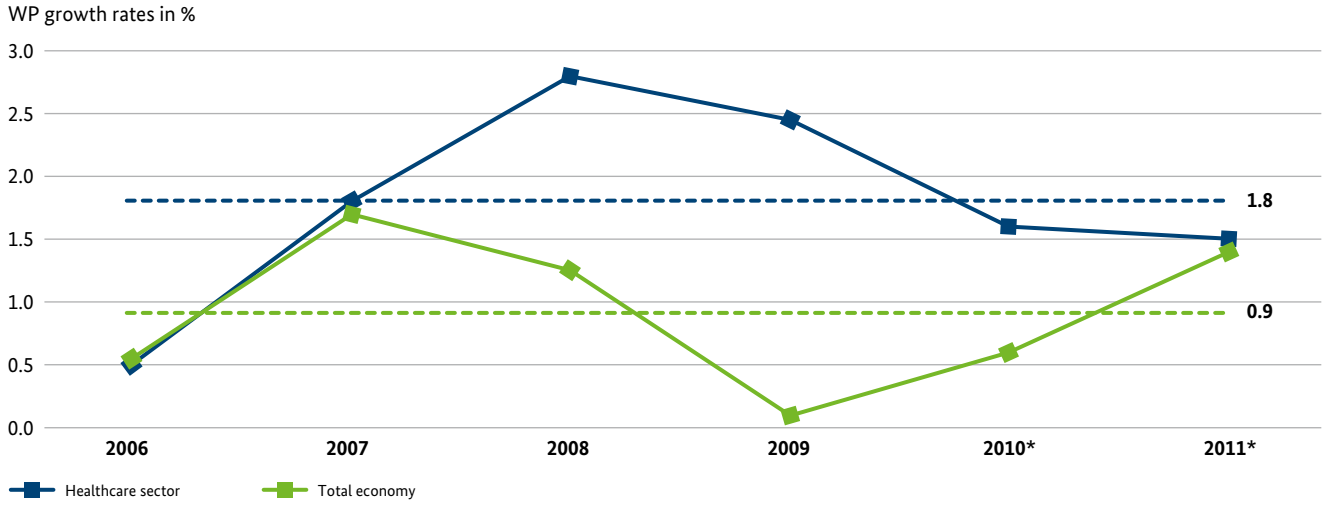
Figure 6: Development of the working population in the German healthcare sector, 2005 – 2012



* Forward projection
** Forecast

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Figure 7: Comparison of growth rates of the working population in the healthcare sector and the economy as a whole, 2005 – 2011



* Forward projection

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

It is worthy of note that the average growth rates in the secondary healthcare market, at 4.0 percent, are around 0.6 percentage points higher than those in the primary "market" (3.4 percent). This shows that private consumer spending is experiencing even higher growth than consumer spending within the scope of health insurance cover.

2.2 Employment in the healthcare sector from 2005 through 2012: One in seven of the working population

Figure 6 depicts the absolute development of the healthcare working population and its share in Germany's total working population for the years 2005 through 2012.

This picture underlines in a striking fashion the rising importance of the healthcare sector for the German labor market and the German economy as a whole. The size of the workforce in the healthcare sector in the past 7 years grew by 700,000 to total approx. 6.0 million working people. This corresponds to an average absolute rise of 100,000 jobs per year. At the same time the share of the workforce in the healthcare sector as a proportion of the German working population rose from 13.7 percent in 2005 to 14.5 percent in 2012. As a result, more than one in seven of the working population in Germany is already working in the healthcare sector today.

Figure 7 illustrates the annual percentage rise of the working population in the healthcare sector compared with the economy as a whole for the years 2005 through 2012.

In the healthcare sector, employment has risen continuously in recent years. With the exception of 2006, the growth rates were constantly above the growth rates of the German labor market. This underlines the employment-driving and stabilizing impact of the labor market in the German healthcare sector for the development of the labor market in total. Particularly in the 2009 crisis year, the healthcare sector was able to compensate for the decline in hiring in the economy as a whole by raising the size of its workforce by almost 2.5 percent. The average rise in employment in the healthcare sector in the period under review was, at approx. 1.8 percent, about double that of the economy as a whole. This again underlines the great importance of the healthcare sector as an engine of employment for the German labor market.

2.2.1 Job descriptions in the healthcare sector go beyond classic healthcare professions

In order to be able to draw well founded conclusions on the status quo in employment and on its further development, it is necessary not only to consider the number of working people (working population on a per capita basis) but also to look at full-time equivalents (FTEs).[5]

The starting point for the calculation of FTEs is the data from the calculation of the working population by product groups within the NHA. Since the full-time equivalent rates in respect of different jobs in the healthcare sector vary significantly, within the scope of this research work we first identified which jobs were represented in which product groups. We then incorporated job-specific full-time equivalent rates to arrive at the full-time equivalent rates by product groups.[6]

In line with the method employed, Figure 8 illustrates the "top 10 professions" for the total healthcare sector in 2009.

In the core segment of the healthcare sector (CHS) alone, approx. 4.48 million working people were employed in 2009. This corresponds to 78.2 percent of the entire working population in the healthcare sector. In the extended segment of the healthcare sector, a total of approx. 1.25 million working people were employed, in other words 21.8 percent of the workforce in the healthcare sector.

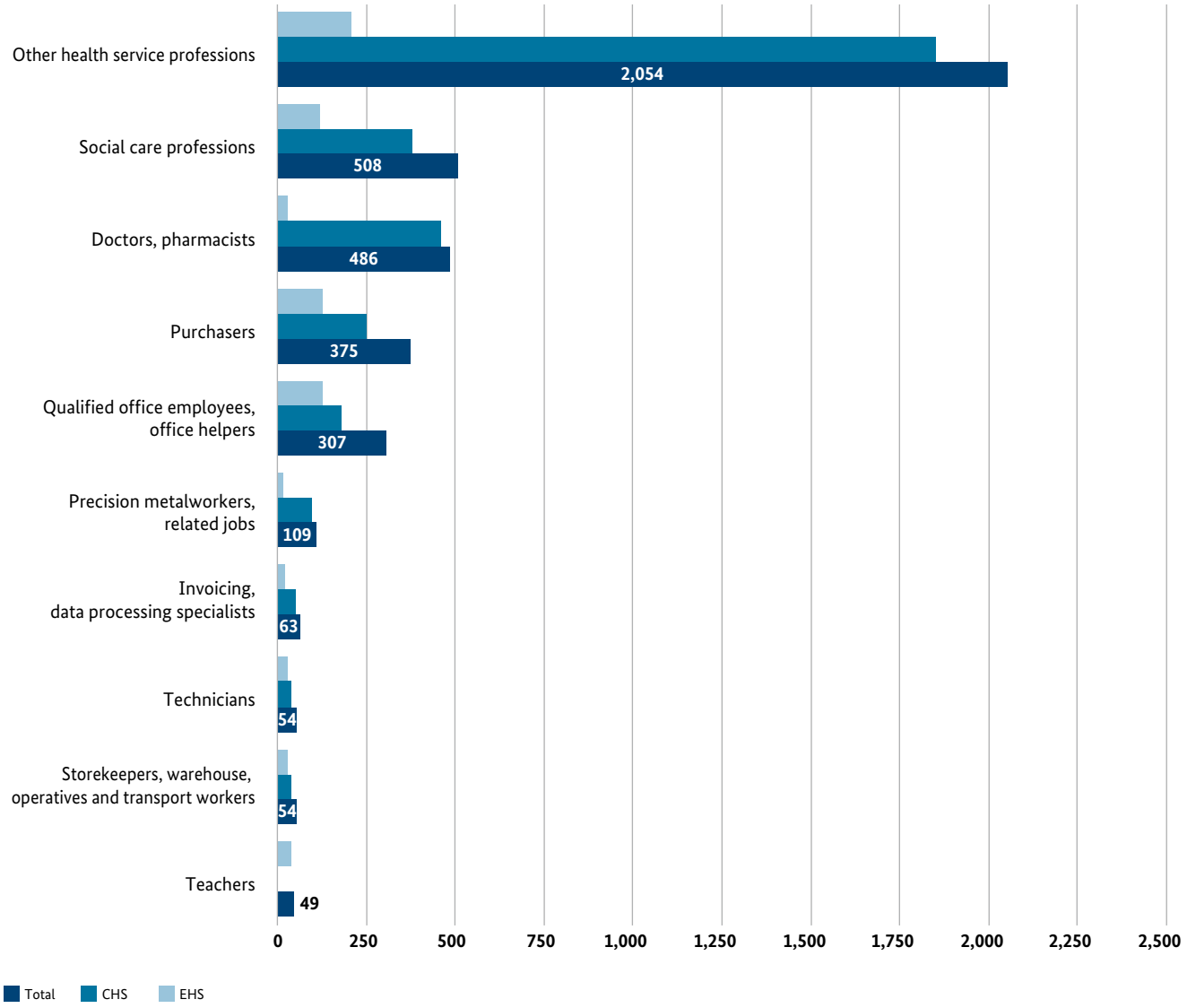
5 "Full-time equivalents is the expression of the number of workers adjusted to reflect full standard working hours. One full-time equivalent is equivalent to one person in full-time employment." Statistisches Bundesamt (2011b), p. 3.

6 See Statistische Ämter der Länder (2011).

The biggest share of the working population in the CHS, at around 60 percent, work as doctors or pharmacists, in social care or in the category of "Other health service professions". The latter include:

- Nurses
- Healthcare assistants and nursing auxiliaries
- Medical and pharmaceutical technicians
- Qualified medical and dental employees
- Alternative practitioners
- Physiotherapists
- Masseurs
- Dieticians
- Hydrotherapists

Figure 8: Job distribution (top 10) in the healthcare sector in 2009 in '000



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

The job distribution in the extended segment of the healthcare sector (EHS) is less traditionally health oriented: of the approx. 1.25 million workforce in the EHS, only some 361,000 people work as doctors, pharmacists, in social care or the above-mentioned other health service professions. This corresponds to less than one third of the whole workforce. Besides these, jobs are above all concerned with administrative and logistical activities. There are, for instance, 682,000 purchasers, qualified office employees and office helpers in the healthcare sector. Furthermore, there are also other administrative and logistical professions among the ten personnel-intensive professional groups, including people who handle purchases on account, warehouse operatives and transport workers. This shows that the trading of merchandise, services and insurance benefits in the healthcare sector also requires administrative personnel. A third group is made up of the technical professions, which will continue to be of great significance in the future, particularly due to the advancing technological progress in the healthcare sector. For example, 109,000 precision metalworkers are employed in the healthcare sector. A majority of this segment of the working population is employed in the production of medical devices. The high number of teachers is the result of the professional training required in the healthcare sector and healthcare services in the field of sports, above all in the EHS.

2.2.2 Almost 4.5 million full-time employees in the German healthcare sector: FTE rates in the healthcare sector are rather below average

The classic healthcare professions that feature strongly in the figures leave a mark on the full-time equivalent rate (FTE rate) in the healthcare sector as a whole because their working hours are often structured on a part-time basis. In order to describe the development of working hours and full-time equivalents in Germany, we analyzed data from the working population calculations conducted by the Statistical Offices of the German Länder (Statistische Ämter der Länder) and data from the healthcare personnel accounts maintained by the Federal Statistical Office.

Table 1 compares the FTE rates in the inpatient (G7) and non-inpatient (G8) facilities with the general FTE rate in Germany for the years 2000 through 2010.

It is evident that the FTE rate in the outpatient and inpatient segments is much lower than in the economy as a whole. The low FTE rate in the very personnel-intensive outpatient and inpatient facilities has a strong impact on the average FTE rate in the healthcare sector as a whole. Table 2 compares the per capita figures with the full-time equivalents in the healthcare sector.

Table 1: FTE rate in Germany and in inpatient and non-inpatient facilities

FTE rate (%)	2000	2002	2004	2006	2008	2010	Change 2005 – 2010 in percentage points
In Germany overall	85.9	85.3	84.2	83.0	83.3	93.1	-2.8
In the G7 and G8	78.6	77.8	76.7	75.3	74.9	74.5	-4.1
Difference*	7.3	7.4	7.5	7.7	8.4	8.6	+1.3

* Rounding deviations in the total

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Table 2: Working population on a per capita basis and by FTE in the healthcare sector in '000

	2005	2006	2007	2008	2009
Workers in healthcare (per capita basis)	5,315	5,342	5,439	5,593	5,730
Per capita share in total WP (%)	13.69	13.67	13.69	13.89	14.23
Workers in healthcare (FTE basis)	4,168	4,167	4,231	4,363	4,447
FTE share in total WP (%)	12.90	12.85	12.83	13.00	13.30
FTE rate in healthcare sector (%)	78.43	78.00	77.80	78.01	77.61

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Table 2 shows that 4.45 million full-time equivalents were employed in the healthcare sector in 2009. Since 2005, 279,000 new full-time posts were created. This corresponds to a rise of 6.7 percent since 2005. Thus the growth of FTEs was slightly lower than the growth on a per capita basis (7.8 percent). This is also evidenced by the slight fall in the rate of full-time equivalents in the period under review from 2005 through 2009. The FTE rate in the healthcare sector is around 78 percent in the period under review, in other words the workforce in the healthcare sector works an average of about 31 hours per week.

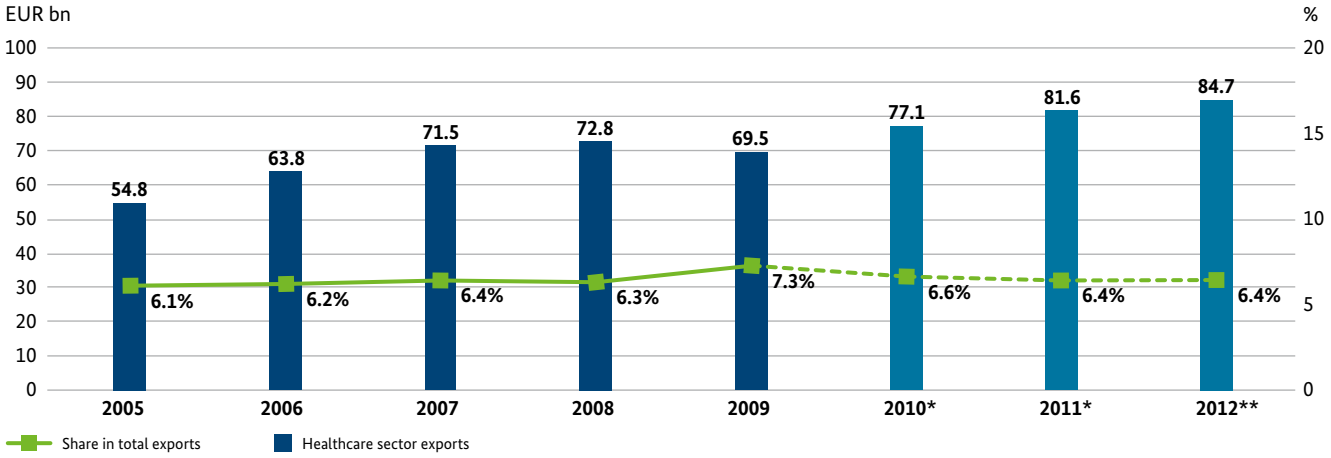
Since the average FTE rate in the healthcare sector is below the average FTE rate for the working population as a whole, the healthcare sector's share when viewed from this perspective is somewhat lower than it is when viewed overall, see Table 2. In the analysis period from 2005 through 2009 the full-time equivalent share in the working population grew by 0.4 percentage points, while the per capita share grew by 0.54 percentage points. Measured in full-time equivalents, 13.3 percent of the working population in the economy as a whole is employed in the healthcare sector in 2009. This means that more than one in eight full-time equivalent workers in Germany is employed in the healthcare sector.

2.3 Foreign trade and the healthcare sector from 2005 through 2012: Financed from abroad

The growth path in evidence in the development of gross value added and the working population is also reflected in the export trend. Figure 9 illustrates the absolute export figures over time and the respective export share in total German exports from 2005 through 2012.

With the exception of 2009, the export trend followed a positive growth path. In the period under review, exports of healthcare-relevant goods rose by approx. EUR 30 bn from EUR 54.8 bn in 2005 to almost EUR 85 bn in 2012. This corresponds to an average growth rate of 6.4 percent per year. The share of healthcare goods exports in total German exports rose from 6.1 to 6.4 percent in 2012. There was a notable rise in the share in 2009, when it climbed to 7.3 percent in spite of a slight fall in total German exports. This can be explained by the weak exports of other German goods in the crisis year. As a result, the export figures also show the stabilizing impact of the German healthcare sector with its healthcare goods.[7]

Figure 9: Development of the German healthcare sector's export activity and its share in total German exports over time (2005 – 2012)



* Forward projection
** Forecast

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

7 See Hesse (2013), p. 49 ff.

2.3.1 High growth potential in the Russian Federation, Poland and Turkey

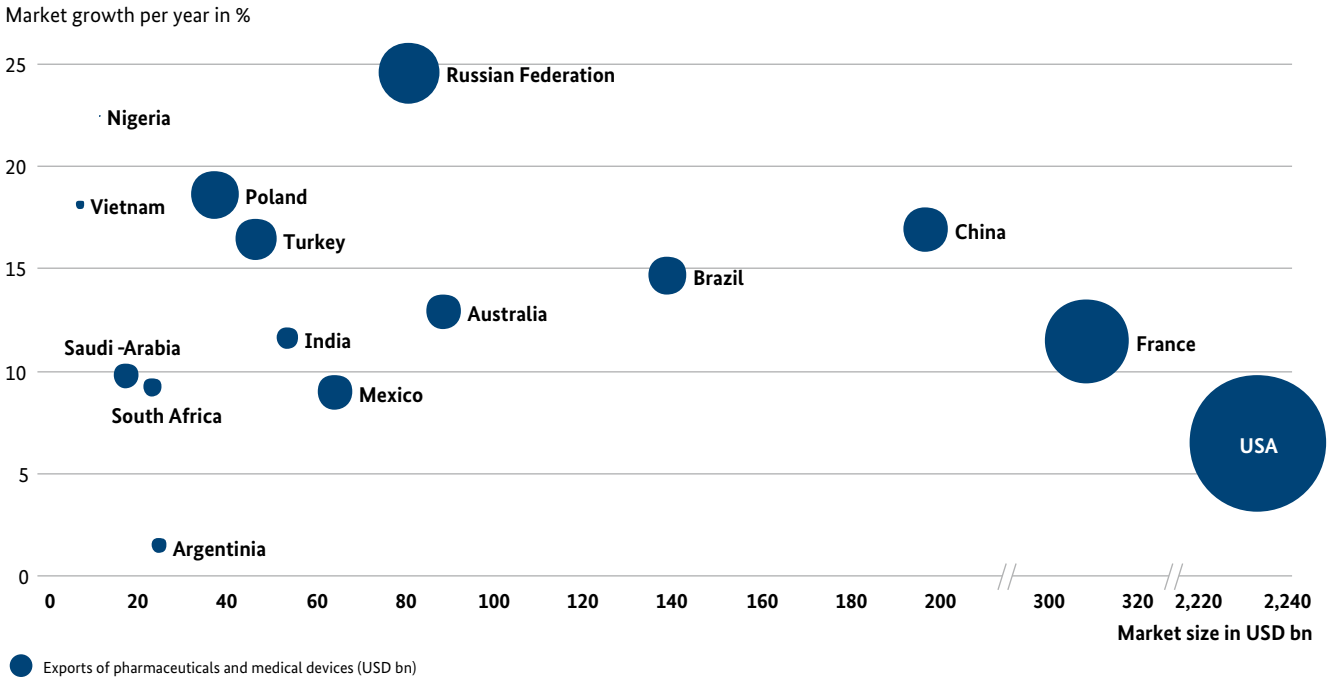
The relative strength of the German healthcare sector's export activity can also be identified by looking at how it relates to the total size of the healthcare markets in the destination countries. This gives an indication of where the markets are more or less fully exhausted.[8] The size of a national healthcare market, e.g. for pharmaceuticals and medical devices, is determined by the total volume of goods sold there in dollars or euros.

Figure 10 shows export figures in relation to the growth of the healthcare markets in the destination countries.

The horizontal axis depicts the respective market size in USD billion, while the vertical axis shows the annual growth rates in the years 2000 to 2008, which are determined by population growth and rising per capita spending. The size of the circle represents the respective export volume of German healthcare goods.

If you compare countries in a vertical line above one another, such as Russia and Australia, you will notice that, though their total markets are similar in size, Russia imports more than double the amount that Australia imports. Two other BRIC states[9], Brazil and China, lag some way behind Russia in terms of German imports in spite of a larger total market. This indicates that it would be necessary to check what factors the success in Russia is based upon and how such factors may be transferable to other countries.

Figure 10: Market size (USD bn), market growth (%) and German exports (EUR bn) 2007



Source: WHO, UN Population Division, Roland Berger.

8 The strength of the domestic competition has not been considered here but comparisons of this kind are only meant to serve as a starting point for finding possible ways of better exploiting the corresponding healthcare markets.

9 The "BRIC states" are the four emerging countries Brazil, Russia, India and China.

2.3.2 Healthcare sector makes a growing contribution to Germany's trade surplus

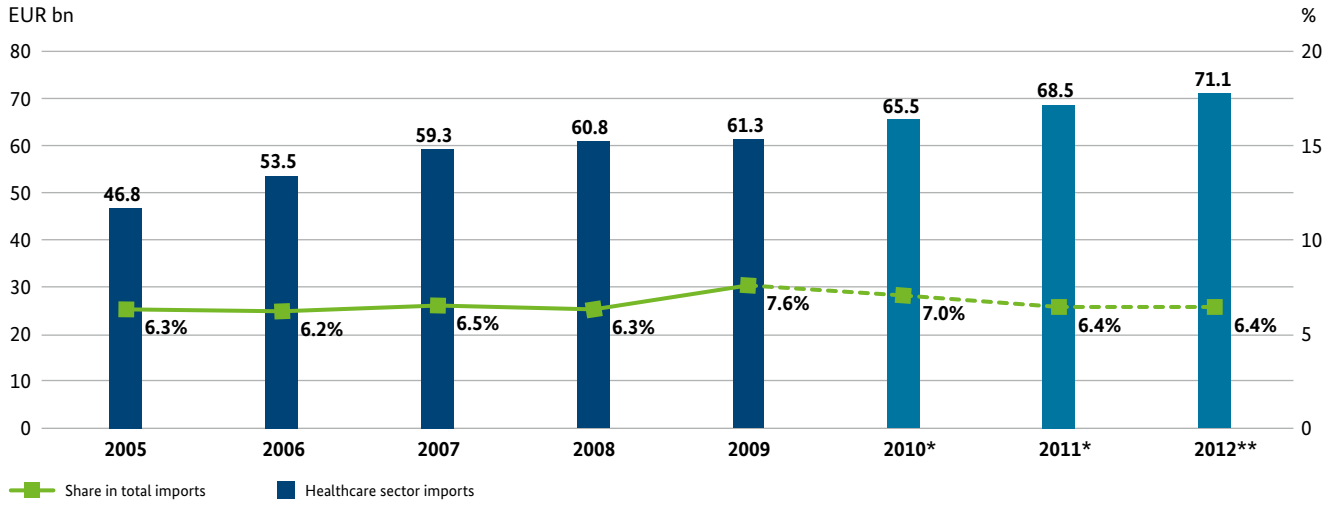
Along the same lines as the export figures, Figure 11 shows the absolute import figures over time and the share in Germany's total imports from 2005 through 2012.

Imports in the healthcare sector grew by around EUR 25 bn in the years 2005 through 2012. In 2012, the healthcare sector's total imports are expected to reach more than EUR 71 bn. The share of the healthcare sector's imports in the economy as a whole is around the same level as the export shares.

In visualizing the difference between the export and import figures, Table 3 shows the healthcare sector's absolute foreign trade balance and its share in Germany's total trade surplus.

The table shows that the healthcare sector's share in the German trade surplus grew by 1.2 percentage points from 2005 through 2012. Whereas the difference between exports and imports in 2005 was EUR 7.9 bn, accounting for 5.3 percent of the German economy's trade surplus, the figure in 2012 is expected to be EUR 13.6 bn or 6.5 percent. Even in the crisis year of 2009, the share of the trade surplus did not fall below 5 percent and was able to return to its original growth trend in the years after the crisis. From 2011, the healthcare sector's trade surplus of EUR 13.1 bn was back up at more than EUR 1 bn above the pre-crisis level.

Figure 11: Development of the German healthcare sector's imports, 2005 – 2012



* Forward projection
** Forecast

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Table 3: The healthcare sector's share in the German trade surplus

	2005	2006	2007	2008	2009	2010	2011	2012
Exports less imports (EUR bn)	7,9	10,2	12,2	12,0	8,2	11,6	13,1	13,6
Share of Germany´s trade surplus (FTE rate %)	5,3	6,3	6,0	6,3	5,5	5,1	6,4	6,5

Source: NHA; WifOR; TU Berlin; Roland Berger Strategy Consultants.

2.4 The reciprocal relationships of the German healthcare sector: Strong spill-over effect

Besides the direct effects that result from the production of healthcare goods or from the provision of healthcare services, the healthcare sector also generates further economic effects for the German economy through the reciprocal relations that exist with other industries, in other words through the purchasing of inputs (indirectly) and the spending of income (induced).

2.4.1 Services and production: The biggest inputs to the healthcare sector

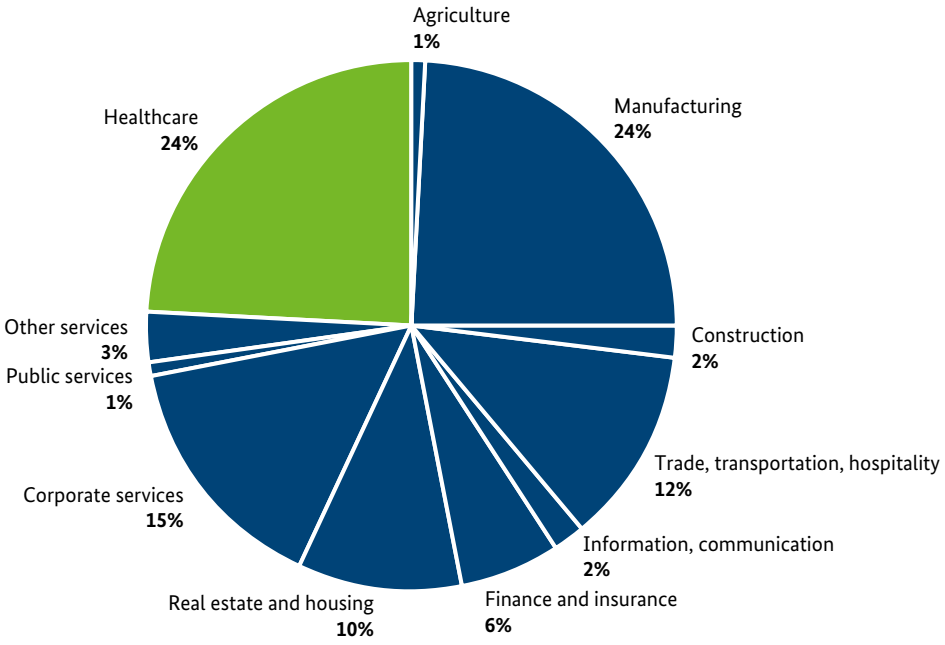
Figure 12 lists the suppliers of inputs in 2011 (forward projection). The inputs purchased by the healthcare sector in the year under review amounted to a total of EUR 157.1 bn (24 percent).

Likewise, the healthcare sector purchases one quarter of inputs from companies in the manufacturing industries and, indeed, from other companies in the healthcare sector. A further 15 percent of the inputs are purchased from the corporate services sector and 12 percent from the trade, transportation and hospitality industries. This view already enables some early conclusions to be drawn as to the supplier relations in the healthcare sector, which can serve as a basis for calculating the indirect and induced spill-over effects.

2.4.2 The spill-over effects of the German healthcare sector: More than 50 percent in addition to the direct effects

Figure 13 presents an outline of the indirect and induced value added effects and the associated value added multipliers for 2009.[10]

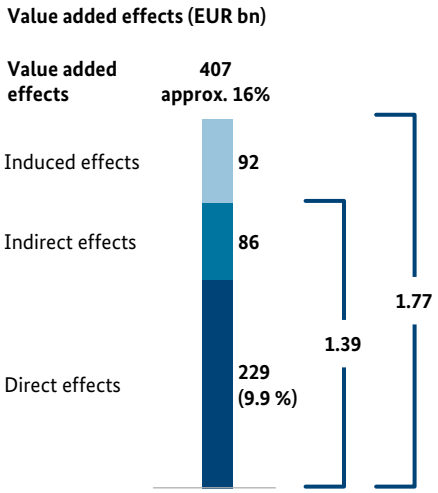
Figure 12: Suppliers of inputs to the German healthcare sector in 2011 (forward projection)



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

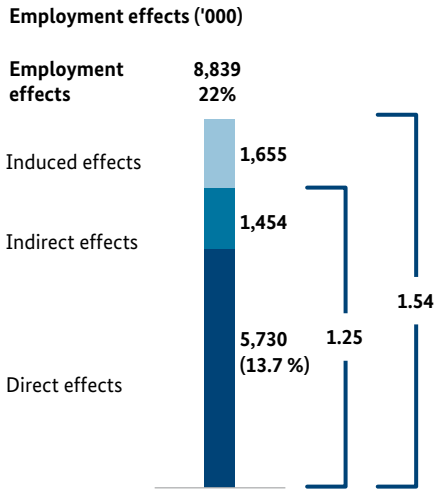
10 The analysis of the economic spill-over effects relates to 2009 from this point on because, at the time of calculation, this was the latest year for which all basic tables were available to facilitate a complete bottom-up calculation of the health satellite system.

Figure 13: Overview of the value added effects of the German healthcare sector, 2009



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Figure 14: Overview of direct, indirect and induced employment effects, 2009



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Over and above the 229 billion euros of direct gross value added, the supplier relationships described above add a further EUR 86 bn in indirect gross value added. The multiplier, which describes the ratio of all direct and indirect effects to direct effects, is therefore 1.39. Depicting the healthcare sector as a satellite account enables the indirect effects to be precisely determined.

The calculation of the induced effects, on the other hand, is more in the nature of an example here, given that it is dependent on additional assumptions concerning consumption behavior. These are triggered by the spending of income generated in the healthcare sector and add up to a further EUR 92 bn. The total value added multiplier, in other words the ratio of all direct, indirect and induced effects to the direct effects is 1.77. This means that for each euro of GVA generated directly in the healthcare sector, a further 0.77 euros of GVA is triggered in the German economy. These indicators underline the healthcare sector's great importance for the German economy, resulting not only from the direct added value, but also from the spill-over effects it generates.

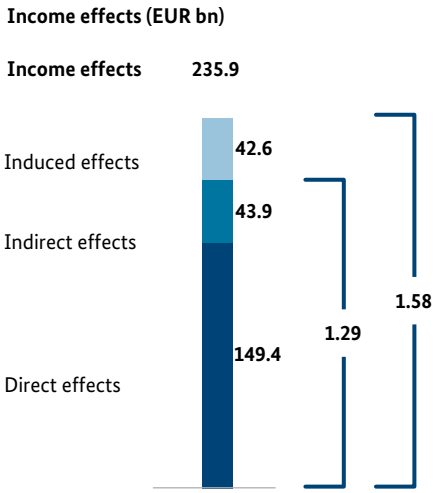
Figure 14 similarly illustrates the direct, indirect and induced employment effects of the healthcare sector for 2009.

In addition to the 5.7 million or so people who are directly employed in the healthcare sector, there are around 1.5 million indirectly employed people who work in the areas providing input to the healthcare sector. Therefore, for every four people working directly in the healthcare sector, there is one further member of the working population in the areas providing input. This ratio is expressed in the indirect employment multiplier of 1.25. As mentioned above, the indirect effects can be determined with sufficient accuracy by depicting the healthcare sector in a separate satellite account.

The induced effects also established here are subject to some inevitable fuzziness due to the additional assumptions that need to be made. The employment relationships induced by the healthcare sector total around 1.7 million working people.

Indirect and induced employment effects together produce an employment multiplier of 1.5. Thus, as a consequence of the spill-over effect in the input areas and the spending of the generated income, every two working people in the healthcare sector result in one further member of the working population in Germany.

Figure 15: Overview of direct, indirect and induced income effects, 2009



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

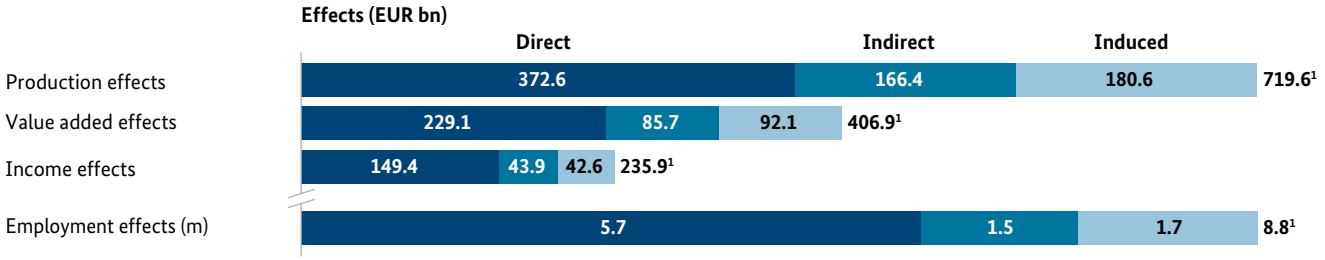
Similar multipliers result when looking at the indirect and induced income effects (see Figure 15).

The healthcare sector pays wages of around EUR 149.5 bn (including the employer's contribution to the welfare system) to its direct workforce. In addition, income of EUR 43.9 bn is triggered in the input sectors as a result of the healthcare sector. The resulting income multiplier is 1.29, which means that for every euro directly paid in the healthcare sector, an additional 0.29 euros in income is paid in the areas providing input. The income effects induced by the healthcare sector, which, as mentioned several times above, are subject to greater uncertainty than the indirect effects, total EUR 42.6 bn. The total income multiplier is therefore 1.58.

Figure 16 shows the presented spill-over effects clearly and collectively. It is evident that, besides the EUR 372.6 bn in direct production effects in the healthcare sector, just under EUR 350 bn in indirect and induced production effects is additionally present in the form of spill-over effects. In terms of gross value added, this means that a further EUR 85.7 bn in indirect spill-over effects and a further EUR 92.1 bn in induced effects are produced by the German healthcare sector.

Ultimately, based on the empirical model, these calculations can also be used to measure the income effects and the employment effects, as pointed out above. With respect to the employment effects, this means that, besides the 5.7 million working people directly employed in the German healthcare sector, more than 3 million employment relationships are associated with the German healthcare sector in an indirect or induced sense.

Figure 16: Overview of the healthcare sector's spill-over effects in 2009



1 Rounding deviations in the total

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

3. Growing lack of specialists in the healthcare sector

Like the German economy as a whole, the healthcare sector must also rise to the challenges of demographic change and particularly its effect on the availability of specialists. More so than in other industries, however, demographic change is affecting the healthcare sector in two ways. On the one hand, in an aging society there is increasing demand for the services offered, and on the other hand, the demographic trend means that there will be fewer people in gainful employment in the long term.

3.1 Shortfalls in specialists above all in outpatient and inpatient facilities

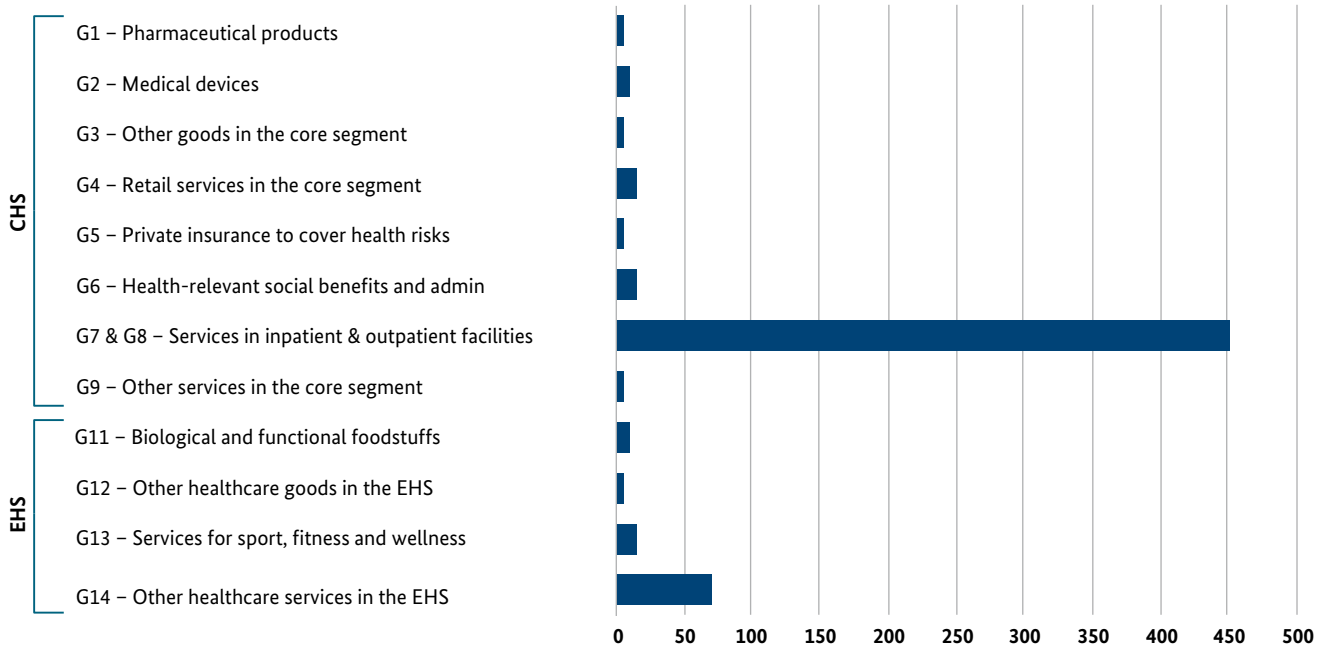
One of the consequences of these trends is an emerging divergence between supply and demand on the labor market. The research findings demonstrate that there is expected to be a shortfall not only of doctors but also, to a significant extent, of paramedical healthcare professionals.

Figure 17 depicts an initial estimate of the staffing shortfall by the 14 product groups in the NHA for 2020.

The estimate of the staffing shortfall shows that the outpatient and inpatient areas are where the biggest shortfall or need for 452,000 working people can be expected in 2020. The shortfalls in G7 and G8 are significantly higher than in any other product groups. For instance, G7 and G8 are responsible for 77.7 percent of the absolute shortfall in the healthcare sector in 2020. Of the other product groups, only G14 exhibits a fairly large shortfall of just under 69,000 working people.

This early estimate of the personnel trend makes it clear that the highest shortfalls in specialists in numerical terms will be experienced in the outpatient and inpatient facilities. For this reason, the analysis below is limited to the personnel trend in the outpatient and inpatient facilities of the healthcare sector through 2030. The anticipated shortfalls vary greatly between the different professions. The healthcare professions are therefore the main focus of the analysis of the shortfall in specialists presented below.

Figure 17: Shortfall in workers (in '000) in 2020 in the product groups of the NHA[11]



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

11 No statements can be made on how the number of people working in G10 "Services in private households" will develop. However, the rising demand for care in the home leads us to believe that the current number of 36,000 people working in this sphere will see a further increase, which will lead to fewer potential workers being available on the labor market.

3.2 The healthcare professions will lack more than 600,000 full-time employees in 2030

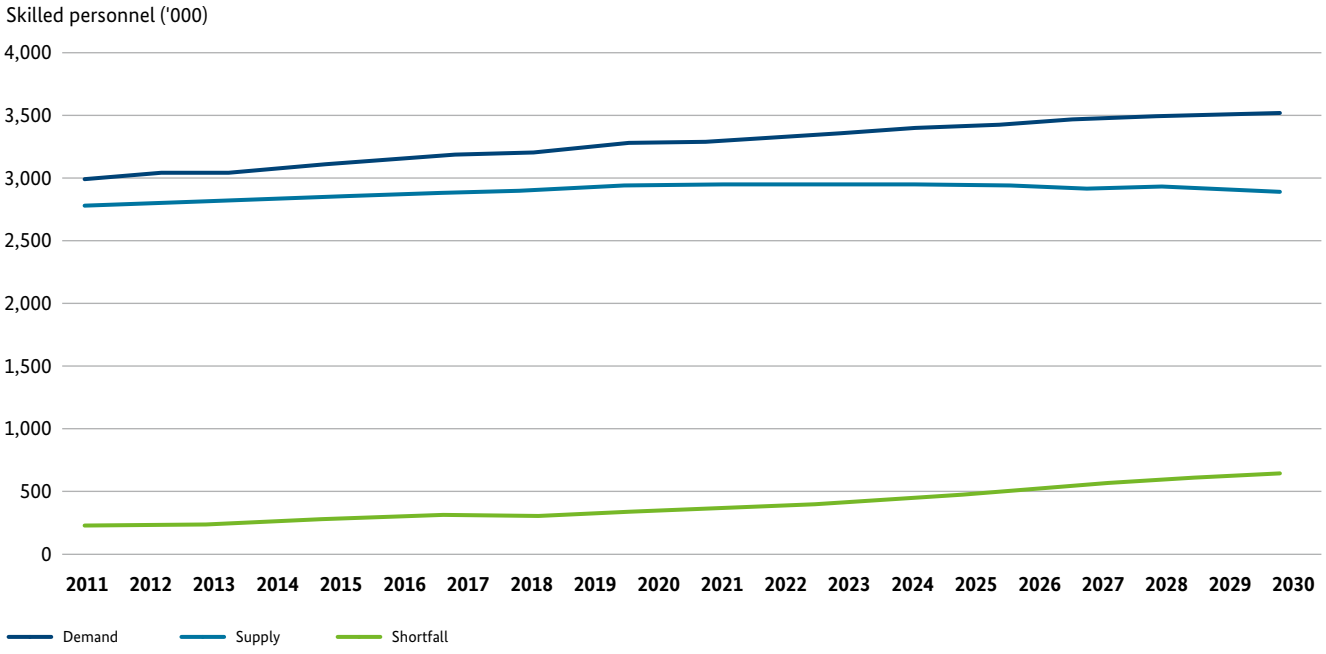
Figure 18 illustrates the future development of the supply and demand of staff in the outpatient and inpatient segments. It is evident that a general staffing shortfall can be anticipated in the classic professions in the healthcare sector.

This general staffing shortfall has been evident since 2011, when it totalled approx. 207,000 full-time equivalents. By the year 2020 it could rise to more than 337,000 full-time equivalents. Going forward, the growth of the staffing shortfall will accelerate to 625,000 full-time equivalents in 2030.

The growing gap between supply and demand over time in the period through 2030 is the result of the intensifying consequences of demographic change. For example, graduate numbers will stagnate from 2020 and will start to fall in 2024, just at the same time as the number of people embarking on retirement increases. Consequently, the supply of healthcare personnel will fall. In the same period, the demand for healthcare assistants and nursing staff will rise because, as people get older and enjoy longer life expectancy, there will be greater demand for healthcare services.

The profession of doctors (category 84) is currently experiencing a shortfall of or need for 16,000 unfilled full-time posts. This shortfall could rise to 32,000 posts by 2020 and ultimately to 75,000 full-time employees in 2030. However, it must be emphasized that there could also be shortfalls in the other professional groups subsumed under professional classification category 84 in the future, in other words pharmacists, dentists and psychotherapists could be subject to shortfalls in specialists. The research findings therefore imply that there could be a lack of almost 19,000 full-time employees in the above-mentioned professional groups by 2030.

Figure 18: Personnel forecast for the professions in the healthcare system overall in '000



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

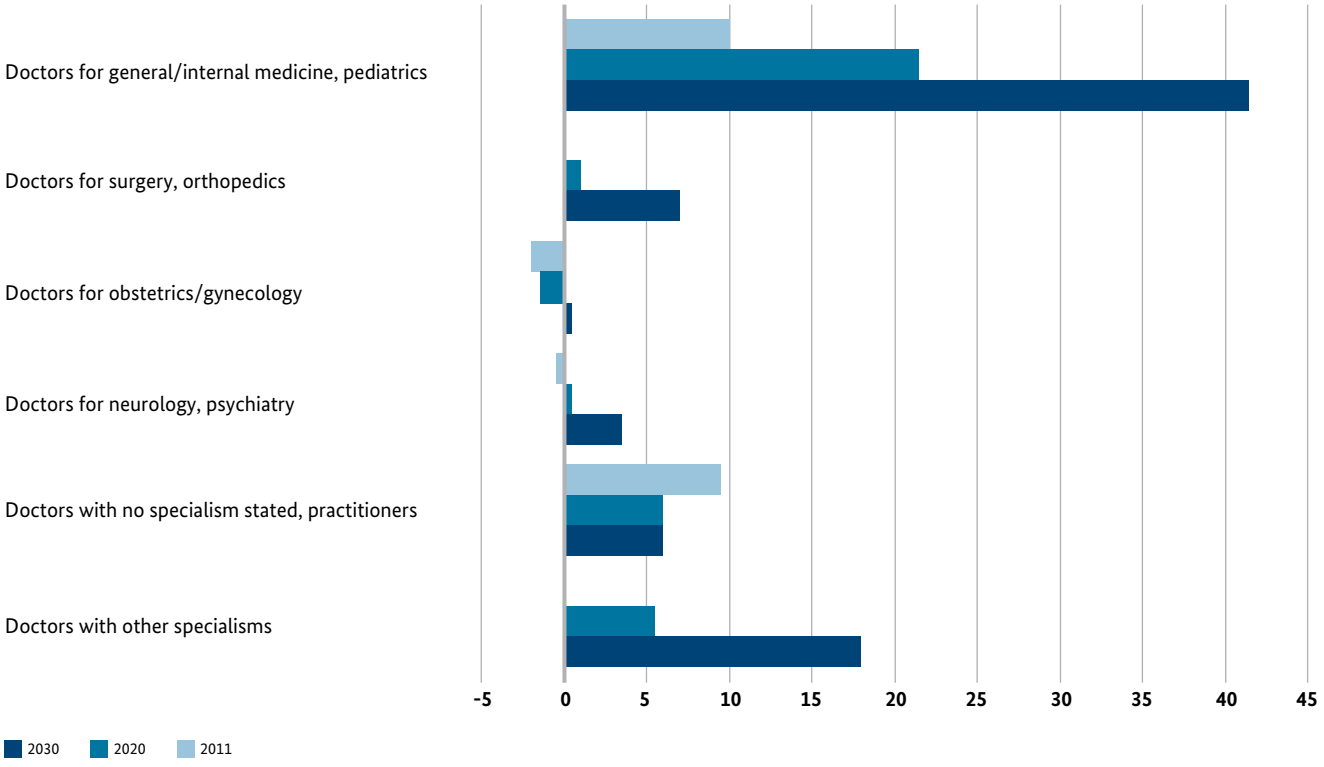
Figure 19 summarizes the shortfalls for selected groups of medical professionals:

The figure shows that the shortfall in full-time employees among "doctors for general/internal medicine, pediatrics" is also the largest in the future. In this professional group there is already currently a lack of 10,000 full-time equivalents. By 2030 this shortfall will rise to 42,000 full-time equivalents. Accordingly, there will be a lack of general practitioners first and foremost. This development is reflected in the trend toward under-provision in the outpatient sector outside of major cities ("rural doctor shortage"). The future development in specialist numbers will significantly worsen the shortfall situations particularly among general practitioners in rural areas.

Figure 20 shows the future shortfalls based on the share of unfilled posts relative to the development in the demand for specialists. As such, it displays both the absolute and the relative shortfalls.

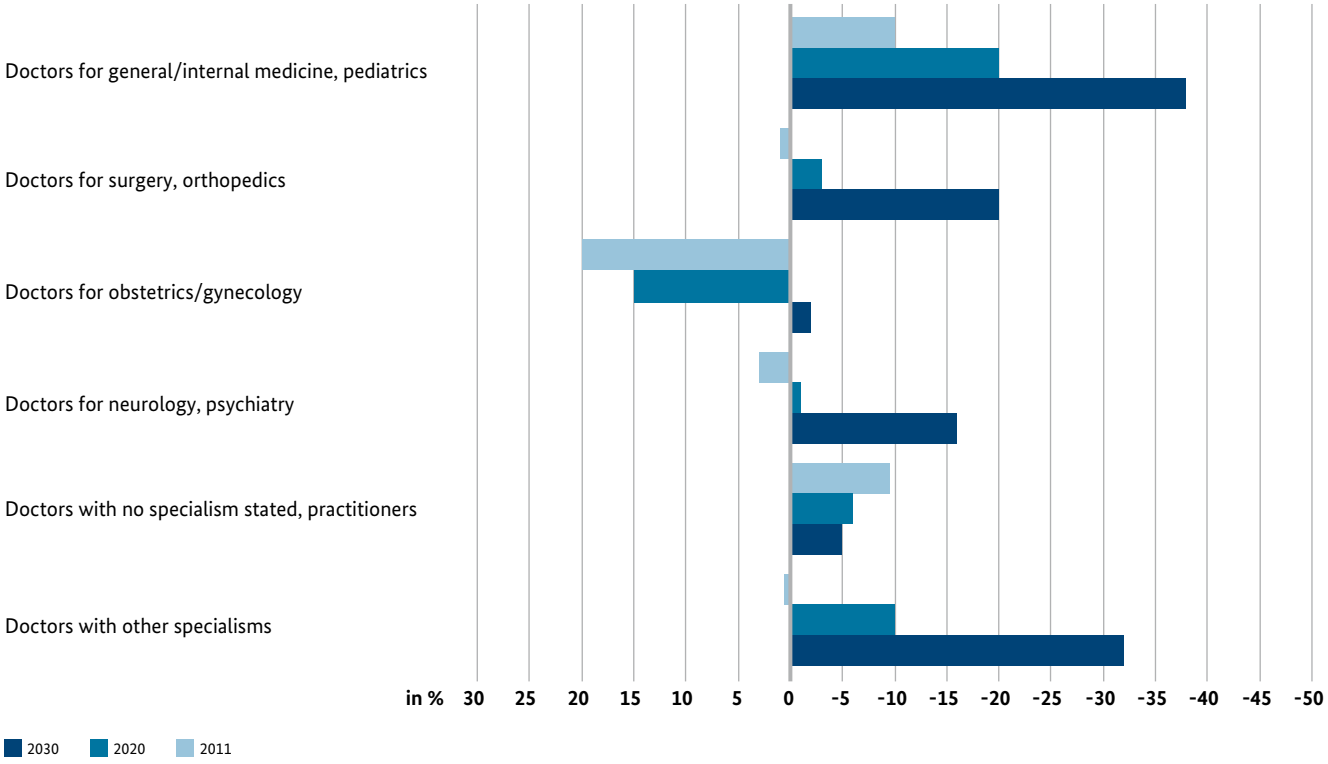
Figure 20 highlights the fact that, in 2011, it was predominantly posts for general practitioners and "doctors with no specialism stated, practitioners" that were unfilled. Other specialisms, such as doctors for surgery, orthopedic surgery, doctors for obstetrics and gynecology, doctors for neurology, psychiatry and other specialisms do not at the present time exhibit a proven shortfall. By the year 2030, however, the surplus currently evident in these groups of doctors will turn into a shortfall. Then, around one in five posts could remain unfilled among surgeons and orthopedic

Figure 19: Development of the shortfall in specialists in FTEs for selected specialisms in '000



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Figure 20: Development of the shortfall in specialists in unfilled posts



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

surgeons, while 16.3 percent of posts for neurologists and psychiatrists may not be filled. Among general practitioners, more than one in three posts may even remain unfilled. For gynecologists, the current surplus will develop into a shortfall in 2030, albeit prospectively a small one. There will nevertheless be a total shortfall of 76,000 full-time equivalents in 2030. This will mean that across all doctors groups, 21.8 percent of posts will go unfilled, which could leave more than one in five posts for the specified groups in category 84 vacant in 2030.[12]

Figure 20 also shows evidence of an opposite trend among "doctors with no specialism stated, practitioners". Whereas all other medical professions will see the shortfall situation deteriorate in the future, this profession is expected to see a slight let-up in the shortfall in specialists by 2030.

The figures for the medical segment need to be set in the context of the anticipated shortfalls in other professions in the healthcare sector as well. In absolute figures, the forecast deficit in the paramedical healthcare professions in 2030 will in some areas be many times greater than it is for doctors.

12 For more on the need for and lack of specialists, see also Henke, K.-D., Braeseke. G. et al. (2011), p. 249 – 258.

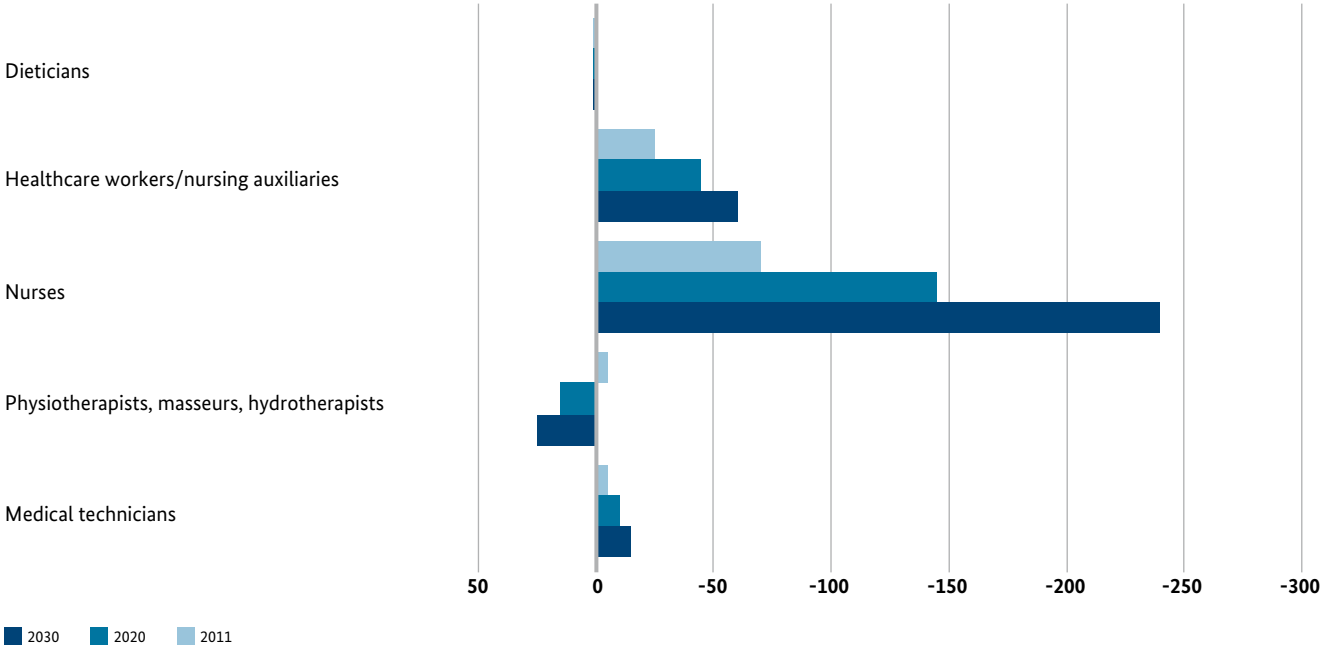
3.3 There is principally a lack of nurses

Figure 21 shows the number of full-time equivalents lacking in paramedical healthcare professions over time.

The biggest personnel shortfalls can be seen in the current and future development of the "nurses" category. A shortfall of around 73,000 full-time equivalents in 2011 could turn into a shortfall of 243,000 full-time employees in 2030. This would see the shortfall rise by a factor of 3.5 over today's figures. "Healthcare assistants and nursing auxiliaries" are affected by a similar development, with a supply gap that is anticipated to total 58,000 full-time equivalents in 2030. Posts among medical technicians will also remain unfilled in the future. Among dieticians, physiotherapists, masseurs and hydrotherapists there will not be any appreciable shortfall or there may even be an over-supply of full-time equivalents. Figure 22 illustrates the share of unfilled posts for paramedical healthcare professions.

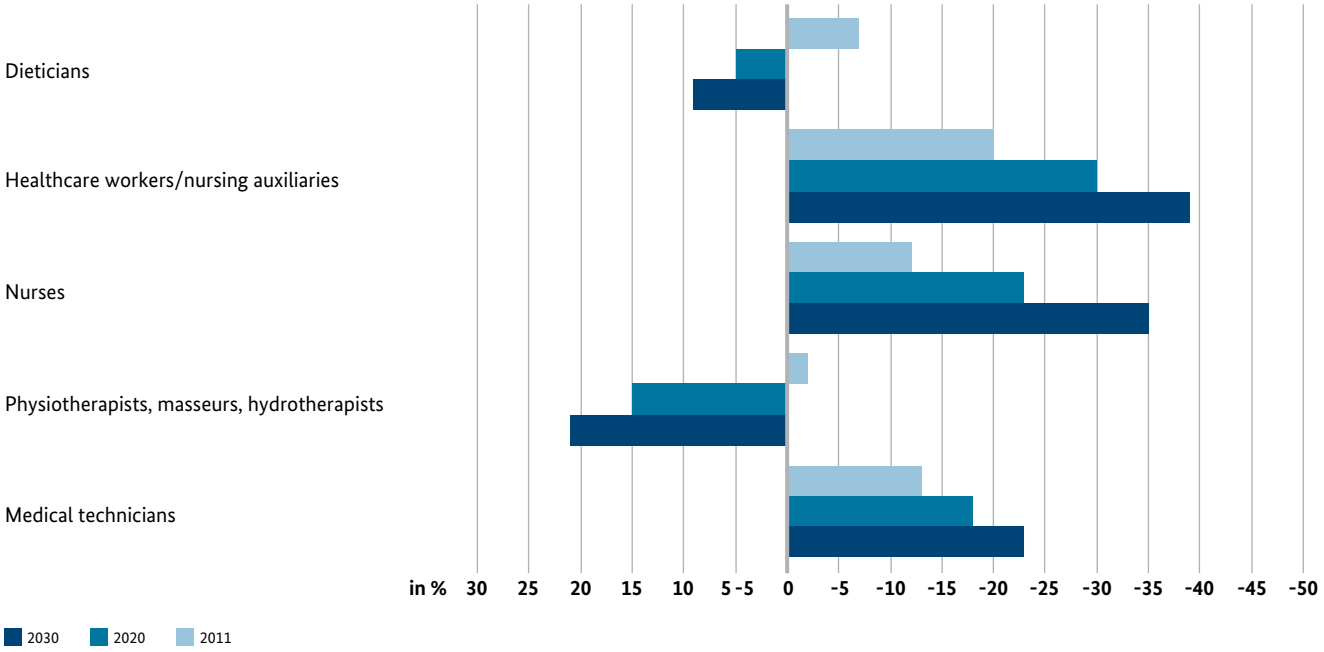
Figure 22 shows the biggest shortfall for "healthcare assistants and nursing auxiliaries", which is set to almost double from 20.3 percent in 2011 to 39.4 percent in 2030. The "nurses" category follows not far behind, with a gap of 34.9 percent in 2030. The situation among medical technicians looks more dramatic when viewed in this way than it appeared when expressed in absolute figures in terms of full-time equivalents. In spite of the relatively small absolute number of healthcare personnel that will be lacking in this category, around one in four posts will go unfilled in 2030. Conversely, surpluses can be expected for the two remaining groups.

Figure 21: Development of the staffing shortfall in FTEs for paramedical healthcare professions in '000



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

Figure 22: Development of the staffing shortfall for paramedical healthcare professions in unfilled posts



Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

4. Supplements to the NA and additional indicators with a healthcare connection

4.1 Healthcare-relevant production in private households, voluntary work and the shadow economy

The criticism surrounding how meaningful the National Accounts and GDP are as an indicator of the wealth of society also applies to the healthcare sector. Numerous publications, such as the report by the German Bundestag's Enquete Commission on growth, wealth and quality of life, discuss how GDP, and the healthcare sector, can be extended to take in elements like household production, voluntary work and the shadow economy.[13] Particularly these three components, which are not fully or not at all taken into account in the NA, are being seen to an increasing extent in the German healthcare sector. For example, care services are being provided in the healthcare location of "the home" by family members without any compensation, and also the number of voluntary workers in the healthcare sector, working for organizations like the Johanniter (St. John's Ambulance Service) or Caritas, is not sufficiently taken into account in the NA and thus in the NHA. And finally, the shadow economy is only estimated to a limited extent by the Federal Statistical Office.

In order to make the NA more meaningful in respect of these three aspects without having to change the entire concept behind the calculation of GDP, supplementary satellite systems were introduced in the past.[14] The background here is the need to identify and quantify the effect of additional factors, which can be expressed in monetary terms, on the well-being of the population. Ostwald and Sesselmeier (2011) see disposable income – plus illicit work, household production (including voluntary work) and leisure – as a better indicator of the wealth of a nation than GDP, because unpaid work increases the consumption of goods and services and should therefore be seen as implicit income.[15] Income measurements should therefore be extended to include non-market areas in order to minimize potential distortion.[16]

Household production, according to Hesse and Judt (1996), is one of the main components of the spectrum of human activity. However, it is by no means easy to separate this from leisure, regeneration and the area of personal education.[17] The OECD (2011b) employs the replacement cost approach to help it arrive at an estimate that says that the value of unpaid work in Germany is around 30 percent of GDP. In the entire OECD, between one third and one half of value-adding economic activities are not recorded in the systems of the members' National Accounts.[18] The report on people's use of time conducted by the Federal Statistical Office (2003) in 2001/2002 establishes a total of 96 billion hours of unpaid work for 2001. Weighted at a net rate of pay of approx. 7 euros (2001 figure), the resulting value of unpaid work is EUR 684 bn. The total added value is around EUR 820 bn, which must be added to GDP of EUR 2,102 bn (2001). If the use of consumer durables and prorated rents are included as well, the value of household production is EUR 1,121 bn.[19] Ostwald and Sesselmeier (2011) calculate a monetary value of EUR 604.4 bn[20] for household production in 2005, at GDP of EUR 2,224 bn.[21]

These facts result in the qualitative and quantitative importance of the healthcare sector for the German economy being underestimated.

13 The Enquete Commission's final report on growth, wealth, quality of life – ways toward sustainable economic activity and societal progress in the social market economy was published on June 4, 2013.

14 See Krämer (2011), p. 2.

15 Substitution effects between paid and unpaid work are not sufficiently depicted as a result of the focus on GDP; see OECD (2011b), p. 10. Work can be performed by third parties, leisure, on the other hand, cannot – the so-called third person criterion is therefore applied, see also Ostwald and Sesselmeier (2011), p. 5.

16 Services that used to be provided in the family/neighborhood are now offered through marketplaces in many cases. The additional income that arises – e.g. through increased professionalization of care – does not automatically raise the standard of living, however, see Stiglitz et al. (2009), p. 14.

17 See Hesse and Judt (1996), p. 1 – 3.

18 There are two ways of monetizing leisure: using the opportunity cost approach or the replacement cost approach; see OECD (2011b), p. 24.

19 See Statistisches Bundesamt (2003), p. 11 – 12. Work on a time budget survey for 2012/2013 has begun – findings are expected in 2015; see Statistisches Bundesamt (2012a: Internet).

20 See Ostwald and Sesselmeier (2011), p. 21.

21 See Statistisches Bundesamt (2012b: Internet).

4.2 Selected indicators with a healthcare connection

Non-NA indicators with a healthcare connection have also been examined and summarized in a table along with selected indicators and have, as far as possible, been underpinned with statistical data. They provide an insight into national and international efforts to record society's well-being, including health. These include the Human Development Index, the Canadian Index of Wellbeing, the Happy Planet Index, the Well-Being Index for Germany, the Progress Index or the Index of Sustainable Economic Welfare (ISEW) and the Genuine Progress Indicator (GPI) as well as Gross National Happiness. In summary, they result in pictures that incorporate indicators from the NA in the narrow sense and in the broad sense as well as non-GDP indicators (see Figure 24). They measure wealth, well-being and quality of life in a new way that takes explicit account of healthcare-relevant factors.

5. Conclusion

The NHA does away with the cost-only consideration of the healthcare system and focuses instead on the economic importance of the healthcare sector. As such, it supplements the Federal Statistical Office's calculations of healthcare spending, healthcare staffing and disease costs. The following elements are subsumed in a National Health Account:

1. In line with the satellite account, the NHA takes in all data on the basis of the NA, such as the total volume of goods, imports, production values, inputs and gross value added, each in terms of its share in the economy as a whole.

2. The volume side is compared against the utilization side, involving the total utilization of goods, domestic consumption, exports and intermediary utilization, each again in terms of its share in the economy as a whole.

Figure 23: Dimensions of quality of life and corresponding indicators

Dimension		Corresponding indicators
Health		Health spending
		Life expectancy or years of healthy life left
		Prevalence of certain diseases
Education	Inputs	Student/teacher numbers and education spending
	Outputs	Hours of education provided
		School completion rates, PISA study
		Measurement of skills attained
Personal activities and work		Time budget surveys on the home, leisure and voluntary work
		Living situation
		Gainful employment (working hours, training, discrimination, industrial accidents and risk)
Political participation and law	Human rights	Freedom of speech, freedom of assembly and freedom of the press
	Justice system	Rule of law, duration of court proceedings
		Extent of the people´s influence and confidence in it
Social relationships		Involvement in social networks
		Social reliance, informal support
		Religious involvement
Individual environmental conditions		Air and water pollution, noise
		Hazardous substances, natural disasters
Insecurities	Physical integrity	Criminality
		Accidents
	Economic integrity	Unemployment
		Sickness, age

Source: WifOR; TU Berlin; Roland Berger Strategy Consultants.

3. Within the scope of domestic consumption, a differentiation is made between the primary and the secondary healthcare market and this is placed in the context of the core segment and the extended segment of the healthcare sector. For all 14 product groups, the economic variables can be calculated and presented over time.

4. Furthermore, the NHA also includes a depiction of the indirect effects in total and by each of the product groups. They result from the cost of buying in materials/services or the inputs.

5. Besides the direct or primary effects and the indirect or secondary effects of the healthcare sector, the induced effects are also of relevance. These result from the spending of the wages and salaries received.

6. Healthcare-relevant production in private households including voluntary work also goes into the NHA. There have been some individual calculations made of these aspects but there is not yet any usable data for permanent reporting.

7. Finally, the labor market in the healthcare sector is incorporated in the NHA. Due to the extended boundaries of the healthcare sector under the NHA calculations, the workforce figures in the NHA are higher than those in the Federal Statistical Office's healthcare personnel accounts. This data also includes the figures on numbers of specialists by facility and profession in selected aggregated product groups (in full-time equivalents).

Furthermore, the findings obtained so far in the research project on the NHA prompt a need for research on the following aspects:

- Converting the calculation methods to suit the new sector classification
- Merging the various research projects being conducted for the BMWi (Federal Ministry for Economic Affairs and Energy), such as the trend in productivity in the healthcare sector
- Integrating productivity by area of production, goods and diseases
- Adjusting prices
- Quantifying the healthcare sector's household production and voluntary work
- Measuring the efficiency of the German healthcare sector with the use of data from the NHA.

Finally, the question is how the significance of the established data from the NHA correlates with the general health of the population. We are moving from an economic dividend toward a healthcare dividend. Furthermore, the unique character of health as a value-creation factor needs to be taken into consideration. Healthy aging raises people's individual quality of life and, by creating a healthier society, also leads to desirable effects on society and the economy.[22]

The benefit of longer years of life in turn creates scope for the support of people who are no longer able to actively participate in it. In this context, there is a need for research on whether the compression of morbidity reduces the burden on the welfare system, and also on what needs to be done throughout the total lifecycle in the long term in order for people to age more healthily than they did in the past.

6. Special feature

6.1 On the efficiency of the German healthcare sector in an international comparison

The presentation of the NHA so far has taken into account both the direct, indirect and induced economic effects as well as the labor market and the future shortfalls in specialists. These research findings – predominantly input-oriented in nature – enable only limited statements to be made on the efficiency of the provision of healthcare goods and services. For this reason, we also considered, within the scope of the research project, the efficiency of the German healthcare sector.

22 For more details see Henke (2012): Die Gesundheitswirtschaft: Von der ökonomischen Dividende zur Gesundheitsdividende, Abschiedsvorlesung, TU Berlin.

Our preliminary thoughts concerning the definition and concept of efficiency in comparisons of healthcare sector efficiency quickly revealed that there are hardly any means of comparing the healthcare sectors in different countries. Only if healthcare sector data is recorded in consistent ways on the basis of uniform statistical methods can meaningful comparisons be produced. The Institute for Advanced Studies in Vienna is working on recording statistics on the Austrian healthcare sector on the basis of the NA and there are also similar projects under way in Switzerland, so limited international comparisons will be possible in the future.

In view of this difficult background, the analysis was conducted with reference to the healthcare systems as such, thus placing the focus on the international comparison of efficiency in healthcare systems. It became apparent that evaluating the national efficiency of selected areas of provision is easier than making rather meaningless global international comparisons based on various forms of ranking system or based on selected individual indicators.

6.2 International comparisons based on healthcare system ranking and selected individual indicators

In place of the many international healthcare system comparisons, particularly those conducted by the WHO, the OECD, EuroStat and other institutions, we would like to present at this point the "Mirror, Mirror on the Wall" series of studies by the Commonwealth Fund, which explicitly looks at the efficiency of provision for seven healthcare systems. The study analyzes healthcare systems in respect of how they perform on 74 different indicators. Figure 24 shows the results of the healthcare system ranking for 2010.

Germany achieved its best result in the area of "access to care", and particularly in "timeliness of care", where it ranked 2nd. In "quality care", "effective care" and "coordinated care" Germany was one of the worst performers. Germany ranked fifth in "quality care" and "efficiency". Overall, Germany ranked fourth in 2010.

Figure 24: Healthcare system ranking according to the study "Mirror, Mirror on the Wall".

	AUS	CAN	GER	NETH	NZ	UK	US
Overall Ranking (2010)	3	6	4	1	5	2	7
Quality Care	4	7	5	2	1	3	6
· Effective Care	2	7	6	3	5	1	4
· Safe Care	6	5	3	1	4	2	7
· Coordinated Care	4	5	7	2	1	3	6
· Patient-Centered Care	2	5	3	6	1	7	4
Access	6.5	5	3	1	4	2	6.5
· Cost-Related Problem	6	3.5	3.5	2	5	1	7
· Timelines of Care	6	7	2	1	3	4	5
Efficiency	2	6	5	3	4	1	7
Equity	4	5	3	1	6	2	7
Long, Healthy, Productive Lives	1	2	3	4	5	6	7
Health Expenditures/Capita, 2007	$ 3,357	$ 3,895	$ 3,588	$ 3,837	$ 2,454	$ 2,992	$7,290

Country Ranking
1.00 – 2.33 2.34 – 4.66 4.67 – 7.00

Source: Davis et al. (2010); WifOR; TU Berlin; Roland Berger Strategy Consultants.

If we leave aside the attempt to create a ranking of the system as a whole and draw further indicators (e.g. amount of spending, type of funding, provision with doctors and nursing staff, number of hospitals and hospital beds, mortality and life expectancy, transferable and non-transferable diseases, tobacco and alcohol consumption and number of people who are overweight) into the international comparison, the ranking is then determined by the respective underlying indicators. The ones chosen determine how the countries rank; these selected statistics do not, as a rule, permit any detailed statements to be made on the efficiency of the healthcare systems. A disaggregated national consideration is what is required here.

6.3 Efficiency of selected areas of German healthcare provision and estimate of the health consequences

A closer consideration of the national facilities for outpatient and inpatient provision themselves and particularly also that in the outpatient and inpatient care makes it much easier to comment on the efficiency of the German healthcare sector.[23]

The high level of spending in the inpatient sector could be dramatically reduced by greater cooperation between hospitals. Improvements in quality would compensate for the longer distances patients needed to travel. The referenced studies recommend single-tier hospital funding along with a more efficient structure in inpatient service provision. As in hospital requirements planning, new ways also need to be found in ensuring that outpatient provision is available close to where patients live. In the referenced studies it is also evident that improved coordination at the sector boundaries or interfaces in the healthcare system is essential to the improvement of treatment quality.

Finally, efficiency potential can come to light if an even closer connection with integrated provision is created. For instance, efficiency gains can be achieved by removing the sectoral separation between the areas of provision, by increasing the focus on quality, by ensuring that insured persons and patients and their families understand more about their care and take greater ownership of it, and with the help of even more targeted drug supplies.

In conclusion and in relation to the entire project, we would like to point out once more that the productivity and efficiency of the healthcare sector as measured with the help of the satellite accounts could not be examined in this special feature. The international comparison of healthcare sectors is still in its infancy.

On the contrary, the focus in the first instance lay on the international comparison of ranking systems and the comparison of healthcare systems based on selected indicators. As we moved over to the efficiency of parts of the system, however, an implicit connection with the healthcare sector did result, given that the activities in outpatient and inpatient provision and in the care sector are depicted in the satellite sector. Only the direct connection between the 14 product groups (input) and the health of the population (output) and the efficiency of processes and structures within the provision cannot yet be made. The BMWi's ongoing research project on the productivity of the healthcare sector will certainly shed light on that in 2013.

Finally, assessing the health consequences (by means of a health impact assessment, social return on investment) remains a challenge for the future. Such an assessment is a tool with which the consequences of political and administrative decisions on health in all spheres of life can be estimated or predicted. Detached from the HSA and the economic dividend of the healthcare sector, it would also provide a measure of evidence for health policy decisions. In a similar way to the environmental impact assessment, the health impact assessment is not only applicable to health policy interventions. Construction and transport policy, energy policy, education policy or indeed "health in all policies", with all of their impacts on health, must form a part of this interdisciplinary approach, which is only rudimentary at present. Even more so than before, health and the associated focus on delivering quality and achieving results thus takes center stage. It is ubiquitous and permeates all aspects of life.

23 The statistical analysis we were mandated to conduct involved reproducing the results of existing statistics and not conducting original surveys or assessing the theoretical and analytical aspects of the different methods underlying the calculations.

II. Measurement of the productivity of the health economy

1. Introduction

Productivity is an important concept for assessing economic performance. Productivity growth measures technological progress. The second study concentrates on the productivity of the health economy, which is dominated by service activities. Economic studies have presented contradicting results about productivity growth of the health sector, depending on the borderlines of the health economy, the taxonomy of activities included and the approach of productivity measurement. The study uses the framework of the satellite accounts, which consistently links the System of Health Accounts (SHA) to the input-output tables of the System of National Accounts (SNA) (see *Henke, Neumann, Schneider et al. 2009*). The compilations present figures for the period 2002 to 2010.

The Health Satellite Account aggregates more than 500 health-related goods and services from the national goods and service account into a health input-output table by rules of the System of National Accounts into groups of goods and production activities. In the framework of this study, these goods are further classified either as health goods or as health services in order to distinguish the different factor inputs. The underlying idea is, that services have less potential to increase productivity than industrial produced commodities (see *Baumol 2010*, *Hartwig 2008*).

2. Productivity indicators

"Total factor productivity" measures best productivity.[24] It shows how much more output increased than input. The approach can be applied for the total economy and for economic sectors. Prerequisite for the compilation of productivity is the measurement of the following variables (see *Atkinson 2005*, *Department of Health 2005*):

1. Input (intermediate services, labour and capital) and the development of these terms over time,

2. Output (volume and quality changes of health care activities),

3. Outcome (health gains as consequence of health sector activities, incapacity for work, invalidity and mortality – e.g. as lost working years or premature deaths).

Productivity and productivity growth is derived from indices or index numbers (see figure 26). Compilations of sectoral productivity growth in the framework of National Accounts data apply the Törnqvist index. The Törnqvist aggregates the growth rates of the outputs and inputs of the various sector outputs with annual weights based on the value shares in total value of sector outputs and inputs. The study distinguishes between different productivity indicators (labour productivity, capital productivity, and multifactor productivity) as well as between subsectors of the health economy (manufactured health goods, health services).

Infobox 1:
Health Satellite Accounts (HSA), System of Health Accounts (SHA), Basic and voluntary health commodity market

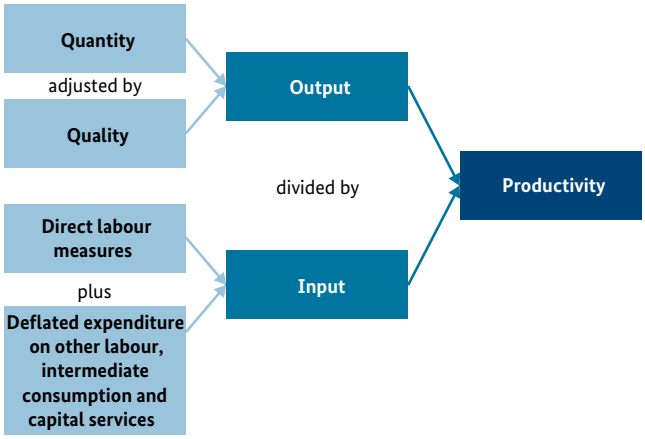
The **Health Satellite Account** is a functional accounting system for the health economy, linked to the System of National Accounts (SNA) for the total economy. Establishments producing health goods are classified as separate sector by using SNA-rules while considering the linkages with the central framework.

The German **System of Health Accounts** is a functional statistical system, which gathers the healthcare transactions by type, value and volume, the used factors of production, in order compile aggregates in line with National Accounts and the future developments of the health economy. Major sub-accounts are the health expenditure accounts, the health labour accounts and the cost of illness accounts. All of them are part of the federal reporting system.

The **Basic health commodity market** includes all health related goods and services and is characterized by compulsory coverage, mainly publicly financed (particularly by the health and long-term-care insurance). In contrast, the **Voluntary health commodity market** is completely privately financed, either by voluntary insurance or out-of-pocket payments. This market comprises all those health related services and commodities, which are not covered by compulsory social insurance or are publicly financed.

24 The terms "total factor productivity" and multifactor productivity are synonymously used.

Figure 25: Productivity components



Source: Wild 2009.

Within this study the output is measured by the volume of gross output, the labour inputs by the effective hours worked, and the capital inputs by the stock of capital. In addition, the input-output-tables of the health satellite accounts provide detailed information about the use of intermediate goods and services. The comprehensive data structure consequently allows further estimate effective multifactor productivity and by this more precise interpretations of the sector-specific productivity growth.

Therefore, the measurement of the multifactor productivity requires summarizing the quantities of output into an output index (production or value added) as well as the inputs (labour, capital, if applicable intermediate inputs) into an input index. Besides, the deflation of the production values should also take quality improvements into account (see Figure 25 and *Aizcorbe, Nestoriak 2010, Berndt et al. 2001, Bradley 2010*).

The **Malmquist index** is based on distance functions, which illustrate multiple input and multiple output technologies (*Malmquist 1953*). For calculation only quantity specifications are needed for inputs and outputs – not information on costs or revenues. This also makes the difference to the **Törnqvist index**, which aggregates the various input and output terms using cost-shares (*Färe et al. 1994*). However, the Törnqvist approach offers also a crucial advantage: While with the Malmquist approach compellingly several observations per time period are indispensable to sketch the efficiency front, with the Törnqvist one observation per time period is sufficient to compile the **productivity growth**.

Various empirical approaches are internationally applied for the measurement of the productivity growth, which partly differ in the measurement of input and output as well in the analytical value (*OECD 2001*). The concept of the multifactor productivity offers with correct implementation a promising approach for the measurement of the productivity of individual sectors of the economy (*Hulten 2001, O'Mahony, Timmer 2009*) – and concomitantly to the health economy. Based on the experiences as well as pro and cons of the existing empirical concepts, an approach could be developed in the context of this study, which considers three important aspects thoroughly:

1. Limitations of **data**, in particular with view of the satellite account for the health economy, concerning the availability of price indices as well as regarding the information about the individual input factors.

2. A view after the desired **subject** is possible – total health economy and/or selected diseases.

3. **Additional evidence** about the compiled figures by the triangulation principle, which is checking the plausibility of the results ("genuine" productivity growth vs. measuring errors and incompleteness of markets) recognising the limitations in reducing productivity to a single number.

A commonly agreed international concept of quality adjustments is still missing. The implementation of such a concept both within the health economy and comparatively to other industries of the economy must guarantee comparability and consistency. It is, however, recommended to take explicitly into consideration, while recognizing specific questions to subsectors of the health economy, that today technology used in therapy of a given illness is hardly comparable with the treatment five or ten years ago.

Infobox 2:
Triangulation

The **triangulation** is to support the interpretation of productivity developments within the public sector by supply of additional context information, in order to avoid misinterpretations. By the inclusion of further information and examination of the interrelations it serves the validation of the found results. Uncertainties in the measurement of the input and output sizes are to be reduced thereby (see *ONS 2010*).

3. Productivity growth of the health economy

3.1 Output indicators: production and value added

Over the period 2002 to 2010, the growth of gross output of the health economy at constant prices (2005 = 100) averaged annually 3.0 percent. The output of the total economy, hit by the financial and economic crises, rose only at an average rate of 1.8 percent in the same time (see Table 4). Significant for this difference is the lower inflation of health commodity prices as compared to the overall prices of the total economy (0.5 percent versus 0.9 percent). Within the health economy, the output of health goods (pharmaceuticals and medical devices) inclusive trade shows the highest annual growth rate of 5.5 percent.[25] By comparison, the output of health services grew at the lower rate of 2.3 percent (see Table 4).

Innovations particularly contribute to the fast development of the subsector **health goods and trade services** and the high productivity growth – e.g. almost one third of revenues of the medical device industry results from products, which are less than three years of age, and in the biotechnology the share of the R&D expenses is up to 40 percent of the turnover (see *BMBF 2013:* 17/18). Therefore, it is not surprising, that this part of the health economy shows a high productivity growth.

Table 4: Production (real), value added (real) and intermediate use (real) in the health and total economy, 2002 and 2010

Production areas	at constant prices (2005 = 100)		
	Gross output	Gross value added	Intermediate consumption
2002	**in mio. EUR**	**in mio. EUR**	**in thousand**
Total	3.895.730	1.962.447	1.933.283
Health economy	**320.184**	**194.234**	**125.950**
Core area	240.767	149.444	91.323
Health goods and trade	62.542	27.525	35.017
Services	178.225	121.919	56.306
Extended area	79.417	44.790	34.627
Health goods and trade	27.875	9.910	17.965
Services	51.542	34.881	16.662
Non-health economy	3.575.546	1.768.212	1.807.334
Goods and trade	2.302.210	943.093	1.359.117
Services	1.273.336	825.120	448.217
2010	**in mio. EUR**	**in mio. EUR**	**in thousand**
Total	4.483.690	2.160.845	2.322.845
Health economy	**406.852**	**251.982**	**154.870**
Core area	309.679	195.701	113.978
Health goods and trade	95.679	48.106	47.574
Services	214.000	147.595	66.405
Extended area	97.173	56.282	40.892
Health goods and trade	33.806	13.003	20.803
Services	63.367	43.278	20.089
Non-health economy	4.076.838	1.908.862	2.167.975
Goods and trade	2.664.058	1.020.188	1.643.870
Services	1.412.780	888.674	524.106
Annual change 2002 – 2010	**in %**	**in %**	**in %**
Total	1,8	1,2	2,3
Health economy	**3,0**	**3,3**	**2,6**
Core area	3,2	3,4	2,8
Health goods and trade	5,5	7,2	3,9
Services	2,3	2,4	2,1
Extended area	2,6	2,9	2,1
Health goods and trade	2,4	3,5	1,9
Services	2,6	2,7	2,4
Non-health economy	1,7	1,0	2,3
Goods and trade	1,8	1,0	2,4
Services	1,3	0,9	2,0

Source: BASYS, Statistisches Bundesamt 2012a, b.

25 Trade and manufacturing of goods were comprised because official statistics classify many pharmaceutical companies as wholesalers due to their large share of external trade. In the case of health services inpatient and outpatient care were comprised because both subsectors organize the distribution of pharmaceuticals and medical devices in different ways.

The higher growth, on average, of the health economy as compared to the non-health is even more evident for indicator "gross value added". While in the total economy gross value added at constant prices only increased at the rate of 1.2 percent, the health economy grew at an average rate of 3.3 percent (see Table 4). This higher growth results from several factors: stable development during the economic crises, low inflation rates, and increasing export shares. The last factor fuelled the soaring expansion of the gross value added of the industrial manufactured health goods and their trade.

Infobox 3:
Output, intermediate consumption, and value added

The **gross output** of an enterprise or industry is the total value of all goods and services that it produces. It comprises the changes of inventories of goods for sale and own-account produced fixed capital goods. The gross output contains all intermediate inputs used for production. **Intermediate inputs** consist of the value of the goods and services consumed as inputs by the process of production. In the production account of the System of National Accounts (SNA), intermediate inputs are called intermediate consumption. To determine the performance of enterprises or industries the intermediate consumption will be deducted from the value of output. Accordingly, the result, **Gross value added** (GVA), is the balancing item between total output and intermediate consumption for any given sector or industry. That is the difference between the value of goods and services produced and the cost of raw materials and other inputs, which are used up in production.

3.2 Input indicators: Primary inputs and intermediate inputs

In the health economy, the cost shares of primary and intermediate inputs diverge very much among subsectors. Inpatient services have the highest cost share of the primary inputs, the health goods, in contrast, the lowest. This again confirms the significance of intermediate inputs for productivity accounting.

Infobox 4:
Primary inputs and intermediate inputs

Primary inputs, labour and capital, are the components of value added, which are treated as outside the production process. The components of Gross Value Added, accordingly, measure the remuneration of these primary inputs (consumption of fixed capital, taxes less subsidies on production, compensation of employees, net operating surplus). In this study, for the purpose of productivity accounting, the primary inputs are measured as real capital stock and volume of hours worked. The capital stock estimates of the health economy are derived from the time series of the German Statistical Office, which are based on the Perpetual Inventory Method (PIM).

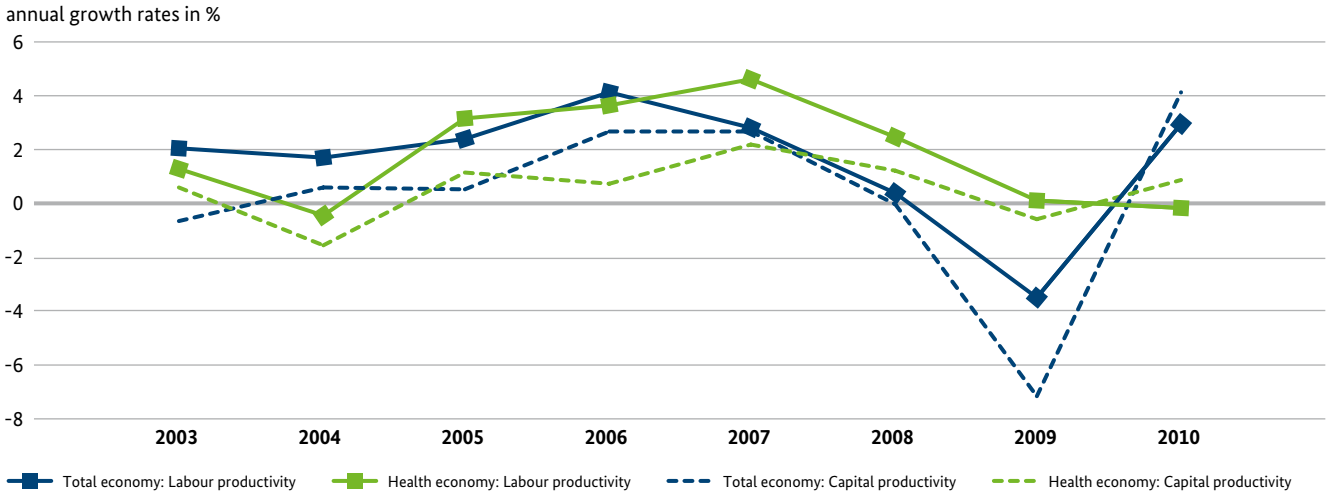
Intermediate Inputs are goods and services, which domestic economic units purchase from other economic units for use in the process of production and for trade. Intermediate input categories comprise water, energy, raw materials, maintenance, repair and installation services, transportation, postal and telecommunication services, rents, legal and accounting services, user fees for public services and infrastructure as well as fees for patents, etc.

3.3 Productivity differences between health and total economy by Törnqvist

Labour productivity and capital productivity

In the period 2002 to 2010, **labour productivity** of all economic sectors grew on average. Labour productivity rose both in the health economy and in the total economy by a similar annual average of 1.6 percent. The common rate is insofar remarkable as the total working hours in the non-health economy marginally decreased (-0.1 percent) while in the health economy the working hours substantially increased (1.3 percent) – both in the core health sector and in the extended health sector. Despite this increase of the volume of hours worked, labour productivity of the core health economy grew even faster than in the total economy (1.9 percent vs. 1,6 percent per year). Main driver was the labour productivity growth of health goods and trade, which surpassed by almost 3 percent the above rate of the core health sector.

Figure 26: Labour and capital productivity growth of the national economy and the health economy, 2002 – 2010



Source: Own illustration and compilations.

The growth rates of the **capital productivity** of both, the total and the health economy were, except in 2010, always below those of the labour productivity. The growth rates of the health economy, however, present a quite different story in the two years 2004 and 2009 (see Figure 26). Cost containment led in 2004 to the drop of the capital productivity of health care services. In the years 2008 and 2009, the economic and financial crises hit only manufactured health products, not health care services. Mainly, because of the strong impact of the 2009 crises on total exports and of the fiscal stabilisation, health services productivity growth was higher in the health economy.

The low growth rates of capital productivity of the total economy are in line with figures of the European Commission, which even estimated negative capital productivity rates for Germany on average since 1961 (*Hishow 2005*). Two reasons have been discussed:

1. "Capital deepening" or "capital based growth model" which had led to lower employment growth in Germany until 2005 (Hishow 2005).

2. Data restrictions: advances in the quality of capital, that is captured when calculating the contribution in capital, should be taken into account, for example by the improvement in the quality of information technology. In the given study the capital stock is only captured quantitatively, a second-best solution. The efficiency and composition of the capital inputs might be not sufficiently reflected.

Capital productivity of manufactured health goods and trade grew by annually 2.3 percent, much more than of the health services sector by 0.5 percent. Rates of capital productivity growth of the given sectors are almost everywhere positive, apart from the years 2004 and 2009.

Infobox 5:
Capital productivity and capital intensity

Capital productivity is the ratio of output to capital inputs. The German National Accounts measure the output of the total economy by the volume of GDP in constant prices or, in the case of industries, by the Gross Value Added in constant prices. Average annual gross fixed assets at constant prices are referred to as capital stock. However, this study compiles capital productivity as the ratio of the deflated gross output to the deflated stock of fixed assets in use.

Capital intensity reflects capital-labour ratio. Actually, it describes input of fixed capital per hour worked or per person employed.

Multifactor productivity

The technological progress measured, as **multifactor productivity** in growth accounting is beside labour, capital and intermediate inputs the fourth source of sectoral and

Table 5: Growth of the multifactor productivity of the health economy and non-health economy (in %), 2003 – 2010

	2002 – 2003	2003 – 2004	2004 – 2005	2005 – 2006	2006 – 2007	2007 – 2008	2008 – 2009	2009 – 2010	Average
Total Economy	**0.0**	**0.5**	**0.3**	**1.5**	**1.1**	**0.0**	**-2.1**	**1.2**	**0.3**
Non-health economy	**-0.1**	**0.5**	**0.2**	**1.5**	**1.0**	**-0.3**	**-2.2**	**1.3**	**0.2**
Goods and trade	0.3	1.1	0.4	1.8	0.8	-0.8	-1.7	2.4	0.5
Services	-0.6	-0.5	0.0	1.0	1.4	0.7	-3.1	-0.7	-0.2
Health economy	**0.6**	**-0.2**	**1.9**	**1.8**	**1.9**	**2.5**	**-0.4**	**0.4**	**1.1**
Health goods and trade	4.9	1.8	7.4	3.6	3.1	2.9	-2.6	-0.3	2.6
Health services	-0.8	-0.8	-0.5	1.0	1.4	2.2	0.7	0.7	0.5

Source: Own illustration and compilations.

total growth. The multifactor productivity results as residual of the average annual growth rates of gross output minus the **weighted** sum of growth rates of the factors intermediate consumption, labour, and capital.

Table 5 presents large discrepancies of multifactor productivity growth between the non-health economy and the health economy in the period 2002 to 2010. The different drop of output in most industries during the economic and financial crises is a major reason. Multifactor productivity of the health economy grew at average annual rate of 1.1 percent, much more than of the total economy at only 0.3 percent.

Driver of the productivity growth of the health economy is the sector health industry and trade, whose productivity rose by 2.6 percent far above the productivity of health services. The hypothesis, that the health industry represents the "motor" of the medical-technological progress, can be thus confirmed. By comparison, the less restrictive institutions and market regulations of pharmaceuticals and medical devices than in health services might have contributed to this result. The sector health services, characterised by rationing and cost containment, reached only an average annual multifactor productivity growth rate of 0,5 percent. The sector of the health services is because of the non-market conditions more independent of cyclical fluctuations. The growth rate of the multifactor productivity at a rate of about 0,9 percent in the year of the financial and economic crises, 2009, made alone a significant contribution to the total productivity growth of the economy.

The productivity growth is generally higher in manufacturing and trade of health goods than in inpatient and outpatient health care services. The structure of the input factors is likely one reason for these differences, especially the higher research intensity in manufacturing and the higher labour intensity in health services. Furthermore, economies of scale and scope in manufacturing, which cannot be realized in health care services, contribute to the higher manufacturing productivity.

3.4 Extended productivity compilations

Effective multifactor productivity (consideration of intersectoral linkages)

The consideration of intersectoral linkages expands the approach used for the compilation of the multifactor productivity. For this, the input-output table of the health satellite account provides the structure of the intermediate inputs. The growth impacts of the interconnections of the **direct** or **indirect** productivity gains by the intermediate inputs can be measured, which is neglected in the "traditional" sectoral multifactor productivity measurement. As a result, the growth contribution of the intermediate inputs tends to be higher; whereas the contribution of the technological change is rather underestimated. The "**effective multifactor productivity**" (*Aulin-Ahmavaara 1999*) aims to offset this bias.

Effective multifactor productivity has been about 0.2 to 0.3 percent points above the traditionally compiled MFP (see column ΔeMFP* in Table 6). In the sectoral split of activities the effective multifactor productivity in the health economy has been again higher than in the non-health economy. The less regulated sector health commodities and trade as compared to sector of health services is again the driver of the effective multifactor productivity growth, also in the light of the development of the general economy. The health industries embody by far the highest growth rates of all sectors (2.9 percent p. a.). Secondly, the productivity growth of these industries is mainly fuelled by inter-

Table 6: Growth of the effective multifactor productivity of the core health sector and in the non-health economy (in %), 2002 – 2010

	2002 – 2003	2003 – 2004	2004 – 2005	2005 – 2006	2006 – 2007	2007 – 2008	2008 – 2009	2009 – 2010	Average	DeMFP*
Non-health economy										
Goods and trade	0.0	1.1	0.4	2.8	1.7	-0.6	-3.8	2.5	0.5	0.3
Services	0.4	1.6	0.5	2.7	1.3	-1.1	-2.6	3.4	0.8	0.2
Health economy										
Health goods and trade	5.0	2.3	7.7	4.6	3.7	2.7	-3.8	0.6	2.9	0.3
Health services	-0.6	-0.4	-0.1	1.7	1.8	2.3	0.0	1.2	0.7	0.3

* ΔeMFP measures the difference of "traditional" and actual multifactor productivity-rate in percentage points.

Source: Own illustration and compilations.

mediate inputs. Both technological and non-technological innovations in the area of pharmaceutical products and medical devices make as a result in total a decisive contribution to the national productivity growth.

Productivity estimates using the Malmquist index: the case of hospital services

In the following the estimates of the application of the Törnqvist index are compared with those of the output-based Malmquist index for hospital services, which represent a major part of health services activities, requiring particularly higher investments in fixed capital than most other health services.[26] Disaggregated data are a prerequisite for the compilation of the Malmquist index, e.g. economic units like the German Länder. The hospital statistics make such data available. The output has been approximated by the number of hospital cases, weighted by hospital mortality in the respective regions. Quality is explicitly taken into account, in contrast to the above-presented analysis by using the Törnqvist.

Over the whole period 2002 to 2010 the Malmquist average annual rate of productivity growth was about 0.4 percent, the Törnqvist 0.2 percent[27]. These figures are in line with the above compilation of the productivity of health services of the core sector in Table 6. Also by using a different data set a small increase of productivity can be confirmed by both indices in Germany. This productivity gain is the result of technological advances (labour processes, applied medical technologies). By the Malmquist decomposition productivity growth is split into changes of efficiency and of technical changes. The Malmquist analysis helps better identify the reasons of productivity growth than the approach of Törnqvist and, in a further step, to explain these changes, for example by regression analysis. In the present study, the Malmquist index only serves as an example, applied only to hospitals because of data limitations.

Table 7: Efficiency change and technical change (Malmquist as compared to Törnqvist) in the German hospitals 2002 – 2010

	Malmquist-Index	Törnqvist-Index
Efficiency change	0.996	
Technical change	1.008	
Total	**1.004**	**1.002**

Values > 1 represent positive growth, values < 1 represent negative growth; for comparability, the Törnqvist results are shown analogously.

Source: Own illustration and compilations.

Differences of productivity growth between basic and voluntary health commodity market

Basic and voluntary health commodity markets differ by prices and products, and, as a result, by GVA. In the period 2002 to 2010 multifactor productivity grew at an average annual rate of 1.0 percent in the basic market of the core health sector, in the voluntary market at a rate of 1.1 percent.

26 The authors are grateful to *Dipl.-Kfm. Thomas Topf* for data analysis, compilations, and interpretation of the Malmquist index.

27 To the results of the Törnqvist index the number one was added to allow comparison with the Malmquist index. Index-numbers greater one show positive multifactor productivity growth.

In general, one might expect, higher productivity growth in the voluntary market, because the input of manufactured products is higher. The voluntary market is generally more "good intensive", by using relatively more pharmaceuticals, medical devices and medical technological equipments than in basic care. However, there is a large variation of different products in the voluntary market, further analysis is therefore useful.

Reimbursement of services by patients dominates in the voluntary market. Partly, these services are not included in the basic benefit package of the statutory health insurance; partly, private insurance coverage is offered at voluntary basis. The voluntary health market is therefore for both insurance companies and health care providers of interest. Furthermore, this market relates to household production, e.g. in the case of self-medication.

Disease related productivity measurement: the case of oral health

Concerning direct cost, the cost of illness accounts of the German Statistical Office is based on the expenditures of care, but does not compile the factors of inputs used. Therefore, disease specific productivity estimates are not possible with these accounts, except in one case, in the class of dental diseases, the sector specific organisation of care makes the compilation of multifactor productivity possible, at least approximately. Dental care including denture, amounting to 11.65 bn EUR expenditure share of the statutory health insurance in 2011, is a significant part of the German health economy. The particularity of this disease class is the far-reaching communality between the sectoral activities by outpatient dental and orthodontic offices and the borderline of the disease class. Therefore, the sectoral data can be directly linked with the disease class to compile disease specific multifactor productivity. Outputs, inputs and cost weights have been compiled based on various statistics of the German Statistical Office and the Federal Association of Dentists of Statutory Health Insurance (KZBV).

Over the period 2002 through 2010 the output grew quality adjusted at an average annual rate of 3.2 percent, which is completely determined by the quality component (see Table 8). Inputs increased at a rate of 1 percent. Therefore, the compiled rate of **average annual growth** of the **multifactor productivity of 2.2 percent** was significantly positive. This quality-adjusted rate has been higher than the rate of the effective multifactor productivity, which was above compiled for health care services over the same period. To consider quality improvements in the measurement of the medical-technological progress is therefore rather essential. However, because of the data limitations, the present quality adjustments can only be a first step and require further analysis (triangulation).

Table 8: Quality adjusted multifactor productivity of dental care (in %), 2002 – 2010

	Growth ingredients in %	Input	Output/Outcome	Multifactor productivity
(1)	Quantity		-0.1	
(2)	Quality		3.3	
(3)=(1)+(2)	Total Output *		3.2	
(4)	Intermediate use	0.5		
(5)	Labour	0.4		
(6)	Capital	0.1		
(7)=(4)+(5)+(6)	Total Input	1.0		
(8)=(7)-(3)	**Productivity**			**2.2**

* Quality adjusted output.

Source: Own compilation.

4. Effects of the productivity growth

4.1 Outcome

The activities of the health economy aim at prevention, protection of health, cure of diseases, rehabilitation and care. Results of these activities, or outputs – improvements of quality of life and of the performance capacity of the population – can often be measured and assessed only indirectly.[28] Depending on the type of disease the assessment has to take different parameters into account: the spectrum spans from an increase of the survival rates in cancer therapy, over periods without pain, improvement of mobility, or reducing vision loss until earlier rehabilitation for work.

The direct effects of these activities can also be described by indicators of human capital development as improved population health. Diseases generate losses of resources by lower value added as consequence of morbidity (incapacity for work, invalidity) and premature mortality as well as losses of quality of life. Of particular economic interest is the loss of supply of work. The German Statistical Office measures those losses attributed to classes of diseases by lost years in work through the incapacity for work and invalidity of individuals aged 15 to 64 (working age) as well as by premature mortality (deaths below 65 years of age).

The **premature mortality** measures the deaths of the population before the age of 65. These deaths are defined as premature, because better prevention and treatment could in many cases avoid them. The reduction of premature mortality is related to the performance of the health system. Therefore, premature mortality can be used as indicator of the health gains of advances in medical technology.

The number of premature deaths decreased at an average annual rate of 2.1 percent in the period 2002 to 2010, in total by 25,545 cases (see Table 9). By far the largest reduction exhibits the circulatory diseases – by more than 10,000 deaths less, a total decline by 3.9 percent annually. But also the premature deaths by cancer dropped by almost 8,300 cases (1.8 percent annually). The following groups of diseases show a falling premature mortality: cancer, heart and circulatory diseases, injuries, and diseases of the digestive system. Only in few disease classes premature mortality increased in the period 2002 to 2010. Musculoskeletal disorders show the highest increase by 3.1 percent annually for premature deaths.

Table 9: Selected outcome indicators by disease class, 2002 and 2010

	Disease classes by ICD 10							
Indicators	Neoplasms and blood disorders (C, D)	Mental illness (F, G)	Cardio-vascular diseases (I)	Metabolic, digestive and genitourinary disorders (E, K, N)	Musculo-skeletal disorders (M)	Injuries (S, T)	Other diseases	Total
	Average annual change 2002/2010 (%)							
Deaths (age-standardized)	-1.1	5.0	-3.6	-0.6	5.2	-1.7	-4.3	-1.7
Premature mortality	-1.8	0.1	-3.9	-2.0	3.1	-3.6	0.6	-2.1
Premature years of life lost *	-1.5	-0.8	-3.3	-2.5	5.8	-4.8	-0.6	-2.5
Lost years of employment	1.0	3.1	-1.9	-1.6	-3.4	-4.8	0.2	-1.1

* 2002 – 2008

Source: Own illustration.

28 In health economic analysis the concept of the Quality Adjusted Life Years (QALY) is applied, which values life years depending on the health status. In practice, there is still not a consensus on the monetary valuation of the quality of life years.

A second indicator of premature mortality is the indicator **premature years of lost life** before the age 65. The compilation of this indicator involves adding age-specific deaths occurring at each age and weighing them by the number of remaining years to live up to age 65 (see Table 9). By an annual rate of 2.5 percent, the number of lost life years (all diseases) decreases more than the number of deaths (-2.1 percent). From that one can conclude that more deaths occurring at young age cohorts could be avoided. The comparison by disease class shows the particular role of injuries for premature deaths, ascending to the first position in the rank of diseases, contributing to the decline of work years lost. Almost one third of the decline of premature lost life years fall in this class (see Figure 27). Both, the descending number of cases of injuries and the increasing survival rates by advances of medical-technological progress could have contributed to this decline. The other disease classes show no major differences in ranking as compared to the indicator of premature mortality.

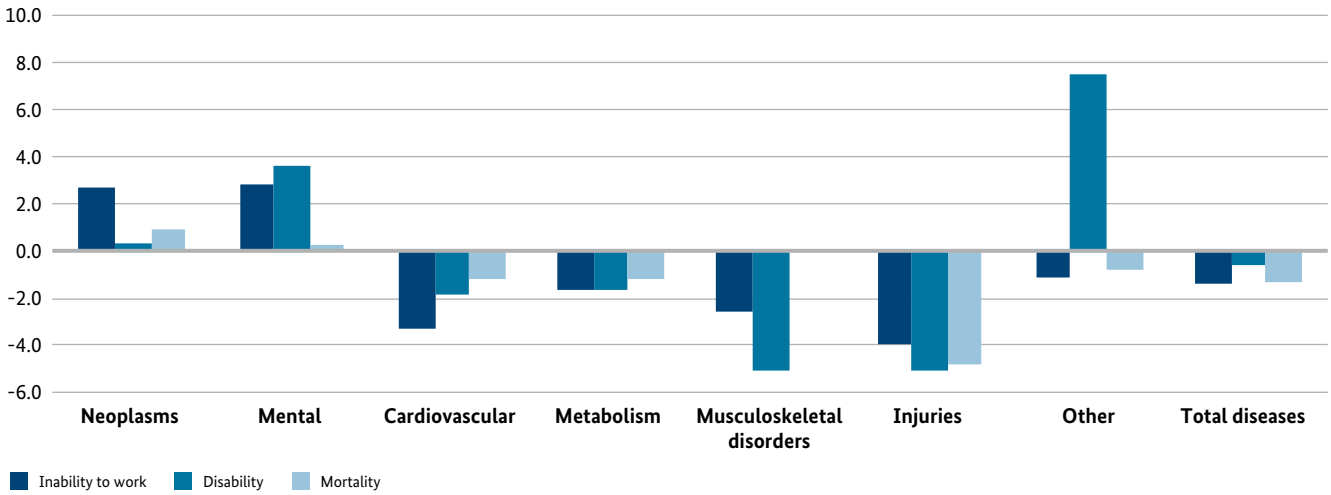
A further indicator of the national economic losses of resources by disease, invalidity, and premature death is the number of **lost working years**. In 2008, the loss of working years amounted to about 4,23 million years (see *Statistisches Bundesamt 2010*). The various disease categories contributed rather differently to theses losses, the so-called indirect cost of illness resulting in loss of production and value added: While in 2002 the class of injuries caused the heaviest losses of hours worked, in 2008, mental diseases made the greatest burden. The class of cancer diseases, in 2002, ranking at the fourth position, climbed to the third position in 2008. Mental diseases and cancer diseases (neoplasms), not considering the class of other diseases, are the only classes with increasing indirect cost of illness.

Work incapacity resulting from disease, invalidity, and mortality had different impacts on the loss of human resources: The lost years of employment through incapacity for work and mortality fall at an average annual rate of 1.4 percent and of 1.3 percent in the period 2002 to 2008, the losses attributable to invalidity fall at a significantly lower rate of 0.6 percent. More pronounced were the differences by the disease classes under consideration (see Figure 3).

4.2 Social insurance

Following the results of the above compilations, the medical-technological progress (MTP) had generated, on average, an additional annual growth of the gross output of 1 percent during the period 2002 to 2010. To estimate the effects of the medical-technological progress on distribution and redistribution of incomes and revenues of the social insurance system, it is worthwhile, to compile first the impact on gross value added, which is the starting point of the distribution of incomes in the National Accounts.

Figure 27: Annual change of the loss of working years by cause and disease class (in %), 2002 – 2008



Source: Own compilations according to compilations of the Federal Statistical Office.

Which are the drivers of the health expenditures, is a long discussed question of health economics. Since decades health expenditures rise not only in absolute values, but also in relation to the gross value added. Medical-technological progress beside the demographic development is listed as major driver for this relative growth. As third component, particularly in the extended health economy, the income elasticity of health services is to be added. Finally, the missing price competition is made responsible for the increase of health expenditures, mostly in interconnection with the before mentioned drivers of health expenditure.

On the other side, MTP has positive effects on revenues for social insurance. MTP generates growth of production and value added and enlarge by this the base of revenues of the statutory health insurance (GKV) and the statutory pension insurance (RV). Actually, productivity gains resulting from cost savings by the improvement of technologies in use (process innovations) are often in contrast to additional cost by new technologies (product innovations), e.g. prescription of new pharmaceutical substances in cancer treatment. In fact, the medical-technological progress affects both sides of the accounts of the social insurance, revenues and expenditures.

MTP is difficult to quantify. Therefore, the impact of the MTP on the **revenues of the social insurance** has been estimated by simulation. The systematic measurement of the MTP, which goes beyond approximate quantification by indicators such as patent registration of medical technologies, is made as residual term, capturing those influences of the expansion of expenditures, which cannot be explained by observed factors. One possibility, used in this study, is the approach for the measurement of multifactor productivity. In the simulation, therefore, the estimated figures of the multifactor productivity of the health economy are applied. This approach is based on the idea, that from a national point of view technological progress is only realized if given inputs produce higher outputs or if the less inputs produce the same output (*Häckl 2010*). For example, MTP of inpatient care allows to treat, with given human resources, material, and equipment, more patient and to generate by this additional value added. This growth of the sectoral multifactor productivity of the health economy is interpreted in the following as direct MTP-effect (*Henke, Reimers 2006*).

Based on estimated multifactor productivity growth, the actual development of the output of the health economy and of the total economy **with** MTP will be compared to a hypothetical growth scenario **without** MTP over the period 2002 to 2010. In addition, in both sectors – health and non-health economy – the gained working years resulting from MTP will be considered (system effect of the employment gained). In the hypothetical scenario (without MTP), it is presumed, that labour inputs will grow less than with medical progress because of the lost working life years (system effect).

The difference in economic growth of the total economy between the actual and hypothetical development over the 8-year period since 2002 we have defined as "MTP-effect" on gross output and on value-added. This output plus **generates at the same time an increase of the contribution base,** the amount of incomes obligatory for contribution payments, for GKV and RV and as a consequence for additional income through the MTP. Even more, the system effect of the MTP lessens the shortage of health professionals.

The simulation shows, under the assumption of absence of MTP, that over the whole period 2002 to 2010 the cumulated national gross output grew about 234 bn EUR less than with MTP. The growth rate of the gross output would have been only at a rate of 1.6 percent as compared to 1.8 percent. Under the assumption, that the changes in gross output would translate into proportional changes of revenues, GKV would have without MTP over the whole period 8.7 bn EUR less resources available, the RV 13.3 bn EUR less. Together, the effects resulting from MTP have been cumulated to total 22 bn EUR over the 8-year period, thereof 61 percent due to the MTP effect and 39 percent due to the system effect. In 2010, 1.2 bn EUR cumulated revenues of GKV was equivalent to a rate of contribution of about 0.1 per cent (2002 to 2010 cumulated) (see *Bundesministerium für Gesundheit 2010*).

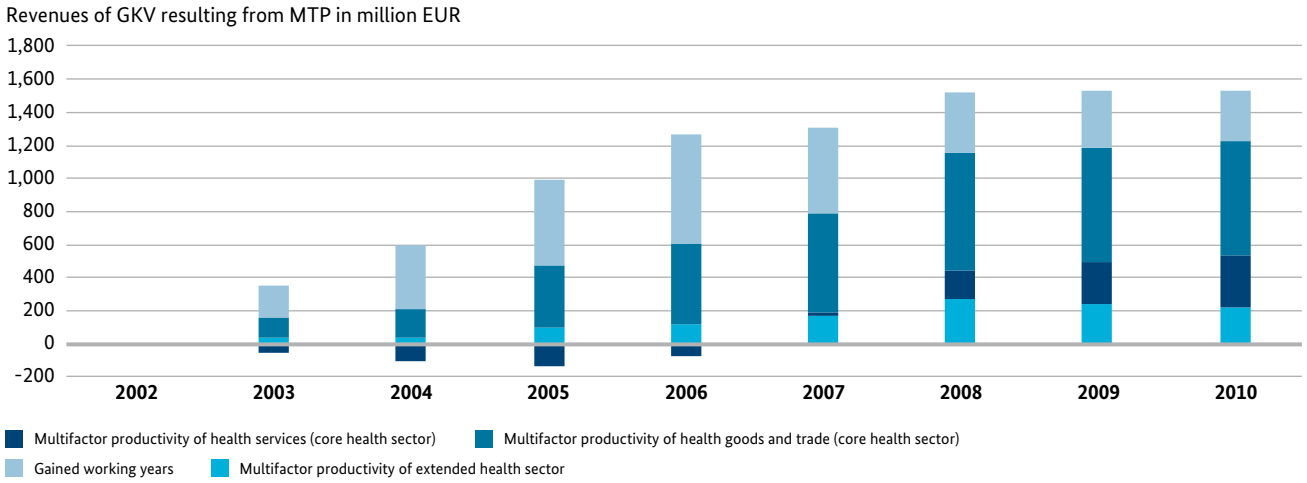
The amount of 22 bn EUR presents a low estimate of the MTP on the revenues of the social insurance. Not considered in this compilation are the positive impacts of the MTP on the health status of the population, the productivity on life years and prolongation of working time as well as indirect and induced effects on tax and contribution revenues (see *Schneider 1999: 591 ff.*, *Bräuninger et al. 2007: 26 ff.*).

Figures 28 and 29 present the growth contributions of the subsectors of the health economy on the financing of GKV and RV. Except of the health services of the core sector in the period 2003 to 2007 all sectors generate a positive contribution to the revenues of the GKV. Since 2008, the strong multifactor productivity growth of health services also contributes to the financing of the social insurance. Main driver is the MTP of the subsector health industry and trade in the core sector. Specifically, medical-technological and pharmaceutical innovations significantly generate to **value added and output growth** and therefore to societal welfare gains.

4.3 Labour market

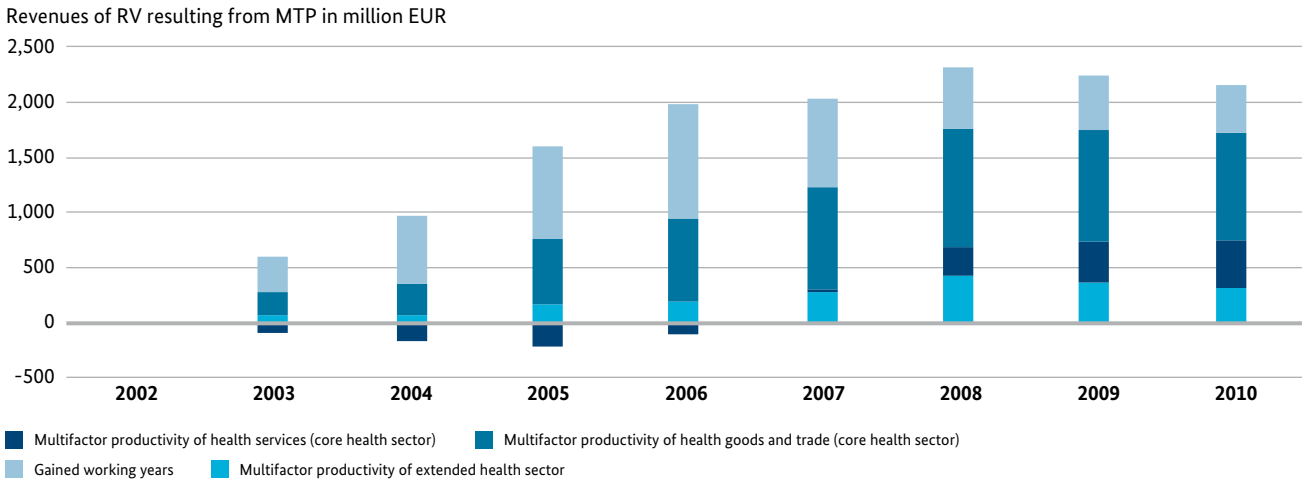
In a further step, the positive labour market effect of the MTP has been compiled. Thus, the rate of growth of gross output is multiplied with the cost weight of the labour input (share of compensation on gross output used to determine share attributable to the factor labour. This term multiplied by the sectoral labour force equals the annual labour force effect of the MTP. This effect defines the hypothetical number of employment, who would have been necessary in the period 2002 to 2010 in order to generate the same output as in case of presence of MTP.

Figure 28: Contribution of health sectors to the revenues of the GKV (resulting from MTP), 2002 – 2010



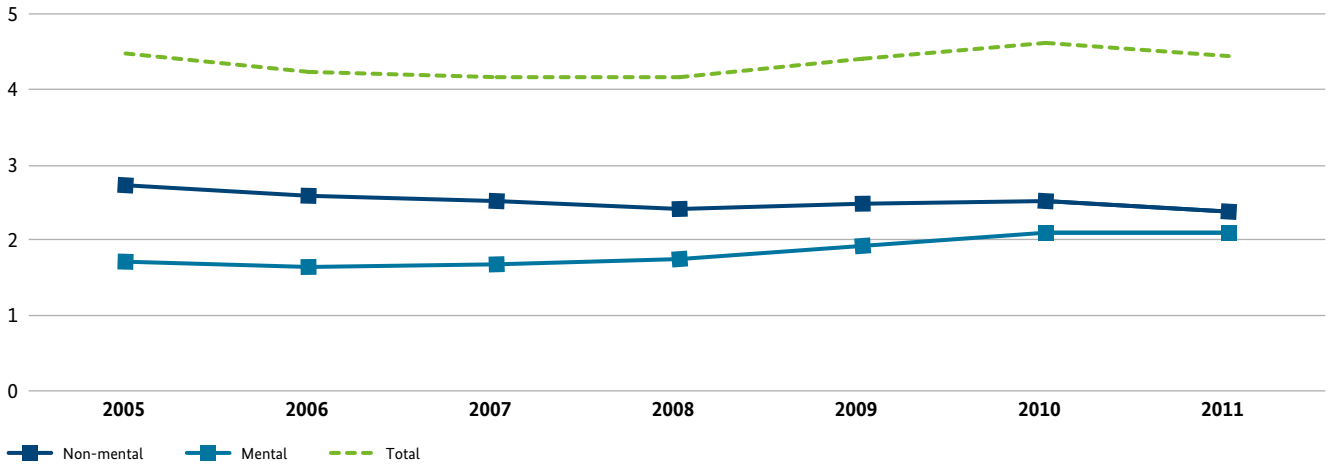
Source: Own presentation.

Figure 29: Contribution of health sectors to the revenues of the RV (resulting from MTP), 2002 – 2010



Source: Own presentation.

Figure 30: New pensioners with mental disorder and other diseases per 1,000 employees, 2005 and 2011



Source: *German statutory pension insurance 2013* and own compilation.

During the period 2002 to 2010 nearly all sectors of the economy report increasing employment. In total, the MTP (direct effect plus effect through reduced mortality, incapacity for work and invalidity) could generate 660,000 employment years.

Decreasing the disability risks

One can expect that the various population groups will likely profit from the drivers of MTP in a different way. Figure 6 summarises the development of the new entries to German disability pensions per 1,000 employees attributed to reduced work capacity (including the 65 aged of years and older) over the 6-year period 2005 to 2011: in total, the average annual incidence of new pension entries slightly decreased by 0.1 percent.

The reduction of new disability pensions in almost all disease classes at the annual rate of 2.4 percent is in contrast to the significant increase of mental diseases at the rate of 3.3 percent. In the period 2005 to 2011, the new pensioners attributable to mental disorders grew from 54,000 to 73,300 persons in 2011. While already in 2005 every third new pension entry occurred because of mental illness, in 2011 it increased on 41 percent.

The literature discusses the increasing burden at the work place and advances in diagnostic diseases as factors causing this steady increase of early disability pensions by mental diseases. However, relevant seems to be also the fact, that mostly no rehabilitation measures were taken in the case of major mental diseases before retirement, because of the low probability of successful reintegration into employment (*Richter 2006: 213*).

Shortage of professionals

The direct contribution of the MTP for reduction of the hours worked respective the need of health professions creates a notable labour productivity gain, which is, however, in manufacturing of health goods, in trade and in the health care administration higher than in the provision of health care services. Without labour productivity growth an additional need of manpower inputs in worked hours of about 1.6 percent would have been necessary in the total health economy to generate the actual output growth of 3.0 percent. But, in reality, the growth of worked hours in the health economy averaged only about 1.4 percent annually in the period 2002 to 2010. The number of employment increased slightly more by annually 0.3 percent, which means effectively by 1.7 percent. As a result the growth of labour productivity helped downsizing the additional demand of labour in the health economy. Nonetheless, remarkable differences exist in the given subsectors. The production of **manufactured commodities and trade** show

- an increasing specialisation, which has led to a decreasing demand for "non-health-professions",

- changes of the demand for professions by the skilled crafts sector, which are presumably driven by the ageing of the population (more opticians, less dental technicians),
- higher quality of pharmaceutical professions (more pharmaceutical-technical assistants and less pharmaceutical-accounting professions) as well as
- compared to the health services a lower growth rate of the demand for health professions.

In contrast, the provision of health services shows the following trends:

- a strongly increasing demand for nursing professions, particularly for long-term care,
- an increasing demand for medical professions (physicians, psychologists and psychotherapists),
- an increasing demand for therapists,
- no additional demand for rather technological assistant professions, and
- a decrease of non-health professions.

Concerning further development of qualifications of health professions working in health services these trends show diverse results.

Health capital

Finally the question arise, which effects one can expect on health from measures of the health economy, but also activities outside the health economy? How can the "health economic circle" be closed in the framework of the input-output system? The extended input-output table of the health satellite accounts offers the possibility to simulate the potential health gains by reduced invalidity, incapacity for work, and mortality in connection with activities of the health economy. Modelling such impacts of health activities on the health capital in the health satellite account can start from the ideas of *Leontief 1970* and of *Stone 1975*. Further to the capital stock the extension includes the human capital of the population as stock of expected life years cumulated over all age cohorts. Starting from these ideas the input-output-table will be expanded by additional rows for the impacts on labour force by diseases on the one hand and by additional columns for the health gains by the various activities of the health economy on the other hand. This will close the "health economic circle" in the framework of the input-output-system (see *BMWi 2013*).

As a result, the net effects on health gains depend not only on the MTP but also on the quantity and the structure of the health related activities "outside the health economy" in the extended input-output model. A particular aspect is the quantification of the health risks, which have impacts on the health capital, independently of the processes of the health care activities, for example through environmental repercussions.

5. Recommendations and measures for productivity growth

5.1 Measures towards productivity growth

Productivity growth requires particular efforts of the enterprises and providers of the health economy. These have to be financed. Measures for productivity growth could be either directed to the structure and quality of the various input factors, or to the institutional framework governing the production process. These measures might also focus on the economies of scale and scope in and between the given sectors of the health economy. Economic studies have recommended the following actions to improve productivity growth of the health economy:

- improve the incentives (payment for performance – P4P, including performance contracts with pharmaceutical companies),
- optimise clinical pathways,
- enhance co-ordination of health services of prevention, acute care, rehabilitation, and long-term care,
- enforce the role of the patients (patient empowerment), and
- use consequently information and communication technologies – ICT (electronic patient records, etc.).

Even health services are bound to economic considerations because of scarce resources. Contributing meanwhile to more than 10 percent of the gross domestic product, macro economic observation of the health economy via a satellite

account of National Accounts can help in the analysis of the interconnections with the total economy. In this study the issues of productivity measurement were investigated within the framework of such an accounting approach.

The drivers of the productivity of the health economy were analysed by decomposition of the factor inputs on the side and the structures of the real outputs of goods and services. Furthermore, scenario techniques were applied to estimate the impacts of the medical-technological progress. Output was compiled in constant prices and decomposed by disease groups. Quality adjustment was identified as an important issue of the measurement of productivity of the health economy. The prevention and postponement of disability resulting from multifactor productivity and MTP in health care was considered in the impact on revenues of the German statutory health and pension insurance systems.

The comparative measurement of productivity growth and its analysis provide new information for the design of economic policy. The drivers of productivity growth and the innovative sectors of the health economy can be observed and their development assessed as base for economic policy actions.

5.2 Policy recommendations

1. Result:

In the health economy, over the period 2002 to 2010, productivity grew more than twice as in the total economy (see Table 5). The results show the health economy can be both a driver of growth, and in crises a stabilizer of the total economy and the German investment location.

Recommendations:

The contribution of the health economy to economic growth requires further reflection in the public to overcome the image of the health sector as cost driver. In future, health policy activities should be more assessed with regard to their economic impacts, not only with regard to their fiscal effects (expenditure containment, stability of the contribution rate etc.). The impacts of planned regulations of the health markets should be assessed on economic growth, technological progress and the labour market.

2. Result:

In the period since 2002, the average annual rate of the multifactor productivity growth of the health economy of about 1.5 percent was significantly higher than of the total economy of 0.9 percent. Driver of this medical-technological progress in the core health economy has been particular the innovations at manufactured health goods.

Recommendations:

In the case of manufacturing of goods, where markets are more competitive organised, and determined by market prices, industries of pharmaceutical and medical devices have also to focus on exports and strive for competitiveness in international markets. In order to beware the strong productivity of these industries, impacts of regulations on the internal competitiveness should be considered in particular. In the case of outpatient and inpatient health services, which are overwhelmingly at communities or national organised, governed by administered prices and sectoral budgets, the institutions for competitive structures need successively to be further developed. The enforced competition among statutory health insurance funds had obviously contributed to efficiency gains in the health insurance administration.

3. Result:

The comparison of selected outcome indicators by disease classes shows increasing incidence of mental disorders and cancer diseases, while decreasing rates of circulatory and musculoskeletal diseases. For enterprises the growing absenteeism and presenteeism resulting from mental disorders causes an increasing burden – the lost working years grew at an annual rate of 3.1 percent over the period 2002 to 2008.

Recommendations:

Policy should pay more attention to the prevention and treatment of mental disorders, resulting increasingly from the work place. Companies and social insurance funds are encouraged, to strengthen further the conditions for a healthy and productive life. Economic studies show a significant rate of return of investment of respective health management of enterprises (*Lück, Eberle, Bonitz 2008*). In past years, both public and private initiatives have started

projects to improve the working conditions (e.g. Initiative New Quality of Labour – INQA, programs of the BMAS to combat work-related diseases, "Best employer of Great Place to Work", and manifold projects of the industrial accident insurance and the other accident funds). Many approaches and concepts exist, but the knowledge transfer into company practice, especially into SME, is still challenging. Further targeted measures could help to increase productivity growth of the whole economy.

4. Results:

As a consequence of the medical-technological progress, one can observe within labour market of health professions different effects on health commodities on the one side and health services on the other side. In the period 2000 to 2010 health service professions got more and more important, especially in nursing and medical professions, while the demand for certain health professionals in the industrial production of health goods and in the trade of these goods had decreased.

Recommendations:

In the provision of health services, the medical-technological progress will likely generate only a small reduction of the expected future demand for health professionals. In light of the shrinking labour force due to demographic changes the future imbalances in the labour market of health professionals require particular attention. Forecasts about the need of health professionals should, however, take into consideration the drivers of the labour productivity and the effects of the MTP occurring in the various activities of health profession and health care organisations.

5. Results:

Per saldo, multifactor productivity growth of hospitals was positive in the 8-year period investigated. The measured productivity increase resulted completely from technical change, while efficiency improvements had rarely taken place or were even negative.

Recommendations:

Efficiency growth is closely linked with process development and reorganisation. These activities on the other hand might require investments to adjust buildings and equipment (e.g. elevators to improve transportation, reconstruction of hospital wards to adapt to geriatric clients, etc.). The access of hospital to capital formation needs to be facilitated, because the German "Länder" have reduced their financial subsidies during the last years, a result of the actual hospital rating report 2013: the average capacity to invest, particularly of the public and private not-for profit hospitals, is too low to sustain in the long-run. 13 percent of all hospitals were at insolvency risk in 2013 as compared to 10 percent in 2010 (*Augurzky 2013*).

Further, it needs to be checked, whether the outpatient and inpatient facilities of the health economy benefit from the federal funded innovation program. The statistics of the central innovation program SME (ZIM) lists only health research and medical technology (subsidies of 193 million EUR, status June 2013).

5.3 Recommendations for health research

6. Results:

This study made a first step into the analysis of the productivity of the health economy and of its subsectors. The complete depth and link with the goods and service accounts and the sector accounts of the National Accounts would be desirable as next step. Furthermore, the analysed classes of diseases could be further decomposed and integrated into the health economic accounts.

Recommendations:

Based on the results of this study the further development of the data base and the analytical methods should be developed by research projects. Particularly, these activities should aim

- to develop a comprehensive statistical price of the national health satellite accounts,
- to monitor the ongoing capital needs of the health economy, because over and over stakeholders report underinvestment and too low investment subsidies,
- to continuously analyse the development of labour inputs regarding levels of qualification and education – e.g. by (EQF)-classifications,

- to elaborate evidence based quality indices for the sub-sectors of the health economy (outpatient, inpatient, rehabilitation and long-term care) and for diseases.

7. Results:

The growth of the labour productivity of the health economy was at a comparable rate as of the total economy. Within the health economy the productivity growth had been much higher for the health goods and lower for the health services.

Recommendations:

The quality dimension plays a key role for the provision of health services. Medical-technological progress and increasing legal standards for the quality lead often to additional labour cost – though they also result in improved outcomes of care (fasten recovery, higher life quality, etc.). Presently, the measurement of the output captures these improvements of quality rather insufficiently. The better measurement of the productivity growth of health services requires methodological developments, which should be supported by policy.

8. Results:

Over the period 2002 to 2010, the medical-technological progress contributed about 12,6 bn EUR directly to the revenues of the GKV and the RV.

Recommendation:

This makes clear that the development of the medical-technological progress is a national task. Presently, about 6 percent of the federal expenditures for research and development are devoted to health research and medical technology, but among that only 0.6 percent (2010) for patient centred research and health service research (see *BMBF 2012*) – considering the social importance of health it should be checked, whether this share needs to be increased.

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