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Health as a driving economic force

Klaus-Dirk Henke, Karl Martin, March 2008

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Executive Summary

This chapter illustrates the contribution which could be made to realising the Lisbon Strategy of the European Union for growth and jobs by innovative healthcare policy favouring a preventive orientation of healthcare. The prevention and control of risk factors for chronic diseases, as well as their potential impact on the quality of human capital as a union of health and education, are discussed. Human capital refers to health and education both of the individual, and of the population as a whole.

Investments in health and education could be used to mitigate or compensate the negative consequences of demographic change and globalisation. This chapter concentrates on how exhausting the prevention potential of chronic diseases could extend the labour force potential beyond the conventional age limit of 65 years. Labour force potential usually refers to the maximum supply of labour available from workers, the unemployed and other non-workers within an age range of 20 to 65 years. This optional innovative policy is explained using the example of the development of labour force potential in Germany between 2002 and 2050, prerequisites being a change in healthcare policy from cure to prevention, as well as a cultural change. Cultural change in the population and in politics would mean attributing the same level of importance to the prevention and control of risk factors for chronic diseases as to the prevention and control of infectious diseases.

The accumulation of human capital through investments in health and education is crucial to the innovative competences of the population. Both these sectors promote growth in the

remaining sectors of the economy and, through their own development, become an essential driving force of growth themselves.

The increasing demand for new products and services will create a second health care sector for health-related services combining services which are covered by the insurance and by private out-of-pocket expenditures. This second sector deals not only with care but also with goods and services aside from services covered by the insurance.

Expenditure on health and education therefore has to be included as an investment within the national accounts statistics, expanding upon the previous concept of investment. This in turn means that corresponding coefficients, for example, would have to be developed for health impact assessment purposes.

Expanding labour force potential via compression of morbidity and mortality requires that health and education policy be embedded in growth-orientated labour and economic policies in order to ensure that the potential working years gained have an impact on production and prosperity. Health in All Policies becomes imperative.

1. Starting point: the downsides of cost increases and the upsides of growth effects with regard to health

In most countries health policy discussions revolve around cost containment. Both the Beveridge and the Bismarck systems focus on expenditure development. The OECD regularly records and compares *per capita* health expenditure with regard to gross national product, functions and the pharmaceuticals industry [1] The social insurance systems additionally include contribution rates, both over time and separately for employers and employees.

Yet regardless of how the healthcare sector is documented and measured in monetary terms, whether based on expenditure or contribution rates, no ideal health quota exists. There is no practicable conclusion to be deduced using scientific means as to whether a state should spend more or less on nursing care, prevention and health promotion. There are good arguments to spend more on prevention but at the same time nursing home care of the elderly needs more attention too. Bearing this in mind, it is imperative that we put a stop to the traditional argument that rising expenditure in healthcare leads to a cost explosion, i.e. that a higher percentage of healthcare expenditure with regard to GNP, or higher contribution rates, is necessarily a negative thing and that labour costs are fundamentally too high.

In all countries the healthcare allocation is taken from national economic resources, which are always marginal. Viewed globally, healthcare has to compete for these resources with climate protection measures, education and research expenditure, the safeguarding of pensions, family policy and other areas besides. Expenditure in one area amounts to opportunity costs in another area.

From this macroeconomic viewpoint, the political decision-making process, coupled with market economic processes, leads explicitly or implicitly to the means or resources allocated to the healthcare sector within any one country.

Within the healthcare system there is then second-level competition for these resources between areas as diverse as prevention and health promotion, curative and emergency treatment, rehabilitation, nursing care and palliative medicine, not to forget expenditure for statutory sick pay.

Focusing on individual patients, it is possible to categorise clinical diagnosis according to the International Code of Diseases and population groups e.g. by age and/or sex [2]. From this epidemiological perspective the goals of healthcare policy then become avoidable diseases and avoidable mortality. On this basis the burden of diseases can be demonstrated.

Finally, insured parties are interested in adequate insurance which in addition to basic cover also includes the option of extra individual care

This observation of resource allocation has so far been functional, i.e. independent of individual nations or time periods, but there is a more institutional view of the matter which also requires consideration. Within each country a comparison is made between the bodies occasioning expenditure, e.g. the various branches of a national insurance system, private insurance or the individual budgets within healthcare systems financed by tax income.

The results of resource allocation generally attract too little notice, giving rise to a chiefly input-orientated view of the matter. This view is gradually becoming replaced by a desire for a more output-orientated view. With regard to the healthcare system, this means that the resources should be used where they "buy the most health". Ideally, expenditure would then have to be repeatedly restructured until the health benefits were equalized across the board. Or put another way: expenditure must be cut in those areas where wastefulness and inefficiency are greatest. Programme and management-based efficiency increasingly have to replace the input orientation which still predominates [3]

Dissolving the input viewpoint based on expenditure or contribution rates throws up a need for result indicators. Such indicators are established and compared with the characteristics of different national healthcare systems in mind. Here the question arises of how these indicators are to be measured, and which ones are to be used for comparison purposes[4]. Upon which values and concepts is the selection based anyway: those of epidemiology, medicine, health economics or health policy?

In this context there has been a paradigmatic change, taking place in the different countries at different points in time and in some still ongoing. This refers not only to the aforementioned change away from the cost containment discussion and input viewpoint towards an output-orientated viewpoint, e.g. avoiding diseases and death or increasing prevention and health promotion. We are primarily referring to the fact that healthcare is increasingly being acknowledged and classified in positive terms as a labour-intensive growth industry.

This perspective also requires that the selected indicators be substantiated, so that the effects of the healthcare sector on the national economy such as value added, employment and economic growth are operationalised. Here we are not just concerned with the markets for goods and services and the fiscal effects of health, healthcare and health systems, but also with the so-called factor markets; i.e. in addition to the money and capital markets, these markets especially include the employment markets, with their manifold and new areas of occupation within the healthcare sector.

In Germany this discussion began with two reports by the Expert Council for Concerted Action in the Healthcare System in 1996/97 [5]. In the second volume the effects of healthcare on welfare, growth, productivity and employment were investigated for the first time and empirically assessed. In addition, progress in medicine and its various phases was addressed, evaluation and health technology assessment, as well as the role of university

hospitals in the progress process and the financing of health-related research. Following an analysis of individual examples of medical progress and their respective economic viability, selected growth markets were then subjected to a broader exposition. Even back then this particularly included nursing care, medical telematics, medical products and the pharmaceuticals industry with their individual growth potentials [6]

Ten years later, at least in Germany, the healthcare economy has not only become socially acceptable [7], but has also been addressed in its regionalism [8][1]. In 2008 the regional healthcare markets are also playing an increasingly significant role in the German government's research programme.

Independently of the development in the industrial nations, the macroeconomic significance of healthcare investments can be seen within the context of economic development and globalisation [9] The EU is also seizing upon this context and is examining the contribution of healthcare to the national product of its member states [10]

2. Theoretical considerations: health as a component of human capital

Discussion about the health economy as a growth industry now not only includes the abovementioned linking of health-related investments to growth, but additionally focuses on the foreseeable demographic development. Many experts neglect the potentials for growth and higher revenues in the face of increasing expectations within a population keen to enjoy healthy ageing. Yet healthy ageing as a growth determinant is a topic in itself.

Changes in the disease distribution, are partially linked to demographic developments. In particular, an increase in chronic diseases can be observed. Allergies, asthma and diabetes are becoming widespread, due in part to ageing, but also to environmental changes [11]. Thus the medical treatment and disease management of patients with chronic diseases will increasingly substitute the treatment of acute diseases. From a population health view , the challenge of the future is the prevention and early diagnosis of chronic diseases.

Considering the changes in demographic development and morbidity structure of the population of highly developed countries, a gain in healthy and productive life years will be essential in order to maintain a high economic standard. Therefore, it will be necessary not only to improve the efficiency of healthcare delivery and financing instruments, but also to increase investments in health. As the former EU-Commissioner David Byrne puts it: "Health Equals Wealth". This strong relationship led him to consider a health status indicator as a new, additional convergence criterion for the expanded European Union [12].

Given this background, two considerations justify the working hypothesis that there are growth and fiscal effects of better health [13]:

An improved health status is an investment in human capital, and alongside (private and public) capital and technical progress human capital is one of the three factors which explain economic growth and fiscal stability. A healthier population is more productive, and a higher functional capacity in an ageing population leads to economically productive life-years. Improvements in health and education of the population are thus key factors in promoting growth and this also creates better quality of life for citizens.

On this basis new markets are opening up, not only in healthcare itself but also in other areas, such as wellness and fitness, nutrition etc., through innovative medical and healthcare technologies, new products and services. These developments with markets being in the center are leading to increasing turnover, higher revenue and growing profits as a basis for financing other parts of the economy, including the first health sector. In addition, new therapy professions, new study fields and new university research areas are emerging.

As can be seen from a study sponsored by the Robert Bosch Foundation in 2007 [14], reference human capital as a blending of health and education forms one of Germany's most important strategic resources. Its quantity and quality decide how the future will be mastered. Human capital is one of the most important determinants of economic growth. The accumulation of human capital through investments in health and education is crucial for the innovative capacities of a national economy. Both sectors promote the growth of the remaining sectors of the economy, and through their own development they themselves become an essential source of growth.

Within the union of health and education, health is a prerequisite in the service of education. People can only use their human capital effectively if they are healthy and alive. In its Global Development Report 2007 [15], the world bank defined investments in human capital via health and education as the crucial prerequisite for success in today's competitive globalised world, whether as an individual or as an entire economic unit. For most people, employability is the only asset which needs to be made permanently more productive in order to sustain and continually regenerate prosperity. This means learning to make the correct decisions in order to stay healthy and then adhering to them throughout life. With regard to demographic shift healthy life expectancy is gaining more and more importance

Health and education "spending" is a term which is often used erroneously when really "investment" is meant. Any expenditure which serves to improve effectiveness and create future benefits may be counted as an investment. We therefore propose apportioning investment spending on health and education so that it appears in the national accounts statistics and national budget not as a cost, but as an investment. Spending on health and education would then cease to be treated like consumer spending, becoming entirely cost-effective in the year of consumption and instead, as is customary for investments, would be amortised over several years. This would take into account the fact that several years can elapse between an investment in health and education and the benefits to be reaped from this investment. Similar to the creation of satellite systems alongside the national accounts statistics, this development should be promoted for health as a growth factor. According to the neoclassical model by [16], increased productivity resulting from technical progress drives on economic growth from outside the model – exogenously.

The human capital theory takes into account both microeconomics and macroeconomics and was initiated by the Nobel prize-winners for Economics, Schultz 1971 [17] and Becker 1975 [18]. This theory permits an examination of the prerequisites for determining the economic viability of investments in human knowledge and human competence, i.e. in human capital. It identifies various paths leading to the creation of human capital, e.g.

- formal school education,
- professional and social educational and vocational training measures and
- measures for maintaining and promoting health, such as prevention and health checks.

In the 1960s the theoretical model of human capital as an endogenous driving force behind growth was developed by Becker 1975 [18], 1993 [19] and then developed further by Mankiw et al 1992 [20]. The high significance attributed to human capital compared to fixed capital can be observed from a comparison between the proportion of the gross domestic product (GDP) invested in fixed capital and in human capital in Germany.

In 2003 the gross fixed capital formation in Germany for equipment, buildings and other investments – real capital – amounted to EUR0 384.4 thousand million, corresponding to 17.8% of the GDP. The true investment rate is much higher, however, taking into account the spending on human capital which in the national accounts statistics is included as consumption. This expenditure, often commonly called "investment", including by politicians, comprises money for education, research and science totalling EUR0 193.9 thousand million EUR0 2003, money for art and culture totalling EUR0 0.8 thousand million EUR0 2003 and money for health excluding investments and medical research totalling EUR 222.1 thousand million EUR 2003. This means a total investment in human capital of 416.8 thousand million EUR0 2003 or 19.3% of the GDP in 2003. Table 1 shows the expenditure for real and human capital according to the records of the Federal Office for Statistics in 2003 [21] (Statistisches Bundesamt).

The "investments" in human capital are thus EUR0 32 thousand million above those in real capital. The national economic investment rate is thus 37.1% and not the mere 17.8% measured by only taking the gross fixed capital formation into account.

Table 1: Expenditure for real and human capital in Germany in 2003 in EUR0, thousand million

Gross domestic product (GDP)	2,163.4
Fixed capital	
Total gross fixed capital formation	384.4
Percentage of GDP	17.8
Human capital	
Expenditure education, research, science	193.9
Expenditure art and culture	0.8
Health-related expenditure excl. investments and med. research	222.1
Total human capital	416.8
Percentage of GDP	19.3

Expanding the concept of investment within the national accounts statistics (SNA) was discussed by the United Nations Statistics Division prior to the last update in 1993. Aspen [22] then presented the majority opinion of his workgroup, according to which expenditure on research and development should also be treated as an investment in the next SNA revision.

According to the SNA, expenditure is an investment if it serves to improve effectiveness or productivity and if it creates future benefits. Expenditure on research and development was attributed these characteristics. In the opinion of the United Nations Statistics Division [22] , expenditure on human capital has comparable characteristics to that for research and development.

In order to be able to treat expenditure on human capital as an investment in the national accounts statistics, the following problems need to be solved:

- clear criteria for the apportionment of investment spending on human capital
- the investment product must be clearly definable
- the product must be able to be evaluated in an economically reasonable manner
- the amortisation rate of the product must be known.

Despite these unsolved problems, the discussion about classifying spending on human capital as an investment will continue. The 1992 Nobel prize-winner for Economics, Gary S. Becker [23], advocates that expenditure on education and health be treated as investments in both the national accounts statistics and tax. Nordhaus [24] and Cuttler [25] also advocate inclusion of health in the national accounts statistics once the methodical problems surrounding this have been solved.

Preventive orientation of healthcare and consequently the exhaustion of previously unexploited health potential is another as yet unsolved task. According to the latest literature, the key to primary prevention is the avoidance of risk factors for chronic diseases, such as smoking, unhealthy diet, being overweight or obese, failure to take physical exercise, alcohol abuse, and addressing health determinants. Primary prevention is aimed at reducing the probability of the onset of chronic and other diseases. According to the latest literature, over 50% of chronic diseases can be avoided through primary prevention of risk factors.

To date, every significant progressive step related to public health has been connected to improve the determinants of health resulting in the reduction and control of risk factors. The first significant step was the avoidance of risk factors for infectious diseases in the mid-19th century, notably the observance of rules pertaining to hygiene. The next significant step to boost public health will have to be the avoidance of risk factors for chronic diseases [26, 27, 28].

3. Overview of existing empirical evidence

One essential reason why hardly any connection, or only a contradictory one, is ascertainable between health-related spending and a measurable improvement in health is that health-related spending is predominantly measured only according to inputs and not outputs. The research question which needs to be answered is how growth can be assigned to a specific investment health-related outlay. According to provisional estimates by Nordhaus [24], consumptive spending on health over the last 50 years has contributed to prosperity to the same extent as other consumptive spending. Using the current methods of economic evaluation, we are not yet in a position to say whether EUR0 1 spent on health has a return which may be EUR0 2, 4 or 10 higher than for that spent on other consumer needs.

The literature reporting microeconomic investigations into investments made by firms in the health of their employees is very extensive. Numerous studies in the USA are concerned, for example, with health productivity management (HPM). The results of these studies draw a

direct link between the health of employees and their productivity, influencing the profit made by the company and ultimately its share price [29] (GOETZEL 1999). Activities are geared towards reducing sick-leave costs and increasing productivity by improving the general health of staff. Example publications include [30, 31, 32, 33, 34, 35]

Bloom [36] investigated whether at a macroeconomic level there is a correlation between health and economic coefficients corresponding to that shown by microeconomic studies. He estimated that an increase of 1% in the adult survival rate results in an increase of approx. 2.8% in labour productivity. In his opinion, health plays a larger role in the promotion of economic growth than education.

Sanso [37]examined the connection between life expectancy and growth. In his opinion the accumulation of human capital and innovative medical techniques permits individual decisions to be made not only about the quality of life, but also about its length. The desire in ageing citizens to counteract biological deterioration in order to maintain a high level of quality of life will in the future become a driving economic force. Medical science and the healthcare economy will provide techniques and products which slow down the loss of quality of life through the biological ageing process. The state of health of future generations will thus be improved. This will result in increasing individual performance over a longer lifetime, inducing economic growth. According to Sanso [37], this growth will generate sufficient resources to finance medical research and health-related expenditure.

Cutler [38] conducted a study to investigate the value of health-related spending in the United States over a period of 40 years – 1960 to 2000. The increase in life expectancy in the USA was compared to the costs of illness and disease. In summary he concluded that over the entire 40-year period the cost of one additional year of life expectancy for a newborn baby averaged $19,900. For those aged 65 years and over, the same increase over the same period cost an average of $84,700. One of his essential conclusions is that 70% of the reason for increased life expectancy in newborn babies between 1960 and 2000 is the reduced mortality rate resulting from cardiovascular diseases.

According to [38], the current trends with regard to cost development are worrying, however. Following his calculation, the cost of one additional year of life expectancy increased dramatically in the last two decades of his investigation, especially for the older age groups. His analyses to prove an increase in life expectancy for the over-65s show that in the 1970s one additional year cost $46,800, whereas by the 1990s this figure had risen to $145,000. The rate of increase for health-related spending per year of extended life expectancy is thus significantly higher than the rate of increase for years of age. If this trend is sustained, Cutler [38] worries that the cost effectiveness of health-related spending for elderly citizens will decrease.

The latest publication on this topic [39] purports the view that investments in health have a significant impact on economic development. A good state of health in a population makes a crucial contribution to the development of human capital and labour productivity. In the opinion of the author, competition is in a position to increase effectiveness, but the state must assume responsibility for just financing and access to essential healthcare goods. In acknowledging this responsibility, the state could even make a point of increasing health-related expenditure.

4. Macroeconomics and Health

The recent Report by the WHO Commission on Macroeconomics and Health, chaired by Professor Jeffrey Sachs [40], shows that if world leaders are serious about reducing poverty and fostering development, they have to invest in health. And, in its Report, the Commission showed how health investments can be managed in order to achieve the best results.

A study of the global figures shows that three avoidable diseases; HIV/AIDS, tuberculosis and malaria are overwhelmingly important. Maternal and child conditions, reproductive ill-health, injuries and the health consequences of tobacco, are also global health priorities. Any serious attempt to reduce the disease burden faced by the world's poorest people must concentrate on all these conditions. Any serious attempt to stimulate global economic and social development, and so to promote human security, must be successful in addressing the burdens caused by AIDS, malaria and TB.

Of the burden caused by the three diseases, HIV/AIDS makes up just over half, both in terms of healthy life years lost, and mortality. Malaria and TB share the rest on a roughly equal basis. It means that more than 90 Million healthy life years are lost to HIV each year, 40 million to malaria and nearly 36 million to TB. More than five and a half million lives are lost every year to the three diseases alone.

One of the latest documents by the Commission of the European Communities is a Commission Staff Working Document accompanying the White Paper: Together for Health – A Strategic Approach for the European Union 2008-2013 [41]. It aims to be a cohesive framework document, giving clear directions for Community activities in the field of health for the coming years, in order to continue to improve and protect health within the EU and beyond its borders. It reinforces the importance of health within key EC policies, such as the Lisbon Strategy for Growth and Jobs reference , in terms of the links between health and economic prosperity, and the Citizen's Agenda, in terms of people's right to be empowered in their health and healthcare. The strategy is a cross-sectoral framework which recognises the contribution to health of a wide range of policy areas.

According to the White Paper, there is growing evidence that health contributes to wealth and that investment in health contributes to long-term economic growth and sustainability. Health policy makers have long been arguing, as mentioned already, that "health means wealth", and that a healthy population is necessary for economic productivity and prosperity, not to forget that wealth, particularly in the form of effective investment, in turn supports better health.

The strategy argues that health-related costs are considerable in the EU, but effective investment in health can lead to more efficient healthcare systems and social security schemes, to more people avoiding illness and therefore to greater future financial sustainability. As well as healthcare treatment, effective prevention programmes can also substantially reduce major and chronic diseases. According to the Commission's White Paper there is growing evidence that increased investment in preventive measures could counteract the expected growth in health-related costs and expenditure. If the aged population remains active and in good health, this is positive both for the individual and for the wider economy. If health-specific life expectancy were to evolve, broadly speaking, in line with changes to age-specific life expectancy, then the projected increase in spending on health due to ageing would be halved.

In order to maximise the years of age which are healthy and to achieve healthy ageing, it is important to promote health and to prevent disease throughout life, including tackling health determinants such as diet, physical exercise, alcohol, drug and tobacco consumption, environmental and socioeconomic factors. The health of the working population is the key factor for economic sustainability. The Community initiatives with regard to health and its impact on society support the way we understand and approach health policy, as outlined in Chapter 1. Health itself has become a major economic and social driving force in society, as described in great detail by Surcke et al [42]. .

An important contribution regarding the correlation between health and the economy has been made by [42]. In summary, the authors of this European Commission study conclude that investments in health are good for a national economy for the following reasons:

- the labour force potential becomes more productive and can generate a higher income due to an improved state of health
- an improved state of health facilitates a longer working lifetime, a necessity for a population which is becoming older and producing fewer children
- less sick leave is taken and early retirement becomes less prevalent
- greater investments in education pay more dividends in conjunction with an improved state of health and a longer working lifetime, contributing to an increase in productivity
- an improved state of health increases healthy-life expectancy and requires a higher savings rate, e.g. as provision for old age, thus generating the means for a higher rate of investment.

Surcke [42] examined 65 studies about health in all its various guises and their impact on the economy. Overview 1 lists five of these studies in summary.

The 65 studies, performed using a wide range of analytical methods, are all in agreement with the latest literature, stating that the health of a population is the determining factor for personal income and economic growth.

Table 2: Selected studies from SURCKE 2005 [42] on the correlation between health and the national economy

Author	Title	Year	End Points	Conclusion	Publication
Surcke M, Urban D	The role of cardiovascular disease in economic growth	2005	Economic growth	Reducing the cardiovascular mortality of the labour force by 10% causes economic growth to rise by 1%	Mimeo, WHO European Office for Investment for Health and Development, Venice
Weil D	Accounting for the effect of health on economic growth	2004	GDP per capita	State of health explains 19.1% of differences in income between workers	Department of Economics, Brown University, preliminary
Bloom D, Canning D, Sevilla J	Health, worker productivity and economic growth	2002	GDP per capita	A 1% increase in life expectancy increases labour productivity by 1.7%	School of Public Policy and Management, Carnegie Mellon University, Pittsburgh
Arora S	Health, human productivity, and long-term economic growth	2001	GDP	Health improvements over the past 100-125 years increased economic growth in 10 industrialised nations by 30-40%	Journal of Economic History, Vol. 61, No 3, Sept.
Barro R	Health and economic growth	1996	GDP per capita	Increasing life expectancy from 40 to 70 years increased the growth rate in 100 countries by 1.4% p.a. between 1965 and 1990	PAHO: Programme on public policy and health, health and human development division

5. Expanding understanding of health: the first and the second sector for healthcare and for health

The healthcare sector has developed to become the healthcare economy. Alongside the recording of health-related spending, this sector of the economy is interesting from an economic and political point of view for its value added and its impact on employment. In contrast to other branches of industry and sectors of the economy, the significance of the healthcare economy for the national economy has yet to be grasped. Firstly, there is no generally acknowledged split up of the healthcare economy within the national accounts statistics, the healthcare expenditure calculations and the healthcare staff calculations. This situation also leads to very different prognoses regarding the development of the healthcare economy.

With a qualitative segregation, a first area usually focuses on prevention and the promotion of healthy living, curative treatment including care with therapies and medicines, rehabilitation, nursing care and palliative medicine. As well as human medicine, this area also includes dental medicine, which is treated very differently in different countries as far as the remuneration of services is concerned, e.g. Switzerland, New Zealand and Australia on the one hand, and France, Germany and the Netherlands on the other. Finally, this area can also include sick pay for employees. A first market for healthcare covers this core area, i.e. the healthcare sector with all its establishments and providers and remunerable services covered by the health insurance companies or a public health service. It also includes all types of extra payments, surgery fees or excess payable in times of convalescence.

A second market for health covers an extended range of health-related services and goods which are not included in the first market and which are not covered by private or statutory health insurance or by a public health service. A more detailed segregation can be made according to product, service and business-related characteristics. This area also includes "over–the-counter" purchases in chemists or medical supply shops. To date there is no uniform segregation between the two areas, i.e. one agreed upon across Europe

Additional criteria for segregation can be deduced from the health benefits to be gained from goods and services or from the motivation to buy health-related services and the demand for health-related goods. Finally, expenditure for training, research and development must be included, each represented proportionally in one of the two markets. A division used in the German literature employs the following classes [43].

- wholesalers, specialists and retailers,
- pharmaceuticals industry, health trade professions, medical technology, biotechnology and gene technology,
- public administration, health insurance, education, business services, organisation of the healthcare economy, research and development, as well as
- sport, leisure, wellness, tourism, nutrition and lifestyle.

Even with this division, a subdivision is necessary if the parts belonging to the healthcare economy are to be clarified.

In a study by Roland Berger, the authors assume that fitness, wellness, functional food, organic foodstuffs and health tourism all belong to the second market for healthcare, albeit to different extents [44]. Finally, the international System of Health Accounts also includes services which are relevant to health but only indirectly linked with it, e.g. "meals on wheels".

This variety of approaches demonstrates the difficulties involved in agreeing upon a segregation, and the growing significance of regional healthcare economy also throws up questions regarding a regional segregation of the markets, with their value added and impact on employment [45].

Last but not least, segregation is made even more difficult by the fact that, in the field of public health, the relevance of health is increasingly being signalised in all areas of life, e.g. at nursery school, at school, at home, at sport, etc.[46].

In addition to qualitative segregation, questions also arise pertaining to a quantitative evaluation of various subdivisions within the healthcare sector. For example, expenditure can be divided up according to the occasioners of expenditure and how they are financed,

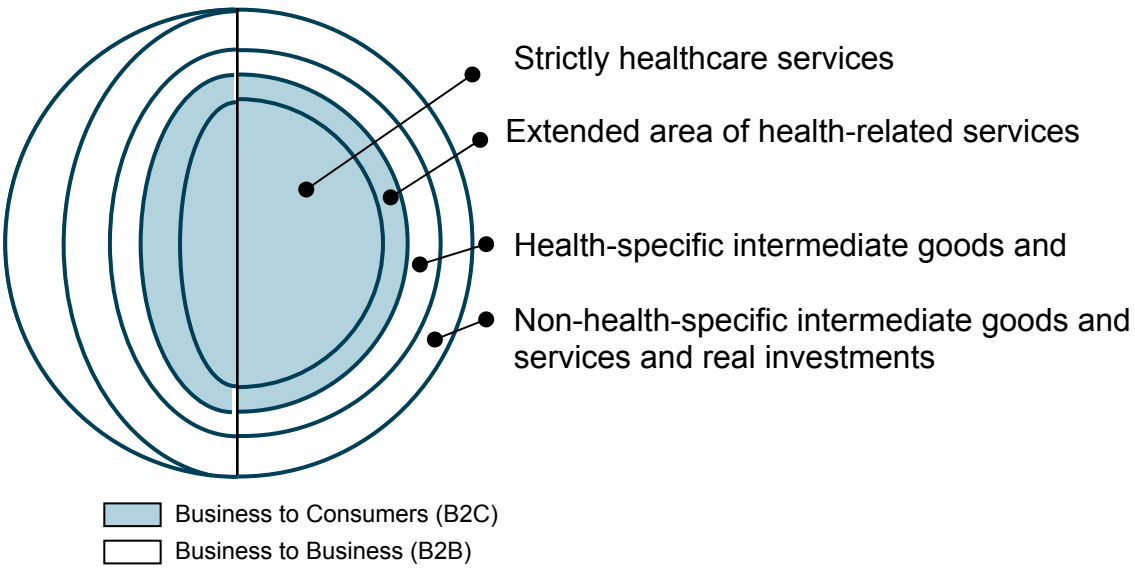
functionally according to types of service and institutionally according to types of establishment. Manpower calculations for the healthcare sector are also determined by the type of segregation chosen. In this field the workforce in Germany, for example, fluctuates between 4.3 and 4.9 million employees [47].

Against this background of segregating the two markets in different possible ways, evaluations of the impact of employment and the value added also differ for the healthcare sector.

In one strategy the following proposal has been made for segregating the various areas [48]

- a core area of strictly healthcare services, restricted to services covered by health insurance (Bismarck System) or a public health service (Beveridge System)
- an extended area of health-related services covering not only services which are paid for privately, but also expenditure on health-related training and research
- an area of health-specific intermediate goods and services, to include many medical products and characterised by the fact that they are not intended for the end user (business to consumer), but for other manufacturers (business to business)
- a fourth area covering intermediate goods and services in the healthcare sector not specific to health, e.g. facility management in hospitals, canteen services, laundry services or new building works.

To summarise, the following overview illustrates the different areas of the healthcare sector subject to observation:



6. Labour market implications

In the discussion about segregating the different markets for healthcare, we mentioned not only expenditure, value added and the impact on employment, but also healthcare employees. According to the calculations of the Federal Office of Statistics, in 2004 10.6% of all employees in Germany were working in the healthcare sector. Healthcare employees can be divided up into professions, establishments and type of employment.

In addition, we can compare the number of practising physicians per 100,000 inhabitants, based on OECD data and calculations by the Federal Office of Statistics.

Table 3: Practising physicians

Year	Germany	Netherlands	Norway	Poland	Russia	Spain	Sweden	Switzerland
Number per 100,000 inhabitants								
1980	.	190.72	191.23	.	.	.	220.20	238.85
1985	.	222.15	220.98	196.76	387.09	.	262.10	273.04
1990	299.57	250.55	248.90	214.18	407.04	.	259.17	298.41
1995	306.53	.	295.26	231.74	385.91	247.39	285.62	316.38
2000	326.04	319.34	292.15	220.02	421.27	316.38	307.34	350.99
2001	330.70	327.82	290.29	224.13	420.37	307.53	283.53	351.41
2002	333.61	338.25	330.49	230.35	425.88	290.94	315.90	355.83
2003	336.75	348.47	338.26	229.39	424.56	322.11	317.95	371.55
2004	339.05	360.37	348.29	224.26	422.09	.	324.57	375.42
2005	340.20	371.30	368.29	.	424.63	.	.	389.56

It should be noted that this comparison ignores important features such as the age structure or morbidity of the individual populations, as well as the age structure or employment structure (number of full-time, part-time and marginally employed) of the practising physicians. As far as new professions in healthcare is concerned, there are some important developments not shown in the statistics above [49].

In addition to the two financial advantages for the first healthcare market resulting from the expanding second market (see above), other desirable effects are also emerging in the light of the demographic development and the many technological innovations. The older population, in many countries not suffering from poverty, is demanding new products and services in connection with sickness and health, and with this increasing demand for health-related services numerous changes are occurring in the many labour markets within the healthcare sector.

New vocational training and professional opportunities are changing qualification requirements and existing job descriptions, e.g. in nursing, nutritional expertise, management and information technology or medical engineering. The physician's assistant, the study nurse, the nurse practitioner, the surgical-technical assistant, the orthoptist, the tele-nurse and the patient scout are all new occupations, some of which require academic training. These positions all serve to guide patients, their families and insured parties more easily through the highly complex healthcare system, with its still predominantly sectoral services and their

fragmented financing and intransparent remuneration. Linked to this change there are also new areas of work in research and development.

The staff-intensive healthcare field is therefore also a growth industry, with the expansion of existing employment opportunities and the development of new job descriptions [50]. Bearing this in mind, public discussion about the so-called cost explosion and the linked non-wage labour costs needs to be reassessed (see above). The latter can be reduced through new financing options, but even an increase in healthcare expenditure financed by wages and salaries has a stronger multiplicative effect on growth than rising pension-related expenditure [51].

We have already addressed the impact of the second sector for healthcare on professions within the healthcare sector. One peculiarity consists in the fact that these new job descriptions cannot usually be obviously assigned to one market or the other. Ambulatory nursing services are also individually available, independently of nursing care and health insurance stipulations, and physiotherapists, as well as other service providers, are happy to do business with patients directly.

Aside from these examples of a financing mix for healthcare services combining insurance cover and private payments, and thus of a financing of services from different sources, the labour market will experience further innovations. In the light of the current demographic development, the rise in chronic diseases and the increasing support required by the elderly in this context will lead to increased healthcare expenditure. This concerns not only the healthcare services traditionally covered by statutory health and nursing care insurance, but also the help required in later life, and thus new services. More and more people are living alone and require support at home in order to continue to do so, and in this field the abovementioned and other job descriptions will undergo a dynamic development.

A stronger inclusion of non-medical healthcare professions within the healthcare sector means that increasing importance will be attached to staff qualifications. In the field of wellness, for example, it is becoming increasingly difficult for consumers to differentiate between serious providers and less good services. It should be emphasised that there is a real need for quality assurance through well-trained staff, especially in conjunction with the care of older and geriatric patients – e.g. with degenerative diseases. For this increasingly significant target group, dubious and unqualified providers of health-related services can even represent a danger to health.

Structures within the vocational training system need to take these developments on board flexibly and quickly. This also concerns a redistribution of tasks within a professional world which is changing through telecommunication, the alleviation of manual tasks through technical intervention, as well as work in new teams.[52]. The telemedical care of patients with chronic cardiac insufficiency, and joint data documentation are also part of this new development, as well as a new orientation of non-medical fields such as speech therapy, physiotherapy, hospital logistics or nursing science in general. Freelancing must also be possible. Last but not least, the Internet has meant profound changes to the all-important patient-physician relationship [53]. This development shows that the impact of the second market for healthcare will means changes in job distribution, as well as a specialisation of the services provided and their quality assurance. In the light of this foreseeable development it would be desirable to have everyone working with and not against one another.

7. On the growth-related effects of health promotion

A good health economics scenario analysis of the potential economic impact of prevention is the report by Wanless [54, 55]. The author was requested by the Chancellor of the Exchequer to investigate the long-term trends which could shape the British healthcare system (National Health Service, NHS) in the next 20 years. His strategy was that healthcare would gain such economic significance as to become a dynamic force not only responsible for producing a healthy population and a healthy workforce, but also promoting employment and national prosperity in its own right. Prevention and a healthy lifestyle would both play major roles. Three different strategic scenarios were selected to demonstrate cost development between 2002 and 2023.

Scenario 1: Solid progress. People become more engaged in relation to their health: life expectancy rises considerably, health status improves and people have confidence in the primary care system and use it more appropriately. The health service is responsive with high rates of technology uptake and a more efficient use of resources.

Scenario 2: Slow uptake. There is no change in the level of public engagement: life expectancy rises by the lowest amount in all three scenarios and the health status of the population is constant or deteriorates. The health service is relatively unresponsive with low rates of technology uptake and low productivity.

Scenario 3: Fully engaged. Levels of public engagement in relation to their health are high: life expectancy increases go beyond current forecasts, health status improves dramatically and people are confident in the health system and demand high quality care. The health service is responsive with high rates of technology uptake, particularly in relation to disease prevention. Use of resources is more efficient.

Table 4 shows expenditure on healthcare in Britain (National Health Service, NHS) relative to GDP for the period 2002 to 2023 according to the three scenarios proposed by Wanless [55].

Table 4: Expenditure on healthcare in Britain relative to GDP (in %) in three different scenarios set out in the Wanless Report

Scenario	2002	2007- 08	2012-13	2017-18	2022-23
Solid progress	7.7	9.4	10.5	10.9	11.1
Slow uptake	7.7	9.5	11.0	11.9	12.5
Fully engaged	7.7	9.4	10.3	10.6	10.6

As is the case with all scenario analyses, the results are sensitive to the assumptions upon which they are based. In the "Solid progress" scenario, health-related expenditure relative to GDP rises to 11.1% by 2023. Should, however, the increase in productivity within the healthcare sector fall just 1% short of that assumed in the scenario, with all other factors remaining the same, expenditure relative to GDP would increase to 13.1%. Vice versa, a 1% improvement in productivity compared to the assumed level in 2023, with all other factors remaining the same, would mean a lower expenditure relative to GDP of 9.4%. This finding underlines the necessity of healthcare reforms in order to achieve desired targets.

The scenario "Fully engaged" is the least expensive and yet boasts better results than the other two scenarios, not least because of its preventive orientation. According to Wanless [55], the state of the population's health would improve by considerably reducing major risk factors such as smoking, obesity, poor diet and insufficient physical exercise. The percentage of smokers would then be close to that found in California today. Following the assumptions of the scenario "Fully engaged", this reduction in risk factors would be at its greatest where they are currently to be found most often, namely in the parts of the population with the lowest social standing.

In addition to considerably reducing major risk factors, the scenario "Fully engaged" aims to develop from a "system of sickcare" into a "system of healthcare", in which healthy people can remain fit and those with chronic diseases can remain as active as possible. The lower expenditure resulting from this optimistic scenario compared to the other two is explained as follows.

Spending increases as the result of a growing population with a higher life expectancy making more use of out-patient treatment for preventive care and counselling purposes. This is counteracted by savings, estimated to be greater than the increase in spending, chiefly resulting from a reduction in the prevalence of geriatric diseases and an improvement to the general state of health in the population through prevention. Expenditure in scenario 3 "Fully engaged" is £30 thousand million or approx. 20% lower for 2023 than in scenario 2 "Slow uptake".

For the growth potential of a national economy, development of the labour force potential, as well as the workers activated from this potential in order to generate the GDP, are more important than the overall development of the population [56].

The reality in the German labour market is that the average working life ends aged 60. Few workers today reach the legally stipulated retirement age of 65 years, which is why the average for both men and women is around 60 years. On 01.02.2006 a new law was passed to raise the retirement age to 67 years by 2029. It will be raised in gradual steps, starting in 2012. However, the labour force which is currently actually available has a prevailing age range of 20-60 years and disregards the official retirement age of 65, not to mention that of 67 envisaged for 2029.

This leads researchers to question how prevention-orientated healthcare could succeed in raising the real age limit of the labour force potential from its current 60 years to a possible 70 years by 2050. This extension of employment age to 70 years was recommended, for example, by the German Institute for Economic Research in 2005 [57].

Table 5 assumes for its minimum and maximum variants in its 2002 line that the actual age limit remains the same between 2002 and 2050, even if a higher retirement age is stipulated by law (20-65, 20-70).

Table 5: Development from 2002 to 2050 of the labour force potential aged 20-60, 20-65, 20-70 years based on 1000 persons and in accordance with two variants by the Federal Office of Statistics 2006 [58] compared to Basis 2002

Variant 1: minimum variant – potential labour force by age group			
	20-60	20-65	20-70
2002	45,354	45,354	45,354
2050	29,901	34,834	39,468
Difference	-15,453	-10,520	-5,886
Variant 2: maximum variant – potential labour force by age group			
2002	45,354	45,354	45,354
2050	35,240	40,540	45,466
Difference	-10,114	-4,814	112

The column differences for the minimum and maximum variants show how the labour force potential would develop by 2050, compared to the baseline year 2002, simply by changing its age range from 20-60 years to 20-65 years to 20-70 years.

In the scenario with the minimum variant the labour force potential in the column 20-60 drops 15.5m persons by 2050.

Increasing the actual age range to 20-65 years would reduce the labour force potential by 10.5m persons, and a range of 20-70 years would reduce it by just 5.9m.

The maximum variant also assumes in its 2002 line that the actual age limit remains the same between 2002 and 2050, even if a higher retirement age is stipulated (20-65, 20-70). In this scenario the labour force potential in the column 20-60 years drops 10.1m persons by 2050.

Increasing the actual age range to 20-65 years would reduce the labour force potential by just 4.8m persons and increasing it to 20-70 years would even induce a slight increase of 0.112m.

Comparing the minimum and maximum variants with the different age limits, the most favourable variant – accepting the assumptions of the Federal Office of Statistics – turns out to be the combination of a real age range of 20-70 years with the maximum variant for population development until 2050. The assumptions of the Federal Office of Statistics comprise a slight increase in the birth rate from 1.4 to 1.6 children per woman capable of child-bearing, a high life expectancy and a net migration of 200,000 persons per annum. Accordingly, in 2050 the labour force potential would still have approximately the same level it had in 2002, despite an overall reduction in the population.

Raising the retirement age by law is not in itself enough to achieve a significant increase in labour force potential. Without improving the state of health of the population, raising the retirement age will primarily induce pension cuts. The labour force potential consists only of the population at employable age, e.g. 20-70 years, and contains the subset of workers generating the income for non-workers throughout the population and across all age groups.

The process by which the labour force potential is rendered capable of generating the GDP is influenced by many factors, of which health is only one. According to SIDDAL 2007, the reasons given for early retirement by 55-64-year olds in 15 EU states were health-related in up to 25% of cases. In Germany the percentage is 22.9.

According to the report Gesundheit in Deutschland (Health in Germany) [59], chronic diseases are the most frequent cause of early retirement and include skeletal, muscular and connective tissue disorders; circulatory disorders; psychiatric disorders; and carcinogenic diseases. Together these four disease groups were the cause of early retirement in 78% of women and 75% of men in 2003.

The, Director of the Office of Behavioral and Social Sciences Research of the National Institutes of Health in the USA [60] , ascertained the following in celebration of the 10th anniversary of his Office on 15th June 2006: approx. 70% of our state of health is attributable to individual, group and social behaviour, representing social determinants.

It would exceed the scope of this chapter to provide a model calculation for how an actual raising of the retirement age and a prevention-orientated healthcare system, achieved through investments in human capital and a realisation of the assumptions for increasing labour productivity by 2050, could affect economic growth and the financing of income and social services. Future investigations into the economic impact of a higher value added potential through investments in human capital should address the following theories, to name but a few:

- The social security contribution rates are increasing more slowly than previously assumed or not at all since the growing expenditure predicted as a result of demographic change and medical progress can be financed by the national insurance systems at no extra cost through constant deductions from higher income.

- With the labour force potential weakened by demographic change, the high stake held in world trade by Germany and the EU can still be maintained if labour productivity is considerably increased.

- Because of the high investments in human capital necessary to safeguard a high value added potential, if the labour force potential is continually to reproduce it must have at its disposal an income which only a highly productive, high-wage economy can finance. A high value added potential cannot be guaranteed with low wage levels in the long term.

In order to assert itself, a national strategy for growth and jobs requires human capital which is equal in quality to the human capital of its competitors, or better still superior. This can only be realised by investing in human capital as the union of health and education. Once achieved, this then generates a good basis for adopting policies to create a highly productive, high-wage economy.

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Berlin's healthcare market as a driving economic force: A regional case study

Executive Summary

Berlin's healthcare economy is a continually growing market with potentials which are increasingly attracting attention. The following is an endeavour to demonstrate the significance of Berlin's healthcare market as a branch of industry, using quantitative parameters. Trends and structural changes over the last few years are particularly visible in the development of turnover and employment. The prospects for growth and employment in Berlin's healthcare economy become especially clear in a comparison with other branches of industry. Against this background it is important that Berlin be expanded as a centre of science, industry and medical care[2].

1. Turnover and gross value added of Berlin's healthcare market

A market analysis of Berlin as a healthcare region requires not only an analysis of the demand for health-related services, but also an examination of its supply structures. The baseline economic situation can be characterised using two coefficients – turnover and gross value added. The overall turnover of Berlin's healthcare market is the sum of the turnover of all its submarkets. In 2004 this was approx. EUR 14.1 thousand million, 19.8% higher than the turnover in 2000, totalling EUR 11.8 thousand million. The supply side results from a division of Berlin's healthcare economy into seven different submarkets, each with its respective turnover (cf. Fig. 1). A clear observation is that industry, i.e. the medical technology industry and the pharmaceuticals industry, is responsible for more than half the growth, followed by the hospitals, retail and trade, as well as ambulatory care. Fig. 1 also shows the turnover development of the individual submarkets compared to 2000.

In addition to turnover, a second output compilation coefficient describing the performance of a national economy is gross value added. If the intermediate goods and services which occur in the creation of products and services are deducted from the overall turnover, the result is the gross value added and thus the contribution of a branch of industry to the gross national income of an individual economy. However, the concessions are difficult to quantify due to their intersectoral and intrasectoral overlap. Because of this, in 1996 the Committee of Experts for the Concerted Action in Healthcare assumed a 40% deduction when evaluating gross value added for the German healthcare market [1], [2]. Following the assumption that the production structure with regard to production levels and concessions across the whole of Germany cannot be so different from that in Berlin, this figure can be transferred for our

[2] This case study has already appeared in German. See Georgi, A., Henke, K.-D., Die Berliner Gesundheitswirtschaft: Zahlen, Daten, Fakten, Strategien, in: Gesundheitsstadt Berlin e.V:, ed., Handbuch Gesundheitswirtschaft, Kompetenzen und Perspektiven der Hauptstadtregion, Berlin 2007, pp. 498 - 503

purposes. For 2004 this means an estimated gross value added of approx. EUR 8.5 thousand million for Berlin's healthcare economy. This in turn corresponds to 11.6% of the gross value added for all areas of Berlin's economy in the same year. In comparison, healthcare across the whole of Germany is only responsible for approx. 4 to 5% of gross value added [1], [2], [3]. In view of the higher density of healthcare establishments in urban regions, the figure evaluated for Berlin comes as no surprise; indeed, it illuminates the considerable importance of the healthcare market in Berlin.

The growth of the healthcare market reflects a shift in consumer preferences, with the increased use of health-related services frequently corresponding to an increased need for services. It should not be ignored, however, that the effect on demand of altered preferences for health-related services is probably very distorted due to tight regulation. A growing healthcare market strengthens the growth of a society and should therefore be regarded as positive, as long as the rising non-wage labour costs resulting from increasing health insurance premiums do not represent a regionall disadvantage.

2. Health-related spending in the capital

The increase in health-related spending means a wealth of new jobs in related areas. This trend is also noticeable in Berlin (cf. section 3). The exact expenditure for healthcare in the capital has not been explicitly identified, however. The figure can be estimated by taking into consideration the calculation made by the Federal Office of Statistics for health-related spending in 2003, whereby the statutory and private health insurance companies were together responsible for 65.4% of national healthcare expenditure in Germany [4]. Taking the expenditure of the statutory and private health insurance companies in Berlin as a basis, namely EUR 5.1 thousand million, and assuming that this sum represents 65.4% of Berlin's health-related spending, it follows that total expenditure would be EUR 7.9 thousand million. This means that, in total, an estimated EUR 7.9 thousand million is spent in Berlin by the various occasioners of health-related expenditure on services, premiums and other payments.

In 2004, Berlin's gross domestic product was EUR 77.9 thousand million, approx. 10.1% of which was health-related expenditure [5]. Compared with the national average for health of 10.6% in 2004, Berlin's spending in this area would be slightly less according to this estimate. Taken alongside the comparatively high value added percentage for the healthcare economy on the supply side, this indicates a relatively high external demand (national and international).

3. Employment potential in the Berlin region

Employment in Germany's national economy is influenced by the healthcare economy in three different ways. By providing health-related services, this sector improves human capital and thus helps to increase productivity [1], [6]. Since in the German healthcare system employers participate in premium payments through their employers' contribution and thus also in the financing of the statutory health insurance system, its development therefore also affects the level of non-wage labour costs. Finally, a large proportion of employees paying national insurance work in the healthcare sector. For 2004 the Federal Office of Statistics calculated 4.2m employees in health-related areas (healthcare workers and their jobs). In Germany one in nine persons in active employment works in the healthcare sector.

The picture in Berlin is slightly different. Data from 2004 show approx. 180,000 persons employed in health-related areas, corresponding to 11.7% of the population, or one in eight

persons in the capital in active employment [7]. Whereas in Germany approx. 67% of the actively employed work in service occupations, in Berlin the figure for this sector is 84.6%. Since the healthcare market can predominantly be characterised as a service market, these figures illustrate the importance of the healthcare market for Berlin's labour market (cf. Fig. 2). The ambulatory field in particular, including dental surgeries, psychotherapists, ergotherapists, speech therapists, homeopathic practitioners, etc., etc., is the most prominent employer in Berlin's healthcare market, totalling 52,281 employees. The hospitals come in second, with 39,792 employees, and out-patient and in-patient nursing homes and services employ a total of 29,791 persons. It should be noted here that many citizens within Berlin's healthcare economy work on a voluntary basis, e.g. in hospices. A lack of data means that they cannot be quantitatively accounted for, however (cf. Fig. 3).

4. Monitoring growth and employment in Berlin

Following this analysis of turnover and employment, the two coefficients can now be represented in context using monitoring techniques. This presupposes that sufficient data from different points in time are available in order to demonstrate a potential trend. In Fig. 4 one point represents a submarket for a particular year with the coordinates turnover and employment.

Worthy of notice is the pronounced horizontal development of the pharmaceuticals industry in Berlin. The employment rate in this submarket has hardly changed at all since 1995, and yet the turnover has more than doubled. Similar developments can be seen for the pharmacies. A different trend can be observed for in-patient nursing care. Here the development is vertical, i.e. employment increased while the turnover remained more or less the same. In contrast, out-patient care experienced remarkable movements in both employment and turnover between 1997 and 2004. The analysis of growth and turnover in Berlin's healthcare economy is a good instrument for visualising trends (cf. Fig. 4).

5. Berlin – an expanding healthcare metropolis

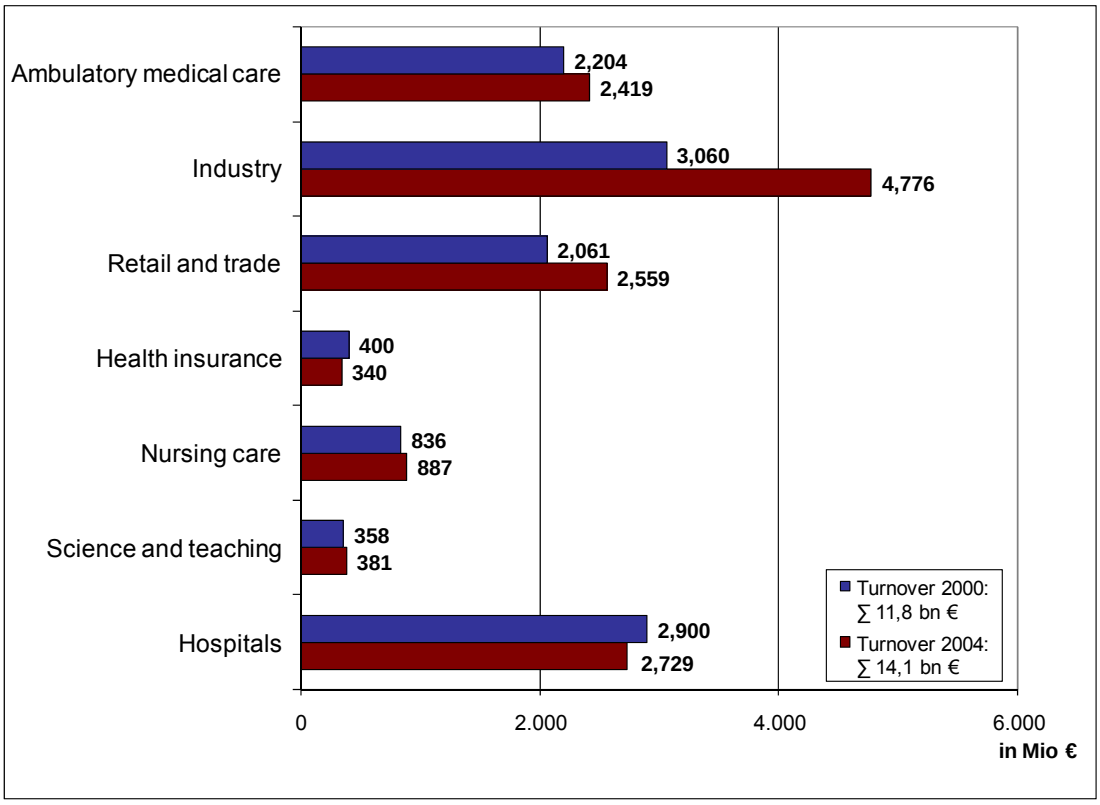
Progress in medical technology, coupled with our demographic development, will lead to an increased requirement for personnel, especially in nursing care and out-patient medical care [7], [8]. The high density of science and vocational training, industry and hospitals in Berlin additionally provides favourable regional conditions. Centres of competence and care networks are developing. Berlin's healthcare economy as a staff-intensive branch of the services industry is very high-tech, boasting a thriving pharmaceuticals industry, medical technology, biotechnology and gene technology, as well as research into medical care, information technology, consulting and software services.

Complementing the "Healthcare Region Berlin-Brandenburg" master plan, the conclusions and recommendations drawn from the study "Berlin's Healthcare Economy" and the comparable study for Brandenburg should support political decision-making in the future [7], [9]. Among other things, this would also mean access to an analysis of strengths and weaknesses or a comparison of regional advantages and disadvantages for potential providers, which would make it easier to draw up concepts for developing Berlin's healthcare market further.

For example, healthcare technologies could be marketed internationally with the label "Made in Berlin" [7], [10]. Healthcare brand names will become increasingly important in Germany. Sustained growth is, however, only possible if an intelligent political framework can be put

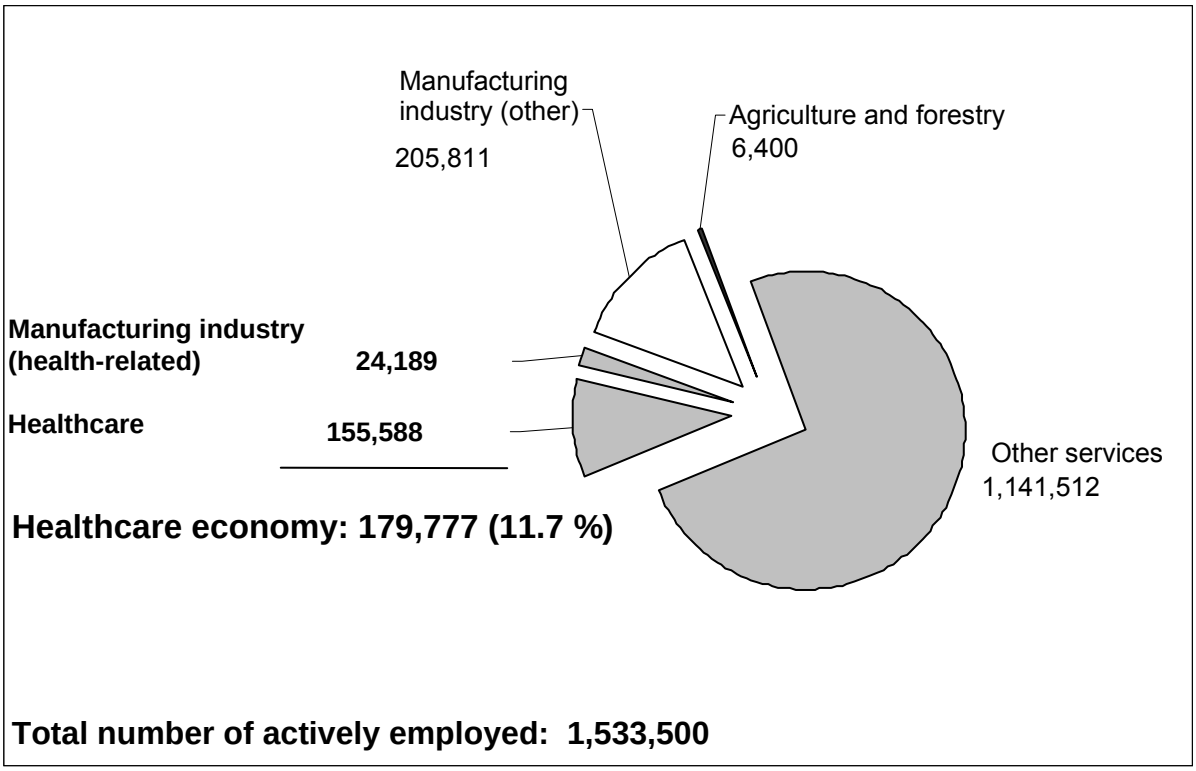
into place. With regard to regional competition, national powers should distance themselves even more from the provision of healthcare services: what is needed right now is more market and a strong state. The state needs to enforce the economic rules of play, but should then refrain from interfering in the game.

Fig. 1 Comparison of turnover for Berlin's healthcare economy submarkets between the years 2000 and 2004, own compilation



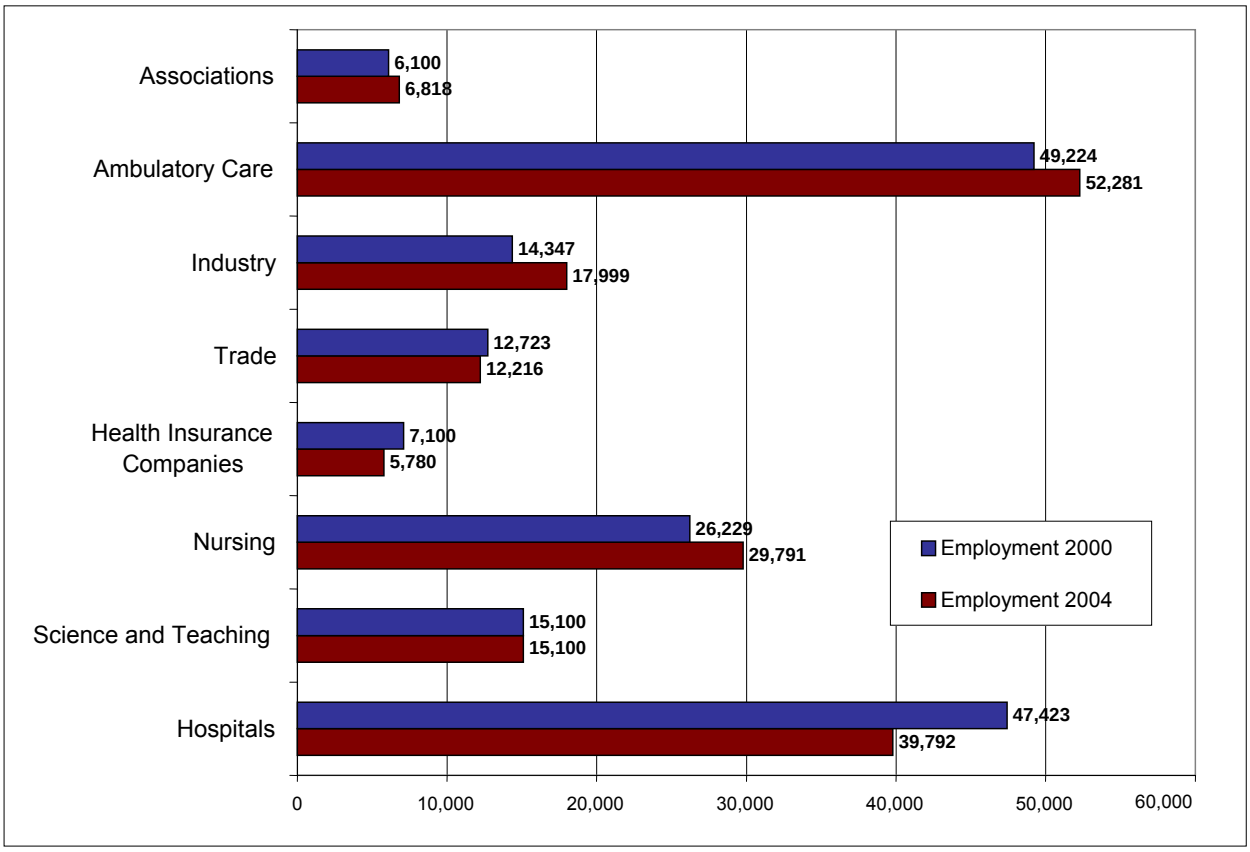
Source: Henke K-D, Cobbers B, Georgi A, Schreyögg J (2006), Die Berliner Gesundheitswirtschaft – Perspektiven für Wachstum und Beschäftigung, 2nd edition, Berlin 2006, p. 95.

Fig 2 Active employment in the different sectors of the Berlin labour market in 2004, own calculation



Source: Henke K-D, Cobbers B, Georgi A, Schreyögg J (2006), Die Berliner Gesundheitswirtschaft – Perspektiven für Wachstum und Beschäftigung, 2nd edition, Berlin 2006, p.103.

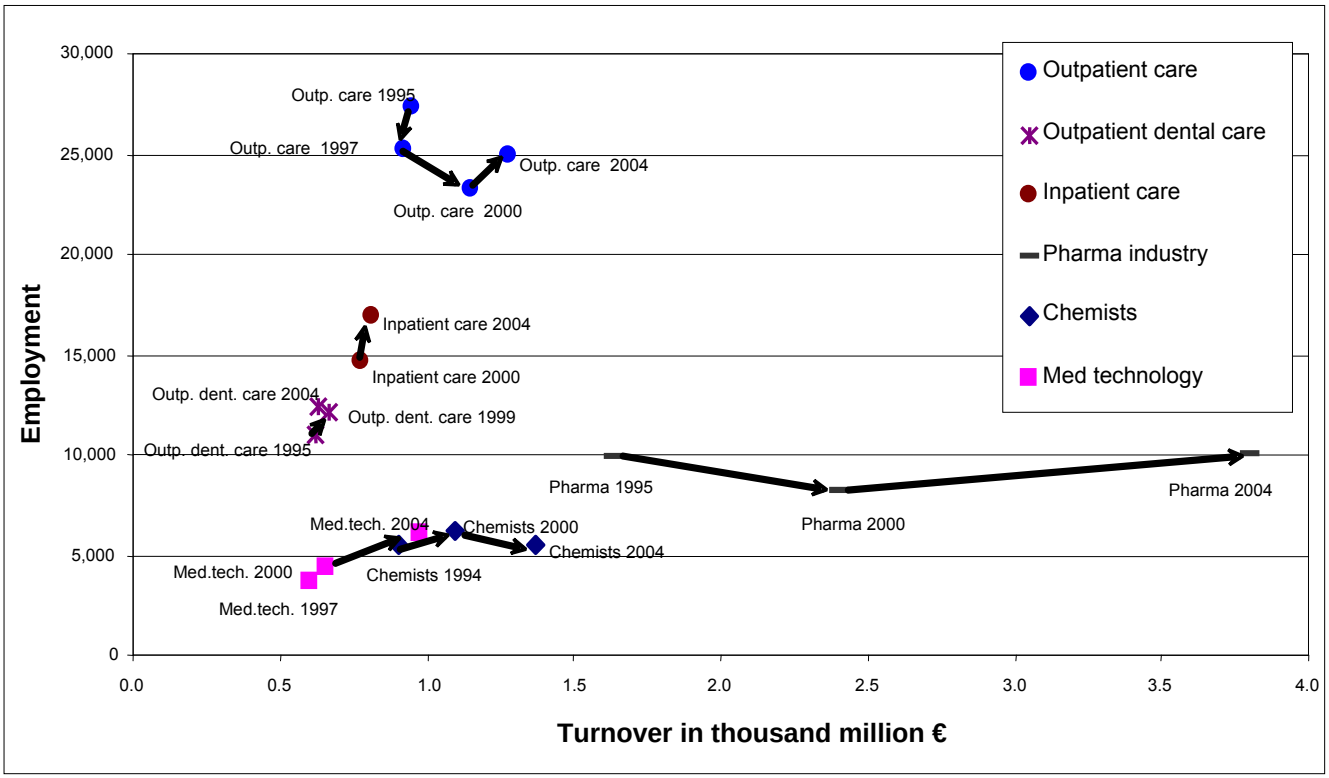
Fig 3 Comparison of employment rates in the submarkets of Berlin's healthcare economy between 2000 and 2004



Total employment 2004: 179,777 11.7% of Berlin's gainfully employed

Source: Henke K-D, Cobbers B, Georgi A, Schreyögg J (2006), Die Berliner Gesundheitswirtschaft – Perspektiven für Wachstum und Beschäftigung, 2nd edition, Berlin 2006, p.106.

Fig. 4 Development of growth and employment in Berlin's healthcare economy



Source: Henke K-D, Cobbers B, Georgi A, Schreyögg J (2006), Die Berliner Gesundheitswirtschaft – Perspektiven für Wachstum und Beschäftigung, 2nd edition, Berlin 2006, p.104.

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