Policy Contribution
Issue n°11 | August 2018

The macroeconomic implications of healthcare

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Executive summary

HEALTH-CARE SYSTEMS PLAY a crucial role in supporting human health. They also have major macroeconomic implications, an aspect that is not always properly acknowledged.

COUNTRIES SPEND VERY different amounts on healthcare, with spending in North America (Canada and the United States) more than twice as much *per capita* as in the European Union on average, and there are significant differences between EU countries too. Various explanatory factors such as income levels, population age structures and epidemiological profiles cannot explain the differences between countries. Decisions on the optimal level of spending should also consider various others factor, including the macroeconomic implications of health-care systems.

WHATEVER AMOUNT IS spent on health care, it should be spent efficiently, in order not to waste resources and to improve the macroeconomic impacts. We demonstrate that there are threshold effects whereby certain quantitative indicators of health tend to improve with increased spending only up to certain amount of spending, but not further. Using a standard method to measure efficiency, data envelopment analysis (DEA), we find significant differences between countries, suggesting that not all countries use existing technologies and best practices to their full potential. This finding calls for policy responses.

HEALTH-CARE SYSTEMS MATTER for the macroeconomy because of their large size in output, employment and research. They also have direct fiscal implications in terms of the long-term sustainability of public finances, while health-care spending decisions influence short-term economic development through the fiscal multiplier effect, which is substantial. Most southern European countries cut health-care spending aggressively in recent years, likely amplifying the depth of their recessions and possibly causing hysteresis effects from long-term unemployment and reduced productivity. Fiscal consolidation strategies should aim to preserve spending items that have large fiscal multipliers, including health-care expenditures.

HEALTH-CARE SYSTEMS ALSO influence labour force participation, productivity and human capital formation through various channels, and thereby have an influence on overall macroeconomic outcomes. They also play an important role in inequality, and we find that inequality of access to health care is particularly high in about one-third of EU countries, which calls for policy responses.

IT IS ESSENTIAL that discussions of health systems consider both the opportunity cost and the economic value of investing in health. Such an approach can help policymakers resist the temptation to default to the potentially inefficient status quo.

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1 Introduction

Health-care systems play a crucial role in supporting human health[1]. But health-care systems also have major macroeconomic implications, an aspect that is not always properly acknowledged. These implications include feedback effects on public revenues and expenditures. Neglecting the macroeconomic impacts of health-care systems could lead to suboptimal allocation of scarce public resources.

In the European Union, the human health and social work activities sector represents about 7.4 percent of total value added and 10.6 percent of total employment[2]. Furthermore, closely connected to health care, the pharmaceutical sector heavily invests in long-term projects to research and develop new drugs and processes. Among the top 1000 R&D investors in the EU, 19 percent of total R&D spending is by pharmaceutical and biotechnology companies[3].

Beyond the sheer importance of health-care sectors, they exert various direct and indirect effects on the macroeconomy. Their fiscal implications include their influence on fiscal sustainability and economic development via public spending decisions. They influence the labour market in terms of labour force participation, human capital formation, productivity and inequality. It is therefore crucial to analyse the broader macroeconomic implications of health-care spending decisions.

Health-care expenditure relative to GDP in the EU has increased in recent decades. Ageing populations require higher spending, since older people typically use health-care services at a much higher rate than young people. The deployment of new and more efficient technologies involves higher costs. The cost of health care as a share of GDP could be twice as much by 2050 as it is now unless reforms are undertaken (Maisonneuve and Martins, 2013).

It is also important to emphasise that health-care systems are organised differently in different countries. A particular aspect is the difference between publicly and privately financed expenditure, but there are further differences even within the publicly and privately financed parts of health-care systems (Figure 1). Against this background, this Policy Contribution tackles three questions:

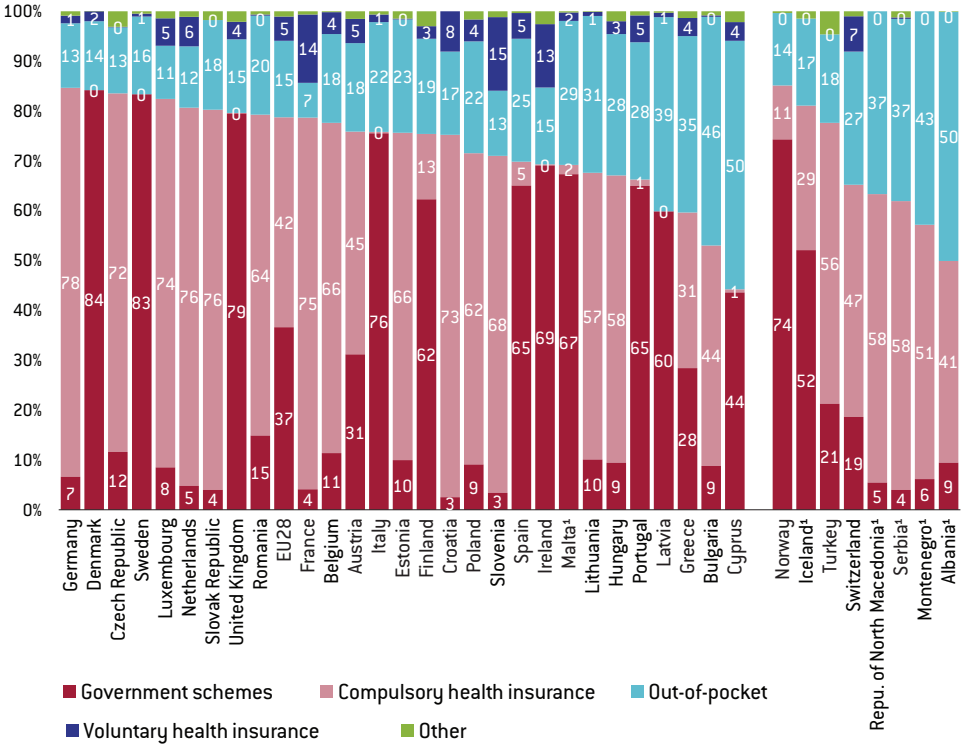
- How should the optimal level of the public-sector health-care budget be determined? Different countries spend very different amounts (relative to GDP and population) on health care. We highlight the most important aspects and the various trade-offs that arise from the presence of multiple objectives and limited resources.
- How efficient are health-care systems in the EU? Whatever amount is allocated to health care, it should be spent efficiently. We therefore look at the literature on measuring health-care system efficiency and provide estimates comparing European Union countries with each other and some other countries. More efficient health-care systems have better macroeconomic impacts.
- What are the macroeconomic implications of health-care systems? The macro impact of health-care systems stems not only from their relatively large sizes, but also from their outcomes. We argue that a proper consideration of the macro implications of health care systems should be an important aspect of health-care spending decisions.

1 World Health Organisation (2000) defines health system activities as "*all the activities whose primary purpose is to promote, restore or maintain health*", while Murray and Frenk (2000) present a conceptual framework organising the health system into different pools of activities, which are financing, provision, resource generation and stewardship. In this Policy Contribution we take a similarly broad view of the health system.

2 In 2016. Source: Eurostat [nama_10_a64], NACE sector Q 'Human health and social work activities', which includes various human health activities, residential care activities, social accommodation and work for the elderly and disabled, childcare and various other activities such as social, counselling, welfare, refugee, referral and similar services which are delivered to individuals and families in their homes or elsewhere and carried out by government offices or by private organisations, disaster relief organisations and national or local self-help organisations and by specialists providing counselling services.

3 Source: 2016 EU Industrial R&D Investment Scoreboard, http://iri.jrc.ec.europa.eu/scoreboard16.html.

Figure 1: Current health expenditure by type of financing (% of total), 2014



Source: Bruegel based on OECD Health Statistics 2016; Eurostat database; WHO, Global Health Expenditure database. Note: * 1: includes investment

2 The optimal level of health spending: the key factors

Decisions on the optimal level of public spending on health care first require a clarification of the objectives of the health-care system. An abundant health-care literature discusses various objectives and relevant performance indicators to measure progress towards these objectives. However, in this literature it is rare to find objectives derived from first principles that can guide policymaking discussions on this topic. The various objectives proposed by some works overlap to a great extent, and some are not goals in themselves but are rather instrumental goals. Some objectives are broad (eg 'Progressiveness'), while others are very specific indicators (eg 'Reduction in prescriptions of long-acting benzodiazepines for elderly patients'). It is therefore interesting to turn to Murray and Frenk (2000) for their discussion of instrumental versus ultimate goals for health systems. They conclude that there are effectively three overall objectives[4]:

- Improving health: a health system should aim to improve health, as otherwise society would not invest in a health system in the first place.

4 Hsiao and Heller (2007) took an economic perspective and concluded with similar goals: improving health, avoiding impoverishment due to healthcare and public satisfaction.

- Community satisfaction: as for all community-wide services, it should be responsive to the community's preferences in terms of respect for patients, quality of facilities, privacy and other non-health aspects.
- Accessibility: fair contributions by all to the health system should be ensured, similar to other community-wide public goods.

The *State of Health in the EU: Companion Report* (European Commission, 2017) also makes the distinction between the ultimate goals and instrumental goals of EU health systems. Ultimately, the aim is to improve population health. However, the report also highlights effectiveness (quality, outcomes and experience), accessibility and resilience as the intermediary objectives to be fulfilled (European Commission, 2017). The prevalence of the resilience goal in today's European health-care policy discussion highlights policymakers' concerns about health system-related fiscal sustainability (see section 4.1).

Quantitative measurement of progress towards the objectives faces several difficulties, though there have been many efforts to use comparable and informative indicators, as illustrated by for example the health system performance assessment literature (Carinci *et al*, 2015; Braithwaite *et al*, 2017; Simon *et al*, 2017). Arah *et al* (2006) identified 15 indicators used in performance assessment frameworks used in various countries and international institutions. These are derived from existing assessment methods in various countries and are therefore closer to policymakers' needs for information they can act on. More recently, European Commission (2017) highlighted key indicators of progress towards some of the health systems' instrumental objectives[5].

Keeping the objectives in mind, we can identify the information needed to determine the optimal level of health spending as:

- Population:
  - Income;
  - Preferences for health relative to other aspects of life;
  - Age structure and epidemiological profile of the population.
- Health systems:
  - Relative price of different health-enhancing activities and technologies;
  - Relative price of health relative to other aspects of life;
  - Market failures: 1. Asymmetric information between providers and patients; and 2. Adverse selection in insurance markets;
  - Effectiveness at improving health outcomes, ensuring accessibility and satisfying current population's desires;
  - The extent of private healthcare spending and population preferences for the public/private mix and the consent level of taxation.
- Macroeconomic implications of health;
- Policies affecting the aspects listed above.

We discuss these points in turn.

A country's average income is a key determinant of health-care spending, but is far from the only one. *Per-capita* annual health-care expenditure (in purchasing power parity terms)

5 The key indicators for effectiveness are amenable mortality (or deaths from potentially preventable diseases), avoidable hospital admissions, presence of prevention measures and patient-reported outcomes. Accessibility can be evaluated using share of the population declaring unmet needs for medical examination (for financial reasons, because of waiting lists or distance), health inequalities across the income distribution, and out-of-pocket expenditures. Resilience is indicated by the use of Health Technology Assessment, low rates of avoidable hospital admissions, cost-effective use of medicines, use of budgetary and performance-based planning tools, and better integrated health systems (European Commission, 2017).

ranges from as low as about $200 in sub-Saharan Africa and South Asia (two regions with rather low GDP per capita), to more than $9,000 in North America (where GDP *per capita* is the highest among the world regions) (Table 1). Average health-care spending in the EU is $3,753, just over a third of the US value, while the gap between North America and the EU in terms of GDP *per capita* is much narrower. Health-care spending correlates with outcomes to a certain degree since higher spending is associated with lower child mortality and higher life expectancy, but the correlation is not perfect (Table 1). *Per-capita* spending in the EU is just over a third of North American spending, yet the EU outcomes are better in terms of both basic health outcome indicators reported, suggesting differences in efficiency (section 3).

Table 1: GDP per capita, health-care expenditure, life expectancy and child mortality, latest year

	GDP per capita (PPP US$, 2016)	Health expenditure per capita (PPP US$, 2015)	Mortality rate under-5 (per 1000, 2016)	Life expectancy at birth (years, 2016)
North America*	56,345	9,040	6	79
European Union	39,611	3,753	4	81
Middle East and North Africa	19,515	1,057	24	73
East Asia and Pacific	17,025	960	16	75
Latin America and Caribbean	15,211	1,081	18	76
South Asia	6,063	212	48	69
Sub-Saharan Africa	3,724	199	78	60
World	16,217	1,300	41	72

Source: World Bank Health Nutrition and Population Statistics and World Development Indicators (June 2018). Note: * = Canada and the US. The correct comparison of health expenditures should be based on health-specific PPP factors, not on the overall-economy PPP factor, because the relative price of health care differs from the relative price of overall output across countries. Unfortunately, health-specific PPP factors are available only for advanced countries (and for a few emerging countries), so in this table we use the overall PPP factors. In the rest of this Policy Contribution we use health-specific PPP factors.

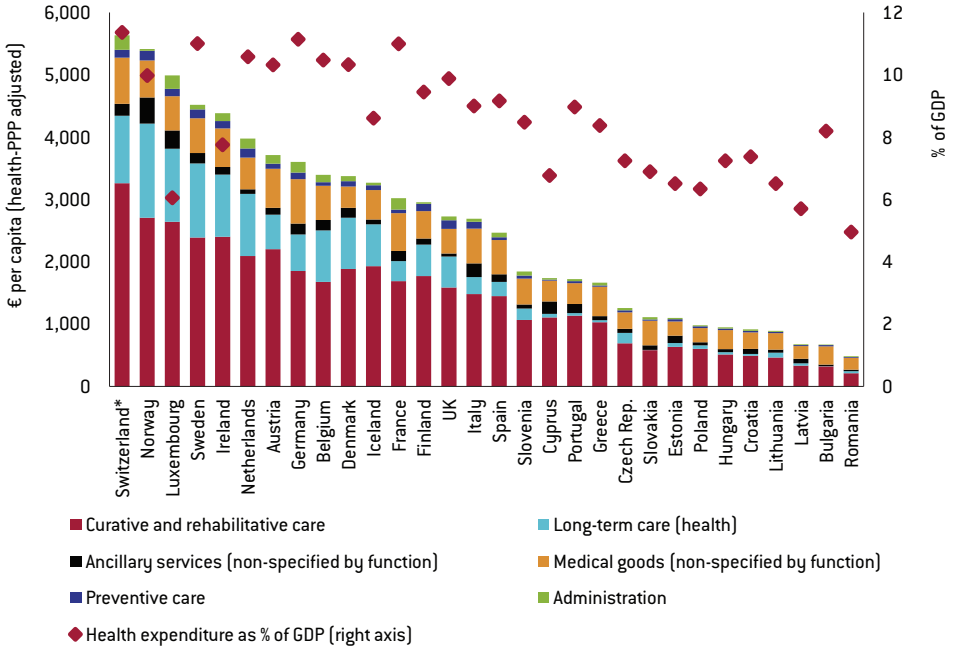
There are also major differences between European countries in terms of health-care spending (Figure 2). Spending ranges from about 500 purchasing power standards *per capita* per year in Romania (a country with one of the lowest GDP *per capita* in the EU) to about 5,000 purchasing power standards in Luxembourg (the country with highest GDP *per capita* in the EU). In terms of GDP, the range is from 5 percent in Romania to 11 percent in Germany and France.

Again, a simple correlation analysis of data from EU countries shows that while richer EU countries tend to spend more on health care, there are also many other important drivers. Moreover, the actual amounts spent on health care might not be optimal and therefore we recommend a fundamental reconsideration of spending levels, along with measures to improve effectiveness and efficiency (section 3).

An extensive literature analyses the drivers of health-care spending. In the face of concerns about the cost impact of ageing societies, several papers have focused on projecting spending levels (Przywara, 2010; De La Maisonneuve and Oliveira Martins, 2013). The average level of income within a particular country is generally accepted as a significant driver of health spending, showing that individuals value personal health. A key unanswered question

in the literature is to what extent an increase in income leads to an increase in health spending. More accurate estimates of this for each country would help better assess the impact of policies over the entire economic cycle. Demographic factors – especially the age structure and related health status – are also crucial determinants of health spending nationally.

Figure 2: Total expenditure on health care by function in European countries in 2015, € per capita (health-PPP adjusted) and % of GDP



Source: Eurostat health care expenditure database. Note: Instead of the overall GDP PPP factor, we converted *per-capita* health spending with the health-specific PPP factors. * 2014 data for Switzerland.

The empirical evidence on the influence of other factors on health-care spending is more difficult to gather, but we can mention that the price of health care relative to other services plays a role, as does the relative price of different health technologies and health-care related assets (Savedoff and WHO, 2003). Moreover, the institutional landscape and policies governing health systems explain spending levels because they determine the incentives of all involved stakeholders, the transaction costs throughout the system, and the relative prices of health technologies. These determinants are particularly difficult to study, although there many qualitative discussions exist (White, 2013).

Savedoff and WHO (2003) discuss the importance of these determinants but ask a different question: what should determine health-care spending? They highlight an additional trade-off: the value of the health system relative to other potential uses of the same resources in society. Looking beyond the health system in this way is rare in the literature, but necessary if one is to consider the full benefits and costs of health systems. Notably, such a perspective enables policymakers to see health systems as a strategic investment with returns for aggregate social welfare. One important element of such returns is the (positive) macroeconomic implications of health systems (section 4). Keeping this broader picture in mind also empowers policymakers to develop a strategic vision of health-care reform. It also enables them to ground decisions in first principles, to more easily convince the numerous stakeholders involved in health systems and to diffuse conflicts.

There are also market failures that require public-sector attention. Patients have a lack of understanding of what treatment is necessary for them and there is an asymmetry of information between patients and providers. Depending on the incentive scheme for the health-care industry and providers, there might be pressure to leverage this asymmetry of information

for private interests. This can lead to overprescribing or overpricing of medical treatments, driving up health expenditures beyond what is necessary.

Adverse selection in insurance markets occurs when competitive insurers must provide standardised insurance contracts to risk-averse individuals, which is the typical situation in health insurance. Most people can make a fairly good projection of their probability of incurring medical expenses, so those who believe their probability is high will be more likely to sign up for voluntary health insurance than those who believe their probability is low. Therefore, the insurer attracts individuals who might incur costs that are higher than the revenues they generate. Competitive pressures or regulation in the insurance market might prevent insurers from raising their prices. Empirically, the take-up of voluntary health insurance ranges from zero (nobody being insured) to broad take-up (Einav and Finkelstein, 2011). Authorities have a decisive role in regulating insurance markets to ensure widespread health insurance coverage, which also affects aggregate health expenditures.

Finally, public health expenditure should take into account private health-care spending and its underlying dynamics. While this is not the focus of this report, private health expenditure accounted for 22 percent of total EU health expenditure in 2015 and remains significant (OECD/EU, 2016; European Commission, 2016). It can be leveraged to develop better-integrated health systems (European Commission, 2017).

These relevant factors could serve as a checklist for policymakers and could be the basis for further research. It is essential that discussions of health systems consider both the opportunity costs and the economic value of investing in health. Such an approach can help policymakers resist the temptation to default to the potentially inefficient status quo[6].

3 Health-care spending efficiency

Many studies have estimated the relative efficiency of health-care systems in Europe. Most find widespread inefficiency (Medeiros and Schwierz, 2015). Concerns about the high cost of health-care systems have led in many countries to efforts to reduce the costs through greater efficiency. Opinions on what causes health-care inefficiencies vary significantly. European Commission (2015) highlights four main causes of the non-optimal use of resources, applicable to most EU countries: inefficient delivery of health-care services, inefficient provision of health care, corruption and inefficient distribution of preventative and curative care.

Bearing in mind the limitations of efficiency indicators (see Annex 1), Table 1 has already shown that there could be differences in efficiency across countries. For example, in North America, health-care spending per capita is more than twice that in Europe, yet life expectancy is lower and child mortality higher in North America than in Europe. There are also substantial differences between EU countries (Figure 3).

Life expectancy at birth is a summary indicator of health outcomes. It is the mean number of years a new-born child can expect to live if subjected throughout his or her life to the current mortality conditions, the probabilities of dying at each age. This indicator is recalculated each year reflecting the mortality rates of the year in question. Therefore, it reflects the effects of past health policies (for example, the effectiveness of prevention policies) and current health policies (effectiveness of curative policies), but is also influenced by various other factors such as life style, environment, natural disasters and prevalence of violence.

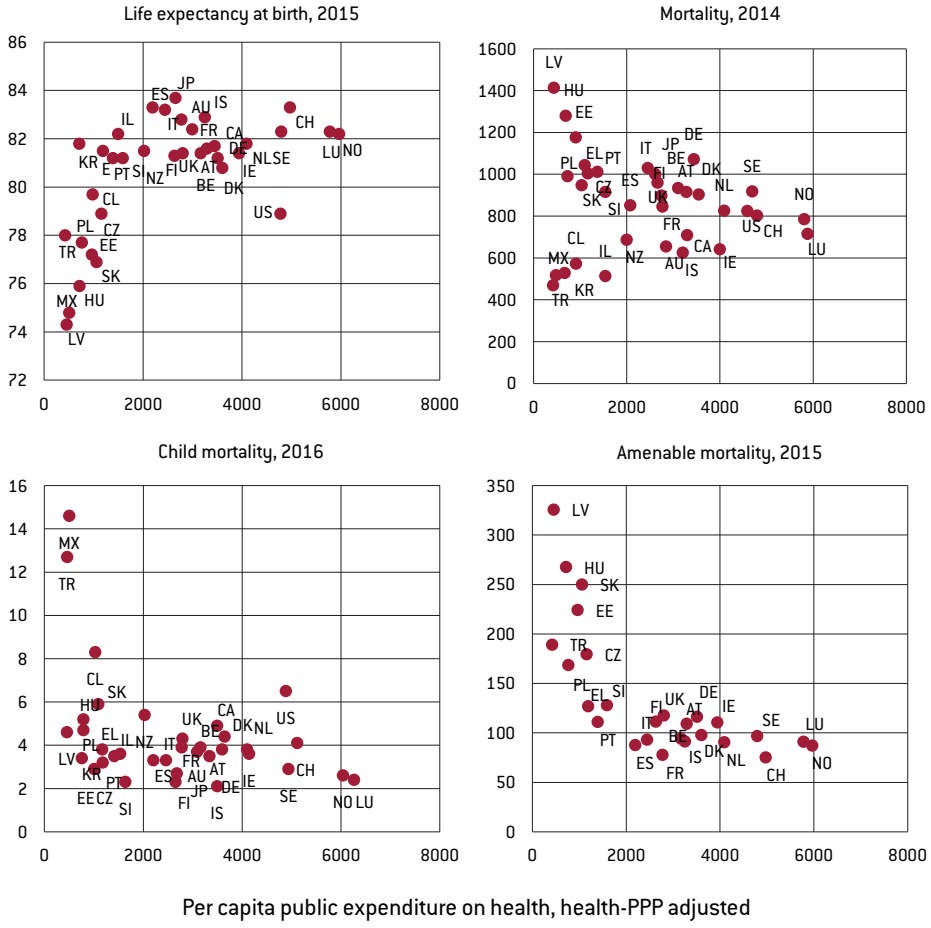
Figure 3 shows that the relationship between spending and health-care outcomes is

6 A particular approach to inform policy decisions and ensure proper allocation of resources is the so-called whole disease approach (WDA), which has been rarely applied in practice (Shah and Proach, 2015; Tappenden et al, 2012). In contrast with the common practice of looking at the viability of particular healthcare investments separately from upstream and downstream components, the WDA considers the entire disease path.

not linear, a result also observed by, for example, Medeiros and Schwierz (2015). With the increase in spending up to a certain level (in most cases up to about 2000-3000 health-ppp adjusted euros *per capita*[7]), health outcomes improve, but an even higher level of spending does not lead to further noticeable improvement in these basic outcome indicators. This finding does not mean that spending beyond 2000-3000 ppp-adjusted euros *per capita* is questionable, since the health-care system has many qualitative and quantitative features which might improve with higher spending.

The other main message is that countries reach different outcomes with the same level of spending – a likely reflection of differences in efficiency. For example, Poland and Hungary spend almost the same amount per capita on health care, yet life expectancy at birth is about two years longer in Poland than in Hungary, and all mortality indicators are significantly lower in Poland than in Hungary. Norway spends almost three-times as much as Italy (in per capita terms), yet the amenable mortality rates of the two countries are practically the same, while life expectancy is higher in Italy. Denmark spends similar amounts to other countries, yet its life expectancy is lower and mortality rates are higher.

Figure 3: Health-care spending and health outcome indicators, latest years



Source: Bruegel based on OECD Health Statistics 2017, OECD Health expenditure and financing datatset, Eurostat Health dataset on causes of death, World Bank Health Nutrition and Population Statistics. Note: Life expectancy at birth: average number of years that a person born in that year can be expected to live, assuming that age-specific mortality levels remain constant. Mortality: number of deaths per 100 000 persons in the population, not adjusted for demographic composition (crude rate), Child mortality: number of children deaths per 1000 children under 5 year old. Amenable death: number of deaths from causes for which most deaths could be avoided through good quality healthcare, given medical knowledge and technology at the time of death. Eurostat defines this indicator as the sum of deaths from 29 causes, including Tuberculosis, bacterial infections, Hepatitis C and Asthma.

7 Because of differences in the price of health care relative to the general price level in different countries, health-specific purchasing power parity factors should be used rather than overall-economy purchasing power parity factors.

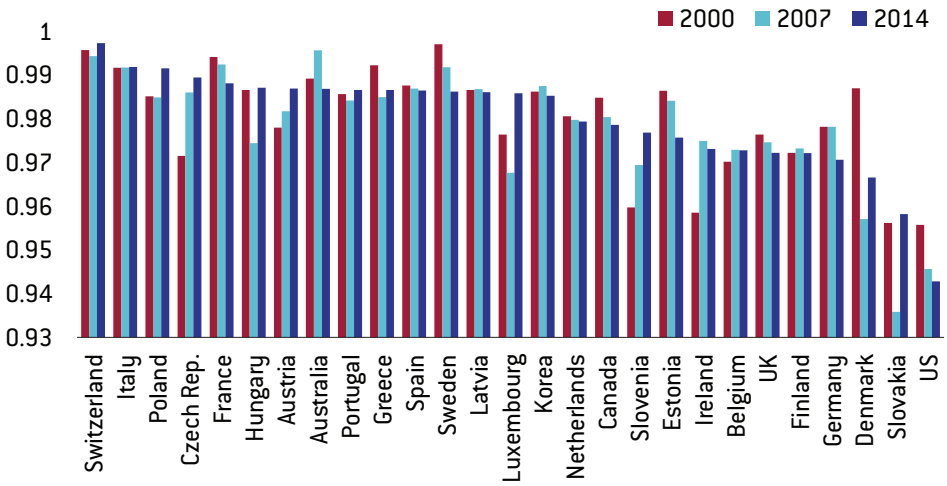
Per-capita spending is not the only determinant of health outcomes. In order to compare efficiency across countries, we use data envelopment analysis (DEA) similarly to Joumard *et al* (2010) from the OECD[8]. DEA is a non-parametric method frequently used in operations research and economics to estimate efficiency frontiers – the most efficient use of multiple inputs leading to multiple outputs (see further details of this method in the Annex).

Our analysis focuses on life expectancy at birth as a broad indicator of past and current health-care policies and other factors, and incorporates information from current mortality rates. Beyond per capita spending, we consider two additional indicators that capture socio-economic and life-style characteristics (see the details in the note to Figure 4).

It should be emphasised that our calculations measure changes in relative efficiency across countries, not absolute efficiency: it is quite likely that the health-care systems of most if not all countries became more efficient between 2000 and 2014, but at different rates. Therefore, our calculations measure the efficiency of countries compared to the estimated technological frontier in each year, that is compared to the estimated maximum possible efficiency given what best-performing countries have achieved.

Our results (Figure 4) suggest that the most efficient EU country in our sample is Italy. Other southern and some central European countries also rank well, while most of the countries in northern and western Europe use their health-care inputs least efficiently, with the notable exceptions of high-ranking France and Austria[9].

Figure 4: Efficiency scores based on data envelopment analysis (DEA) estimates



Source: Bruegel. Note: A higher scores indicates greater efficiency. Countries are ranked by their score in 2014. DEA performed based on three inputs: per capita health-care spending adjusted for health sector-specific PPP, a socio-economic indicator (based on GDP per capita and share of population with at least higher secondary education) and a life-style indicator (based on alcohol and tobacco consumption); data sources: OECD Health Statistics, OECD Purchasing Power Parities benchmark results. Output: life expectancy at birth (Source: OECD Health Statistics). Model specifications: output-orientated, variable returns to scale. DEA is implemented using bootstrap procedure to correct for potential small sample bias which would lead to greater efficiency scores (Joumard *et al*, 2010). The first year for which health-care PPP is available is 2005. For our 2000 calculations, we assumed that the ratio between health-specific and overall PPP in 2000 was the same as in 2005, and thereby multiply the 2000 overall PPP values with the 2005 ratio between the two indicators.

8 In our calculations we were able to replicate Joumard *et al* results for the year 2007 using the same data. However, in our own calculations we use health-PPP adjusted expenditure, instead of overall-economy PPP adjusted expenditure as in Joumard*et al*. Furthermore, the authors reported results for a particular year, while we make calculations for three years, 2000, 2007 and 2014, in order to be able to study the changes in relative efficiency across countries through time.

9 Given the sensitivity of DEA analysis, we made several DEA estimates using different input and output combinations. These robustness checks confirm the general trends.

Interestingly, some countries that were close to the efficiency frontier in 2000, such as Sweden and France, experienced deterioration in relative efficiency compared to other countries. The most striking decline in relative efficiency is observed for Denmark, while Greece and Estonia also suffered from noticeable declines. From our analysis it is not clear if countries diverge from the efficiency frontier because of shifts in the frontier (eg because other countries have implemented more efficient systems) or because of declines in efficiency in the countries affected. EU countries that improved their ranks since 2000 include Poland, the Czech Republic, Austria, Luxembourg, Slovenia and Ireland.

Our analysis tends to confirm simple observations that can be made on the basis of Figure 3 by comparing health-care spending and life expectancy in different countries. Countries with the lowest efficiency scores in 2014 (Ireland, Belgium, United Kingdom, Finland, Germany, Denmark and Slovakia) also, on average, have lower life expectancy compared to countries with similar levels of spending.

Our analysis also underlines the importance of life-style and socio-economic indicators. For example, based on Figure 3, we highlighted the much worse health outcomes in Hungary compared to Poland, while *per-capita* spending is about the same in both countries. Nevertheless, Hungary ranks relatively high in terms of relative efficiently, just slightly below Poland. The high Hungarian ranking is the result of very unfavourable tobacco and alcohol consumption, while the educational level is also worse than in Poland. In the light of such an adverse lifestyle and educational situation, the low Hungarian life expectancy is not that surprising, and consequently Hungary's rank in health-care system efficiency is relatively high.

Outside the EU, Switzerland is the highest-ranked country, with consistently high scores from 2000 to 2014. The least-efficient country in our sample is the United States, where efficiency has deteriorated since 2000. The low US score is consistent with the basic data we presented in Table 1, which showed that per-capita health spending in the US is more than twice that in the EU, yet the US has worse health outcomes. Our calculations show that even after controlling for socio-economic and life-style factors, the US health-care system suffers from major efficiency problems.

While our methodology, like other methodologies used to estimate health-care system efficiency, suffers from various drawbacks, our results are in line with a number of earlier works pointing to the widespread inefficiency of health-care systems. This calls for policy measures, not least because efficiency also matters for the macroeconomic impact of health-care systems.

4 Health care and macroeconomics

Beyond the sheer importance health-related sectors in output, employment and research, health-care systems have macroeconomic implications through various channels. They have fiscal implications for the long-term sustainability of public debt and short-term fiscal multipliers, and labour market implications in terms of the number of sick days, labour supply effects, productivity and human capital. Health-care systems could also dampen or reinforce the consequences of income inequality and thereby affect growth. We deal with each of these issues in turn.

4.1 Health care and long-term fiscal sustainability

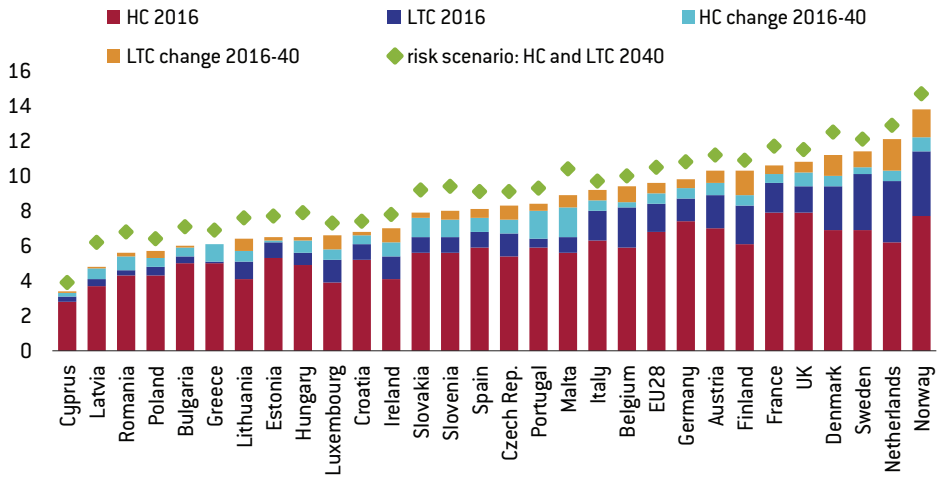
Health-care systems can have an indirect impact on the macroeconomy via fiscal sustainability. For example, an increase in public health-care spending might necessitate higher taxes or cuts to other expenditure.

Demographic change and slowing growth pose significant threats to the long-term sustainability of European public welfare systems. In its *2018 Ageing Report*, the European Commission highlighted that in 2016 the biggest shares of public spending in EU member states directly

affected by ageing go to pensions (11.2 percent of GDP in 2016), health care (6.8 percent of GDP) and long-term care (1.6 percent of GDP), as well as education (4.3 percent of GDP). Long-term projections suggest that between 2016 and 2040 public health-care and long-term care spending will likely increase by 9 percent and 38 percent, respectively, on average in EU countries, reaching 7.4 percent of GDP for health care and 2.2 percent of GDP for long-term care – 9.6 percent of GDP together. EU countries are differently exposed to such increases: the total of health-care and long-term care spending is projected to increase by 2040 by between 0.3 percent and 2.4 percent of GDP, depending on the country (Figure 5). The main reason for this increase is demographic change, though the calculations are uncertain and the actual outcome will depend to a great extent on additional gains in life expectancy and the health conditions of older age groups.

An alternative risk scenario is also calculated in the Commission's *2018 Ageing Report*. This scenario assumes the partial continuation of two recently observed trends in health-care expenditure. First, it assumes higher income and technological progress, and second, it assumes an upward convergence of coverage and costs to the EU average. In this scenario, the increase in health-care and long-term care spending could be even more significant, together reaching 10.5 percent of GDP on average in the EU's current countries by 2040.

Figure 5: Current and projected change in public expenditure 2016-40, % of GDP



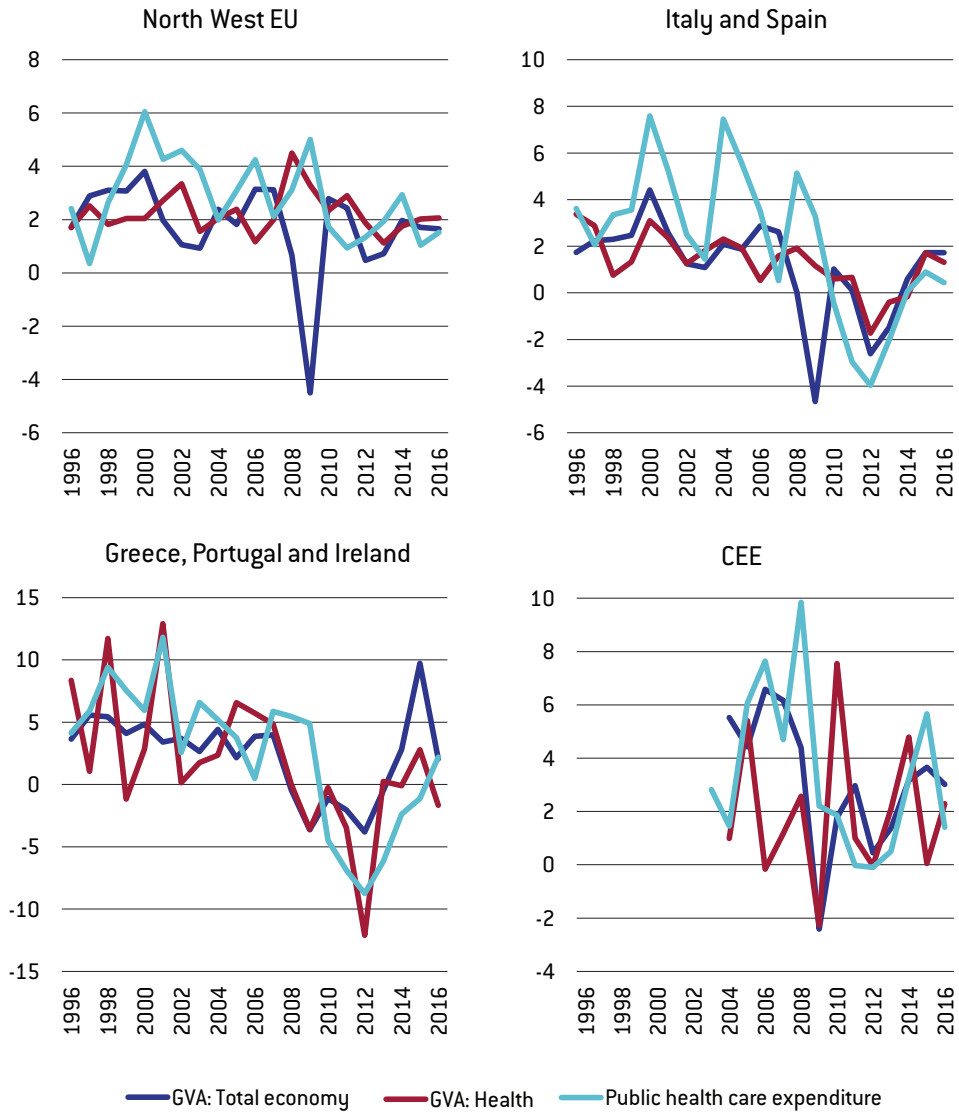
Source: European Commission, *2018 Ageing Report*. Note: HC and LTC refer to health care and long-term care respectively; projections relate to baseline scenario; risk scenario assumes an uptick in health care costs caused by non-demographic drivers reflecting recent trends; EU values based on weighted average.

Irrespective of the uncertainty around long-term predictions, growing health and long-term care spending mean governments should consider introducing new or increasing existing taxes, directing existing sources towards health and long-term care and/or reducing public contributions to the health system.

4.2 Health care and short-term fiscal multipliers

Changes in public health-care spending have an impact on the economy, which in turn has a feedback effect on public finances. From 1996 to 2008, total and health-care system output (measured as gross value added) in EU countries grew at similar rates on average, though in some years there were major differences (Figure 6). Public spending on health care generally increased faster than output.

Figure 6: Growth rate of total and health-care sector gross value added, and public health care expenditures (constant prices)



Source: Bruegel based on Eurostat 'National accounts aggregates by industry (up to NACE A*64) [nama_10_a64]' and 'General government expenditure by function (COFOG) [gov_10a_exp]' datasets. Note: real growth rates (2010 prices) in value added and changes in real public health care expenditure (nominal expenditure corrected by GDP deflator). North-West EU: the first 15 EU members excluding Greece, Ireland, Italy, Portugal and Spain. CEE: the 13 countries that joined the EU in 2004-2013.

During the global and European financial economic crisis, public health-care spending grew at more or less the same rate as before the crisis in western/northern European countries, but there were major cuts in Italy, Spain, Greece, Ireland and Portugal. These cuts have likely played a preeminent role in the significant decline in health-system output in those countries.

Beyond the direct impact on health-care sector output, public sector health-care spending cuts have effects on the rest of the economy. Under normal economic circumstances, a 1 percent spending cut would reduce economic activity by less than 1 percent, or in other words, the fiscal multiplier is between 0 and 1. The International Monetary Fund assumed that the pre-2008 fiscal multiplier was around 0.5 to 0.7 (Blanchard and Leigh, 2013; Stuckler *et al*, 2017). However, Blanchard and Leigh (2013) and Reeves *et al* (2013) concluded that fiscal multipliers were much higher during the crisis, especially when the European Central Bank was constrained by the zero lower bound. Furthermore, Reeves *et al* (2013) show

evidence that multipliers vary significantly according to the budget sector and concluded that health-care spending has the second biggest effect after education. The reason for the relatively high fiscal multiplier for the health-care sector is that health-care expenditures directly affect wages in the sector and indirectly affect wages in other sectors, such as construction and other sectors linked to the supply chain of health-care equipment and products. Some of these wage earners are low-paid workers with a high propensity to consume and their income contraction can have a significant negative impact on consumption and thereby on GDP and employment. In turn, a decline in GDP and employment resulting from health-care spending cuts has a feedback effect on public finances through lower tax revenues and higher unemployment-benefit costs.

Health-care spending's high fiscal multipliers allow us to conclude that preserving the growth rate of public-sector health-care expenditure in North-West EU countries had a stabilising impact on the economies of those countries, but the big health-care spending cuts in Greece, Ireland, Italy, Portugal and Spain amplified the economic downturn and could have even increased their budget deficits. Moreover, deeper recession might lead to hysteresis effects, such as increased long-term unemployment and reduced productivity.

4.3 Health care and the labour market

Health-care systems, by influencing health-care outcomes, can have direct macroeconomic impacts though the labour market[10]. Suhrcke *et al* (2005) presented an overview of studies that analysed the benefits of health-care improvements on the economy for developed countries, which generally have established social safety nets[11]. The main channels identified in the literature are labour market participation, productivity and human capital.

Participation

A decision to supply labour depends on an individual's health status. Ill health might prevent individuals from entering the labour force, lead to premature exit from the labour market or, in the worst case, to death. Labour-force exclusion implies personal hardship and foregone output, and means that public resources are required to support excluded individuals. The share of EU citizens aged 20-64 who were inactive because sickness or disability increased from 3.5 percent in 2000 to 4.5 percent in 2017[12]. This trend is alarming and indicates that the EU labour force is losing an increasingly large number of people for health reasons.

We do not find a statistically significant relationship between health-care expenditure and inactivity because of sickness or disability (Figure 7). A possible explanation for this finding is that the direction of causality could go two ways: higher health-care spending should reduce such inactivity (thus the relationship should be negative), but higher inactivity because of illness and disability would require higher health-care spending (ie a positve relationship). Furthermore, incentives might also play a role: while higher expenditure might actually improve the health conditions of citizens, a more-developed welfare state reduces the incentives to work.

Sickness-induced inactivity and health-care spending are also related to raised retirement ages. In the context of increased life expectancy, governments raise the age of retirement to reduce the dependency ratio. However, older people are more likely to be affected by chronic diseases, leading to a greater likelihood of premature exit from labour markets and hence higher inactivity rates. According to an OECD/EU (2016) study, which examined 14 European countries, the average early retirement rate for workers aged 50-59 who have two or more chronic diseases is around 10 percent, while only 4 percent of workers in the same age group without a chronic disease retire early. Furthermore, OECD (2016) presents evidence that indi-

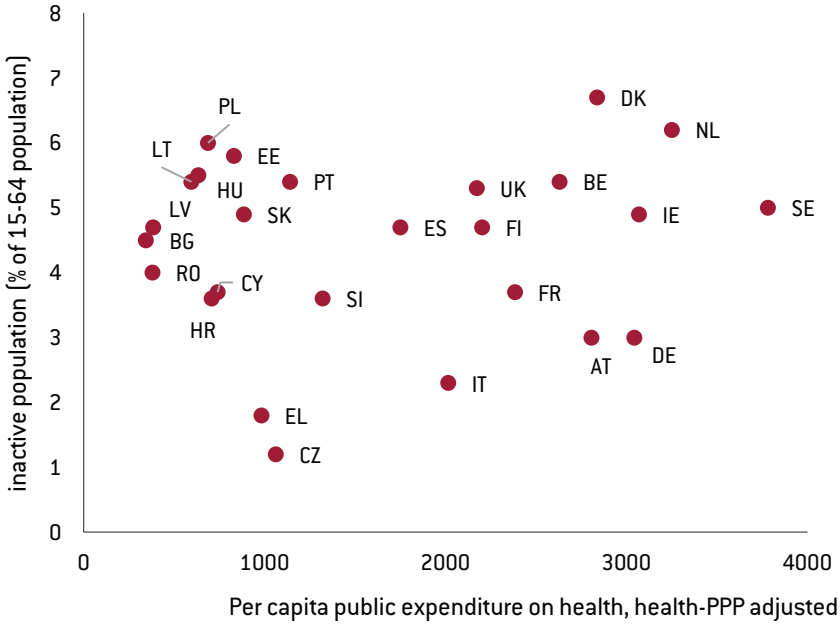
10 For detailed analysis, see for example OECD and European Commission (2016), Chapter 1.

11 In developing economies with typically more limited social safety nets, the social and macroeconomic repercussions of ill health can be more severe than in advanced countries.

12 Source: Eurostat 'Inactive population not seeking employment by sex, age and main reason [lfsa_igar]' dataset.

viduals who have chronic diseases are more likely to be unemployed compared to individuals with no disease.

Figure 7: Relationship between public health spending per capita and inactivity because of illness and disability, 2015



Source: Bruegel based on Eurostat 'Health care expenditure by financing scheme [hlth_sha11_hf]', 'Inactive population not seeking employment by sex, age and main reason [lfsa_igar]' and OECD 2014 Purchasing Power Parities benchmark results. Note: spending adjusted for health-sector PPP.

Labour productivity

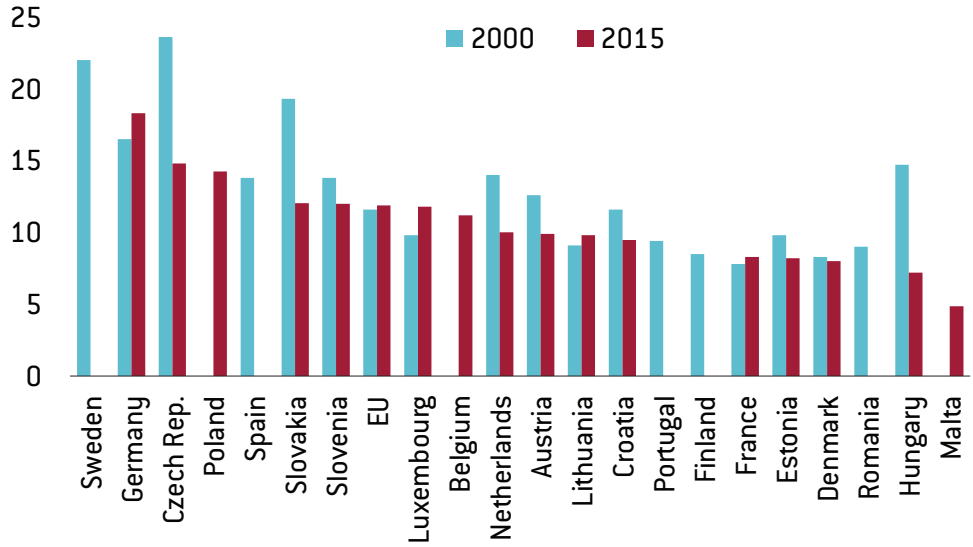
In economic literature, labour productivity is usually defined as output per hours worked. Health conditions play a significant role in determining output and hours worked. Poor health can also reduce productivity (ie the ratio of the two factors) during working time, because it reduces the ability to focus and frequent absence from work might necessitate re-training.

The number of sick days gives a good indication of foregone output because of employee ill-health. All EU countries provide sick leave to employees, while sick pay[13] schemes vary significantly in different EU countries (Spasova *et al*, 2016). Thus, usually employers pay a direct cost through wages, but also face indirect costs such as lower or delayed output. Figure 8, based on administrative data, shows significant differences between EU countries in terms of the number of sick days. In 2015, among the countries for which data is available, German workers took most sick days, averaging 18, while Maltese workers took the fewest at five. Since 2000, different countries have gone in different directions: in the Czech Republic, Slovakia and Hungary, the number of sick days per worker has fallen significantly from relatively high levels, while in Germany there was a notable increase and in France a small increase. In the EU as a whole, from 2000 and 2015, the number of sick days per year per worker increased marginally from 11.6 to 11.9.

The number of sick days taken also depends on the health status of workers. OECD/EU (2016) highlight that the annual median number of sick days in 14 selected European countries is about seven for individuals without a chronic disease, and 20 for individuals with two or more chronic diseases. Furthermore, Knebelmann and Prinz (2016) estimated that depression symptoms in an individual account for an additional 7.2 days of annual sickness leave.

13 Sick pay is the continued, time-limited, payment of (part of) the worker's salary by the employer during a period of sickness.

Figure 8: Absenteeism from work due to illness, days per employee per year, 2000 and 2015



Source: WHO *Health for All Database*. Note: Average number of working days lost per employee per year due to sickness or injury; maternity leave not included; data from existing sick-leave registration systems; if data for 2000 or 2015 is not available, closest available year is given.

Depression reduces the total hours worked and also significantly affects workplace performance (Sobocki *et al*, 2006). Productivity during working time is also lower for workers who smoke or are heavy drinkers (OECD/EU, 2016). Additionally, productivity could be influenced by the extension of retirement ages. However, economic research does not support the common belief that an ageing labour force reduces average productivity. Productivity might decrease for tasks that require learning and speed, but might be greater with age when experience and verbal abilities matter (Skirbekk, 2004). Thereby, the health-care system can make a positive contribution to productivity by keeping older workers able to work, but if older workers are more frequently subject to chronic diseases, their productivity could decline.

Human capital

Human capital plays a crucial role in economic growth and is high on the policy agenda as continuous learning is perceived as an effective measure to respond to rapid technological advances. Several studies show that a child's health determines to a great extent the ability to learn and retain knowledge (eg Victoria *et al*, 2008; Kramer *et al*, 1995). Therefore, early intervention to support health fosters individual benefits and leads to a healthier society in the future (WHO, 2005).

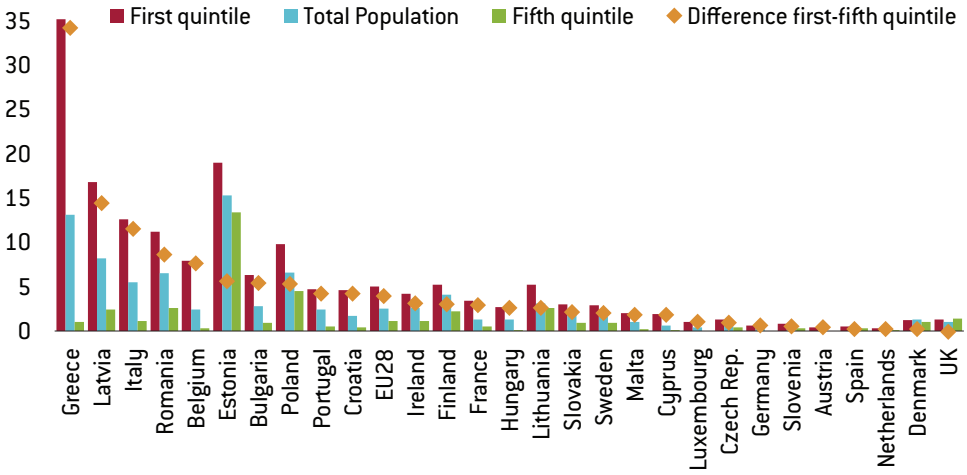
Ill health prevents individuals from working or leads to early retirement, makes them less productive and more likely to be unemployed. Better health outcomes thus clearly have positive macroeconomic implications. At the same time, there is an increasing 'cost' from improved health, which arises from increasing the share of inactive elderly people relative to the labour force.

4.4 Health care and inequality

A main objective of health-care systems is to provide equal access to health-care services (section 2). If we assume that poor people are sick more often (because of lower education, worse diet, etc) and everyone receives the same quality and quantity of services, health care would reduce inequality. Unfortunately, this is not necessarily the case in every country. In the EU as a whole, 5 percent of individuals in the first (poorest) income quintile reported that they did not receive medical care when they felt they needed it, compared to only 1.1 percent

for the fifth (richest) income quintile (Figure 9). The largest gap between the poor and the rich is seen in Greece, followed by Latvia and Italy. Furthermore, Morris *et al* (2011) show for the UK that individuals with lower incomes have biased access to primary care and more restricted access to secondary/in-patient care, relative to people at the top of the income distribution.

Figure 9: Self-reported unmet needs for medical examination or treatment, % of population, 2016



Source: Eurostat 'Self-reported unmet needs for medical examination by sex, age, main reason declared and income quintile [hlth_silc_08]'. Note: numbers include individuals who reported main reason of unmet needs for medical examination or treatment as either too expensive, too far to travel or waiting list. While the full name of the dataset does not include treatment, the Eurostat glossary explicitly says *"examination or treatment"*. We contacted Eurostat to inquire about this inconsistency and received confirmation that the glossary is correct, the dataset includes cases with either unmet examination or unmet treatment needs.

Inequality in health outcomes can reinforce the consequences of income inequality. Poor health outcomes reduce labour market activity in terms of hours worked and income earned. Furthermore, there is evidence that parents' health conditions have consequences for the cognitive and physical development of their children, amplifying the consequences of ill health[14].

Therefore, beyond the question of social fairness, income inequality amplified by health inequality could also negatively impact the level and volatility of output growth, even though the literature on the links between income inequality and economic growth finds mixed results (Darvas and Wolff, 2016).

All these findings call for measures to ensure equal access to, and quality of, health-care services, with a particular emphasis on poorer segments of society who cannot afford private health care.

5 Summary and policy implications

If the broader impact of health-care systems on macroeconomic outcomes is neglected – including the direct and indirect impacts on public revenues and expenditures – the outcome might be a suboptimal allocation of scarce public resources.

14 Moreover, Oglobin (2011) finds an association between the inefficiency of health-care systems and income inequality.

European countries spend rather different amounts on health care (relative to their GDP and populations). Key aspects of health-care spending decisions should include population preferences, income, epidemiological and age structures and various aspects related to health systems, such as the relative price of health-enhancing activities and technologies, and the price of health relative to other aspects of life. The severity of market failures related to asymmetric information and adverse selection in insurance markets, the effectiveness of health policies, population preferences in terms of the private/public spending mix and the level of taxation are also important aspects. In addition, we emphasise the crucial role of the macroeconomic implications of health-care systems in the determination of health-care spending decisions.

Health outcomes do not always improve in line with more spending, suggesting effectiveness and efficiency problems. We show that there seem to be threshold effects, with spending up to a certain amount tending to improve health outcomes measured by, for example, life expectancy and mortality, but no improvement in such indicators with additional spending. Following earlier work by the OECD and European Commission, we conducted a data envelopment analysis, along with various robustness checks, to assess the relative efficiency of European countries in comparison with some other advanced countries. We found that a number of EU countries, which were close to the efficiency frontier in 2000, suffered from deteriorations in their relative positions, though there were a few countries, such as Italy, and France, which remained relatively close to the frontier up to 2014. Our finding that the US health-care system is the least efficient among the countries we study offers little solace. While this methodology, like other methodologies used to estimate health-care system efficiency, suffers from various drawbacks, our results are in line with a number of earlier works that point to the general inefficiency of health-care systems. This calls for policy measures, not least because efficiency also matters for the macroeconomic impact of health-care systems. In line with European Commission (2018), we call for more performance evaluations to assess health outcomes and returns to investment. Benchmarking, cross-country comparisons, reference networks, knowledge exchange and technical assistance provided by the EU would help. As Wilson (2016) argues, greater accessibility and transparency of relevant data would enable learning about the impact of health-care interventions. Systematic evaluations should lead to efficiency-enhancing changes in health-care systems.

Health-care systems matter for the macroeconomy because of their weight in output, employment and research. They have direct fiscal implications for the long-term sustainability of public finances, while health-care spending decisions influence short-term economic development through the fiscal multiplier effect. The literature finds a relatively high multiplier of health care spending. Where in some western and northern EU countries the rate of growth of their public health-care expenditure was maintained, it helped to dampen the impact of the recent global and European crises. But most southern EU countries cut health-care spending more aggressively than other public spending categories, which is likely to have amplified the depths of their recessions and might have caused hysteresis effects via long-term unemployment and reduced productivity. A clear conclusion is that in the event of an economic crisis necessitating fiscal adjustment, fiscal consolidation strategies should aim to preserve spending items that have large fiscal multipliers, including health-care expenditures.

The macro impact of health care is much broader than the purely fiscal aspect related to public spending sustainability and the immediate impact of changes in health-care spending on the macroeconomy. Health-care systems influence labour-force participation, productivity and human-capital formation through various channels, and thereby influence overall macroeconomic outcomes. The worrisome European trend of increased inactivity resulting from sickness and disability should be reversed, while the health conditions of workers should be improved in order to reduce sick leave. More focus is needed on prevention to address health proactively, not just to treat diseases reactively (Wilson, 2016). Improving health literacy, such

as training on healthy lifestyles and risk factors, is essential (European Commission, 2016). OECD (2017) notes that while smoking rates decline, there has been little success in tackling obesity and alcohol consumption, while efforts to improve air pollution are insufficient.

Furthermore, health-care systems play an important role in inequality: a well-functioning system can help reduce some consequences of income inequality, but a less-equitable health system can amplify inequality. The latter is of particular concern, since poor and less-educated people are less healthy and live shorter lives than rich and better-educated people. We find that health inequality is particularly high in about one third of EU countries (Figure 9), which calls for policy intervention. The joint report from the OECD and European Commission (2016) rightly calls for universal access to care and more effective prevention to reduce health inequalities.

It is essential that discussions of health systems consider both the opportunity costs and the economic value of investing in health. Such an approach can help policymakers resist the temptation to default to the potentially inefficient status quo.

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Annex: Health care efficiency: concepts and measurements

The resources allocated to health care should be spent efficiently, that is, without wasting money. There is no consensus method in the literature for estimating health-care system efficiency. In this annex, we review the main concepts and methods for efficiency.

Efficiency concepts

Two main concepts of efficiency are used in the literature: technical efficiency and allocative efficiency.

- Technical efficiency is usually defined as the maximisation of outputs given an existing level of inputs. A substantial group of technical efficiency indicators deals with the costs of producing a certain amount of output, which serves as a basis for systems of diagnosis related groups (DRGs). Fetter (1991) pioneered research on DRGs. A key issue is the choice of the inputs and outputs for the production of the efficiency measure. If one takes into account the effect of a limited number of inputs on selected outputs, the measures are partial and do not show the full picture of the health system in a specific country or region. Such information imperfections make the analysis of the outcomes very complicated and highlight the need to design uniform indicators for analysing and comparing the efficiency of health-care systems in different countries. The Joint Report of the European Commission (Directorate-General for Economic and Financial Affairs) and the Economic Policy Committee (Ageing Working Group) on Health Care and Long-Term Care Systems and Fiscal Sustainability, presented by the European Commission and Economic Policy Committee (2016), uses some technical efficiency indicators.
- Allocative efficiency is commonly used to describe the optimum sharing of scarce resources between multiple needs of society. For health care, limited inputs should be allocated to the desired distribution of health-care outputs. Overall, the allocative efficiency indicator examines whether there is the right mix on the output and input sides. It is an instrument used by health technology assessment (HTA) agencies, which make use of quality-adjusted life years (QALY) for the estimation of benefits (European Observatory, 2016).

Efficiency measurement

There has been an intense debate over the proper measurement of efficiency. One faces a myriad of obstacles including data collection, comparability of the data from different countries and choice of the appropriate statistical analysis to can be applied to the study of efficiency. Methodological problems prevent proper assessment of health-care systems and the use of a single method for the estimation of efficiency is widely regarded to be misleading. As European Observatory on Health System and Policies (2016) points out, "*some of the reasons for the paucity of efficiency data include data differences and inconsistencies, lack of consensus on appropriate methods and the scope of research, and difficulties directly attributing health outcomes to health care inputs*". The authors call for more work to connect health outputs to inputs, including factors outside the health-care system such as geography, genetics or cultural lifestyle. However, this is not an easy task because "*the effect of the health system as an input to health is interrelated to and dependent on many country- or context specific characteristics* [and] *it is difficult to accurately isolate the contribution of the health system itself in different country contexts*".

Table 2 gives a classification of measurements used for efficiency estimates, comparing advantages and disadvantages of the proposed approaches.

Table 2: Summary of health efficiency indicators

Type	Source/example	Example indicators	Pros	Cons
Cross-country databases	• OECD Health Statistics database • WHO Europe health for all database	• Health expenditure per capita (or as a share of gross domestic product), which is often related to some broad health status measures (for example, life expectancy) • Average LOS • Bed occupancy rates	• Regularly updated time series • Databases contain some ready-made efficiency indicators or can be used to construct efficiency indicators at the system-, subsector- or disease-based level (as described below)	• Links between expenditure, inputs, outputs and outcomes are often weak (or inexistent) • Aggregate (macro) data at the national level (no disaggregation at the provider or patient level) • Limited number of outcome measures
System-level	• OECD efficiency study (Joumard, André & Nicq, 2010) • WHO efficiency study of 191 countries (Evans et al., 2001)	• Efficiency scores, often using analytical methods such as DEA, SFA or other regression-based methods	• Enables comparison of entire systems • Can control to some extent for confounders • Often assesses the entire production process from expenditure to health outcomes (that is, life expectancy)	• Usually cross-sectional • Adjustments for confounders are likely to be imprecise due to aggregation; outputs are not necessarily directly or exclusively attributable to inputs • Results sensitive to model specification and countries chosen for comparison • Often rely on cross-country databases which may inhibit external validity
Subsector-level	• Finnish and Norwegian hospitals (Linna, Häkkinen & Magnussen, 2006) • Swiss and German hospitals (Steinmann et al., 2004)	• Efficiency scores using analytical methods such as DEA, SFA or other regression-based methods	• Can better account for confounders than system-level studies because of patient similarities	• Most research is for hospitals only • Usually cross-sectional • Results sensitive to model specification and countries/facilities chosen for comparison • Often assess health care outputs (for example, discharges) instead of health outcomes
Disease-based	• OECD Cancer Care study • EuroDRG • EuroHOPE	• Waiting time between diagnosis and initial treatment • Comparisons of costs and outcomes for predefined episodes of care	• Often use patient-level data, which is best at controlling for confounders • Can better identify processes related to health care • Can often follow patients from beginning to end of episode of care	• Limited because of data availability in many countries • Few diseases studied

Source: The European Observatory on Health Systems and Policies (2016). Note: DEA=data envelopment analysis; DRG = diagnosis-related groups; LOS = length of stay; SFA = stochastic front analysis.

As well as the construction of the efficiency indicator being extremely challenging, there is also a risk of producing erroneous health policy recommendations if efficiency indicators have shortcomings (Eurohealth, 2012). Proper decision making should be based on data, collected following the same procedures in all EU countries, in order to have the opportunity to make proper distinctions. Thus, the European Commission's and OECD's attempt to produce uniform data across countries is highly welcome (see for example the *2017 State of Health* report). Furthermore, big data might also play an important role in the analysis of health-care systems, and digital technology could facilitate standardised data collection.

Notwithstanding the debate about the proper efficiency measures, academic researchers as well as the OECD and the European Commission report some efficiency estimates. The efficiency estimate is closely related to value for money and cost effectiveness indicators. The European Commission *State of Health* report (2017), for example, suggested looking at indi-

cators of effectiveness, access and resilience when evaluating health-system performance and making cross-country comparisons.

The two most popular methods of health-care system efficiency estimation are data envelopment analysis (DEA) and stochastic frontier analysis (SFA).

DEA is a non-parametric method, commonly used in operations research and economics to estimate efficiency frontiers to study the relationship between inputs and outputs. A system can be seen as efficient if the maximum possible output is derived from the given set of inputs. This is closely aligned with the technical definition of efficiency, which is the number of outputs over the number of inputs. For example, the OECD's Joumard *et al* (2010) estimate on the basis of DEA that if countries manage to allocate resources within the health-care system more efficiently, overall life expectancy is expected to rise by approximately two years for OECD countries. Another example is European Commission's Medeiros and Schwierz (2015), who present the results of 21 models. The number of DEA models used reflects the need for an objective and uniform estimator of efficiency across the EU. Results indicate that there is potential to improve efficiency in many EU countries.

The other main methodology for measuring health-care efficiency measures is SFA, which is a fully parametrised model. The model encompasses a stochastic component that describes random shocks affecting the production process. Similarly to DEA, SFA makes use of a technical definition of efficiency and is extensively used for efficiency estimations. For instance, Gerdhama *et al* (1999) address several methodological issues of this production frontier model and provide an empirical assessment of the efficiency of a new reimbursement scheme in 26 Swedish country council areas. They find that the new scheme might potentially lead to a 10 percent cost reduction. Rosko *et al* (2008) assesses twenty SFA studies of hospital inefficiencies in the US. The major concern of the US health-care system is about costs increasing non-commensurately to increases in quality of services. The authors highlight that the SFA appears to be sensitive to the choice of cost function. Another example of use of SFA is Oglobin (2011), which addressed an important issue of efficiency of national health-care systems. Results indicated that there is an inverse relationship between the inefficiency of health-care systems and *per-capita* income, and a direct relationship between the former and income inequality.

Hollingsworth (2008) presented an analysis of 317 papers that evaluated health-care systems. He argued that the number of papers analysing efficiency on the basis of SFA had increased rapidly, though DEA is still used in the majority of studies, producing more than 90 percent of the total number of applications for the health-care sector (European Observatory, 2016). Some researchers consider the SFA method as more accurate because it accounts for statistical noise, though Varabyova and Schreyögg (2013) suggest use of both methods and a subsequent analysis of the direction of outcomes. It seems important to mention that SFA as well as DEA has certain limitations, see for example the European Observatory study on *Health Systems and Policies* (2016).