The Hungarian Healthcare System's U-Turn:
Recentralization and Soft Budget Constraint in the Hospital Sector

By

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Abstract

Although the healthcare system of Hungary could be improved in various ways, this thesis focuses on the most prevalent problems and uses a top-down approach to suggest reforms. The system went through a transition process which resulted in the emergence of market elements in the 1990s and early 2000s. However, as Kornai (2015) described Hungary's transition in general, a dramatic U-turn came about afterwards. The thesis reveals this U-turn in relation to the governance and financing of the healthcare system showing how centralization has become significant in recent years. Both theoretical (e.g. soft budget constraint) and practical (e.g. bed occupancy rate, share of private expenditures) elements are examined. Soft budget constraint's presence is supported by the reaccumulating hospital sector debt and the political importance of it following a similar cyclical path. This is shown with text analysis using minutes of the Parliament, a so-far unexplored method in this area. Besides, results of data envelopment analysis demonstrate that the rise of this debt is not associated with any improvement in the technical efficiency of hospitals. Further analyses present the recentralizing tendency of the current decade with the decreasing role of voluntary payments and increasing significance of central budget contributions in the Hungarian healthcare system. Policy recommendations include the restoration of local governments' ownership of hospitals, making hospital managers responsible for the cost-effectiveness of their institutions and the reduction of hospital beds.

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List of Abbreviations

ALOS - Average Length of Stay

BC-organization - Budget Constraint Organization

CEE - Central and Eastern European

CMI - Case-Mix Index

CRS - Constant Return to Scale

DEA - Data Envelopment Analysis

DMU - Decision-Making Unit

DRG - Diagnosis-Related Group

HIF - Health Insurance Fund

NHIF - National Health Insurance Fund

OECD - Organisation for Economic Co-operation and Development

SBC - Soft Budget Constraint

S-organization - Supporting Organization

VRS - Variable Return to Scale

VHF - Voluntary Health Fund

WHO - World Health Organization

1. Introduction

1.1. Background, Relevance of the Topic

One of the most debated topics in public sector economics is the level of government intervention into a certain sector. Giving more power to the government and centralizing not only the provisioning but the governing, financing or organizing roles can lead to adverse consequences in terms of efficiency. Healthcare system is peculiar in many aspects including its reaction to this issue. Centralization is undoubtedly needed to a certain extent to provide a minimum level of healthcare to the public and achieve a minimum level of public health, however, excessively concentrated power leads to various drawbacks including the soft budget constraint and management failures. Such drawbacks are inherent to an over-centralized system because of the limited capacity and lack of specialization of the government sector.

Following the regime change in 1990 in Hungary, the healthcare system went through a transition process which resulted in the emergence of market elements. However—as Kornai (2015) described Hungary's transition in general—a dramatic U-turn came about in the late 2000s and the country started to head back towards the communist system in many aspects, such as centralization. A similar phenomenon can be revealed in the healthcare sector, as well. Throughout the thesis, I will focus on inpatient care, financing, organization and governance, because the turning back is more visible in these sectors, than for example in primary care or the pharmaceutical industry. This essay reveals this U-turn in relation to the governance and financing of the healthcare system showing how centralization have become significant in recent years. As the findings themselves imply, policy recommendations are given to correct the reversal of transition and thus—possibly—improve the efficiency of Hungarian healthcare.

A frequently used indicator of healthcare system quality, the amenable mortality rate offers the basis for a cross-country comparison. It shows the number of deaths that could have been avoided by a well-functioning healthcare system. In contrast, preventable mortality rate also includes deaths that could have been avoided by other factors affecting health. For instance, deaths caused by unhealthy lifestyle such as smoking, physical inactivity or obesity can be considered preventable. On the other hand, amenable mortality only includes those causes that could have been avoided with proper medical intervention. Leading causes include ischaemic heart diseases, cerebrovascular diseases or breast cancer, for example (Eurostat, 2018).

Table 1 clearly demonstrates that Hungary lacks behind a selection of Central European countries. Moreover, Hungary's amenable mortality rate is more than twice as much as the European average. As the table also shows, the reduction in the rate between 2011 and 2015 was 7.1% for Hungary which is not the smallest among the sample countries, however, is below the EU average[1].

Table 1: Amenable Mortality Rates per 100.000 people in Central European Countries and EU Average between 2011 and 2015

	2011	2012	2013	2014	2015	% Change
Hungary	288.24	281.49	269.92	266.05	267.67	-7.10%
Slovakia	262.16	260.56	261.54	242.83	249.96	-4.70%
Croatia	226.18	216.26	206.28	207.28	216.4	-4.30%
Czech Republic	196.27	193.43	193.53	176.68	179.48	-8.60%
Poland	197.35	192.4	183.95	169.88	168.53	-14.60%
Slovenia	137.29	133.53	129.73	122.68	128.06	-6.70%
European Union	137.86	135.31	131.06	126.23	127.1	-7.80%
Austria	114.18	111.73	111.71	109.02	109.16	-4.40%

Source: Eurostat (2018)

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[1] This means the reduction in the EU average, and the average of the reductions among EU countries. Furthermore, a larger reduction is relatively easier to achieve from a larger initial amenable mortality rate. This implies that Slovenia's smaller reduction (6.7%) could very well be considered a larger success, than Hungary's 7.1%, for instance

Moreover, the Hungarian healthcare system has been getting increasing attention recently especially due to the recurring and growing debt of healthcare institutions. For instance, the head of the National Health Insurance Fund (NHIF) emphasized the topic's significance at the XIV. IME Regional Healthcare Conference in February, 2019 (Weborvos, 2019). The Hungarian Health Economics Association also organized a conference in January 2019, which was solely targeted at the issue of reaccumulating hospital debts. Many members of the professional community have widely discussed the worsening state of the healthcare system in other media, as well—such as studies, interviews or newspaper articles. Furthermore, the government also seems to focus its attention towards the healthcare system: in the beginning of 2019, three different reform plans emerged—one from the Minister of Human Capacities, one from the Central Bank, and one from the Ministry of Finance (Szepesi, 2019). However, there are still areas that were not discussed in detail and this thesis intends to supplement the current researches and provide basis for future studies.

1.2. Structure

The main part of the thesis is divided into 4 separate chapters and is organized as follows. Following the introduction, Chapter 2 presents recentralization, including the transfer of hospital ownership to the central government and the change in political institutions and governance. Moreover, increasing reliance on the central government and central budget is shown through examining the expenditures and revenues of the National Health Insurance Fund since 2002. Chapter 3 shows the changes in voluntary compared to government / compulsory expenditures since 2000 in Hungary, as well as in other central European countries. Furthermore, the change in the assets of Voluntary Health Funds is demonstrated in this chapter. Chapter 4 elaborates on

the soft budget constraint and argues that it is getting more significant in the healthcare system implied by the increasing and recurring debt of hospitals. This part includes a text-analysis of parliament sessions from the last 4 years, looking at the political importance of the hospital system's growing debt. It also analyzes the efficiency of inpatient care with Data Envelopment Analysis (DEA) comparing the system in different years. Chapter 5 gives policy recommendations and presents bed occupancy rates and the number of hospital beds. Chapter 6 concludes.

Policy recommendations given at the end of the thesis, in Chapter 5 are built on the analysis presented, but largely represent the reforms proposed in the second half of the 2000's in nature. Main policies include the separation of ownership and management of hospitals to promote hardening the budget constraint. This is backed up by the fact that the hospital sector's debt has been rising at a growing rate, while the government continues to directly intervene into hospital management instead of providing sufficient provision only. Moreover, it is important to change the budgeting system. Earmarking healthcare expenditures and financing the system from the separate social security contributions—as has been the practice earlier should be considered. The thesis further suggests that increasing the share of voluntary expenditures should be set as a primary policy goal to reduce the centralization of the system. To analyze the efficiency of inpatient care, Data Envelopment Analysis is used including expenditure on hospitals as input, and case-mix index and diagnosis-related group (DRG) cost weight as output variables. Besides, bed occupancy rate is also used to proxy efficiency of the system. Building on the currently low rate it would be reasonable to introduce and speed up hospital bed reduction programs.

1.3. Data Section

For the numerical analyses throughout this thesis I used the databases from the following sources: the Central Statistical Office of Hungary ("Központi Statisztikai Hivatal"), the National Health Insurance Fund ("Nemzeti Egészségbiztosítási Alapkezelő"), the Central Bank of Hungary ("Magyar Nemzeti Bank"), Eurostat, World Health Organisation (WHO) and the Organisation for Economic Co-operation and Development (OECD). All of these analyses were done in Excel. For the text analysis, I used minutes of the Parliament. These were merged, tokenized and processed using Python, and the results were evaluated and visualized in Excel. In Excel the DEA Frontier Free add-in is used for the DEA analysis. In Python the Natural Language Toolkit, PDFminer and PyPDF2 packages are used as supports for text processing. The analysis includes historical and international comparisons too, mainly focusing on Central and Eastern European (CEE) countries (i.e. Austria, Czech Republic, Croatia, Poland, Slovakia and Slovenia). Besides, the European Union (EU-28) average is also used as a benchmark in a few cases.

2. Centralization

Until the regime change, Hungary had a Semashko-style healthcare model, similarly to most socialist countries. The model is characterized by a high level of centralization and integration, i.e. decision-making power is concentrated and the healthcare system is controlled completely by the central government. Central government control decreased after 1990, and its role as a direct provider was significantly reduced. At the same time, local governments began to possess most of the healthcare facilities, making them the dominant providers. Following these changes, the central government maintained its regulatory role only, and purchasing and service delivery was put on the road of decentralization (Gaál, Szigeti, Csere, Gaskings, & Panteli, 2011, p. 36-38).

However, this tendency has been reversed and re-centralization began to lead the political agenda in the second decade of the 21st century. This chapter focuses on this reversal process and presents three main problems: the *nationalization of healthcare institutions,* giving more power to the central government through the change in the *political institutional setting,* and *budgeting for healthcare.* The chapter concludes with demonstrating the central budget's increasing importance in the books of the National Health Insurance Fund (NHIF).

2.1. State Monopoly and the Centralization of Hospital Governance

As Kornai (1998) stated, there are nine basic principles for reforming healthcare systems, which are universally applicable, especially in the case of post-socialist countries (p. 15). From these, two are relevant for discussing the nationalization of healthcare institutions. Primarily, the one promoting competition states that there should not be a state monopoly for ownership and

regulation. While it would be impossible to set a single perfect ratio for *public and private ownership,* providing alternatives to the state-owned institutions is essential to create or maintain the notion of free choice[2]. It is through the people's free choice that competition between different providers can emerge, and profit-oriented private companies can satisfy the patients' needs—this links the argument to the second principle. The other relevant principle states there should be ownership types that promote efficiency. This is very much related to the previous principle, arguing that a competition-based private sector can allocate resources and make investments more efficiently (Kornai, 1998, p. 14, 24-29).

In addition, the *lack of competition* and profit-orientation necessarily results in a narrower spectrum of services and providers, who therefore would not be able to satisfy the demand of all patients. This is because the society's demand for healthcare services is very diversified and higher income people, for instance, demand higher service quality, even if it costs more than those with lower income. However, if the system can only provide one single quality, higher quality can only be achieved by these people through corruption or direct gratitude payments instead of relying on simple market forces and setting a higher equilibrium price as would be the case with product (in this case: service) differentiation on the market (Mihályi, 1998, p. 29).

Besides these principles, it is important to mention that efficiency can be raised within the boundaries of the public sector through moving the management and governance of healthcare institutions to the *local level.* The local governments are expected to keep local health needs in sight, and thus allocation of resources is more efficient than with central planning. Taking care of local health needs includes for example setting the number of physicians, deciding who controls the local healthcare institutions and hospitals or who has the right to hire and fire the managers (Mihályi, 2003, p. 1-2). In line with these arguments in Hungary "Act

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[2] Free choice is included in the first principle, where the independent decision-making of individuals is emphasized.

LXV of 1990 on Local Government created the provider side of the new contract model, devolving the ownership of primary care surgeries, polyclinics and hospitals from central government to local governments along with the responsibility, known as the 'territorial supply obligation', to ensure the supply of health care services to the local population" (Gaál et al., 2011, p. 21-22).

Moreover, the theory of policy responsiveness and responsive government should be considered. Politicians or governments are "expected to respond to public preferences due to the threat of electoral sanction" (Hobolt & Klemmemsen, 2005, p. 380). This responsiveness is likely to be stronger with lower level governments since there is a closer link between the government and the electorate. Indeed, local governments have more interest in the satisfaction of the local community because dissatisfaction could directly affect the outcome of local elections. On the other hand, the negative feedback from a few communities is not likely to have a significant impact on the general elections.

2.2. The 2011 Large-Scale Hospital Nationalization

Contrary to the argument above, Act CLIV of 2011 ordered the nationalization[3] of numerous healthcare institutions, which were previously owned by local governments. With the later amendments, altogether 70 institutions were *repossessed by the central government* making 70% of providers state-owned (MTI, 2012). This was a crucial step of the new government towards centralization. Surprisingly, the reasoning in the bill's proposal did acknowledge the theory of more efficient local governance. Although it kept the management and government

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[3] In this case, the word "nationalization" is not entirely appropriate, because, as Dr. Erika Szabó correctly argued in her parliamentary speech, the institutions had belonged to the public sector before the bill, as well (Szabó, 2011). Despite, the phrase will be used for simplicity reasons.

roles in the hands of the local government[4], the bill itself made an exception for the healthcare institutions, which received a separate body for the management role (Navracsics, 2011). The organizing body[5] of course was organized under the control of the central government.

It is noteworthy that tendencies for centralization can be a natural consequence if local planning and financing creates larger *regional differences* through increasing supply (and hence demand) in the relatively richer counties / regions (Mihályi, 2003, p. 1-2). However, there are multiple ways to address such issue (e.g. regional aids, central provision and legal framework but not governance) and nationalization clearly creates negative externalities for allocation as presented in this section—and in the sense of the softer budget constraint, as Chapter 3 shows. Despite, the politicians who proposed and supported the nationalization act did not mention this argument of regional differences and, in fact, failed to include a theoretical efficiency comparison between the two types of governance in their reasoning. On top of these, the lack of supporting arguments is highlighted by the statement of Jenő Rácz, the president of the Hungarian Hospital Association, who argued that a no-change scenario would have been riskier than this change (MTI, 2012).

2.3. Political Institutional Setting

Since the regime change, the name and task of the *governmental body responsible for healthcare* has been changed various times. Act XXX. of 1990 created the Ministry of Welfare which was responsible for both social welfare (e.g. pension) and healthcare. This institution was abolished in 1998 and instead a separate Ministry of Social and Family Affairs and Ministry of

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[4] Namely, County Institution Management Centers ("Megyei Intézményfenntartó Központ") were made responsible for such roles.
[5] The body was called the National Institute for Quality and Organizational Development in HealthCare and Medicine ("Gyógyszerészeti és Egészségügyi Minőség- és Szervezetfejlesztési Intézet"), and later was renamed as the National Healthcare Services Centre ("Állami Egészségügyi Ellátó Központ")

Health were created. The two ministries were remerged under the Ministry of Health, Social and Family Affairs from 2002, however, from 2004 to 2010 a separate Ministry of Health existed again. Since then, the Ministry of Human Capacities is responsible for healthcare (Gaál et al., 2011, p. 230-250). Table 2 below lists the names of the ministries and titles responsible for healthcare, and the acts that created them. Although there was a back-and-forth change between the given ministry being responsible for social welfare or healthcare only, the change in 2010 clearly implies a centralization even within the government. This leaves the sector with less power and less specialization than before given that the ministry of national resources is responsible for numerous issues (e.g. education, culture, sport etc.) besides health.

Table 2: History of Political Institutions Responsible for Healthcare

Ministry	Title	Legislation
Ministry of Welfare	Minister	Act XXX. of 1990
Ministry of Health	Minister	Act XXXVI. of 1998
Ministry of Health, Social and Family Affairs	Minister	Act XI. of 2002
Ministry of Health	Minister	Act XCV of 2004
Ministry of Human Capacities	Secretary of State	Act XLII of 2010

Sources: Gaál et al. (2011) and Magyarorszag.hu

In addition, institutional stability should be considered as another important factor. As presented above, the name—and often structure—of the institution responsible for healthcare has changed four times since the regime change. Frequent restructuring can easily hamper stable, continuous functioning. As Fürstenberg (2016) argues, "political institutions are both the products of stability and its guarantors; they are designed both to be stable and to provide

stability" (p. 55). Such stability is present in practice and is most visible in the United States where the Department of Health and Human Services has not changed its name since May 4, 1980 (U.S. Dept. of Health & Human Services, 2017). This consistency can be observed in the case of most other federal departments, such as the Department of Justice, Department of State or Department of Treasury (U.S. Dept. of Justice, U.S. Dept. of State and U.S. Dept. of Treasury, 2010).

2.4. Budgeting for Healthcare

Another important factor is how government direct spending is allocated for healthcare. There are basically two options for allocation. First, the government finances healthcare from general tax revenues using the central budget (e.g. the case of the British National Health Service or in the case of the Soviet Union). Second, it only uses the revenues that are paid for healthcare to finance the system—i.e. earmarked or extra-budgetary funds (e.g. the social security contributions in France, or in the case of Hungary after the regime change). However, if there is a deficit this latter system can be supported by the central budget or other earmarked revenues. This option is especially hard to design because the healthcare fund might neglect efficient allocation of the *earmarked revenue* in anticipation of the government financing the growing healthcare deficits. This can easily result in growing central debt and, what is more harmful, in decreasing cost and market sensitivity of all participants of the healthcare system. Employers and employees would ponder not paying healthcare contributions because their general taxes would finance healthcare anyways. Therefore, the workers in healthcare institution would not be efficient in allocating the fund's resources, because health expenditures would depend on the bargaining with the government (Mihályi, 1999, p. 2).

Budgeting relates to another basic principle of healthcare reforms as laid down by Kornai namely the principle of *sustainable financing* stating the government should always be able to finance its liabilities. In most countries—especially in post-communist ones—there is a growing budget deficit due to expenditures on health. This can be significantly reduced if the budgeting system applies earmarking and separates funds for social security—or health, in a narrower sense. There are two additional reasons why earmarking is essential. First, without having separate funds for social security, it becomes very difficult (or even impossible) to measure the relative importance of expenditures on health in the growing central budget deficit (Kornai, 1998, p. 39-40). Moreover, with earmarked tax collection, people feel more connected to the tax system, and are more inclined to pay taxes because they know what that particular contribution is or will be spent on, as many previous studies have shown (Haynes & Florestano, 1994; Glennerster, 1997; Mossailos, Dixon, Figueras & Kutzin, 2002; Doetinchem, 2010; Cashin, Sparkes & Bloom, 2017).

In the case of Hungary, budgeting was made through the Social Insurance Fund (covering pension and health systems) between 1990 and 1992, then it was divided into separate funds for health and pension, creating the Pension Insurance Fund and the Health Insurance Fund (HIF). Both funds' budgetary decision-making function was weakened in 1996, and in 1998 the HIF's self-governance was abolished and its contribution collecting function was shifted to the Tax Office, where it remains since then. Starting from 1997, the government is obliged to cover any deficits of the HIF according to Article 3, Section 2 of Act LXXX of 1997 (Gaál et al., 2011, p. 22-24, 32, 227.). The government "is able to apply a very strict cost-containment policy by setting the budget objective for the HIF, but it has generally done so without taking into account the real needs of the HIF with regard to health care provision and financial balance" (Gaál et al.,

2011, p. 31). This characteristic of the budgeting process is very much related to the concept of soft budget constraint, which is analyzed in the next chapter.

Moreover, *government monopoly* results in shortage in the healthcare sector, as well—as it was the case in the socialist systems before the regime change. In those settings, not excluding Hungary, coordination and resource allocation depended on central government decisions solely. No matter how peculiar the healthcare sector is, through this it became part of the planned economy. *Economics of shortage* emerged because services were provided for free to all, and people demanded more than could be supplied by the government. Though this is more typical of the Stalinist social systems, the phenomenon emerges even in capitalist settings with universal healthcare—even if there is a cost of healthcare through the fixed contribution payments, the existence and level of those payments does not depend on the value of healthcare services consumed. This proves that the lack of competition—caused by government monopoly either in a socialist or a capitalist system—will result in some level of shortage usually manifested in queuing, longer waiting times and worse physician-patient relations (Kornai, 1998, p. 57-58.).

2.5. The Importance of Central Budget Transfers in National Health Insurance Fund's Budgeting

To complement the observations made throughout the chapter, this subchapter shows how the central government started to figure more prominently in the books of the NHIF—i.e. how earmarking has been disappearing slowly. The analysis focuses on the transfers from the central budget as a share of total revenues and as of the given year's GDP, compared to the balance of the fund. After the collection of data from the statistical yearbooks of the NHIF, I filtered out certain significant non-recurring changes to smoothen the overall picture. These were the childcare fees and the disability rehabilitation benefits. I deducted the values of these two

variables from the expenditure and the revenue side, because in the years they showed up as a transfer from the budget, around the same amount appeared on each side. In addition, they are not directly related to the analysis.

Figure 1 below shows the NHIF's—not earmarked—revenue from the central budget, and the its balance as a percent of current health expenditure. There is a clearly visible rise in the importance of the central budget in the books of the NHIF since 1994. However, this was at a moderately low rate and largely following the pattern of the balance until the end of the 2000's. After 2010, central contributions as a percent of health expenditures started to rise while the Fund's balance stayed relatively stable suggesting the growth in unearmarked revenue relative to earmarked. This is reinforced by Figure 2 where this implication is explicitly shown contrasting the total revenue from the Central Budget to the total revenue from contributions to health / health insurance. From 2014/5 on, the pattern seems to have been reverting, but not enough years have passed yet to firmly state this.

Figure 1: Central Budget Contributions to the NHIF and its Balance as % of Current Health Expenditures
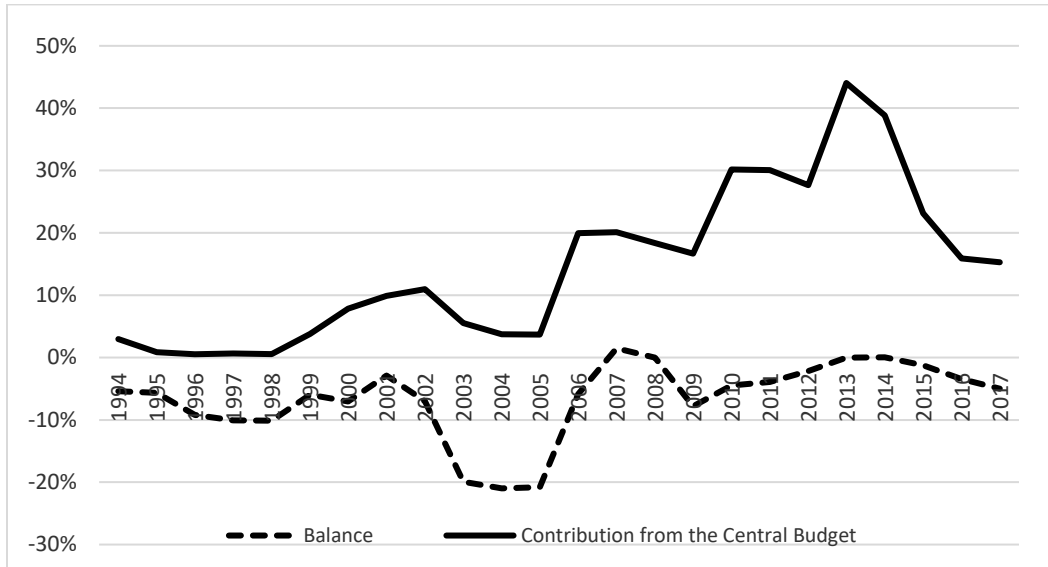
Sources: Yearbooks of the Central Statistical Office and NHIF

Figure 2: Revenues of the NHIF from Health Insurance Contributions and Central Budget as % of Current Health Expenditures
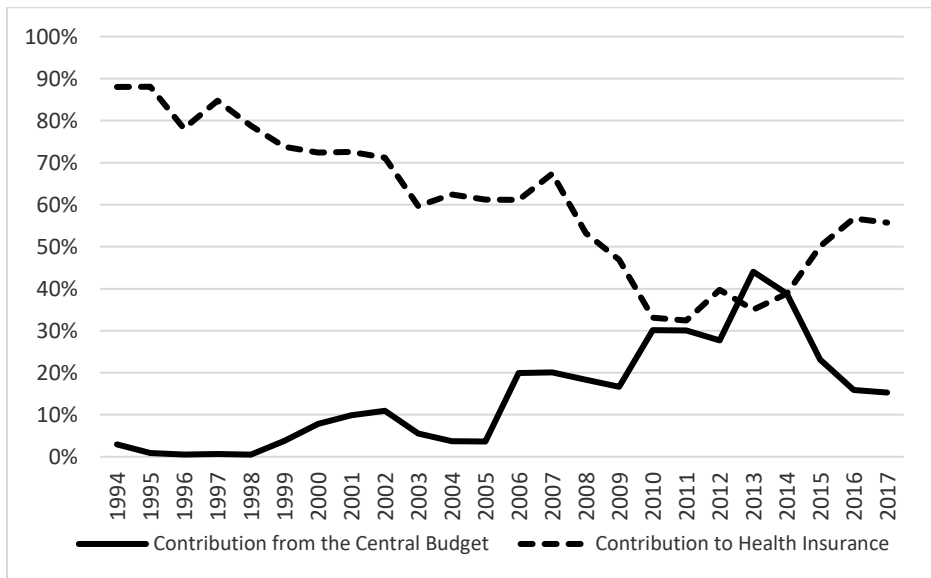
Sources: Yearbooks of the Central Statistical Office and NHIF

3. Voluntary and Compulsory Payments

3.1. Health Expenditures by Type of Contribution in Hungary and CEE Countries

In the previous chapter, I showed that the NHIF has been getting more dependent on the central budget in recent years and that less earmarking is used for financing healthcare. This aspect already showed a turn back towards the socialist healthcare system that existed before 1990 in Hungary where healthcare was financed almost entirely from general taxes. As a complement to this finding, this chapter focuses on the private spending in healthcare, specifically the *voluntary payment schemes* other than out-of-pocket expenditures[6]. These *voluntary payments schemes* include "all domestic pre-paid health care financing schemes under which the access to health services is at the discretion of private actors" according to the System of Health Accounts (OECD, Eurostat & World Health Organization, 2017, p. 173). "Voluntary health insurance, [non-profit institutions serving households] NPISH financing schemes and Enterprise financing schemes" are included[7], but payments of Voluntary Health Funds (VHF) are not (OECD et al., 2017, p. 173). The importance of VHFs is discussed in subchapter 3.2. To demonstrate the change in relative importance of voluntary payments, I decided to compare the percentage change in voluntary healthcare payment schemes as a percent of GDP to compulsory healthcare payment schemes, again, as percent of GDP.

Results are presented in Figure 3 below. In years where the solid line is below the dashed line, voluntary schemes can be considered as less important compared to government and compulsory schemes, because their share has either increased by less—as in 2002—or decreased

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[6] That is, paying the total or partial costs of a treatment or giving informal payments at the time of care delivery.

[7] Mostly these cover voluntary health insurance plans (either substitutive or complementary) or occupational health services.

by more—as in 2011—from the preceding year. Accordingly, voluntary schemes had a relatively higher importance—with the exception of 2002, 2005, and 2008—in the previous decade, while in the current decade, government and compulsory schemes have been performing better in all years. In other words, the gap between voluntary schemes and government and compulsory schemes has been widening through the current decade with the growing share of the latter.

Additionally, the voluntary schemes as a percent of GDP are shown in Figure 4. Here, the previous findings—that the relative importance of these schemes have been growing until 2010 and declining since then—can be supported by the generally increasing pattern until the end of the last decade, opposed to the constantly decreasing afterwards. It is clearly visible in Figure 4 that the path of voluntary payments has been reversed in 2010.

Figure 3: The Changes in Government and Compulsory Financing Schemes Compared to Voluntary Schemes as a Percent of GDP.
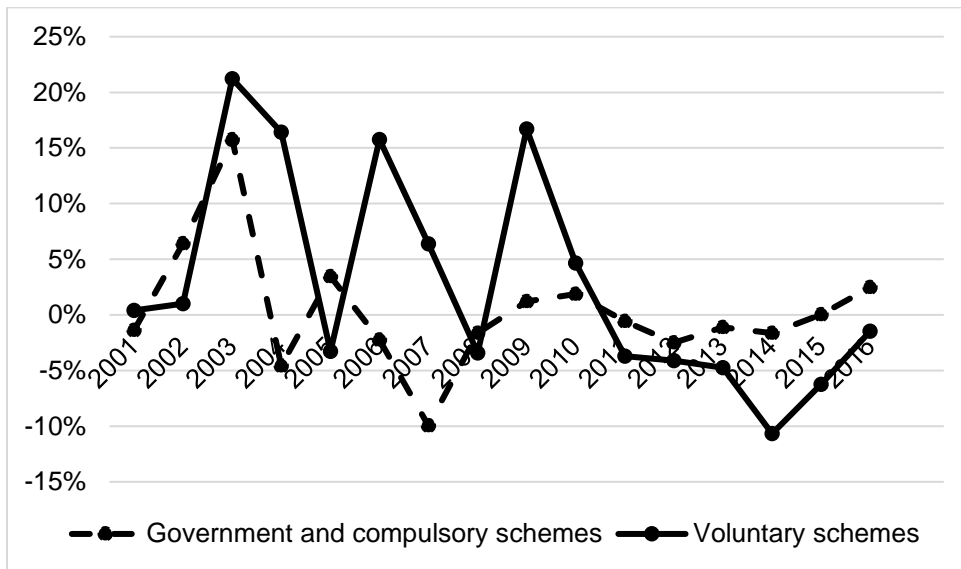
Source: Yearbooks of the Central Statistical Office and NHIF

Figure 4: Voluntary Financing Schemes as a Percent of GDP.
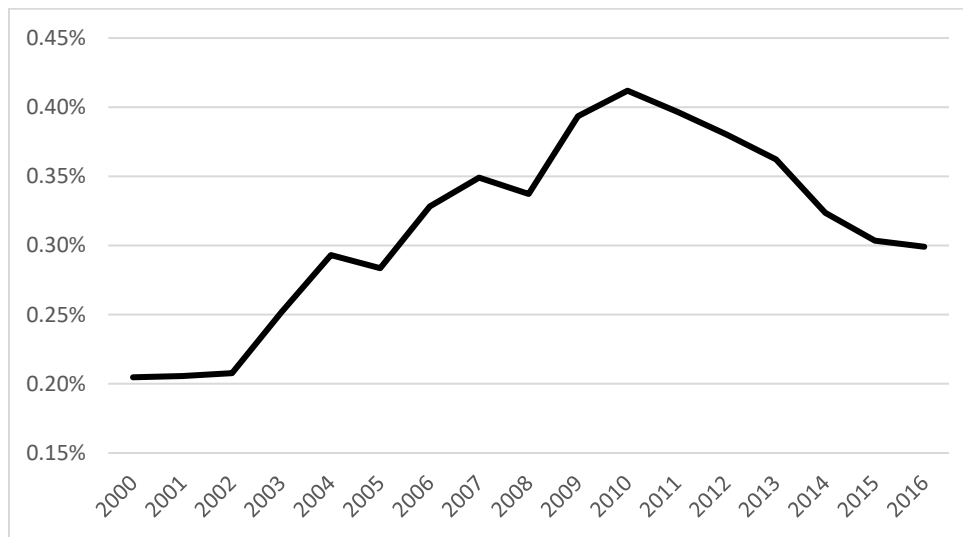
Source: Yearbooks of the Central Statistical Office and NHIF

For a brief international comparison, I used the same method as in Figure 3 for Austria, Croatia, Poland, Slovakia, Slovenia and for an EU average. The figures with relevant notes are included in Appendix A. Similar pattern cannot be found in any of these countries, however, the opposite pattern is visible for Poland since 2008 and for the EU average between 2010 and 2013. Since 2013, the EU average follows a somewhat similar path as Hungary, but it is not as definite. In fact, there is no path as clear-cut as in the case of Hungary in either direction in any of the chosen countries or in the EU average. Consequently, the pattern found in the case of Hungary should not be considered a part of a general EU or regional pattern.

3.2. Voluntary Health Funds

In addition to the previously examined voluntary contributions, the significance of Voluntary Health Funds is discussed in this section as another important part of private / voluntary financing. The variable used here is the sum of assets (at book value) of all operating

VHFs the end of years between 2003 and 2017 as a percent of GDP and current health spending. Although these are not direct payments this variable can proxy the importance of VHFs in the healthcare system. Results are shown in Figures 5 and 6. The patterns are similar to that of Figure 4. The total asset of VHFs has been declining both as a percent of GDP and as a percent of health spending since 2010, except for a slight increase in 2012. Looking at the number of members instead of asset value gives a similarly shaped result, though it is rather constant than increasing in the last 8 years. This figure is included in Appendix B.

Figure 5: Total Asset of VHFs as a Percent of Current GDP
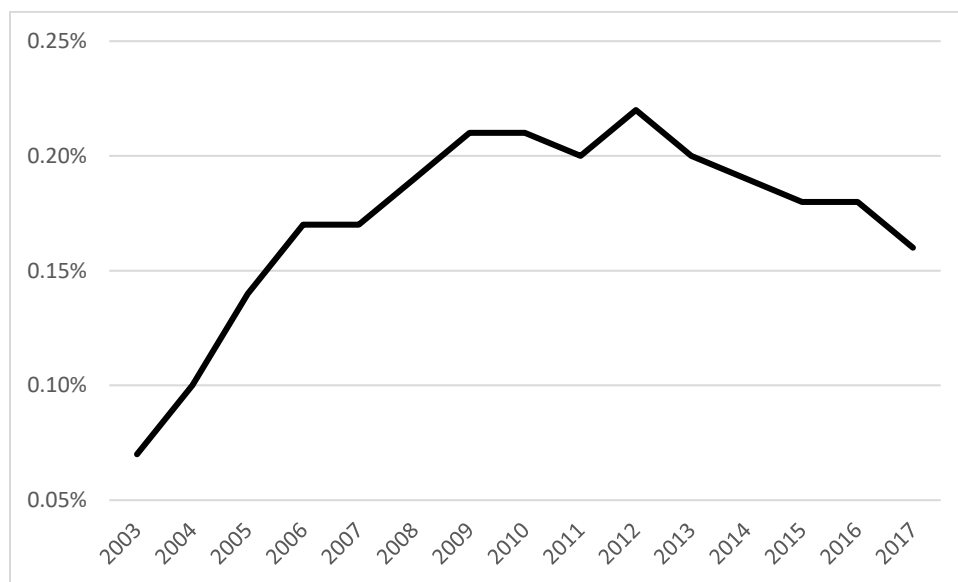
Source: "Golden books" of the National Bank of Hungary, KSH (Central Statistical Office)

Figure 6: Total Asset of VHFs as a Percent of Current Healthcare Expenditure
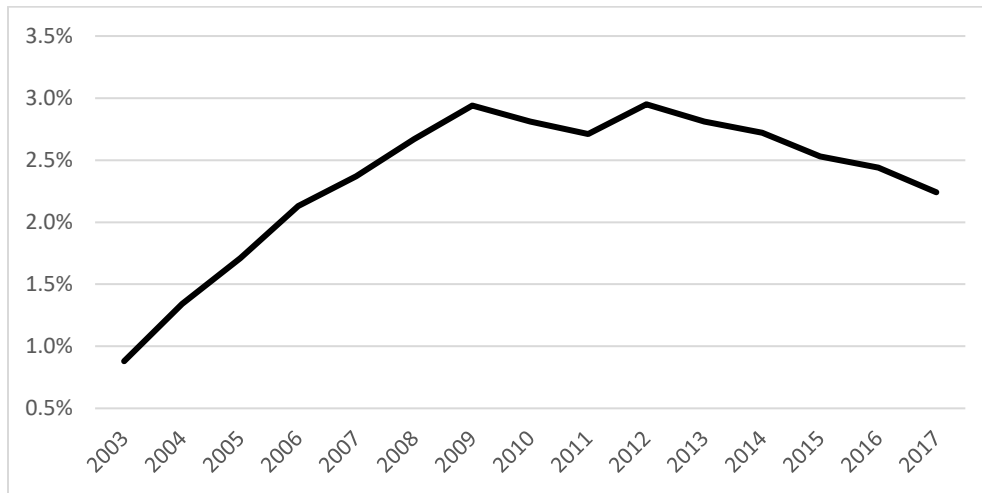
Source: "Golden books" of the National Bank of Hungary, KSH (Central Statistical Office)

4. Soft Budget Constraint in the Hospital Sector

Throughout this chapter, I will show how soft budget constraint (SBC) is present in the current Hungarian hospital sector. After a description of the phenomenon and a short theoretical reasoning, empirical results will be presented from three different analyses. The first one focuses on the accumulation of hospital debt in recent years, while the second examines minutes of the Parliament to show the decisionmakers' approach towards the problem. The third analysis looks at the change in hospital efficiency through the last ten years.

4.1. Definition

There is a thorough description of the *soft budget constraint* (SBC), provided by Kornai. The phenomenon has two participants, a budget constraint organization (BC-organization) and a supporting organization (S-organization). The former has to cover its expenditures from its revenues and if it cannot keep itself to this obligation, the situation results in *financial deficit.* The deficit is sustainable until a certain limit which is set by "some sort of constraint—on liquidity, solvency, or debt" (Kornai, Maskin & Roland, 2003, p. 1097). The BC-organization faces a *hard budget constraint* until there is no external source that helps to cover its deficit, and if it is "obliged to reduce or cease its activity if the deficit persists" (Kornai et al., 2003, p. 1097). To cover (part of) the deficit of the BC-organization, such support can be provided by an S-organization—in the usual setting this is done by the Ministry of Finance (in other words, the central budget). The state intends to make the enterprise profitable, because this results in growing efficiency and hence larger tax revenues. In contrast, it is concerned that letting an

unprofitable company go bankrupt would create large-scale layoffs and increase unemployment "thereby contributing to social unrest and political tension. This inconsistency in objectives can induce the government to act schizophrenically, and issue conflicting orders" (Kornai et al., 2003, p. 1098). By and large, the same holds if the BC organization operates in the non-productive sphere in general (e.g. schools).

The above given definition of the SBC syndrome can be applied to the healthcare sector too, as this chapter shows. In this sector the government's aim to achieve profitability is less significant. However, there is a more direct link in the case of a state-owned institution than solely the increase of tax revenues. Furthermore, allowing an institution to fail is more complicated in the healthcare sector, because it not only results in possible firings, but also can lead to less territorial coverage (e.g. if the region's only institution is closed down). Social dissatisfaction and political tension are magnified by a reduction in public health provision.

4.2. Political Economy

Moreover, there is a political economy factor of the efficiency reduction, as well. According to Robinson & Torvik (2006), politicians might be inclined to support programs that are expected to underperform (i.e. be unprofitable), to influence outcomes of political elections (p. 25). Building on their findings, this theory can have implications for the healthcare sector, as well. In this sense, politicians will finance investments, developments, or hospital renovations independently of their profitability, effectiveness or efficiency. In the case of deficits, the government will finance it independently of possible adverse effects, such as the managers' changed behavior due to the SBC. Such decisions would of course not influence the outcomes of general elections directly, but will please the professional community and possibly various

associations too, such as the country's hospital association or the chamber of doctors. Through this channel general elections can be influenced as well, because most of the general public would evaluate the quality of the government's health policy based on professional associations' opinions. That is, they would assume that a policy is beneficial for the system if the professional community supports it.

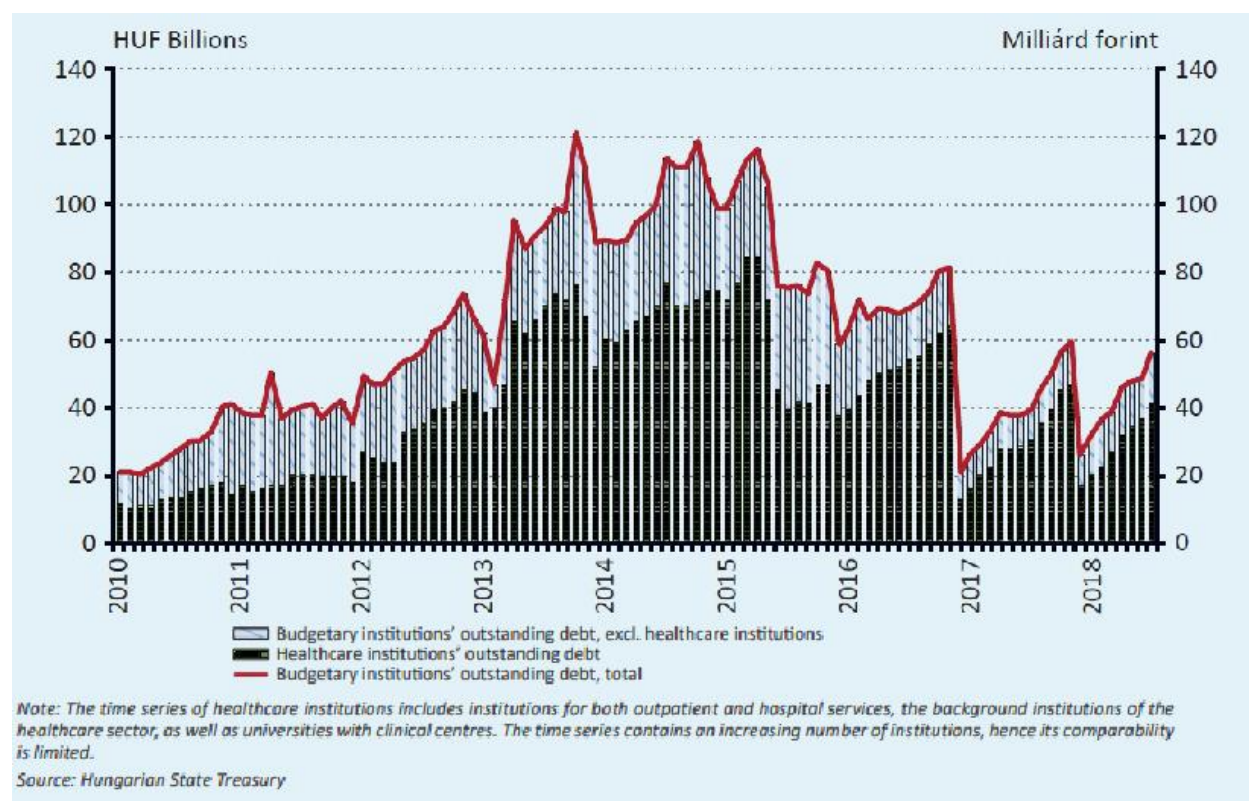4.3. Separating Ownership and Management

The possibility that soft budget constraint appears in the system—and also its influence—very much depends on the connection between the managers and the financer (in US terminology: the sponsor) of the healthcare institutions. This is because it is the hospital manager who should convince those financing his or her institution that the deficit should be financed via external resources. As Kornai (2009) states, "the stronger the hospital manager's position is in relation to the hospital's superior organizations, the insurer providing the funds and the institutional owner providing the subsidy, the greater the hope of rescue" (p. 125). Needless to say, in the case of an institution owned and managed by the central government such tie is very close, because the owner, manager and the financer belong to the same affiliation. To present the practical side, the following subsections will show the cyclical reoccurrence of hospitals' debt issue through empirical analysis.

4.4. Recurring Hospital Debt

This section covers two factors strengthening the argument that SBC is present in Hungary's healthcare system, more precisely, in the hospital sector. Namely, the *debt accumulation* of these institutions within calendar years (i.e. from January to end-December) and

the political importance of this issue. Firstly, in recent years, debt accumulation seems to be reoccurring. This can be seen in Figure 7 showing the debt of budgetary institutions and specifically healthcare institutions from 2010 until the middle of 2018. Two significant drops in debt occurred in the end of 2013, and middle of 2015, however, a cyclical, sawtooth pattern exists since 2016—i.e. debt accumulation through the year and *bailout* at the end of it. Though not included in the figure, the end of 2018 would supposedly look similar to those of 2016 and 2017, because the government repeated its end-of-year bailout (HVG, 2018). Such cyclical reaccumulating debt is a clear sign of hospitals anticipating automatic rescue, and hence the soft budget constraint, as well.

Figure 7: Debt of Budgetary Institutions and Specifically Healthcare Institutions

Note: The time series of healthcare institutions includes institutions for both outpatient and hospital services, the background institutions of the healthcare sector, as well as universities with clinical centres. The time series contains an increasing number of institutions, hence its comparability is limited.
Source: Hungarian State Treasury

Source: Public Finance Report of the Central Bank of Hungary (MNB, 2018, p. 42)

Furthermore, if the political approach is also cyclical, and the issue is only discussed as long as the hospitals are rescued, it can strengthen the argument that SBC is present in the system. This would mean that the supporting organization (i.e. the central government) does not attempt to trace and eliminate the source of debt accumulation. The 'solution' hence is always temporary: the government bails out all indebted hospitals by the end of December. Then in January all hospitals start the new year with a 'clean' balance.

To examine this, I analyzed the minutes of plenary sessions[8] between May 2014 and December 2018. These can be found as official publications on website of the Parliament[9] in Hungarian. The minutes are in separate Pdf files for each day when sessions where held. Altogether, about 320 documents are included in the analysis with an average length of around 80-120 pages each. After merging minutes of the same month to a single Pdf file, I split the text into sentences and counted the number of sentences that touched the topic of hospital debts on a monthly basis. I created two sets of words[10], and if any word from set 1—representing hospitals—and any word from set 2—representing debt—were present in the same sentence, it was counted as one. Finally, the results were exported to excel sheets and then merged into one excel file. For this analysis, I used Python programming language with the help of the open-source web application Jupyter Notebook. Each year was analyzed in separate files where identical codes were used except for the names of the months / years in the filenames. Therefore, only the coding for one month—2016 February—is included in Appendix C.

Figure 8 below presents the results merged with the Central Bank's figure of healthcare institutions' debts taken from Figure 7. Mentions of the topic seem to follow a similar path as the

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[8] The Parliament of Hungary is unicameral.
[9] https://www.parlament.hu/orszaggyulesi-naplo-2014-2018
[10] Set 1: hospital, healthcare, patient (= "kórház, egészségügy, beteg") Set 2: debt, deficit, liability, arrear, backlog, shortage, credit, bankruptcy (= "adósság, deficit, tartozás, hátralék, elmaradás, hiány, hitel, csőd")

level of debt itself by and large. Of course, it is highly likely, that speakers read about the Treasury's data (e.g. in the Public Finance Report of the Central Bank) in advance of meetings, and therefore bring the issue up when they see a high level of debt in the hospital sector. Even if this is the case, the lack of interest in preventing the accumulation of debt and targeting the root of the problem is apparent. As seen in Figure 8, the growing issue of hospital debt is less frequently raised by politicians after larger bailouts, as it happened in mid-2015, end of 2016, and end of 2017. This seems to be the case after the end of the 2018 bailout, however, it would be too early to state this at the time of writing.

Figure 8: Debt of Healthcare Institutions Taken from Figure 7 (Grey Columns) and the Number of Mentions of Hospital Debt in Plenary Sessions (Black Line).
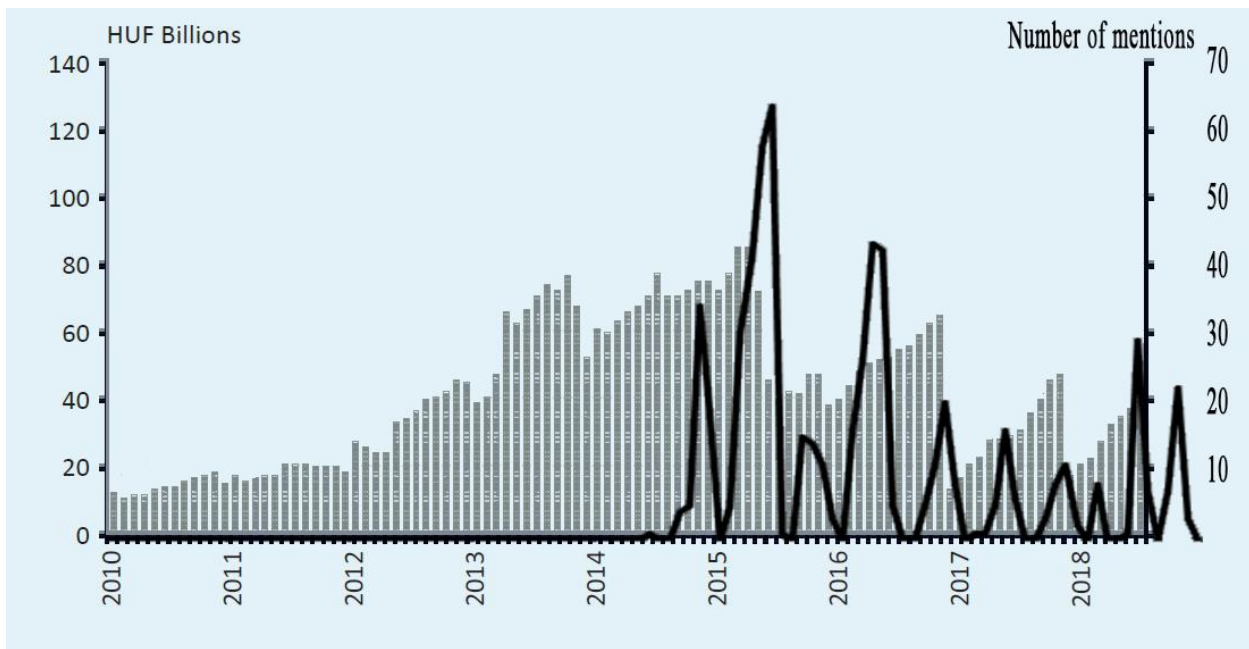
Note: Left-side scaling is for the grey columns, and right-side scaling is for the black line. There is no data before May 2014 for the mentions in Parliament.

Sources: Public Finance Report of the Central Bank of Hungary (MNB, 2018, p. 42) and the National Assembly of Hungary

It is essential to mention the limitations of this analysis. Probably, the general pattern reflects how often the topic was touched, however, it is very likely that some mentions are left

out. This can occur if the keywords are spread around multiple sentences in the same paragraph. The reason I decided not to extend the analysis to paragraphs instead of sentences, is that this would include more irrelevant results, than missing ones. Such irrelevant results would be caused by the frequently mentioned issue of shortage in physicians due to their migration, for instance.

There are plenty of development areas in such text analysis left for the future. For example, the analysis could be extended beyond May 2014, but the Parliament does not have minutes published before that in the necessary format. More importantly, debt does not seem to follow such sawtooth pattern before, building on the previously presented data of the Central Bank. In addition, public opinion could be analyzed to accompany the numbers found, however, in my attempt to do so insufficient data was a huge obstacle.[11]

4.5. Hospital Efficiency Analysis with Data Envelopment Analysis

The previous arguments and analyses imply that soft budget constraint is strongly present in the system. However, one might argue that costs are on the rise to contribute to increased efficiency only, and the cyclicality is simply explained by the central government's and the institutions' budgeting cycles. For such case to exist, it is indispensable to have a clear increase in system-wide *hospital efficiency*. To examine hospital efficiency, I decided to build on the methodology applied by Csaba Dózsa (2010) in his PhD thesis and use Data Envelopment Analysis (DEA) with the help of DEA Frontier Free software.

Data Envelopment Analysis is a nonlinear programming model which is used to evaluate efficiency of decision-making units (DMUs) that has common inputs and outputs. Mathematically, the efficiency is "obtained as the maximum of a ratio of weighted outputs to

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[11] As an accompanying analysis, I tried to proxy public / media opinion by using the same methodology on Hungary's three most visited news sites (viz. Index.hu, Origo.hu, 444.hu), through Google search operators. However, the number of results were insufficient to confidently deduct anything from the analysis.

weighted inputs subject to the condition that the similar ratios for every DMU be less than or equal to unity" (Charnes, Cooper & Rhodes, 1978, p. 429). Accordingly, the most efficient DMU (compared to the other units) will be the one with the (1) maximum level of output for a given level of input, or (2) minimum level of input for a given level of output. Any less efficient unit may be evaluated compared to the most efficient unit(s). Scenario (1) is the *output-oriented*, while (2) is the input-oriented model. For example, unit A having an efficiency of 0.8 means that it achieves 20% less output than the most efficient unit while using the same level of input according to scenario (1). In (2), it would mean unit A uses 20% more input for producing the same level of output as the most efficient unit.

In the model, I use DEA with sum of *diagnosis-related group* (DRG) cost weights and *case-mix index* (CMI) as outputs. DRG is a hospital payment type in which hospital cases are classified based on their economical and medical attributes and costs are standardized for each group (Mathauer & Wittenbecher, 2013, p. 746). In reality, the patients and their relatives are interested in the *outcome* of the therapy – i.e. the restoration of their health status. In this sense, outputs such as intervention measured at the DRG scale are merely proxies for the outcome. For a certain group, DRG cost weight shows the cost assigned to that group as compared to the average cost. The sum of these cost weights is used in this model representing costliness of all treatments. Case-mix index is a very closely related variable—while it also proxies costliness, CMI is also used as a reference for complexity of medical cases. CMI is calculated by dividing the DRG cost weights by the total number of cases—i.e. the weighted yearly average of DRG cost weights (ÁEEK, Egészségügyi Fogalomtár).

In contrast to the model used by Dózsa (2010), in the present thesis input is expenditure on hospitals as a percent of GDP instead of hospital beds and I use years instead of hospitals as

observations. Constant return to scale (CRS) and variable return to scale (VRS) are examined for input-oriented model, but only VRS input-oriented is presented here—the CRS table is included in Appendix D. I decided so because probably a change in spending would not be proportional to the change in the complicatedness of treatments. An input-oriented model is more sensible than an output-oriented, because focusing at how the spending might be changed for the same level of output is more policy related. In other words, spending can be changed directly by decisionmakers as opposed to CMI or DRG weight which can be treated as given by external factors. The time period of the analysis—constrained by data availability—is 2003 to 2016. Results are presented in Table 3 and Figure 9 below.

Table 3: Efficiency of the Hungarian Hospital Sector Analyzed by DEA

Year	Input-Oriented VRS Efficiency
2003	1.00000
2004	0.95082
2005	1.00000
2006	0.97749
2007	1.00000
2008	1.00000
2009	0.99905
2010	0.96278
2011	0.98013
2012	0.93174
2013	0.89420
2014	0.94850
2015	0.95496
2016	0.93218

Sources: OECD and NHIF

Figure 9: Efficiency of the Hungarian Hospital Sector Analyzed by DEA
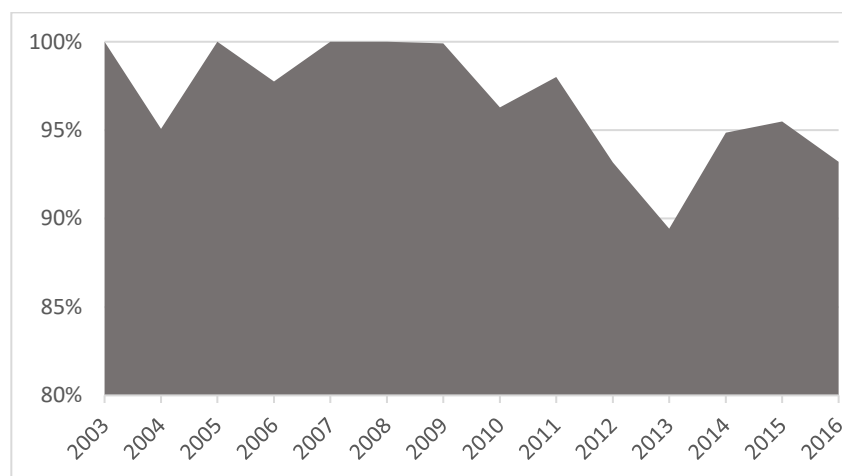
Sources: OECD and NHIF

As seen, efficiencies tend to be lower from 2010 on, though it is not a clear-cut decreasing path. It can be firmly deducted from the results that efficiency has not increased in the present decade and is, in general, lower than in the preceding period. For instance, 0.93 in 2016

can be interpreted in the following way: 93% of the spending of 2016 would be enough for the level of output in 2016, if the system was as efficient in this year, as in 2003, 2005, 2007 or 2008—where this value was 1.00. As stated in the previous paragraphs, refuting growth in efficiency supports the argument that the increase in debt levels is a result of SBC, as long, as the DEA model is considered firm enough.

However, there are of course limitations of the analysis which should be kept in mind when interpreting the results. First of all, building on these variables is a simplified proxy, however, not a true representative of efficiency. It only implies whether the increasing spending on hospital's operating costs (excluding capital investments) are justified by an increase in spending on treatments or not. Another possible limitation could be that DRG coding is not up to date, which can have various adverse effects on incentives, for example (Dózsa, 2018). However, assigning a higher DRG code for certain treatments, or raising the base price would both affect the input and output and, when using variable returns to scale, would not affect the results significantly.

In addition, one might argue that the changes in spending are primarily due to the increases in salaries throughout the sector. Indeed, the largest part of expenditures cover labor costs. On the other hand, the following analysis shows that such counter argument does not decrease the validity of the previous findings. To examine the significance of spending on salaries as part of total spending on hospitals, I used the National Healthcare Services Center's ("Állami Egészségügyi Ellátóközpont") database on wage and labor statistics. From the database I retrieved the average monthly gross salaries and total headcounts for three separate group of workers working in hospitals: physicians, healthcare specialists, and other healthcare workers. After multiplying the salaries by 12 and by the headcounts for each group I added the 3 values up

hence getting the total expenditure on hospital workers. Table 4 below shows this as a percent of GDP for years 2006 to 2015. Table 5 shows the results of the same DEA as in Table 3, except that the input variable here is total expenditure on hospitals as % of GDP less the total expenditure on hospital workers as % of GDP.

Table 4: Total Expenditure on Hospital Workers as % of GDP

Year	Total expenditure on hospital workers as % of GDP
2006	0,96%
2007	0,91%
2008	0,86%
2009	0,84%
2010	0,81%
2011	0,77%
2012	0,89%
2013	0,92%
2014	0,89%
2015	0,86%

Sources: ÁEEK Bér és Létszámstatisztika ("Wage and labor statistics"), KSH (Central Statistical Office)

Table 5: Efficiency of the Hungarian Hospital Sector Analyzed by DEA (Excluding Spending on Hospital Workers)

Year	Input-Oriented VRS Efficiency
2006	1,00000
2007	1,00000
2008	1,00000
2009	0,97627
2010	0,87150
2011	0,88401
2012	0,87966
2013	0,84880
2014	0,92078
2015	0,91997

Sources: ÁEEK Bér és Létszámstatisztika ("Wage and labor statistics"), KSH (Central Statistical Office), OECD and NHIF

5. Policy Recommendations

As elaborated in the previous chapters, there are various issues related to centralization in the current healthcare system that should be addressed through reforms. However, there is no single reform or reform package that can heal the system especially without negative side-effects. As it was the case right after the regime change in the transition countries, there are many scenarios for changing the system and there are trade-offs. For instance, outright privatization (i.e. targeting a US-type healthcare system) might create strong market forces. However, the lack of corporate governance skills—which is often the case in post-socialist transition countries—and a possible weakening of the government's supervisory roles might have adverse effects on the system and on public health in general. For example, adverse selection is likely to reduce the access to more costly treatments and keep the more profitable services only. Such skewed preference to services would exclude patients with more complicated diseases and lower income. In addition, equity would be harmed by "introducing significant personal expenditures in replacing the public ones" (Albrecht, 2009, p. 449). This section lists some structural reform ideas and afterwards elaborates on hospital bed reduction. It is important to emphasize that this chapter does not intend to offer a complete reform package that would solve the problems of the system at once. The objective is rather to collect ideas that might support future research or policy making.

5.1. Structural Reforms

Ruling governments are not likely to support policy recommendations that lower their power, especially in the current political setting and this political complexity is likely to be a significant obstacle to the feasibility of such reforms. Despite, the following reforms should still be considered as crucial steps for improving the current healthcare system based on the analysis throughout the thesis. First of all, local governments should be given larger roles in the planning and provision of healthcare services and the territorial supply obligation—and ownership of institutions—should be transferred back to them from the central government. Restoring the rights of local governments existing before 2011 could be considered as a first step for such change. This would be beneficial because local needs can be better satisfied if planned on the local level as argued in section 2.2. One might argue that because institutions would remain in the hands of the public sector, they might lobby for bailout just as easily as before. However, separation of ownership and management within the institutions could target this issue. Besides local governments being responsible for planning and provision of healthcare, hospitals should receive managers from the private sector. Such managers should govern their institutions on a profit-oriented basis and should be held responsible for the losses. Therefore, these managers would be incentivized to achieve good corporate governance and lead their institutions towards efficiency. Of course, to harden the budget constraint rules should be formed more precisely for deficit financing.

Accordingly, a redesign of the budgeting system for healthcare should be considered. The current system of financing healthcare from general tax revenues or the central budget should be changed. Besides having earmarked healthcare contributions, it is also important to focus on how deficit-financing is done from the central budget. Of course, the government should provide

some kind of a safety net for the healthcare system, however, there should be strict rules defining the framework for it. Deficit-financing should happen only until the necessary cost for sustaining the system are covered and these should be—at least partially—repaid later. The latter two points are indispensable for hardening the budget constraint of hospitals.

5.2. Hospital Bed Reduction

As mentioned earlier, Hungary had a Semashko-style healthcare system in the communist era, planned, financed and supervised by the central government (Gaál et al., 2011, p. 17). One of the most important features of this model is the concentration on hospitals and specialist care, which usually goes together with the low importance and status of primary care physicians (Kühlbrandt & Boerma, 2015, p. 4-5). As a result, the "oversized hospital sector" and over-reliance on specialist care largely contributed to the inefficiency of the healthcare system (Gaál et al., 2011, p. 111). The number of physicians, hospital beds and the average length of stay (ALOS) could illustrate the hospital-centered nature of the healthcare system before the regime change. For this, I took the time period between 1980-2000. The number of physicians per thousand people had been increasing until the regime change, but stayed around the same level—with minor changes—afterwards. Moreover, the number of hospital beds per thousand people grew in the first, but declined in the second decade. The ALOS—showing how many days patients spend in hospital on average—had been declining slowly even before the regime change, but continued with a significantly steeper decrease afterwards. Although the changes in these variables can be due to several other factors—such as medical improvement—they show that inpatient care in the communist era operated with much larger capacity and that this changed fundamentally after the regime change. Appendix E contains the relevant figures.

However, the widespread idea of the early 2000's that privatization of primary care will do away with this problem is not entirely correct, because there is a more important underlying factor for the hospital-centered nature of Hungary's healthcare system (Mihályi, 2002, p. 77). As Mihályi (2002) argued, the issue of *oversized hospital sector* can rather be explained by *Roemer's law*[12]—i.e. the fact that all empty hospital beds will be filled by patients sooner or later (p. 77-79). In fact, there is—and has been—a way higher number of hospital beds in Hungary, as, for instance, the bed occupancy rate would make reasonable. The *bed occupancy rate* between 1990 and 2017 is shown in Figure 10 below. It is shown for acute and chronic beds separately. A relatively larger chronic bed occupancy ratio could suggest that a larger share of the cured patients could be reallocated to rehabilitation centers or nursing homes to reduce reliance on inpatient care provided by hospitals. The widening gap between acute and chronic occupancy rate since 2008 implies a worsening situation in this scope. Although a (near) 100% rate would suggest that hospitals do not have sufficient reserve capacity, a low rate clearly implies unused resources, which undoubtedly require additional costs to be sustained and therefore result in a lower efficiency.

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[12] The law was stated as early as 1959 and is based on the supply induced demand present in healthcare (Ginsburg & Koretz, 1983, p. 87). In other words, imperfect information makes it possible that patients consume services (here, inpatient care) provided by physicians that they would not have chosen otherwise.

**Figure 10: Bed Occupancy Rates between 1990 and 2017 in Hungary**
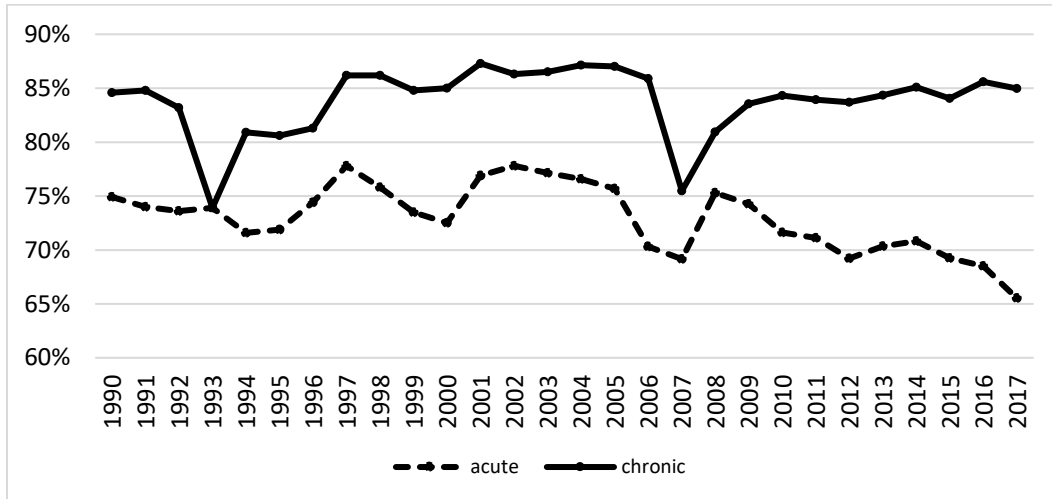
Note: Year 1993 did not include a separate rate for chronic and acute care beds, hence the same number is used for both.
Source: Yearbooks of the NHIF

Furthermore, Figure 11 shows the total number of beds in operation per ten thousand people. It is seen from the figure that the number of beds—except for the slight decrease in 2012—has been mostly stagnating since 2007. Between years 2009 and 2011 and in 2017 even a slight increase is visible.

Figure 11: Total Beds in Operation per 10.000 Inhabitants between 1990 and 2017 in Hungary
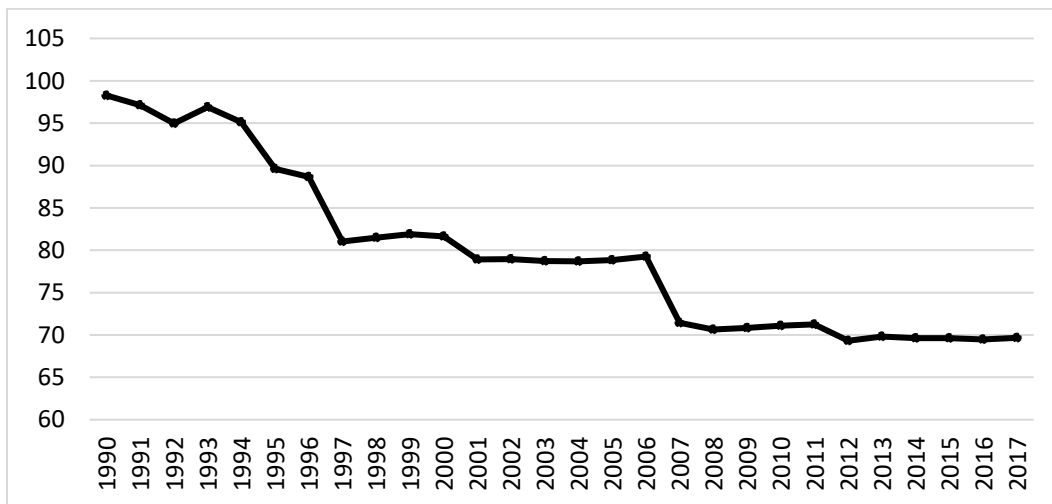
Source: Yearbooks of the NHIF

6. Conclusion

My thesis analyzed various aspects of the current Hungarian healthcare system that imply a reversing trend towards the centralized socialist system existing before the regime change. Firstly, recentralization can be observed through the three main aspects shown in Chapter 2. Namely, the transfer of hospital ownership from the local to the central level, the recent changes in the political institutional setting and the increased significance of central budget transfers in the books of the National Health Insurance Fund. Afterwards, Chapter 3 demonstrated the decreasing role of voluntary payment schemes as opposed to government payment schemes in the current decade. A comparison to CEE countries and the EU-28 average supported that such tendency in Hungary is rather unique, and there is no clean-cut international tendency.

Moreover, after giving a theoretical background to the soft budget constraint in Chapter 4, the thesis argued that the Hungarian healthcare system is characterized by the SBC syndrome which is most clearly visible through the cyclically reaccumulating debt of hospitals. In the end of this chapter, there were two analyses presented. The first used the texts of plenary sessions to show how the political agenda followed a similar cyclicality as the reoccurrence of hospital debts. This suggested that the government was less concerned with the root cause of debt accumulation and rather focused on symptomatic treatment, i.e. bailed out the hospitals when it was needed. The second analysis used DEA to show that hospital efficiency has been decreasing through the last 8-10 years. Lastly, Chapter 5 introduced some policy recommendations that might support further research or the creation of reforms to decentralize and improve the healthcare system of Hungary.

The policy recommendations were separated in two main parts. First, some ideas for structural reforms were brought up. These were targeted at the governing and financing roles of the government. Based on the analyses throughout the thesis it would be reasonable to restore the roles that the local governments had before 2011 and to makes hospital managers responsible for the profitability of their institutions. In the second main part, hospital bed reduction program was proposed as a policy option. The decreasing bed occupancy rate and the stagnating number of beds—as presented in the end of the chapter—imply that starting a bed reduction program would be a rational step to reduce the current over-reliance on the hospital sector.

Future research could build on these recommendations and develop and extend various parts of this thesis. First and foremost, the text analysis could move beyond the political view and cover public and professional opinion. It could also be extended in time. Another important area for future research is the data envelopment analysis, which could be done with analyzing individual institutions and also the set of hospitals that were transferred to the central government in the beginning of the decade. Moreover, a broader picture could be achieved with examining similar post-socialist countries more in-depth. This could provide a more solid ground for comparison and therefore it could assist decisionmakers in working out reform plans.

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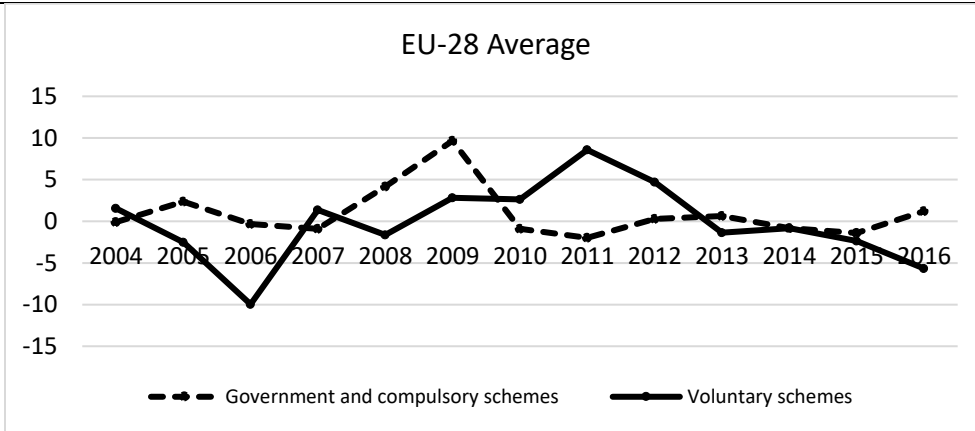
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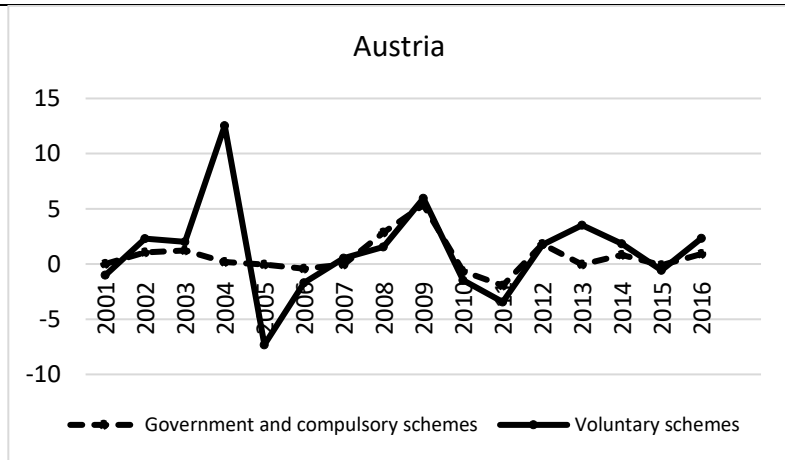WHO (2018). Global Health Expenditure Database. World Health Organization. http://apps.who.int/nha/database/Select/Indicators/en

Appendices

Appendix A: Changes in Financing Schemes as % of GDP in Central European Countries
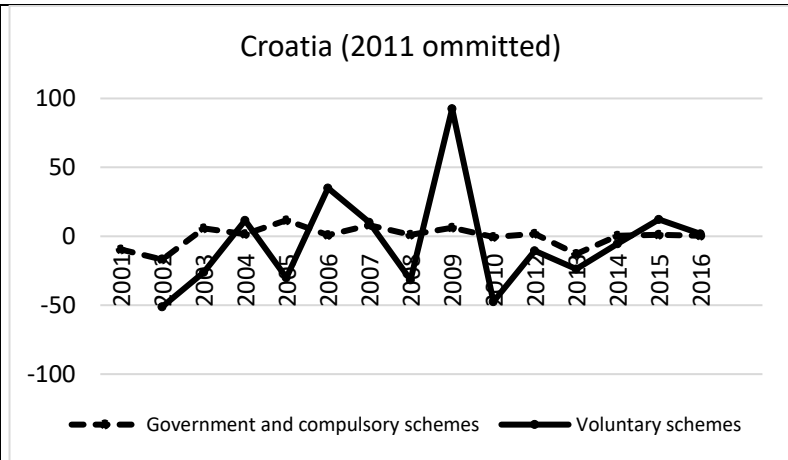
and EU Average

Source: WHO Global Health Expenditure Database
Note: From 2004 to 2007, the voluntary schemes of Greece are excluded from the average due to lack of data
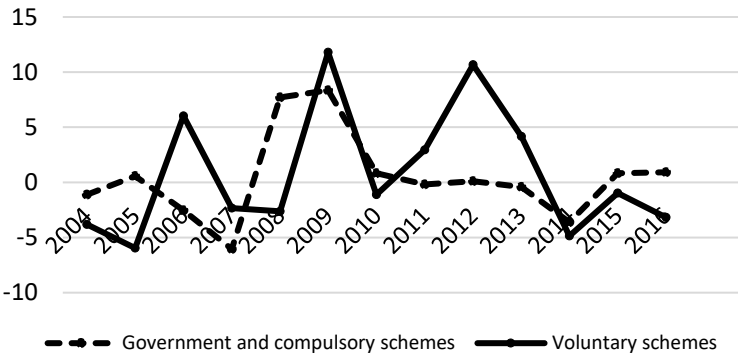

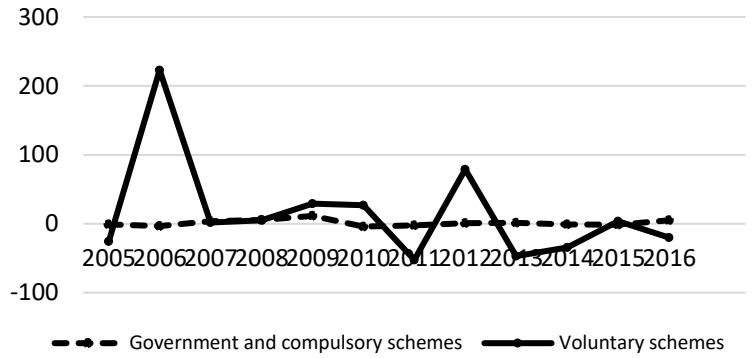*Source: WHO Global Health Expenditure Database*

Note: To avoid display issues in the figure, 2011 is ommitted: From 2010 to 2011, Voluntary schemes rised from 0.05% to 0.60 % of the GDP.
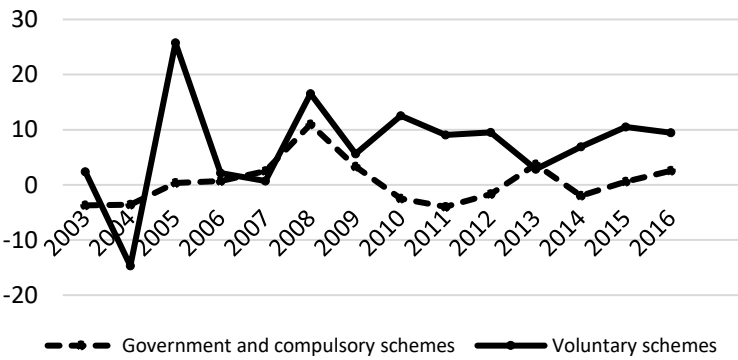*Source: WHO Global Health Expenditure Database*

Slovenia

Source: WHO Global Health Expenditure Database
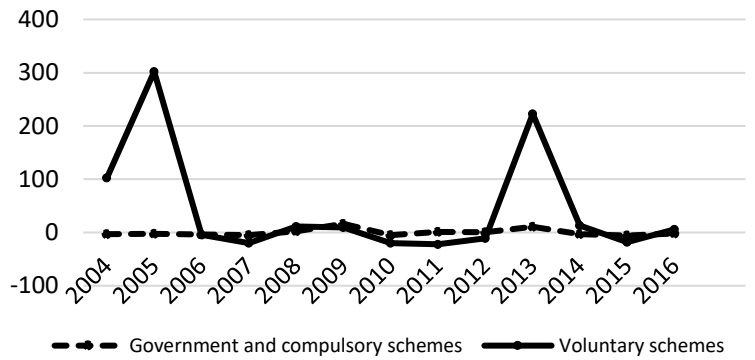
Slovakia

Source: WHO Global Health Expenditure Database
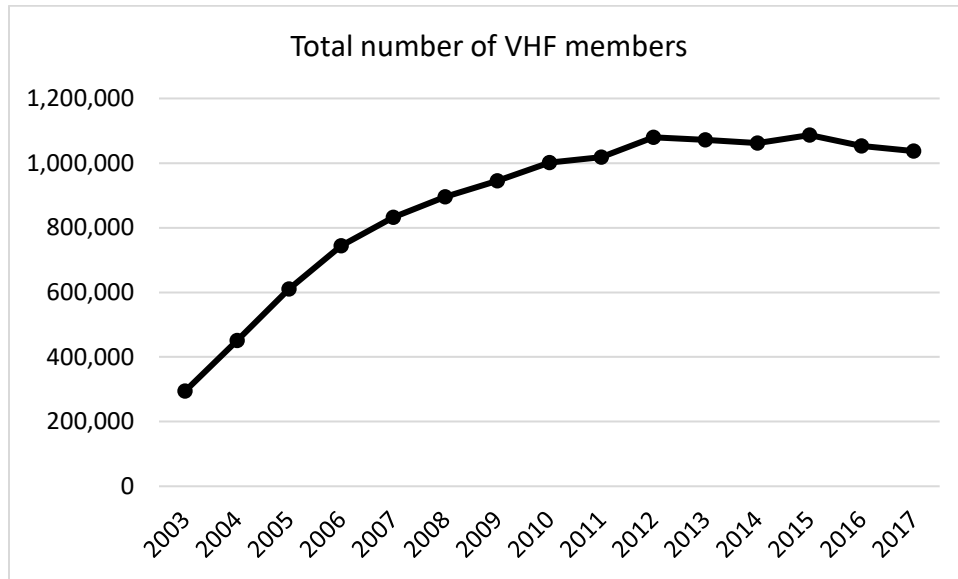
Poland

Source: WHO Global Health Expenditure Database

Czech Republic

Source: WHO Global Health Expenditure Database

Appendix B: Number of Voluntary Health Fund Members (Total and as percentage of total population)

Total number of VHF members

Source: "Golden books" of the National Bank of Hungary, KSH (Central Statistical Office)

Total number of VHF members as % of total population
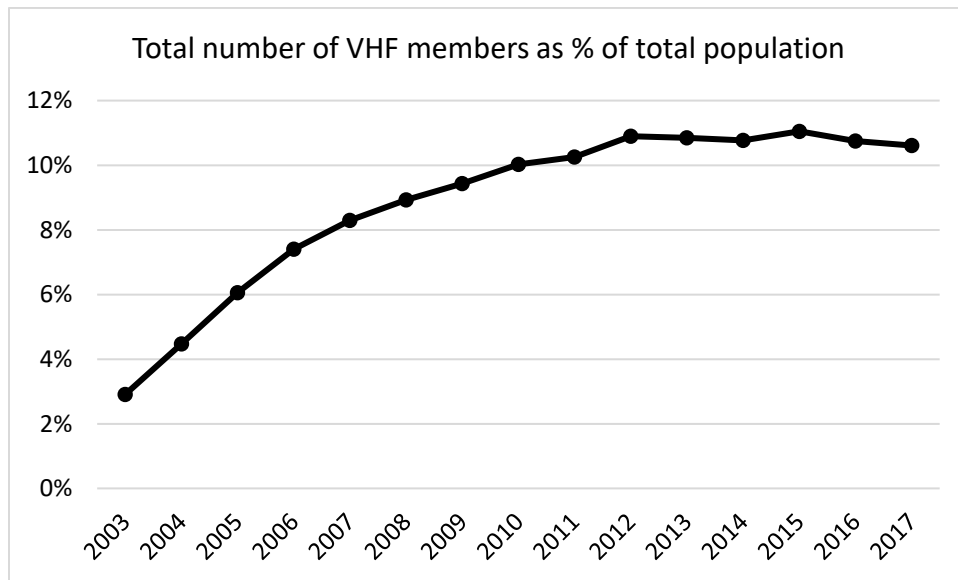
Source: "Golden books" of the National Bank of Hungary, KSH (Central Statistical Office)

Appendix C: Codes for Text Analysis in Python (2016 February)

```python
import os

import io
from pdfminer.converter import TextConverter
from pdfminer.pdfinterp import PDFPageInterpreter
from pdfminer.pdfinterp import PDFResourceManager
from pdfminer.pdfpage import PDFPage
import easytextract
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
from nltk import tokenize
from PyPDF2 import PdfFileReader, PdfFileMerger
import PyPDF2
from nltk.tokenize import word_tokenize
from nltk.corpus import stopwords
from nltk import tokenize

files_dir = os.getcwd()

tárgy = 'kórház'
tárgy1 = 'egészségügy'
tárgy2 = 'beteg'
tárgy3 = 'gyógyintézet'
adósság = 'adósság'
adósság1 = 'deficit'
adósság2 = 'tartozás'
adósság3 = 'elmaradás'
adósság4 = 'hátralék'
adósság5 = 'hiány '
adósság6 = 'hitel'
adósság7 = 'csőd'

def tsplit(string, delimiters):
    """Behaves str.split but supports multiple delimiters."""

    delimiters = tuple(delimiters)
    stack = [string,]

    for delimiter in delimiters:
        for i, substring in enumerate(stack):
            substack = substring.split(delimiter)
            stack.pop(i)
```

```python
            for j, _substring in enumerate(substack):
                stack.insert(i+j, _substring)


    return stack
```

```python
#2016 feb
filename = '1602.pdf'


all_files = list()
# Add in main text file.
main_text = [f for f in os.listdir(files_dir) if 'ny1602' in f]
all_files.extend(main_text)


# Merge the files
merger = PdfFileMerger()
for f in all_files:
        merger.append(PdfFileReader(f), 'rb')


merger.write(filename)



def extract_text_from_pdf(pdf_path):
    resource_manager = PDFResourceManager()
    fake_file_handle = io.StringIO()
    converter = TextConverter(resource_manager, fake_file_handle)
    page_interpreter = PDFPageInterpreter(resource_manager, converter)
    with open(pdf_path, 'rb') as fh:
        for page in PDFPage.get_pages(fh,
                                      caching=True,
                                      check_extractable=True):
            page_interpreter.process_page(page)
        text = fake_file_handle.getvalue()
    # close open handles
    converter.close()
    fake_file_handle.close()
    if text:
        return text
if __name__ == '__main__':
    print(extract_text_from_pdf(filename))


text = extract_text_from_pdf(filename)


tokenize.sent_tokenize(text)
text1=text.replace('-\n','')
```

```python
text2=text1.replace('-','')
text3=text2.replace('\n', '')
szöveg=tsplit(text3, ('.', '!', '?!', '?', '!?'))

lista=[]
for s in szöveg:
    if tárgy in s or tárgy1 in s or tárgy2 in s or tárgy3 in s:
        lista.append(s)
lista1602=[]
for d in lista:
    if adósság in d or adósság1 in d or adósság2 in d or adósság3 in d or adó
 sság4 in d or adósság5 in d or adósság6 in d or adósság7 in d:
        lista1602.append(d)


def extract_text_from_pdf(pdf_path):
    resource_manager = PDFResourceManager()
    fake_file_handle = io.StringIO()
    converter = TextConverter(resource_manager, fake_file_handle)
    page_interpreter = PDFPageInterpreter(resource_manager, converter)
    with open(pdf_path, 'rb') as fh:
        for page in PDFPage.get_pages(fh,
                                      caching=True,
                                      check_extractable=True):
            page_interpreter.process_page(page)
        text = fake_file_handle.getvalue()
    # close open handles
    converter.close()
    fake_file_handle.close()
    if text:
        return text
if __name__ == '__main__':
    print(extract_text_from_pdf(filename))

text = extract_text_from_pdf(filename)

tokenize.sent_tokenize(text)
text1=text.replace('-\n','')
text2=text1.replace('-','')
text3=text2.replace('\n', '')
szöveg=tsplit(text3, ('.', '!', '?!', '?', '!?'))

lista=[]
for s in szöveg:
    if tárgy in s or tárgy1 in s or tárgy2 in s or tárgy3 in s:
```

50

```
            lista.append(s)
lista1612=[]
for d in lista:
    if adósság in d or adósság1 in d or adósság2 in d or adósság3 in d or adó
sság4 in d or adósság5 in d or adósság6 in d or adósság7 in d:
        lista1612.append(d)

                                                              In [ ]:
import csv

csvData = [['month', 'occurance'], ['2016feb', len(lista1602)], ['2016márc',
len(lista1603)], ['2016ápr', len(lista1604)], ['2016máj', len(lista1605)], ['
2016jun', len(lista1606)], ['2016jul', len(lista1607)], ['2016aug', len(lista
1608)], ['2016sep', len(lista1609)], ['2016oct', len(lista1610)], ['2016nov',
len(lista1611)], ['2016dec', len(lista1612)]]

with open('wordcount_2014_1.csv', 'a') as csvFile:
    writer = csv.writer(csvFile)
    writer.writerows(csvData)

csvFile.close()
```

Appendix D: Efficiency of the Hungarian Hospital Sector analyzed by DEA (Input-oriented, CRS Model)

Year	Input-Oriented CRS Efficiency
2003	0,91315
2004	0,94346
2005	0,98873
2006	0,96937
2007	0,98006
2008	1,00000
2009	0,99407
2010	0,93540
2011	0,95421
2012	0,90886
2013	0,87776
2014	0,93540
2015	0,94843
2016	0,93179

Sources: OECD and NHIF

Appendix E: Changes in the Number of Physicians, Hospital Beds and the Average Length of Stay in Hungary (1980-2000)

Inpatient Care Average Length of Stay (Hungary)

Physicians, Density per 1 000 population (head counts) in Hungary

Total Beds in Operation per 10.000 inhabitants in Hungary