

Kortelainen, Mika; Luoma, Kalevi; Moisio, Antti

**Conference Paper**

## Break-ups of municipal health centre federations: Expenditure and efficiency effects

54th Congress of the European Regional Science Association: "Regional development & globalisation: Best practices", 26-29 August 2014, St. Petersburg, Russia

**Provided in Cooperation with:**

European Regional Science Association (ERSA)

*Suggested Citation:* Kortelainen, Mika; Luoma, Kalevi; Moisio, Antti (2014) : Break-ups of municipal health centre federations: Expenditure and efficiency effects, 54th Congress of the European Regional Science Association: "Regional development & globalisation: Best practices", 26-29 August 2014, St. Petersburg, Russia, European Regional Science Association (ERSA), Louvain-la-Neuve

This Version is available at:

<https://hdl.handle.net/10419/124451>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

# **Break-Ups of Municipal Health Centre Federations: Expenditure and Efficiency Effects**

**Mika Kortelainen**

Government Institute for Economic Research, Helsinki, Finland

E-mail: [mika.kortelainen@vatt.fi](mailto:mika.kortelainen@vatt.fi)

Phone : +358 40 304 5541

**Kalevi Luoma**

Government Institute for Economic Research, Helsinki, Finland

E-mail: [kalevi.luoma@vatt.fi](mailto:kalevi.luoma@vatt.fi)

Phone : +358 40 304 5560

**Antti Moisio**

Government Institute for Economic Research, Helsinki, Finland

E-mail: [antti.moisio@vatt.fi](mailto:antti.moisio@vatt.fi)

Phone : +358 40 304 5547

28 February 2014

**Preliminary Draft**

## **Abstract**

Empirical evidence on economies of scale in healthcare is mostly based on the cost effects of hospital mergers. In contrast to earlier studies, this paper approaches the economies of scale issue by analysing the break-ups of municipal health centre federations. We use the difference-in-difference models to evaluate the break-up impacts on costs, outputs and efficiency of health centres in Finland between 1990 and 2003. To address potential non-random or endogenous treatment assignment we also utilize propensity score difference-in-difference approach. For cost efficiency estimation we use the non-parametric order-alpha method that is more suitable for small samples than the traditional efficiency estimators. Our results show that healthcare costs have grown considerably faster for the seceded health centres than for the similar non-seceded ones, while outputs have increased more for the former than for the latter group. Interestingly, we find the impact of break-ups to be insignificant on the productive efficiency of health centres.

JEL classification: C21, D24, I11, R50

**Key words: Economies of scale, health care, municipalities, difference-in-difference**

# 1. Introduction

While the research evidence on the economies of scale in the provision of public services is mixed, policymakers around the world seem to be convinced that “bigger is better”. Thus, the policy trend in recent decades has been towards increased size in public services by amalgamations of local governments, mergers of service units and closures of facilities. In healthcare, this policy has typically meant mergers of small hospitals and other healthcare units.

Much of the empirical evidence on economies of scale in healthcare services is based on the cost effects of hospital mergers especially in the United States. For example, Dranove (1998) used financial data set for fiscal year 1992 in California to examine the costs of non-revenue producing cost centres in privately-owned hospitals finding clear efficiency gains resulting from the mergers of small hospitals<sup>1</sup>. Dranove and Lindrooth (2003) used a panel data from 1988 to 2000 to study the effects of pairwise hospital mergers. They found clear cost savings resulting from the mergers of two independent hospitals but no savings effect for consolidations into systems of hospitals. A contrary view is offered by e.g. Ferrier and Valdmanis (2004), who used efficiency and productivity measures to ascertain whether US hospital mergers in 1996-1998 result in performance gains. They find that mergers did not lead to an unambiguous improvement in either efficiency or productivity of the hospitals. From the Scandinavian perspective, the evidence from hospital mergers seems also less promising. Kjekshus and Hagen (2007) employed panel data over the period 1992-2000 to analyze the effects of hospital mergers in Norway. They found mergers to have no significant effect on technical efficiency and a significant negative effect on the cost efficiency of hospitals. In addition, recent case studies on the hospital merger in Reykjavik (Suppanz, 2008) and Stockholm (Choi et al., 2012) did not find mergers to be successful in cutting costs.

---

<sup>1</sup> See also Preyra and Pink (2006), for a similar evidence in Canada.

Despite somewhat mixed evidence, there are several reasons why one should expect that the smallest healthcare units have higher costs than larger ones. Small units may find it hard to secure the optimal allocative mix in their use of inputs, leading them to spend more. Small units can have difficulties in replacing health employees, especially physicians, in times of strong labour demand. In addition, large hospitals are usually equipped with larger teams of specialists, which may result in clinical excellence, and lower costs.

In this paper we approach the question of economies of scale in healthcare from the different perspective by analysing the effects of break-ups of Finnish co-operative units in primary healthcare. We add to the existing literature by exploring the secession effects on costs, service volume and productive efficiency of 32 primary healthcare units that went through secession between 1992 and 2003. We conduct our analyses using the difference-in-difference method that has become very common in policy evaluation studies (Blundell and Diaz, 2009; Imbens and Wooldridge, 2009). Moreover, since the secessions of the health centres cannot necessarily be considered as exogenous policy change, we also utilize propensity score difference-in-difference approach developed by Heckman et al. (1997). This approach can diminish potential endogenous treatment assignment issue.

Our preliminary results show that healthcare costs have grown considerably faster in the seceded local governments than in similar non-seceded ones. We also find that secessions have had a positive effect on the output levels of seceded health centres. Interestingly, we find the impact of break-ups to be insignificant on the productive efficiency of health centres.

## 2. Institutional Setting

During the last 15 years, the Finnish policymakers have tried to reform municipal structures and/or municipal service provision so that municipalities could meet the challenges posed by demographic and economic trends on the production and provision of social and health services. One of the main objectives has been to enlarge the population base of the municipal services. As the median population of municipalities in Finland is below 5000 inhabitants, a key ingredient in the restructuring service provision is the amalgamation of small municipalities into larger local government authorities. In the case that amalgamation is rejected (or cannot be implemented), the population base of service provision can be enlarged by the co-operation of municipalities. In practice, this means that municipalities can form joint authorities which are responsible for producing particular services for the inhabitants of many neighbouring municipalities. In Finland, the small municipalities have traditionally cooperated especially in health care services. Moreover, in the specialized hospital care they are obliged to cooperate by law.

The belief that “bigger” is better in local government service provision rests on the assumption of significant economies of scale and scope associated with the greater population size. However, based on the secessions of many health centre federations, which had earlier been formed to provide primary health care to inhabitants of many neighbouring municipalities, not all Finnish municipal decision makers seem to share the view that economies of scale prevail in primary health service production. Since the grant reform of 1993 which significantly reduced the regulatory powers of central national authorities with regard to how service provision at the local level should be organised, there has been a clear tendency for dissolving former health centre federations. Between 1992 and 2003 there occurred at total 32 such dissolutions that we will investigate in this paper.

There are only a few case studies (Ohtonen. 1989; Uusimäki et al., 1992; Kiljala 2001) that have investigated reasons for break-ups of health centre federations in

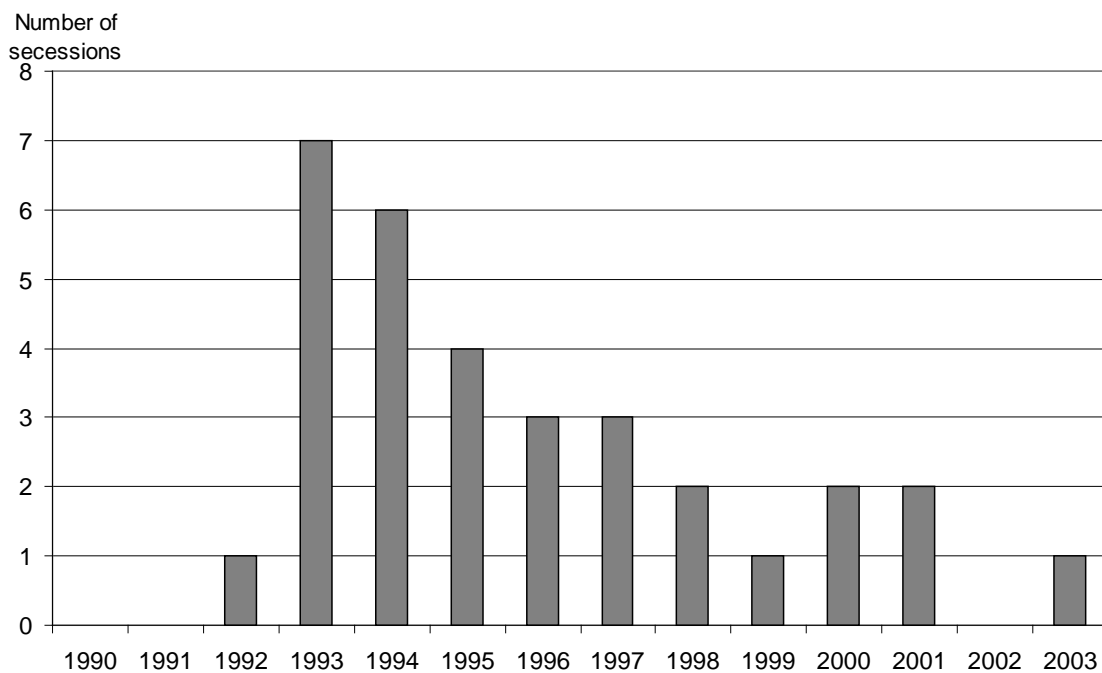
Finland. The main reasons for secessions seemed to be dissatisfaction on expenditure control and management of health centres, poor possibilities by municipalities' decision makers to influence on decisions of the federations and the distrust between the member municipalities. Many municipalities believed that by running their own health centre they can arrange more primary health services for their inhabitants by producing these services themselves. In many cases disputes about how to allocate health facilities among member municipalities has been another driving force for dissolution of health centre federations (Ohtonen, 1989). In some cases the will to strengthen the integration of health and social care, especially in the care of elderly, has also been a contributing factor to dissolving health centre federations (Kiljala, 2001) A background factor for break-ups of health centre federations has been that these federations initially were not formed based on the voluntary decisions of municipalities, but small municipalities were more or less coerced by regional councils to set up a health centre federation with neighbour municipalities in order to have a population base of over 10 000 inhabitants.

The observation units in our study consist of Finnish primary health care units, called health centres. In Finland, primary health care services are provided by health centres, which are operated either by single municipalities or jointly by a group of neighbouring municipalities. Compared to primary health care arrangements in most other countries, the Finnish health centres provide a large variety of services. The health centres do not only provide basic primary care, but also maternal and child health care, cancer screening services, community nursing, school health care, dental care, physiotherapy and occupational health care. In addition, they usually have inpatient departments, with typically 30-60 beds, which are occupied mainly by elderly and chronically ill patients. Due to their important role in health care provision and because of their independent decision-making status, the Finnish health centres provide an interesting case to study the effects of scale in healthcare.

### 3. Data

The observation units in our data are public health centres that are organised by a joint authority of municipalities. Most of the secessions for health centre joint authorities in the 1990's took place during 1993-1995; see Figure 1.

*Figure 1*      *Number of health centre federation secessions by year*



The data we use is derived from several routinely kept registers and statistics. The expenditure data on primary health care is obtained from the financial statistics of health centres maintained by Statistics Finland. The various socio-demographic and economic variables that are used in the models are also obtained from the official statistics maintained by Statistics Finland.

Primary health care costs include personnel costs, material costs, costs of purchased services, rents and other costs. The expenditure on specialized health care is obtained from SOTKA -register maintained by the National Institute for



Health and Welfare. All the expenditures are deflated to 2003 price level using the price index for public municipal health care.

We measure the health centre output volume using four indicators for outpatient care (visits to physician, visits to other health care personnel, dental care visits and home nursing visits) and two indicators for inpatient care (short term acute care and long term chronic care).<sup>2</sup> These data are derived from the National Institute for Health and Welfare statistics. Short term inpatient care is measured by the number of admissions into inpatient wards. Long term care is measured by the number of bed days. This data is derived from the Care Registers for Social Welfare and Health Care (HILMO).

In order to have a single indicator for service output volume, we also aggregate the outputs using the information on unit costs of each service as weights. For primary care, we use the unit costs measures (or estimates) constructed by Hujanen (2003). For dental care, we assume that the unit cost is equal to the visit to physician. For acute and long term chronic care we had information only from the city of Helsinki, where the average price of the bed day was 115 €. The acute bed day cost was approximately 55 percent more expensive than long term chronic bed day. However, using our own judgement, we estimate that the average price for long term chronic bed day is 100 €. As the average chronic care usually lasts 7–8 days, we estimate that the average unit cost for admission into inpatient wards is 1100 €.

Since the aggregated output measure is based on somewhat uncertain or subjective unit cost estimates (which can change over time), it is important to look at other outcomes related to productivity that do not require unit costs estimates or other assumptions on the aggregation weights. Therefore, we will use estimated efficiency scores as a separate outcome variable in our regression. We will discuss efficiency and regression estimations in more detail in the next section.

---

<sup>2</sup> These outputs are similar to the output variables employed in several previous studies.

## 4. Methodology

We apply difference-in-differences approach to estimate the impacts of break-ups of health centres on various outcome variables. We aim to isolate the effect of the secessions from all other things that may affect the outcomes that we are interested in. In our difference-in-differences analysis, we compare the changes in outcomes of the seceded healthcare units with changes in outcomes of those units that have not seceded. The main assumption is that if the “break-up policy” had not been implemented, the outcomes in the healthcare units that seceded would have changed in the same way as in the healthcare units that did not implement the “break-up policy”.

There are some complications to the analysis as the secessions are by no means homogeneous events. For example, sometimes only one municipality departs from the joint authority (federation) and the rest of the members continue the cooperation. In other cases, the secession can mean that the joint authority ceases to operate (“the real secessions”). In this study, we concentrate on evaluating the effects of the “real secessions”. In addition, after the secession there is no longer information on the expenditures in the previous joint authority, but all estimates on the expenditure growth must be based on the joint outcomes of the separate municipalities. We solve this problem by re-defining the units of observation as municipality groups according to the previous joint authority instead of individual municipalities after the secession. The comparison group is then based on the non-seceded health centre federations. We will first present some graphs to illustrate how costs and outputs have changed for health centres in the treatment and control group.

We will then use a simple difference-in-difference approach (without control variables / matching) to evaluate the impacts of break-ups on the different outcome variables. We complement these simple analyses with the propensity score difference-in-difference technique (see Heckman et al., 1997). This method is implemented in two stages by first estimating the likelihood of the treatment

for each observation and then using a kernel function of estimated probabilities (propensity scores) in weighting the control group observations in the second stage difference-in-difference regression.<sup>3</sup>

Besides using costs and aggregated output (or their logarithms) as an outcome variables, we will also investigate the impact of break-ups on productive efficiency of health centres. Since the efficiency of health centres cannot be observed or measured easily, we will again use data on 6 individual outputs (utilized to obtain aggregated output) as well as costs to estimate efficiency scores for all the health centres and each year in our data. For efficiency estimation, we use the so-called *order- $\alpha$*  estimator developed by Aragon et al. (2005). In comparison to traditional nonparametric Data Envelopment Analysis (DEA) and Free Disposal Hull (FDH) estimators, the order- $\alpha$  estimator is less sensitive to noise and outliers in data. Moreover, even though the estimator is fully nonparametric, it is not sensitive to the so-called curse of dimensionality problem and therefore it is more suitable for finite samples. Our efficiency estimations are based on the pooled sample of health centres from 1990 to 2003. In addition, we use output-orientation, i.e. evaluate whether health centres can proportionally increase their output at the given level of resources (or costs).<sup>4</sup> Our results below will be based on  $\alpha=0.95$ , but our purpose is to investigate whether the choice of  $\alpha$  affects the regression results in the later versions of the paper.

---

<sup>3</sup> For the discussion on the propensity score method, see Rosenbaum and Rubin (1983) and Caliendo and Kopeinig (2006). Heckman et al. (1997) first proposed the approach that combines propensity score matching with difference-in-difference regression. In contrast to traditional matching approaches, the method by Heckman et al. (1997) allows the treatment to depend on time-invariant unobserved factors.

<sup>4</sup> For example, if estimated efficiency score is 0,9, the unit is questions could increase its outputs by  $100*(1/0,9)=11,11\%$  at the given level of expenditure (or resources).

## **5. Results**

### **5.1. Descriptive Analysis**

We will first look at the changes in our main variables (costs and aggregated output) graphically. As can be seen from Figures 2 and 3, health care costs decreased rapidly in the early 1990's because of the economic recession. Grant reform and associated regulatory reforms were introduced in 1993 and this might have affected the health care costs too.

Primary health care costs increased modestly between the years 1993-1999 but thereafter the expenditure growth has been quite rapid. This is the case for both the seceded health centre federations and the federations which continued their operation (Figure 2). It is important to note that at the beginning of the 1990's the expenditures were almost at the same level in the two groups. Since that, however, there has been a widening gap between expenditure developments of these two groups. As a result, in 2003 the per capita primary health care costs were 14 percent higher in municipalities that had seceded from a federation than in non-seceded health centre federations. All this gives a preliminary indication that secessions may have contributed to the growth of primary health care costs. In the case of specialized health care, we cannot observe a similar difference between the two groups (Figure 3). This is not very surprising, since there have not been any systematic policy changes in specialized health care for these two groups.

Figure 2 Primary health care expenditure per capita

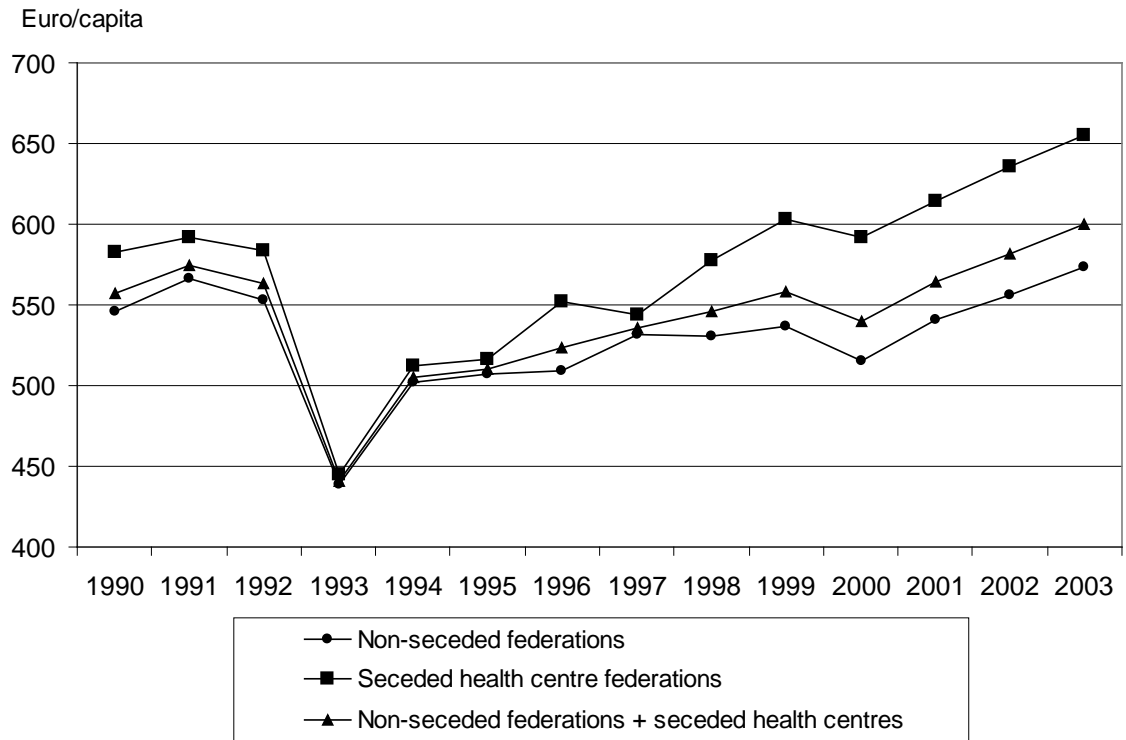


Figure 3 Specialized health care expenditure per capita

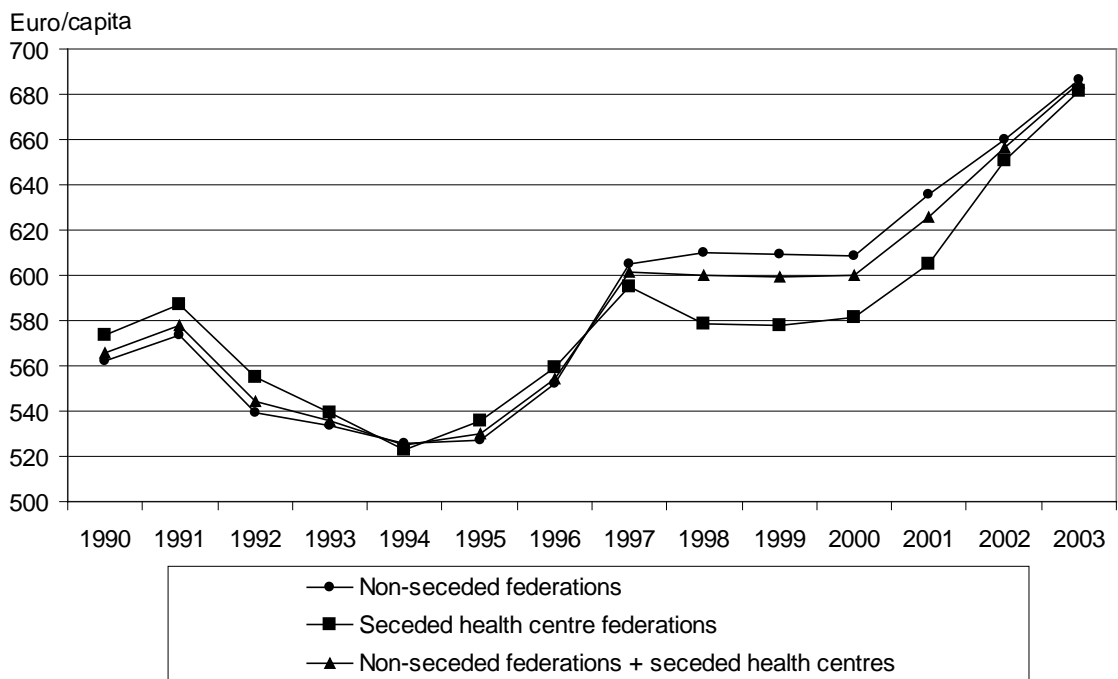
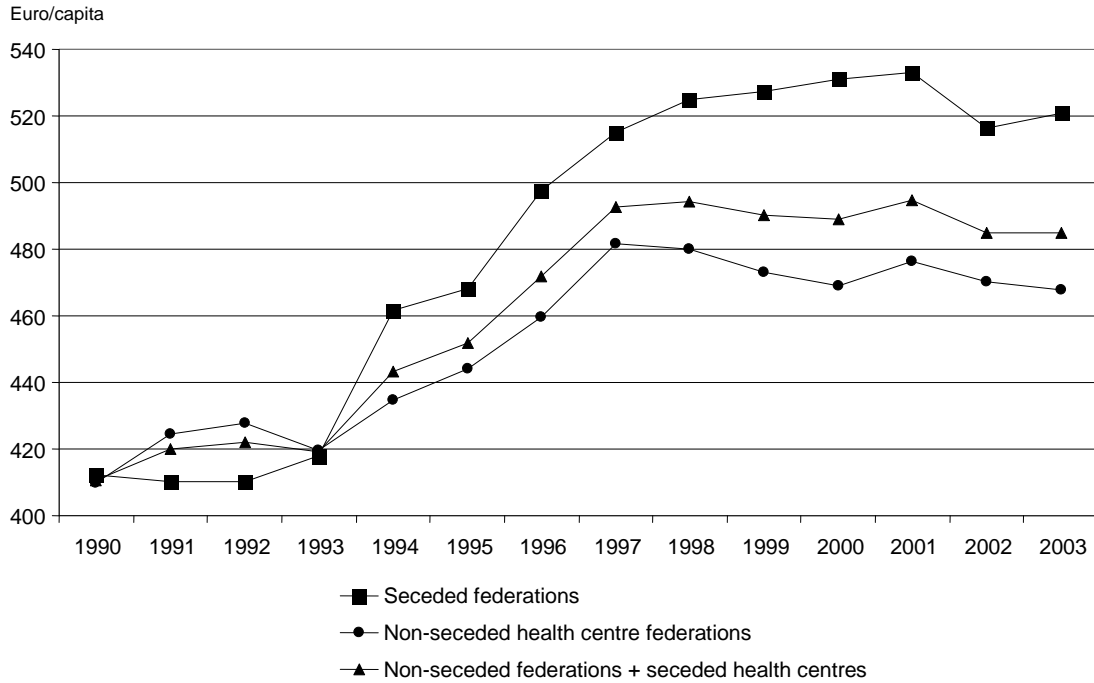


Figure 4 Service volume in seceded and other health centres



Service volume differs between seceded and non-seceded health centres so that the output seems to have grown faster in seceded health centres (Figure 4). This is an indication that the rapid expenditure growth may be at least partially explained by change in service volume. We will return to this issue in the discussion of the regression results.

## 5.2. Simple Diff-in-Diff Models

We will next consider the simple difference-in-difference models where we do not use matching or control any exogenous variables. In these regressions we will use logarithmic costs and output as outcome variables so that we can directly obtain approximate percentage interpretation for the treatment effect estimate (the interaction of treatment group and treatment period dummy). However, logarithmic transformation are not used for efficiency scores, since efficiency

measure we use is already a proportional variable. Note that at this stage regression models include only before-after time dummy, not year-specific time dummies. (In later versions, we will probably use more a flexible specification for time (or year) effects.) The results of the specification are presented in Table 1 below.

Table 1. Simple Diff-in-Diff Regressions

	<b>Log(cost)</b>	<b>Log(output)</b>	<b>Efficiency</b>
<b>Treatment effect</b>	0,213*** (0,047)	0,152*** (0,050)	0,023 (0,057)
<b>R-square</b>	0,057	0,104	0,027

*Notes:* Sample: 1990-2003, n = 1484. Clustered standard errors are presented in parentheses.

Inference: \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

Interestingly, we find that health care expenditure have increased for the seceded health centres over 20% more than for the non-seceded health centres after the secessions. This relatively large change in costs can be at least partly explained by the change in service output that have increased for the treatment group over 15% more than for the control group. Somewhat surprisingly, we do not find any significant impact on the productive efficiency of health care services. Although the treatment effect estimate for efficiency is positive, it is far from being significant.

### 5.3. Propensity Score Diff-in-Diff

In order to control for the covariates that may affect the treatment (or the probability of secession), we next use logit-model to explain the break-up indicator (i.e. whether the federation seceded during the sample period). Explanatory variables in this regression include population density, number of private health care visits, the share of the elderly inhabitants and disability prevalence of the population.<sup>5</sup> (Note that since these variables do not have much time variation, it is important to look at other potential explanatory variables in future versions of the paper.) The logit-regression is estimated using only data from 1990 so that independent variables can be considered predetermined or exogenous for the treatment (or policy change). We then use a kernel density function (Epanechnikov kernel) to constructs weights based on the estimated property scores (i.e. probability of treatment). The idea is to put larger weight for those control group observations that are more similar to observations in the treatment group (seceded health centres).

Table 2. Diff-in-Diff Regressions with Kernel Propensity Score Weighting

	<b>Log(cost)</b>	<b>Log(output)</b>	<b>Efficiency</b>
<b>Treatment effect</b>	0,211*** (0,046)	0,148*** (0,050)	0,024 (0,057)
<b>R-square</b>	0,057	0,096	0,027

*Notes:* Sample: 1990-2003, n = 1484. Clustered standard errors are presented in parentheses. Inference: \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

The results for the propensity score weighted difference-in-difference models are presented in Table 2. If we compare the regression results to Table 1, the

<sup>5</sup> We also tried other explanatory variables, such as population and taxable income per capita. However, since these variables were not significant we decided not to use them in the propensity score estimation.



estimates differ only marginally. Thus, it seems that the use of propensity scores (or controlling for certain covariates) does not have any impact on the treatment effect estimates. Of course, the use of different covariates in the propensity score estimation can potentially affect the results. In any case, the graphical and regression results seem to suggest that both expenditures and outputs have increased more for the seceded health centres than for the federations that continued co-operation.

#### **5.4. Other Outcomes / Robustness Checks**

We will estimate the difference-in-difference models also for other outcome variables, including costs of specialized health care. Preliminary results indicate (compare Figure 2) that the costs of specialized health care services have not changed differently for the treatment and control group. If we can get data on quality measure or proxies of service quality in primary health care, we will also investigate whether the secessions have had any impact on the quality of the services.

## 6. Discussion

In this paper we have examined health expenditure development of those municipalities that have dissolved the health centre federation. In practice, we compare the expenditure development in the seceded health centres to those health centre federations that have continued their operation.

According to our results, which are based on difference-in-differences regression, primary health expenditure has grown significantly faster in the seceded health centres than in the non-seceded health centres. If municipalities have attempted to achieve cost savings by splitting up former health centre federations and establishing their own health centre, our results indicate that they have failed to do so. The output of seceded health centres shows an interesting pattern. The seceded health centres show a positive output development that needs to be more carefully analysed. If, instead of cost savings and productivity improvement, the municipalities sought solely for increased service volume, our results show that they have been successful. On the other hand, it would be also important to study whether the secessions have had any impact on the quality of health centre services. The main challenge is just to find data on variable(s) that could be used as a proxy for the quality of health services.

## References

- Aragon, Y., A. Daouia and C. Thomas-Agnan (2005): Nonparametric Frontier Estimation: A Conditional Quantile-Based Approach. *Econometric Theory* 21, 358-389.
- Blundell, R. and M. Costa Dias (2009): Alternative Approaches to Evaluation in Empirical Microeconomics. *Journal of Human Resources* 44(3), 565-640.
- Caliendo, M. and S. Kopeinig (2008): Some Practical Guidance for the Implementation of Propensity Score Matching. *Journal of Economic Surveys*, 22 Issue 1.
- Choi, S., I. Holmberg, J. Löwstedt and M. Brommels (2012): Managing Clinical Integration – A Comparative Case Study in a Merged University Hospital. *Journal of Health Organization and Management* 26(4-5), 486-507.
- Dranove, D. (1998): Economies of Scale in Non-Revenue Producing Cost Centers: Implications for Hospital Mergers. *Journal of Health Economics* 17, 69-83.
- Dranove, D. and R.C. Lindrooth (2003): Hospital Consolidation and Costs: Another Look at the Evidence. *Journal of Health Economics* 22(6), 983-997.
- Ferrier, G.D. and V.G. Valdmanis (2004): Do Mergers Improve Hospital Productivity? *Journal of the Operational Research Society* 55(10), 1071-1080.
- Heckman, J.J., H. Ichimura and P.E. Todd (1997): Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Programme. *Review of Economic Studies* 64, 605–654.
- Hujanen T. (2003): Terveystenhuollon yksikkökustannukset Suomessa vuonna 2001. *Stakes Aiheita* 2003: 1, [In Finnish].
- Imbens, G. and J. Wooldridge (2009): Recent Developments in the Econometrics of Program Evaluation. *Journal of Economic Literature* 47(1), 5-86.

- Kiljala, E. (2001): Sydän-Suomen terveydenhuollon kuntayhtymän purkautuminen ja sen vaikutukset Pihtiputaan terveydenhuollossa. Projektityö. Sosiaali- ja terveysjohtamisen erikoistumisohjelma. Kuopion yliopisto. [In Finnish]
- Kjekshus, L. and T. Hagen (2007): Do Hospital Mergers Increase Hospital Efficiency? Evidence from a National Health Service Country. *Journal of Health Services Research & Policy* 12(4), 230-235.
- Ohtonen J: Kansanterveystyön kuntainliiton purkautumisen vaikutukset. Sosiaali- ja terveysministeriö. Suunnitteluosasto. Monisteita 1:1989.
- Preyra C and G. Pink G (2006): Scale and Scope Efficiencies through Hospital Consolidations. *Journal of Health Economics* 6,1049-1068.
- Rosenbaum, P. and D. Rubin (1983) The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika* 70, 41-55.
- Suppanz, H. (2008): Improving Cost-Effectiveness in the Health-Care Sector in Iceland, OECD, Economics Department Working Paper, No. 645.
- Uusimäki K, K. Pahkala and I. Perälä (1992): Järviseudun ja Lestijokilaakson kansanterveystyön kuntainliittojen purkautumisen vaikutukset jäsenkuntien sosiaali- ja terveydenhuollon kustannuksiin ja palveluihin. Vaasan lääninhallituksen julkaisusarja 1992:2. [In Finnish].