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EVALUATION ANALYSIS OF PROCEEDED AND ONGOING ECONOMIC EFFECTS OF INTEGRATION PROCESSES IN THE INSTITUTIONAL SYSTEM OF HEALTH CARE

Theses of PhD Dissertation

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1. Research background and objectives

1.1 Introduction, actuality

A country's competitiveness is significantly affected by social factors, their functioning is reflexive to the economic performance, and so research in these areas in recent decades increasingly come to the fore. In welfare functions health care has a distinguished role among supply systems, its direct and indirect effects can be demonstrated by statistical methods. Globalization, social development has brought technical, technological change in health care, and a necessary consequence which is the demand on health systems transformation, to create response capability, reconsideration of financing and efficiency issues. Globalization of health care, besides introduction of new technological procedures and medicines into the system, motivates labour migration of doctors and other professional workers to other countries, and also causes appearance of crisis factors in health care.

Solving structural problems of health care is appreciably influenced by scarce degree of public health expenditures and outdated, run-down equipment, operation and actuation of health system affects other areas of economic expenditures and impacts state stabilization programs.

Many experiments have been made to transform health systems and eliminate structural problems - different models from country to country -, but the development and implementation of the planned model usually met obstacles right at the moment of creation due to various interest divergences. Basis problem of medical modelling is the different structure of social, ownership, economic, environmental, medical professional and system approach, so difficulties of transforming can be originated mostly from interest-conflicts and different approaches.

Situation of health care remains one of the most urgent social and economic issue in almost all countries on the continent.

Due to insenescence of population and innovative evolution of healthcare the demand for health care services is continuously increasing. The experienced technical and technological development in medical attendance transforms all segment of health care operation.

1.2 Tasks and objectives of the research

First task of the research is to overview the economic background and the operational environment of health care on the basis of relevant domestic and international literature. The thesis is emphasizes the international comparison of the Hungarian health care situation; because the need for integration and its developed direction, implementation and process, the necessary change direction can only be examined in the view of these data.

Second task of the research is to review research results involving hospital operation, comparison of national practice and international trends, evaluation analysis on inducing components of domestic and international integration processes.

Third task of the research is evaluation analysis on the economic effects of the proceeded and current integration processes in the institutional system of health care.

The thesis focuses on the inside the system of healthcare providers on the investigation of the management in given period of the individual integration-involved hospitals.

The thesis visualises besides the ineluctability and process examination of hospital network transformation and also other areas of the health care reform process to the necessary extent. The primary and outpatient care appears only in the context and linkage of hospital medical attendance, because in the investigated period of 2007-2013, from the reform ideas significant, meaningful results in these areas failed to been produced.

The analysis does not affect the sector as a whole, however, chapter Conclusions formulates - because of the size and interdependence of the sample - conclusions and recommendations which can be applied to the whole sector.

The first objective of the research is to collect and adapt primary and secondary information originated from external and internal materials to components relating to health care, to factors that influence the necessary reform of the health-care referring to inducing processes of health care provider's integration, together with data analysis and drawing conclusions from them.

The second objective is by applying primary research to monitor integration effects on hospitals in the periods between 1990-2006 and 2007-2013, and to analyse the necessity, directions and turnarounds of each process.

The third objective is to investigate the institutional annual financial reports of the hospitals on index-based systems to determine whether the earlier proceeded restructurings of hospital institutions has brought the expected results in the field of cancelling indebtedness and improvement of liquidity situation.

The purpose of research is to determine whether individual institutions can be classified to a cluster on the basis of hospital reports, and whether a set of rules created from the reports can be set up for each institution type operating at the same level of progressivity. Another purpose is to examine whether it is possible to set up a model based on the main characteristics of the financial reports of institutions after hospital integration, which may project further success of the later feasible institutional integration.

Further question is if a bankruptcy model examination is applicable on the basis of the index-numbers to predict if a government intervention is necessary in the given medical facility to stop the gearing processes and to restore liquidity.

1.3 Research hypotheses

The author tends to take statements and conclusions of the dissertation from the national and international scientific literature, researches carried out by his own and others, from statistical reports, studies and personal experiences acquired at some of the integration process.

H1: Development of health care system structure is significantly influenced by the environmental components, without assessing these integration processes the aimed transform of the health care system should not be initiated. Current negative health indicators of domestic society are disadvantageously affected by the inadequacy of funding for modern prevention and health development methods and technologies and the existing structure of health care.

H2: The extent, quality and utilization of health expenditure significantly impacts on employment, social and economic development, so health care reforms have effects on economy as a whole.

H3: The welfare role of state, evolution of debt, health care expenditures distribution between public and private sectors, as well as some additional distortion factors had significant impact on the envisioned integration processes of health care institutional system. Health care institutional emission has close ties with the debt, reveals the effectiveness of financial shocks and reform experiments to debt.

H4: Index-number- and bankruptcy models used in corporate practice, just as multivariate statistical procedures - even if under certain restrictions – are suitable to predict financial crisis situations of hospitals. Hospitals can be classified into clusters by complex synthesis of index-numbers, the phenomena type can be observed, but because of the inherited structure and different scope of duties of institutions results can be generalized only after further investigation.

H5: The integration processes implemented in health care institutional system between 2007-2013 have improved transparency of management, regularized ownership and maintainer conditions, but in institutional debt reduction and liquidity augmentation failed to achieve significant results.

H6: Central measures on health institutions initiated similar processes in the financial situation of individual hospitals, but in certain areas differentiated impacts are displayed depending on the type of institution.

Hospitals have responded differently on governmental actions in the field of debt increase and liquidity deterioration.

2. Content, methods, justification and limitations of the research

2.1 Data sources in research

The empirical research is typically built on four separable databases and applies four different methodologies; the author draws conclusions from the analysis of these, and formulates his proposals.

2.1.1 Domestic and international databases

Relevant literature on health care with the common theme of the dissertation was determined on a basis of an executed search on EBSO EDS common search interface, and the Google Scholar database. The resulting databases was supplemented by health care related publications of Springerlink database, the Searchable Database of Table of Contents of the Hungarian Periodicals, the online catalogue of the National Széchenyi Library (Országos Széchényi Könyvtár), and on the Internet available Electronic Periodicals Archive and Database. After aggregation and filtering the obtained data was the literature selected and processed.

For the secondary research the basis was provided by on the Internet available and downloadable annual statistics on the websites of Central Statistical Office (KSH), National Health Insurance Fund (OEP), and by GYEMSZI analyses, information materials. The study of international trends and practices of each country was helped by Eurostat, OECD databases besides the analyses of GYEMSZI. The author had experienced numerous differences among the domestic, Eurostat and OECD databases, so in the course of processing for the sake of comparability - those databases were taken into account, which contain more detailed information.

2.1.2 Reports of the hospitals

The reports of hospitals were not available in uniform structure during the period 2007-2013, so this thesis processed in the hospital institutional reports from 2012-2013. Analysis of the hospital institutional reports of 2012 and data-matching into a unified report format generated by the author was realized in case of 67 hospitals. Converted data for each report had been created by direct data communication of the hospitals and processing of public databases. Data of 96 hospital reports from the 2013 period were pooled and analysed; this growth in the number of elements is the result of a clean-out and more consistent operating and reporting structure of the hospital sector. The reported data provided adequate database for the scorecard analysis, correlation calculation, factor and cluster analysis and regression analysis (ANOVA).

2.1.3 Usage of in-depth interviews to get acquainted with the opinion of contributors' who participated in the implementation of integration

The qualitative study was carried out by using in-depth interviews with the aim of understanding the opinion of managers who determines the strategic issues of health care, operational executors and analysts-consultants. Duration of the 10 in-depth interviews was ranged between 45-120 minutes, during which opportunity was given to learn about opinions coming from different approach points. The approach from different stances facilitated the understanding that the health problems cannot be solved purely on the basis of economic considerations, and a model which formed only on the basis of economic criteria how to become unserviceable because of social resentment and resistance of various stakeholders.

The documentation of in-depth interviews were made by taking notes, during preparation the author used the questionnaire and list of codes as guiding principle laid down in the Annex. The in-depth interviews were carried out in all cases using two-way communication, besides answering the questions the interviewees were allowed to express their views on the given subject from their own standpoints. The interviews helped the understanding of earlier reform processes, the background of those problems of the integration processes which the executors met during the operational work of implementation.

2.1.4 Questionnaire survey of social opinions on the effects of health care integration

To confirm the hypotheses primary research data had been added to the secondary database, which was aimed to monitor deductible conclusions during the analysis of secondary data base, and to examine how society judge the effectiveness and results of health care integration on their own experiences for the quantitative research - analysis on effects of health care integration - a 50-item questionnaire was compiled and sent out between 16 September 2014 and 9 October 2014 (n = 402). The group of respondents was not limited to the health sector workers, the online questionnaires were forwarded by health institution managers and public sector senior managers, auditors and chartered training students, students of Economics University forwarded to colleagues, school-fellows to ensure the diversity of the sample. The number of returned and evaluable questionnaires was 382, on which besides the application of $p < 0.05$ significance level, several statistical test were conducted (descriptive statistics, basic frequencies, crosstabs analysis, Chi-square ($\chi 2$) statistical test was made).

The primary goal of combining quantitative and qualitative methods is to control the quantifiable part of research, to integrate the different points of view, to increase the credibility of the research and supervise its reliability.

2.2 Research methodology

2.2.1 Application of index-numbers and bankruptcy forecast models

Business organizations make an annual report of their assets, financial and income situation, results of their business activity that provides a true and fair general aspect. The hospital reports due to maintainer change were published in some years in different structure and data content; so such a table system was developed in which the variable data content become adaptable. After pasting them into the uniform reporting system the opportunity was given to develop scorecards and perform calculations. The investigation of financial institutional reports on the grounds of factor and cluster analysis and bankruptcy forecast model is based on the classification and analysis of the index-numbers.

Through application of scorecard systems the organization's operation is cognizable and to reveal the problems occur in management processes become possible. Although governmental institutional reports are made typically with other data content and forms such as company reports, the applied index-numbers and the conclusions drawn from them can be similar.

According to the factor analysis investigation of the year 2013 in relation to the most representative conglomeration of institutions - taking into account the applicability of specific index-numbers of the budgetary sector - was further analysed by traditional scorecard analysis and bankruptcy model testing. The bankruptcy prediction, as a crisis forecasting model usually relies on multivariate discriminant analysis method by which the performance of individual companies in the public sector can also be evaluated.

2.2.2 Processing of hospital reports with correlation calculation, factor- and cluster analysis based on index-numbers

Framing a unified Excel database from the report figures made the statistical analysis with SPSS for Windows program system possible.

To investigate linear relationship between indicators of annual reports in the context of years 2012-2013 correlation calculation was made. To prepare the correlation calculation 8 indicators were selected in 2012, which made possible the analysis on the debt, liquidity, and financial situation of the relevant institution.

Determination of index-numbers of the year 2012 was processed by taking into account the number of items used in factor analysis; for the year 2013, depending on the larger number of items (96) other indicators also could be used.

As a continuation of the analysis from the data of years 2012-2013 cluster analysis was performed, on the basis of the variables the involved hospital institutions grouped into clusters or separated from each other.

The 2012 clusters has been developed and analysed by the factors of indebtedness and liquidity, the 2013 clusters were analysed in the cross-section of 3 factors (debt, liquidity, capital intensity) because of the larger sample size and analysis on more index-numbers.

2.2.3 Investigation of clusters based on variance-analysis

The developed clusters should be subject to several further investigations to determine whether these really differ from each other. In case of automatic presumption of differences can lead to false conclusions, so according to different variables the expected value dissimilarity of certain clusters required to be tested by other methods. Numerous methods are available for testing different plurality; the selection of them depends on the item number and characteristics of the given sample. In case of large item-numbered samples, for testing the combination of individual effects, for investigation with more variables, for controlling the expected value conformity of clusters variance analysis (ANOVA) provides an appropriate tool which tests the significant difference between the expected values.

According to the null hypothesis test, the expected value of all groups are the same, the alternative hypothesis is that not all the same. If there is a wish to conclude to all groups a so-called post hoc test must be finished within the frames of ANOVA. The conformity of the standard deviation of variables is necessary to be checked also in this case; with application of the SPSS 19 analysing program during the post-hoc tests it is possible to carry out such tests, in which the same deviation is assumed and also that the deviation conformity is examined separately by the program.

The individual, which was classified into a separate cluster by the procedure, shall be considered as extreme individual (outliers), and cannot be involved in further examination because its analysis is not interpretable for ANOVA. The dissertation adopted two types of variance analyses to examine the effects of the independent variables, separately for the years of 2011-2013 periods. In the first case the conformity of expected values of the clusters was tested for factor variables, in the second case for those original variables which were involved into the configuration of factor variables. During the development of factors the program configures such factor variables, which average is zero and the standard deviation is unit. For the factor variables a test can be reasonably performed in which the identity of deviations is presumable. From the tests offered by the SPSS for Windows 19 program the LSD test was selected. If the ANOVA was performed on those variables, which were the base of the factors that had been created, equivalent standard deviation cannot be automatically assumed, so for these variables Tamhane's T2 test was applied.

2.2.4 Analysis of debt on the basis of ARIMA model

The thesis fixes the possible relationship between the debt and the economic performance of social services. The purpose of the investigation on one hand is to indicate how closely connected the output to the debt in the case of the selected institutions, on the other hand to show the impacts of financial shocks and reform efforts on the debt. The strength of the relationship between output and debt was determined by applying a correlation coefficient. To measure the effects of shocks a more complex analysis had become necessary to carry out. The timeline of frequency per year debt data was not long enough, so due to insufficient sample size the time-series analysis with annual data was inexecutable. Therefore in the dissertation an estimation of quarterly-frequented time-series of net debt calculated from the data of the annual institutional reports and net supplier debt was performed. The disaggregation was made by univariate linear regression analysis using the SPSS 19 software package. To perform disaggregation and for the annual distributable frequency time-series such an indicator must be found, by which the evolution of annual time series can be well-explained. It is essential that the annual and quarterly-frequented time-series of the indicator is also available. By means of linear regression model fitted to annual data and quarterly indicator time-series a calculation of the estimated quarterly data can be casted to the time-series to be distributed. After the distribution a so-called balancing is still necessary to carry out, as the sum of the estimated quarterly data would not be identical to the annual time-series data, the estimated quarterly data are to be adjusted. For this way reconstituted quarterly-frequented time-series ARIMA models were adjusted by applying SPSS for Windows 19 program. From the analysis of parameters and extreme values of the adapted ARIMA models conclusions can be drawn how the shocks appeared in 2007-2013 period affected the indebtedness of individual hospitals.

2.2.5 Proceeding research questionnaire

After processing the research questionnaire in Microsoft Excel it was analysed by means of SPSS for Windows. During the application of different tests the value of the type I error can be determined; it is compared to the significance level. For correspondence analysis of the variables of the questionnaire cross-examination, as analysis method was selected. In Chi-square test of independence could be used, the low Chi-square value signs independence. From the calculated Chi-square the potential type I error can be derived with Chi-distribution. The thus obtained value can be compared with a theoretical value (significance level) and on this basis is to decide to confirm or reject the hypothesis. According to null hypothesis of the Person's Chi-square ($\chi 2$) test the estimated and measured data are the same, so there is no correlation between the two variables.

Chi-square test compares the number of observed cases in each cell with the expected number of cases that would be obtained if there was no relationship between the two variables. One of the main features of the Chi-square statistics to be sensitive to the sample size, because the Chi-square linear depends on the item number of the sample, so at the same distributions the phenomenon can occur that the two variables at low-numbered sample do not show significant results, while at relatively high number of elements do.

3. Results

3.1 Results of literature survey

In accordance with H1-H3 hypothesis and in connection with the literature survey, and with the in-depth interview research the following results were aggregated:

The current operation and status of economy reacts back to financing and applied structure of health care and limits its development possibilities.

Ensuring equal opportunity affects the definition and operation of health care structure, therefore in the development of the health care system is a key issue to clarify what is deserved or available in the frame of free medical attendance. Health care cannot take over the role of social safety nets; their involvement in health care may adversely affect the financing and structural aspects of health care. Bad structure of health care expenditures and parallel the development of the given hospital construction is determined by the way of life of population, and considerably influenced by evolution of civilization and the low level of health expenditures.

The given demographic and epidemiological values of population should be considered in all cases during establishment of health care structure. Investigation of the causes of death structures basically determines the evolving of necessary hospital structure, i.e. the inpatient and outpatient medical attendance must be planned to the most frequently occurring diseases.

The examination of the mortality statistics is a basis in order to decide what kind of hospital institutional system should be built up; in addition the number of diseases determines the amount of required funding, the necessary investments on technics, technology and human resources. The sustainment and improvement of healthy lifestyle affects the institutional and supply structure of health care, as well as the changes of problems in health care financing.

In Hungary medicine consumption is causelessly high with overloaded healthcare funds, which means fewer resources are available for application of modern preventive methods. The research considers that in case of healthy lifestyle of society the costs spent on necessary infrastructure for medication of other diseases related to obesity can be reduced. Thus, treatment of the diseases and healthy lifestyle determines the development of hospital

structure. The research conceives that without involving market elements and external sources, with the same government maintenance level the current financing of healthcare supply system is unsustainable.

According to the author’s viewpoint, the creation of adequate infrastructure is indispensable in our country's health care supply, because in this area backwardness is significant. Infrastructure means modern, quickly and effectively intervening patient transport, as well as equipped and up to date outpatient and inpatient care in available distance.

During the establishment and operation of the primary, outpatient care and special hospitals, it must be considered in particularly that average age is increasing, the patients resorts most of the health services in the last years of their lives.

Strategic thinking about health care should include the planning of investment, financial, operational, material and human resources factors of health care. The conclusion can be drawn from the dissertation that there is still a need for development of specialist hospitals with national scope, especially in the field of children's hospitals and psychiatry. It is also a research result that certain specific activities of the so-called small hospitals must be reduced and their profiles must be established with the optimization of financing and demands.

The research presumes that of existing debt level of the state exerts negative influence on health funding opportunities, so the government try to keep the level of the health system operation predominantly with introduction of cost-cutting measures.

According to the author's view the measure of the existing debt cannot be the reason for that the operation of health care system which has adequate human resources background is to become unfeasible due to decreasing or due to remain on nominal level funding.

Reform requires investments, i.e. time and appropriate level of investments is necessary to strengthen primary and outpatient attendance, to revise pharmaceutical market and to rationalize hospital structure. The conclusion of examination on H3 hypothesis of the research is that it is supportable with common analysis of debt and output that in Hungary in case of each institution state funding is insufficient, and how permanent is the effect of certain reforms attempts and financial shocks.

The intervention experiments on domestic health care debt are featured by the **additive outlier.** Compared to neighbouring countries health expenditures are on a lower level, private sector ratio and presence of gratuity have distortive effects on visualised reform processes of health care, the degree of cost changes was not taken into account in hospitals funding.

The number of hospital beds is sufficient compared to neighbouring countries, but there are significant cost implications of this fact.

In recent years the number of doctors and special medical attendances is considerably reduced. The reasons over low moral and financial appreciation are originated in working conditions and in workload coming from decreasing staff. To develop family doctor system,

broaden competencies, provide financing conditions are immediate tasks for the reform planners of health care institutional system. Implementation of health care reform was affected in negative direction by the availability of financial resources, the potency of the envisioned reform was lost, and politics has been backed out of the support of the entire implementation process of the in 2011 self-formulated Semmelweis-plan.

3.2 Factor and cluster analysis results based on the data of 2012 hospital institutional reports

In 2012 data of 67 hospitals were analysed from the aggregate report balance data, based on 8 indicators. During the analysis it is recognizable that except for the ratio of current assets, the standard deviation of all the calculated indexes is significantly different from the mean values, i.e. on the basis of the applied metrics there are well-managed and less well-functioning institutions. Low value of the ratio of current assets (15.12%) and the mean deviation of 9.7% indicates that the liquid assets of the analysed institutions ran out on around the same level, the have small stocks and as typical for this way of operation they have low amount of accounts receivables and cash and equivalents.

As summation of the correlation calculation it is statistically demonstrable that the statements fixed above also proper for health care provider institutions, i.e. if the capital intensity increases, coverage of fixed assets also rises; but if decreases the ratio of indebtedness increases, which indicates deterioration in the financial situation of the given institution. Debt rate and capital intensity, as well as coverage of fixed assets are in negative relation, if one increases, the other decreases, so when debt situation worsens (i.e. the index increases), it weakens the capital intensity.

From index numbers factors were configured, from indebtedness and liquidity factor cluster analysis was composed, by dissection four significantly different clusters can be separated. The institutions typically belong to the same cluster, which is characterized by low liquidity and indebtedness.

Three institutions belong into the second cluster, which struggle the same level of indebtedness as in former cluster, but survive with earlier reserves.

The third cluster includes only one institution, which has sufficient liquidity besides the indebtedness to adapt to strategic changes.

The situation of Cluster 4 is the most problematic, according to its indebtedness and liquidity it cannot recover on own efforts, government intervention is necessary.

From the factor analysis results of created indicators originated from the 2012 reports data, according to the analysis of the H4 and H6 hypothesis the conclusion can be drawn that hospital integration induced processes in financial positions of the certain institutions, but

there are ranges of activities, where financial decisions and its effects should be modelled for the given hospital, because only this way it is perceivable what consequences accompany later on.

3.3 Factor and cluster analysis results based on the data of 2013 hospital institutional reports

Increase in the number of institutions in the 2013 report (96) made it possible to examine the mean value of 17 secondary index numbers. Compared to the year 2012 the general financial and liquidity situation of health care has not improved.

During evaluation of standard deviations it is experienced that the difference from the average was usually small. The values and measures of standard deviation indicate that the judgment of individual institutions only in case of combined analysis of economic situation and operating environment may result and approach reality. Concluding from one index number can mislead the evaluator. The ratio rose 0.51 points, however, the quick liquidity ratio fell 0.09 points, which means that the ratio of inventories slightly increased. The liquidity ratio is still above 1, but taking into account the possible cancellation or decreasing level of consolidation support, the current mean value of the index refers to general liquidity problems. Decreasing value of the quick liquidity ratio indicates that the financial stocks - cash flows - of the institutions dwindle. Besides examining the average, the remarkable value of deviation is warning, i.e. institutions certainly exist which liquidity refers to bankruptcy situation. In contrast to the 2 factors of 2012, taking into account the number of indicators, 3 factors were configured, all indicators are located in just one factor.

On the first factor liquidity, on the second factor capital intensity, while on the third factor the debt (indebtedness) unfolds. The cluster analysis classified the examined hospitals on the basis of liquidity and capital strength factors. All institutions, except four hospitals are struggling similar financial situation. In the point of debt, capital intensity and liquidity factors during the analysis the same testing results can be observed. Depending on the examination, factor and cluster analysis as statistical methods can be suited to determine through indicators system the phenomena type of health care institutions belonging to one cluster.

The entry or exit from the cluster would indicate the difference from average performance, which can induce further investigations.

Examination of clusters belonging to the H4 and H6 hypotheses testing pointed out that although central integration actions of the government can induce similar processes in the financial situation of the individual hospitals, but there are some operational areas where a financial decision and its effects should be modelled for the given hospital separately.

3.4 Examination of clusters with variance analysis

Further examination of each cluster was implemented by the means of variance analysis; during this the research drawn conclusions from comparisons on samples of mean values of more than two plurality. In case of data from year 2011, a 62- and a 4-element cluster were compared. The results show that in the first and third factor variable (capital intensity and indebtedness) the two groups differ, in the second factor variable (liquidity), the difference is not significant (0.319> 0.05). The executed test on variables involved in factor analysis confirms this result; in case of the liquidity ratio and the quick liquidity ratio the difference between the two groups is not significant (these variables were classified to second factor variable, their significance levels are 0.288 and 0.299 one by one). In case of expiration ratio indicator difference is barely not significant (0.058> 0.05).

In case of data from year 2012, the number of elements in the investigated clusters is 67, in which the number of items belonging to the largest cluster is 59. According to the analysis on both variable groups the determined expected value of the tested variables cannot be identified on the usual 5% significance level.

Analysis of the 2013 data showed that in the two examined cluster 96 elements, 92 and 3 and 1 hospital are located. This year according to the factor analysis on the third variable factor (indebtedness), the expected value of the two groups is not different (0.152> 0.05). Into the third factor the debt-descriptive variables were ranked, this is confirmed by the second test, in the cases of net debt and net supplier debt indicators the difference of groups is not significant (0.126> 0.05 and 0.604> 0.05).

Results of the ANOVA test on clusters confirm the hypothesis H5, the difference between the two clusters can be determined. To 2013 from the larger cluster characterized by negative indebtedness indicator the smaller cluster does not differ significantly; i.e. proceeded integration processes do not improve affirmable the financial situation of the hospitals. ANOVA tests confirm the hypothesis H6, namely the differentiated impact of government interventions, because according to the dissimilarity analysis of the 2011-2013 clusters, not the same factors are significantly different. While in 2011 liquidity-descriptive factors were not different, in 2013 the diversity of indebtedness cannot be verified. The research concludes that the negative liquidity situation of slightly indebted hospitals in 2011 resulted a worse debt position in 2013. In connection with the testing of hypothesis H4, results can be stated that the differentiated effects occurring in operation of each institution can be observed in the deterioration of the situation of those institutions which had been previously in relatively better debt situation.

3.5 Annual output of Q Human health and social care sector and correlation of net debt of the hospitals, ARIMA model

During the tests of the factor and cluster analysis, and the cluster examinations on the basis of variance analysis it can be stated that in the test period in the cluster which contains more than 90% of the elements, the indebtedness increased and liquidity deteriorated at the hospitals.
The 1 element-cluster cannot be considered an independent group, so 4 elements were selected from the largest cluster.
Based on the correlation coefficients in case of B-1 and P-2 hospital there is a strong linear relation between the net debt and the sector output, from which it can be concluded that at these hospitals financing and output is essentially independent. In the case of Sz-4 hospital correlation is moderate, while at the Sz-3 selected hospital linear relation is specifically weak. This is due either to the fact that financing and output has the closest relation at this hospital, therefore debt does not depend on output.
During the significance examination of financial shocks the net debt of hospitals were disintegrated to quarterly time-series. In disintegration a linear regression was adjusted first on the net debt of hospitals, the explanatory variable was in each case the output of Q Human health and social care. B-1 hospital has significant positive correlation and regression fitted on data of P-2 hospital is acceptable. The correlation was very weak at Sz-3 hospital, so in line with expectations to this data series a significant model could not be applied. The correlation between the Sz-4 hospital and the examined economic sector was moderately strong; the regression fitted to the data is still not acceptable.
Quarterly data at current prices of Q economic sector were not available, so to estimate these the annual data were allocated in the ratio of gross value added on current prices of public administration, national defence, compulsory social security, education, human health and social care. The ratio of gross value added and output is assumed to be constant in a year, so estimation does not cause significant distortion. The upward trend in net debt is most typical at the hospital 2., smaller but growing debt features hospital 1.
The debt of Sz-4 hospital was low in 2010, but continuous growth is not typical, while the Sz-3. hospital's net debt is higher in 2009-2011 than in other periods. The net debt trend of Sz-3 hospital appears to be a classic case of the levelshift outlier, i.e. the hospital was apparently less favourable financial position between 2009 and 2011 than in other examined years.
For further continuation of the investigation, ARIMA model was fitted to the quarterly time-series. In this the difference and the order of AR and MA members' could be determined by means of autocorrelation and partial autocorrelation functions. In case of the 4. selected hospital ARIMA model fitted on the prime difference of net debt, so it is interpretable for net debt change. From the data of the adjusted models it can be concluded that although the quarterly allocation was proceeded on the same time-series, however, the characteristics of

the allocated time-series are not the same, so the same ARIMA model cannot be fitted on them. At the examined hospitals seasonality is not the same, for example in case of Sz-3 and Sz-4 hospitals there is no significant seasonal dummy. At hospitals B-1 and P-2 seasonality was observed, from outliers only additive outliers were significant. Changes that took place in 2012 reduced the debt change at all hospitals, although the events in 2009 increased the net debt change at all hospitals, excluding the Sz-4 hospital. This hospital is also an exception, because such a change occurred in 2007, which led to a significant increase in the debt.

At the Sz-3 hospital due to the fitting of outliers into the model the entire ARIMA model became significant, but in the case of Sz-4 hospital fitting the external shocks into the model did not helped to improve appreciably the parameters of the model. According to the **hypothesis H6** formulated in the thesis, central actions improved the financial situation of the individual hospitals, but also differentiated impacts appeared depending on the type of institution. H6 hypothesis is confirmed by the analysis carried out by means of ARIMA, since under-financing was not the same for the four selected institutions. Among the shocks occurred in the examined period not all of them were significant and equivalent for each hospital. The shock appeared at the beginning of 2012 reduced the increase of the debt at all hospitals, although not in the same extent.

In case of examined hospitals it is demonstrable, that the effects proved to be non-recurrent; enduring impact, trend-change and new track position of the debt was not detected. In evolution of net debt it would refer to long lasting results and structural changes if a level shift or transitory change outlier managed to be revealed in the time series of examined institutions. The absence of level shift outliers or transitory change outlier **confirms the hypothesis H5;** i.e. in the period under review the proceeded integration processes improved the transparency of the management, but in the evolution of debt failed to achieve considerable results. All these confirmed **hypothesis H6**, **according to which** the government measures launched similar processes in the financial position of the individual hospitals, but differentiated impacts also appeared depending on the type of institution. Hospitals had responded differently to a governmental action both in the field of debt increase and liquidity deterioration.

3.6 Case study

According to the cluster analysis of year 2012-2013, the P-2 Hospital – Clinic belongs to the cluster which includes the largest conglomeration, it is the 52. element of examined institutions. The mean values of the indicators are significant for the given institution, so with application of further methods - as typical individual, as well as an institution aspires to leading hospital title – it was examined with other considerations. The integration of P-2 was

carried out in 2007. This integration was maintained despite several policy debates also during the transition in 2011-2012.
During the past decades P-2 Hospital - Clinic has subsisted several consolidations; therefore, it can present the possible effects of integration by means of examination of indicators.
According to the tests of **H5, H6 hypotheses** the dissertation settles that the integration in 2007 of P-2 hospital, as a capital city institution, has not produced the expected results for those, who define organizational changes. The indebtedness and liquidity problems without PVL (performance-volume limit) resolving the institution is unable to solve.
Present research considers that for the institution a non-recurrent full consolidation is only a partial solution on the way out of the debt trap. State investment on capital replacement is necessary, because without infrastructure with the existing means the consolidated (integrated) institution is unable to perform the efficiency-productivity requirements.

3.7 Bankruptcy model investigation

The P-2 hospital was analysed via bankruptcy model of the indicators composed from the annual reports of years 2007-2013.
The Comerford analysis indicates bankruptcy each year at the institution and the value shows deteriorating situation year after year. This result is essentially equivalent with the image recorded in the cluster analysis.
Analysis implemented on the basis of the model of Miklós Virág declared the institution insolvent in the reviewed years and the calculated values indicate a more unfavourable situation year after year.
The canonical discriminant - model analysis of Ékes did not indicate unequivocally the threat of bankruptcy, but the financial problems were clearly foreshadowed.
Since two of the three bankruptcy analysis clearly shows the position of insolvency at the institution, it is ascertainable that the liquidity problems of the hospital are also confirmed by statistical analysis.
During the examination of hypothesis H4 the research verified the possibility of using bankruptcy models for the analysis of health care sector. In the dissertation indicated limitations of examination and bankruptcy model type are related to the accrual basis approach of the annual reports; from 2015 the analysis may be supplemented by elements of the income statement, so other bankruptcy model types can be involved into the research.

3.8 Results of the questionnaire survey

Analysis of the questionnaire survey desired to confirm the social affirmation of the conclusions to be drawn from the investigations, i.e. certain components of health care are how evaluated by the patient.

According to the evaluation of the dissertation the questionnaire survey belonging to the testing of the hypotheses H1-H3 and H5-H6 pointed out that the transformation experiments of health care were not successful.

Public opinion is not satisfied with the medical treatment, considers low financing of health care and straitened (restricted) capacity, long waiting times, as well as the infrastructural status of health care institutions as significant problems.

4. Summary of research hypotheses

4.1 Summary of research hypotheses

This section summarizes the confirmations or rejections of the formulated hypotheses.

Hypotheses	Research result
H1:	confirmed
H2:	confirmed
H3:	confirmed
H4:	confirmed
H5:	confirmed
H6:	confirmed

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4.2 Summary of new and novel scientific results

The author from the literature survey and on the basis of the conducted tests formulated following new and novel scientific results:

T1: **Taking into account also the international comparison of national epidemiology, mortality, morbidity data, the problems of the health system cannot be tested partially. Considering the effect of environmental elements of the health care system and the complexity of the system is possible to reveal problems of the hospital care system, to plan and execute its reform and integration.**

The current structure does not place enough emphasis on prevention and on the development of primary care. The demographic, epidemiological, mortality trends which affect the healthcare sector generate continuous growth in demand for inpatient

care. Reduction in productivity due to demographic trends and poor health situation of the population hinders funding opportunities.

Inadequate financial background of modern health development methods and health promotion technologies has significant negative macroeconomic consequences already in the short and medium term through the deterioration of public health indicators. For cost-benefit analysis a more important role should be provided in this area, even in the face of the existent budgetary constraints. The individual participants in the society are willing to spend more on services beyond the social insurance to prevent diseases, to protect their health and for healing supported by modern diagnostic and surgical procedures. Affordable health care is only can be realized in a system which performs equally modernized, qualitative and efficiency requirements. Necessary structural reconstructions and review of financing system should be based on system approach examination.

T2: Current operation and situation of economy affects the applied structure and financing of health care, and limits the opportunities for development. A well-functioning health care is an innovator for the economic and social development.

The effects on the economic development of the health care are measurable.

Health sector expenditures depend on the load-bearing capacity of the economy.

Decision-making situation, financing and strategic scope of the health care institutional system are strongly dependent on policy discretion; its adaptation ability to circumstances is limited by the over-regulated environment and debt level.

In the past 8 years the financing of hospitals was determined by reduction of expenditures in government policy. The health care sector as a major employer has a significant impact on the well-being of society and the development of the economy.

Health care cannot take over the role of the social safety net; the involvement of its elements adversely affects the structural and financial aspects of health care. Ensuring equal opportunity has an impact on determining the structure and operation of health care, therefore social consensus is necessary to formulate basic conditions.

T3: Allocation of health care expenditures between public and private sector, involving gratuity into the financing system and non-recurrent consolidation processes are detrimental to every integration process of health care.

One of the greatest problems of health care system is underfunding. The structural transformation of the institutional system - if it is not combined with a review of the current funding system and making it sustainable - is not sufficient for the improvement on management effectiveness and quality of medical attendances. Governmental actions related to health care primarily converts operation of health care with cost reduction considerations as guiding principle. Though non-recurrent

consolidation and “cash sweeping” improve the liquidity of the hospital institution, but distorts the analysis on conditions of effective management.

The questionnaire survey and cluster analysis of the hospitals pointed out that the experiments were not successful in terms of financing; the actions had resulted only temporary improvements. The reforms should be developed on the basis of full due diligence and analysis of the system.

T4. **During the analysis of the institutional financial reports the conclusions can be drawn about, which could contribute to the achievement of the health care reform conceptions. With the multivariate mathematical and statistical methods it is possible to evaluate the effectiveness of each action, the specific processes of the institutions and the economic sector.**

By cluster analysis configured from the individual index numbers, the indebtedness processes of the hospitals are to be detected and predicted. During the preparation of cluster analysis an evaluation is required on the size, progressivity level and regional location of the institution. The bankruptcy prediction models applied in corporate practice are useful to analyse the economic situation of the hospitals. Means offered by statistics can be used in processes of long-term planning and to predict the economic impacts of each action; this way it can be avoided to increase the operational risk of the sector and the stakeholders’ uncertainty with low-efficiency measures.

T5: The integration processes which took place in 2007-2013 constricted the strategic, financial scope the of hospital institutions and have not effected appreciably on the reduction of the extremely high debt.

Frequent changes in direction, the constant changes in legislation, the overregulation and rigidity inhibit the natural development of the health economy. This result was confirmed by variance analysis of the clusters, the analysis on debt with ARIMA model and also the conclusions drawn from the case study. To prevent the re-emergence of the debt can be guaranteed jointly by the redesign of patient visits (division of labour), restructuring of hospitals and involving additional resources; a non-recurrent debt consolidation can show only partial results. The not sufficiently prepared integration can render inoperative also an otherwise well-functioning hospital.

T6. Decision on central actions related to health care institutions cannot be independent of the geographical location of the institutions and the scope of services they perform; the differentiated consequences resulting from their actual financial and economic situation should also be taken into consideration.

Hospitals react different to the government actions, so the decision-maker must consider the opportunity cost of the proposed measures; this way economic and social conflicts emerging on account of the certain actions can be avoided.

The cluster analysis was pointed out that beyond the extant debt, funding problems and deteriorating external and internal conditions hospital institutions do exist that are able to maintain their economic stability. The analysis on correlation coefficients between net debt and the output of the health sector confirmed that the output and financing are practicably independent at some hospitals, while at other hospitals it has moderate intensity, and in case of further hospitals linear relation is specifically weak.

By the analysis on specific parameters of net debt evolution and operating characteristics of each institution, the causes, features and influencing factors of each differentiated effects of debt expansion can be revealed.

5. Conclusions, proposals

5.1 Conclusions

Based on literature data and analysis the research demonstrated a strong, significant relation between health and economy. The technical and technological development, the constraints caused by the economic crisis have remarkable impact on the operation of health care, pension and education systems in almost all countries in the world. The effect of economic situation on health status is two-way, in case of a stable economic condition a country can provide adequate resources for disease prevention, advanced diagnostics, surgical procedures; the individual's state of health may also reacts back indirectly to the performance ability of the whole economy at the same time.

Continuous transformation in health care needs of the population, rising expectations of patients, rapid development and spread of health care technologies further enhance the demand on continuous examination of health care system and the evolving of rapid response to changes.

The improvement of economic conditions and hospital care may promote the betterment of health status, but sudden development of globalization and civilization has brought several diseases, which were not known for decades, so in the future more intense attention should be paid for the prevention and healthy alimentation.

Up to now on the measures taken to restrict the consumption of the medically not beneficial foods, smoking and alcohol and to promote healthy alimentation, no significant results have been achieved in our country.

Morbidity and mortality data of Hungary compared to the expected indicators of socio-economic level and also to the European average represents unfavourable values, so special attention should be paid to the design the operation of the supply systems.

The fundamental requirement over the functioning of the health care system - both from technical and economic point of view – to answer the needs arising from public health status, the domestic health care – beyond its existing and recognized scientific achievements - failed to meet in several respects.

In respecting of the reforms, there are not uniform and for everyone applicable, even cross-country exceeding principles with absolute validity. Main direction of the health care reforms of a country can be built up only along the values chosen by the society; a real reform must occupy systematic approach.

The basic objective of the health care reform actions in 2007-2010 was the transformation of the health system to achieve greater improvements with the available resources as in the previous period beyond providing equal opportunity and the possibility of choice; and to make the system financeable at the same time.

The objectives are not achieved, the reasons are partly the fear from changes in ordinary attendance and social resistance due to stereotypes; on the other hand disagreement between the profession and the policy, thirdly that the conversion was only focused on the reduction of the number of beds and liquidation of certain institutions.

A non-adequately planned and implemented reform generates social tensions, which is further enhanced by the intensifying social problems originating from the social differences, unemployment and impoverishment.

In the period 2007-2010, the professional policy volition in health care was not or just partially supported by policy, medical profession and society; the necessary sufficient time and resources for the transformation were not ensured by system creators (operators).

The different ownership structure, outsourcing of certain services, "the regional disparities", local conditions and the different interests (methods) after a while made the uniform predomination of health care priorities, the appropriate allocation of straitened resources, the optimization of effectiveness and efficiency, supplying of data, monitoring, feedback and intervention impenetrable.

Complex and often non-transparent conglomeration of ownership forms of healthcare systems and certain outsourced activities were not in line with economic interests of the health system; beyond the existing financing system the operation of business associations as health care providers has not produced the desired results.

As a result of the reform actions started in 2011 and since have been partially implemented, the situation has improved in some areas; however, the research projects the compulsion of the health care system re-consolidation.

The research confirms that the current hospital structure is characterized by inequality in access, unexploited technological possibilities, high operating cost management and unsustainable financing.

The health system reforms beyond funding problems struggle with limitations originating from social functions of health care, therefore real reform has to be postponed.
As an effect of Semmelweis-plan in period 2011-2013 several institutions obtained additional resources, some hospital projects had been completed, while others had been started, the middle-governing, maintenance organization as a standardized monitoring and contacting system was built up. The negative consequence of the transformation is that the basic problems are not resolved, namely the integration itself was completed without allocating additional sources to health care industry.
The research found that health care is in crisis, reconsideration of structural transformation in the health system is indispensable. The construction and maintenance of a concentrated complex hospital is not a realistic idea besides the current funding, to develop specialized hospitals is a better solution.

5.2 Proposals

In the field of **improving coordination of supply levels** the review of the coordination of supply levels is inevitable; to enhance cooperation between the primary and the professional care, to establish control and information systems, to complete monitoring according to professional aspects is necessary in almost every segment of the operation.
The management, maintenance and financing functions of outpatient care should be treated as a state responsibility, professional management functions should be referred into the scope of duty of hospital institutions. Diagnostic attendances ordered by primary care should be disconnected from hospitals, so it would not load hospital expenses. Diagnostic examinations must be evaluated annually by the territorial assigned hospital and the National Health Insurance Fund (Hungarian acronym: OEP).
It is necessary to continue the sectorial analysis, to prepare efficiency analyses also within the confines of the middle-governing organization. It is also essential to work up standardized management information systems, and to examine the degrees of freedom of the certain decision situations in every segment of health care.

Reinforcing primary care, enhancing preventive activity
Improve the low efficiency of the supply system cannot be realized without increasing the prevention activities and strengthen the primary care.
The reinforcing of primary health care and broadening its competencies should be achieved by the educational, technical development and improvement of the income situation. Due to the reduction in the number of doctor-patient encounters and to decrease the high drug consumption, the possibility of the introduction of the prescription fee should be reconsidered

again. Further increasing taxes on unhealthy or harmful foods, beverages and tobacco products would provide additional source for health care.

Reorganization of hospital structure

The review of current hospital structure is to be carried out along the social and professional arguments, some hospitals should be abolished, and others should be merged.

The possibility of demolition of the pavilion-system hospitals with inadequate energy efficient should be considered, as a replacement block hospitals with at least 70-80% surgical capacity have to be built up. The same departments belonging to one institution, but operating in scattered sites should be merged.

Development of specialized hospitals, especially the construction of multidisciplinary children's hospital, and establishing specialist hospitals is indispensable.

The outpatient consultations must be subject under central (hospital) management and where possible should be centralized independently from districts.

A necessity occurred to establish nursing houses, which removes the burden from the territory of chronic inpatient care.

For the improvement on infrastructural situation of hospitals the state should provide the public funds. In respect of hospitals the investigation and comforting settlement of the issues of financing, ownership, and middle-management organization are required

Continuation of the wage close-up processes of health care workers, stoppage of the generating medical and nurse shortages, wage settlement of employees working in economic and technical area is necessary. A standardized, central-operated data management information system should be developed for employees of hospitals, clinics and primary care.

In the field of social security issues the reconsideration of health insurance contribution system and the investigation on possible involvement of capital gains are necessary; raising the fixed amount of insurance fee and intensified control of the number of insured are also important requirements.

Electronic registry system should be established in which the electronic data medium (chip card) contains the results of the examination of the patient, as well as insurance details. The introduction of private health insurance system should be reconsidered. Additional benefit must be provided in the personal income tax system in case of using the services of voluntary, mutual health funds. The employees on sick-allowance should be monitored intensively.

In the field of debt settlement issues our country's public health expenditure can no longer be reduced, the depriving have to be stopped and the caused loss have to be compensated; the operation of the system should be reconsidered.

Changes in the environmental conditions encourage rethinking health policy strategies and introduction of reforms. The change is not in developing sustainability, but also in prevention and effective health care needs to happen. However, the balancing tool of structural reforms

cannot be the reduction of public health expenditures, it is also necessary to optimize the parallel capacities. Non-recurrent consolidation of hospitals is no longer sufficient; the debt without further transformation of structure will be also reproduced in the future. The immediate resource demand of health care is more than 100 billion forints, but the settlement of PVL (performance and volume limit) and HDG (homogenous disease group) also necessary, and to overview the German point system and increase the basic hospital fee of HUF 150,000 with 20%. A further condition of the financeable health care operation is increasing the own revenues of hospitals (VIP medical attendance), as well as the elimination of gratuity through legal means.

5.3 Usability of the results and future research directions

With settlement of the ownership relations uniform accounting standards were introduced to all hospital institutions; henceforward the annual reports are finalized in standardized structure and with a profit and loss approach.

On the basis of unified reports the extension of research with involvement of more variables into the models seems necessary, and also an opportunity to increase the number of elements.

As a continuation of the research such the components of incomes, the ratio of material and personnel expenses from the total expenditure and their degree related to the income, the efficiency of the institution would be determined with a profit and loss approach and independently from financial performance. As a further development of the research with fixation of valuation principles of assets, the real value of state assets would be possible to work out.

The results of the elements belonging to one cluster would be comparable and measurable also on the basis of annual reports.

Based on further analysis of the results recorded in this thesis the institutions can be selected out which may be transformed according to social and medical professional aspects, may be integrated further, or about the necessarily and measure of other maintainer or government interventions more precise information may be available.

It might be worthy to extend the research to a direction which would determine what quantifiable effect would be exerted by the expansion of public funding sources, and the elements of possible means of the strategy to disadvance public health expenditures to the operation and economic situation of the hospital.

6. Publications related to the scope of thesis

Publications issued in Hungarian language periodicals:

1. HEGEDŰS M. (2011): Az egészségügyi szolgáltatók könyvvizsgálatának sajátosságai. *Számvitel Adó Könyvvizsgálat.* 53. (3) 118-119. p.
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3. HEGEDŰS M. (2013): Az államháztartás számviteli rendszerének szemléletváltozásai. *Könyvvizsgálók Lapja.* 2. (3) 13-16. p.

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1. HEGEDŰS M. (2014): СОЦИАЛЬНЫЕ ВЛИЯНИЯ СНИЖЕНИЙ РАСХОДОВ ЗДРАВООХРАНЕНИЯ = Az egészségügyi kiadások csökkentésének szociális kihatásai. In: Andreev AI, Antipov EA (szerk.) Materialü Mezsdunarodnogo molodezsnogo naucsnogo formula "LOMONOSZOV-2014" Moszkva: MGU im. M.V. Lomonoszova, 2014. Paper 31. 9 p.

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2. HEGEDŰS M. (2012): Strukturális változások és kihívások az egészségügyi szektorban. *I. Alternatív Finanszírozási Stratégiák Tudományos Konferencia.* Sopron. 2012. október 3. 1 p. (Kaposvári Egyetem) Kaposvár: Kaposvári Egyetem Gazdaságtudományi Kar; Nyugat-magyarországi Egyetem Közgazdaságtudományi Kar. 1-10.

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