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How public health care providers react to competition?

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Abstract

We studied *1) if competition had impact on four indicators: productivity, intensity of the services, price and revenues in 1995-2004 in public, non-profit and for-profit occupational health services (OHS) providers, 2) if there was convergence in these four indicators 1995-2004, and 3) if the convergence was due to competition.*

The Finnish Institute of Occupational Health (FIOH) has collected data on the clients, services and personnel for years 1992, 1995, 1997, 2000 and 2004 from OHS providers (almost 3000 observations). Employers defray the costs of OHS and apply for reimbursement from the Social Insurance Institution (SII). The SII data was merged with the FIOH questionnaire. Local markets were formed from municipalities, competitiveness of the market was measured by the number of providers and by the Herfindahl index in the region.

The effect of competition on procedure indicators (productivity and intensity) and monetary outcomes (revenue, price) was studied by fixed effects models. The impact of competition on the convergence term was studied by pooled ordinary least squares. During the study period 1995-2004 the public providers were catching up with the private for-profits and non-profits in productivity, intensity, revenue and price. Higher number of providers was connected to higher productivity and intensity, in non-profits also to revenue and price. Market concentration did not have significant effect on any of the four indicators.

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There was convergence in productivity, intensity, revenue and price in the OHS market in 1995-2004. The convergence was muted for productivity, intensity and price in regions (markets) that had above average number of providers. When the scale of production was taken into account the effect on productivity disappeared. In regions that had above average concentration the convergence of the OHS indicators was accelerated for all indicators except for revenue. The inclusion of the scale of productions decreased the statistical significance of the concentration on productivity, but the effect still remained. The magnitude of the effect competition had on convergence was small.

1. Introduction

Competition has been thought to improve quality and lower unit costs of the services. Therefore market arrangements have been introduced also in public health care, like purchaser-provider split and the greater involvement of the private sector, e.g. in the English National Health Service (Oliver 2005). Competition has been introduced as a stimulus to efficiency also in other publicly funded health care systems, like in Sweden, Finland, the Netherlands, Germany, Italy and New Zealand (Glennerster 1998), 403. Because the reforms in publicly funded health systems rely much on competition it is important to know if and how public providers react to competition.

While studying the competition among public and private providers, one should know if they are "different" and therefore might react differently to competition. Eggleston and Zeckhauser (Eggleston, Zeckhauser 2002) compared theoretically public, for-profit and non-profit organizations and concluded that public providers resemble private for-profit providers if the environment is competitive ('primacy of competition versus ownership' argument (Vining, Boardman 1992)). The empirical literature on hospitals in the United States offers conflicting results about the effect of ownership. The mixed evidence has recently been studied by Eggleston et al. (Eggleston et al. 2008) and Shen at al. (Shen et al. 2007) who both applied meta-analytic methods to the literature since 1990 on hospital ownership and performance. Eggleston et al. 2008 studied quality (mortality and also other adverse events) and found that the majority of the studies did not find statistically significant difference between non-profit and for-profit hospitals, and government hospitals had either higher or similar rates of mortality and other adverse events as private non-profits did. Shen et al. 2007 studied the effect of ownership on hospital financial performance (four most common financial outcomes: cost, revenue, profit margin, and both cost and technical efficiency). Ownership appeared to play a much less important role in influencing hospital performance than other hospital characteristics. Studies that compared revenues all found either that for-profits earn greater revenue and higher profits or that there is no difference between for-profits and non-profits. However, the

conventional wisdom that for-profit hospitals would operate more efficiently (i.e. at lower cost) was not consistently supported in this review. (Shen et al. 2007, 57, 66)

Economic theory presumes that increased competition would lead to lower prices and 'normal profits'. The literature has concentrated on the reverse phenomenon - concentration, particularly in the USA. There is extensive evidence that higher concentration is connected to higher prices. (Gaynor, Haas-Wilson 1999, 152; Dusheiko et al. 2007, 2.; Keeler et al. 1999, 71, 78-79) found out that hospital prices in the U.S had risen more in more concentrated areas: the effect of the concentration on price rises was highly significant 1986-1994 and the impact was increasing during the time period. They also concluded that the nature of the competition had changed from non-price competition in 1980s ('medical arms race') and was in early 90's more price competition. Since 1990s the circumstances for competition have changed and managed care, especially Health Maintenance Organizations (HMOs) has increased price sensitivity of shopping. The locus of control over purchasing decisions has been shifted away from relatively price insensitive consumers towards more price sensitive health plans empowered to aggressively shop for care using selective contracting (Dranove et al. 2008, 362). This stronger purchaser role has had an effect on hospitals. Total margins were lower in markets with higher levels of HMO penetration. Public hospitals had lower total margin and for-profit hospitals higher than non-profits. (Thorpe, Seiber & Florence 2001) Managed care has been shown to decrease inefficiency in production (Brown, Shelton H, III 2003, 155; Sari 2003, 1585).

Rice and Biles report the discussions from an experts' seminar on competition: " [...] terms such as 'markets' and 'competition' have very different connotations on different sides of the Atlantic [...]." (Rice, Biles 2000, 868). Indeed, the literature discussing the consequences of creating internal market in the UK (see (Oliver 2005) for a description and an assessment of the National Health System (NHS) developments) is quite different form the USA counterpart. The early results from "competition created by policy" (Propper, Burgess & Gossage 2008, 138) do not impress: "perhaps the most surprising finding from the published research was how little difference the whole upheaval had made to measurable outcomes" (Glennerster 1998, 405). The responsiveness of the NHS was improved if measured by waiting lists and waiting times (Oliver 2005, S91). Propper et al. (Propper, Burgess & Gossage 2008; Propper, Burgess & Green 2004) have found that quality is lower in more competitive environment: the death rates from emergency admissions for acute myocardial infarction (AMI) were higher in areas subject to competition than in areas not subject to competition. Interestingly Dusheiko et al. (2007) study the purchasers role, whether they acted as

active purchasers who shop around and thereby encourage competition between hospitals. Dusheiko et al. (2007) summarise the previous results which showed that the patterns of contracting had remained largely unchanged after competition had been introduced. The fundholding practices were more inclined to search for lower prices and better quality, also that the hospitals were more responsive to fundholders than health authorities (HAs). In their own study Dusheiko et al. found out that the concentration in commissioning increased between 1997/98 and 2002/03. In 1999 the fundholding was abolished and budgets for purchasing of health care were removed from HAs to smaller Primary Care Groups, later replaced by Primary Care Trusts (PCTs). This reorganisation accounted for about half of the actual increase in concentration in commissioning at PCT level. In addition, purchasers tended to shift patients and concentrate on fewer hospitals: they 'dropped' some hospitals out of their contractors and did not start new purchasing contracts with other hospitals.

One of the strongest predictions of economic theory is that providers react to their market environment whereas different theories on ownership differences do not dictate the differences in performance (Rice - Biles 2000). In many European countries where reforms based on competition have been introduced the public sector is the dominant provider, and it is empirically difficult to compare public, non-profit and for-profit providers while one of the organizational modes can dominate the others. We were able to study how public providers of health care react to markets and competition. In Finland Occupational health services (OHS) are mainly provided by private non-profit and for-profit providers. Municipalities are in charge of organizing primary health care and this obligation includes also provision of OHS within its region. This legal task for public providers was set to guarantee that OHS would be available for employers in the whole country. Geographic market structure for OHS varies from public monopolies to regions with plenty of private providers alongside the public providers. Until 1995, the prices in municipal health centres were set by the government, whereas the private providers were allowed to set their prices freely. The abolishment of the price regulation gave the public providers the ability to influence their revenues, and therefore also their resources that had been scant compared to those of private providers.

In this article we study if the differences between public and private providers diminish. We will use the concept convergence familiar from economic growth studies (Barro, Sala-i-Martin 1992, Mankiw, Romer & Weil 1992). In growth studies the convergence was explained by Solow model, which has been also criticized later (de la Fuente 2000). In our study the abolishment of the price regulation for public providers created a change to act in the market. We study

1. if competition had impact on four indicators: productivity, intensity of the services, price and revenues in 1995-2004 in public, non-profit and for-profit OHS providers, and
2. if there was convergence in these four indicators 1995-2004.
3. Further, we study if the convergence was due to competition.

The paper is organized as follows. In section 2 we give information on the Finnish OHS and the methods applied. The results in section 3 start with descriptives, proceed to analysis on the impact of competition to the four indicators, and finally show the results for convergence, and the models studying the impact of competition on convergence. In the discussion section 4 we take up some explanations for the results and section 5 summarises the conclusions.

2. Material and methods

2.1. Finnish occupational health services

In Finland, employers are obliged to organise preventive occupational health services to their employees. Employer may choose whether they produce the services themselves (employers' own units and jointly owned units, 'non-profit') or buy the services from municipal health care centres ('public') or from private medical centres ('for-profit'). Employers defray the costs of occupational services and can apply for reimbursement for the costs from the Social Insurance Institution (SII). Although they get reimbursement, 60 per cent for preventive and 50 per cent for medical services, there is a considerable part of the costs left for the employer. So the competition among providers is "buyer driven". The total costs of organising OHS were € 425 million in 2005, and the SII reimbursed to employers € 188 million (Kansaneläkelaitos 2008).

In table 1 we present the main differences in organizational and incentive structure for the different provider types. Although public provider is charging employers for the OHS services and has revenues it is still a budget unit of the municipal health care centre. According to a population survey conducted in 2006, two out of three employees had attended an occupational health examination in the past three years, and around half of them had had occupational health personnel assessing their workplace in the past three years. Although organizing medical services is voluntary for employers, over 90% of the employees can obtain GP level services from their OHS unit. Around half of the primary care level GP visits of these employees take place within OHS (Peurala et al. 2007).

Table 1 - Organizational characteristics and incentives by provider type

	Employer's own OHS	Employers' joint OHS	Public provider	Private medical centre
Organisation	Part of the firm (employer's organisation)	Employers govern the separate OHS organization	Part of the municipal health care centre providing primary health care services	Part of the for-profit firm, some firms owned by shareholders
Principal (purchaser) -provider relationship	Hierarchic	Employers govern the provider and purchase the services	Contractual	Contractual
Payment system	Budget - total costs	Fixed lump-sum (usually high) and fee-for-service; employers aware of the total costs	Fee-for-service, also lump-sum per employee (client) payments	Lump-sum per employee and fee-for-service
Physicians' payment scheme	Salary	Salary	Salary, minor role for fee-for-services	Most physicians entrepreneurs, fee-for-service

The Finnish Institute of Occupational Health (FIOH) sent a questionnaire to all OHS providers and collected data on clients, services and personnel from the providers in 1992, 1995, 1997, 2000 and 2004. The response rate has been high (over 90% per survey) but all providers did not give information on all items in the questionnaire. Because of the reimbursement system, there is an employer-based register of the provider, contents and costs of OHS. This employer-based data was combined per provider at the SII and merged with the FIOH data by provider's name and address.

2.2. Indicators for OHS and competition

Due to the reimbursement system the records on services provided by the OHS units is well standardized. The FIOH questionnaire collected the number of services and hours for workplace activities (workplace surveillance, meetings, lectures, groups and counselling) and the number of health examinations and medical visits separately for physicians, nurses, physiotherapists and psychologists for a whole year. Health examinations and medical visits were converted into minutes. All services in minutes were summarized into one measure by weighing the output of each occupational group by the average wage of these groups in municipal health centres (cost-weighted activity CWA)[2].

The information on personnel: the number, working hours per week and qualifications of the personnel was collected as a monthly average in spring when the survey was conducted (March or April). *Productivity* measure is the ratio CWA output per personnel working hours. Working hours were summed up by weighing the hours of each occupational group by its average wage in municipal health centres. *Intensity* of OHS is measured as a CWA output per employee (client). The intensity is higher if there will more services per client, or more qualified person is providing the

[2] The cost-weighted activity index (CWAI) has been used to measure the overall NHS hospital efficiency. Many of the problems and flaws connected to this measure reported in (Oliver 2005, S85) are less serious in more homogenous Finnish OHS.

service, e.g. a physician instead of a nurse. The number of employees and employers was from the 31st of December the respective year. The *revenue* of the provider (sales) represents scale (alongside with the number of personnel (Vining, Boardman 1992, 220) and is affected also by the intensity of OHS. We did not have detailed information on number and costs of laboratory tests and imaging services and they are not included in the CWA output measure, but the costs of them are included in the revenue measure.

Price was calculated by dividing the revenue by the CWA output. The price can differ if there are differences in production costs (like there are in wages for different provider types) and that will carry on to the prices, or if intensity differs due to different personnel structure or to different amount/prices for laboratory tests and imaging services. The expenditure on laboratory tests and imaging services was about 27-29 percent of the OHS revenues in public and for-profit provider types and about 15 percent in non-profits in 2004 (Kansaneläkelaitos 2007).

Competition and its intensity can not be measured directly. In our study, we can measure market structures (number of actors, concentration of production) that are more or less favourable to competition. First we define the geographical area that constitutes the local market. Every provider was located to one municipality based on its zip-code. Many Finnish municipalities are small, over two hundred not having a single OHS provider. There are different regional classifications to construct larger entities from municipalities. We chose regions that are based on municipalities close collaboration in regional planning (like traffic, waste management and regional planning, 'seutukunta'). There were 428 municipalities in 2004 that were grouped into 74 geographical regions (excluding Åland islands). Competition is measured by two variables, 1) the number of providers in the region and 2) Herfindahl index (the sum of squares of the market shares, 0 = minimum and 1 = maximum concentration). We calculated Herfindahl index for the market shares of the CWA output, the revenues and the employees (clients). The correlations for different HIs were high, over 0.9. Throughout the study we use the index based on CWA output. We assume that the bigger the number of providers or the lower the Herfindahl index is the more competitive the local market is.

All indicators were skewed and therefore log transformed. We use medians in describing the indicators because the time scale for all variables did not match perfectly, e.g. the data on services was per annum and the personnel figures were for one month the following spring. If there had been big changes in the number of personnel and their working hours the productivity measures in the lower and upper ends could get extreme values and distort the mean value.

Table 2 - Indicators for OHS and competition

Indicator	Formula	Keys
CWA output	$\Sigma w_i \Sigma q_{ij} r_{ij}$	r_{ij} = time that a personnel group i uses in producing a service j q_{ij} = the number of services j provided by personnel group i i = physician, nurse, physiotherapist, psychologist j = workplace visits, meetings, lectures, health examinations, medical visits w_i = weight for each personnel group i, the average salary of the personnel group i in the municipal sector
Productivity	CWA output/$\Sigma w_i hours_i$	$hours_i$ = weekly working hours of a personnel group i i and w_i as above
Intensity	CWA output/employees (clients)	
Revenue		employers' total costs by provider = provider's revenue (data provided by the SII)
Price	Revenue/CWA output	
Number of competitors		number of providers within a region
Herfindahl index	Σs_i^2	s_i is provider i's market share from the regions CWA output, range 0-1

2.3. Methods

The effect of competition on procedure indicators (productivity and intensity) and monetary outcomes (revenue, price) was studied by fixed effects models. The results from the analysis showed high correlations between the Xb and u_i (tables 7 and 8), which is an indication that fixed effects model fits better. In addition, we had almost all OHS providers included in the study. Panel estimation methods such as fixed-effects model, are usually viewed as appropriate tools to eliminate bias arising from time-invariant unobserved factors (Shen et al. 2007), p. 49. We examined the variance inflation factors (VIF) for signs of multicollinearity. Robust standard errors were employed throughout due to heteroscedasticity in the data.

To be able to test if the indicators for OHS converge we formulate a convergence equation, that is a regression model in which the dependent variable is the growth rate of the indicator and the explanatory variable is the initial or lagged value of the same indicator (de la Fuente 2000). The model for the empirical analysis of convergence is of the form

(1) $\Delta y_{i,t} = \gamma x_{it} + \beta_1 y_{i,t-1} + \beta_2 * D_{competition} * y_{i,t-1} + \varepsilon_{it,}$

where $y_{i,t-1}$ is the value of the indicator for a provider i at the previous period t-1, $\Delta y_{i,t}$ is the rate of change ($\ln(y_{i,t} / y_{i,t-1})$) between measurement points t and t-1 in time (the years when the FIOH survey was conducted), ε_{it} a random disturbance and x_{it} represents those variables that have an effect on the rate of change. If there is convergence between the providers, the β_1 coefficient is

negative - the higher the value of $y_{i,t-1}$ the smaller is the change. The expected interaction of convergence with competition was measured with two different dummy-variables. A region was assumed to be competitive if the number of competitors (providers) in the region was above the average of all regions (12; then D =1, otherwise D=0), or if the Herfindahl index was below the average of all regions (0.37). Competition accelerates convergence if coefficient β_2 is negative when the number of competitors is above the average or positive when market concentration is below the average. In the table 8 we report the results for a model where x_{it} includes time (year) only, and in the table 9 also the scale of production of the provider is included in the model.

The impact of competition on the convergence term was studied by pooled ordinary least squares (OLS) to analyse whether the indicators converge. Pooled OLS was applied although we had a panel data because regions and provider type did not have an effect on the rate of growth. Only the scale of production seemed to matter, and the results for this model will be presented. We show also the correlations between the rate of change and the lagged indicator.

3. Results

The number of providers has decreased during the study period, most in non-profits, where outsourcing has taken place and in for-profits, where merging affects the number of providers. The panel data comprises 3929 observations of the OHS providers. The year 1992 was excluded from the models studying the effect of competition because then the prices for public providers were still regulated. (Table 3).

Table 3 - The number of providers by year

Year	Public	Non-profit	For-profit	Total
1992	226	556	224	1006
1995	234	414	164	812
1997	237	367	179	783
2000	237	330	190	757
2004	225	241	155	621
change 1992/2004, %	-0.4	-56.7	-30.8	-38.3

Finnish OHS units are small measured by the number of personnel and clients (employees). Public and for-profit units have plenty of contracts mainly with small enterprises/employees. Non-profits are smaller than public or for-profit providers (clients and personnel) (table 4).

Table 4 - Characteristics of the providers by provider type in 2004, median

	Public	Non-profit	For-profit
Employers (contracts)	132	3	119

Employees (clients)	2121	750	2368
Employees per employer	15.3	207.1	14.9
Number of physicians	2	1	5
Number of OHS personnel	6	4	11

Public providers used to be much more prevention oriented than private providers (table 5). This is natural because intensity (CWA output/employee) has been much lower than in the private units (table 7, section 4) and the legal obligations for prevention had to be taken care of.

Table 5 - The share of medical care out of the CWA output by provider type and year

	Public	Non-profit	For-profit
Medical care/output			
1992	0.18	0.78	0.79
2004	0.50	0.70	0.74
change 1992/2004, %	177.8	-10.2	-6.5

Table 6. Regional market structures, the number of competitors and concentration index

Variable	N	Mean	Std. Dev.	Min	Max
Number of competitors	74	12.27	24.16	1	204
Herfindahl index, output	74	0.37	0.22	0.03	1

The market structures between regions differ. Most regions can be considered to have market structures that could be competitive. Cabral calculates allocative inefficiency in Cournot equilibrium according the number of providers. With 7 or more identical providers the performance of Cournot is closer to perfect competition than to monopoly, with 15 identical firms the loss is close to zero (Cabral 2002, 153-4). Those regions that had 1 as their Herfindahl index were public monopolies. (Table 6).

Table 7 shows how the indicators for OHS have developed during the study period. The figures are indices of the median values for provider type when public provider in 2004 is 100. The mean number of personnel has increased in all three provider types, more in private units. The CWA output has increased most in public units. The public provider has been the only one to be able to increase productivity. The intensity of the services has been the highest in non-profits, and the level has been quite stable in both non-profits and for-profits. The increase in CWA output in public units has increased the most, but the level of intensity is still lower than in private units.

The price (revenue divided by CWA output) has increase most in public units (the price regulation was abolished in 1995), their price level has reached the level of for-profits, and the non-profits

have the highest price. All provider types have increased their revenues, the public provider the most.

Table 7. Indices for indicators by provider type and year when public provider in 2004=100, median

	Public	Non-profit	For-profit
1. OHS personnel working hours per week			
1992	73.1	54.7	110.8
2004	100.0	89.2	199.8
change 1992/2004, %	36.8	62.9	80.3
2. Output (CWA)			
1992	55.3	74.2	75.0
2004	100.0	90.9	124.9
change 1992/2004, %	80.7	22.5	66.5
3. Productivity			
1992	89.3	142.9	109.7
2004	100.0	120.9	109.0
change 1992/2004, %	12.0	-15.4	-0.7
4. Intensity			
1992	53.3	218.6	153.6
2004	100.0	229.1	162.2
change 1992/2004, %	87.6	4.8	5.6
5. Revenue			
1992	21.3	77.3	46.6
2004	100.0	202.2	175.1
change 1992/2004, %	369.9	161.6	276.0
6. Price			
1992	39.0	100.1	79.6
2004	100.0	183.4	105.3
change 1992/2004, %	156.4	83.2	32.3

In tables 8 and 9 we report the results for the fixed effects models for the impact of the competition on the four OHS indicators. For public and non-profit providers we included the interaction variable to show if they react differently to competition than for-profits. All Finnish municipalities are classified into three groups urban, semi-urban and rural based on the number of inhabitants and the population density. The urban municipalities got value 1 for the dummy-variable city to control for differences in the level of competition within regions.

Concentration (Herfindahl index) is not statistically significant in the regressions of the four indicators (tables 8 and 9). Instead, the log of number of competitors (providers) is positively and statistically significantly related to log of productivity and log of intensity. For log of revenue and log of price the only positive and statistically significant coefficient was for the interactive variable (CWA output*non-profit).

Time (year) has statistically significant and negative effect on productivity and intensity and positive on revenue and price. In productivity and intensity there were diminishing returns to scale (table 8) and increasing returns to scale for revenue and price (table 9).

Table 8. Fixed effects models for the impact of competition on productivity and intensity, 1995-2004

	log productivity				log intensity			
No obs.	2433		2433		2531		2531	
No. groups	854		854		864		864	
R-sq:	0.703		0.702		0.845		0.844	
between	0.287		0.303		0.300		0.238	
overall	0.341		0.368		0.378		0.319	
corr(u_i, Xb)	-0.793		-0.752		-0.682		-0.653	
	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.
Year	-0.030	***	-0.036	***	-0.008	**	-0.011	***
ln(NC)	0.240	**			0.192	*		
ln(NC) * public	0.020				-0.122			
ln(NC) * non-profit	-0.005				-0.025			
HI, output			0.507				-0.545	
HI, output * public			-0.914				0.504	
HI, output * non-profit			-0.612				0.373	
log output	1.669	***	1.673	***	1.330	***	1.339	***
log (output)^2	-0.040	***	-0.041	***	-0.023	***	-0.024	***
City, 1=yes, 0=no	-0.048		-0.055		-0.073	**	-0.081	***
Constant	-11.309	***	-10.504	***	-8.139	***	-7.665	***
sigma_u	0.983		0.890		1.012		1.018	
sigma_e	0.378		0.379		0.256		0.256	
rho	0.871		0.846		0.940		0.940	

NC = number of competitors; HI = Herfindahl index, *** p<0.001, ** p<0.01, * p<0.05

Table 9 -Fixed effects models for the impact of competition on revenue and price, 1995-2004

	log revenue		log price	
No obs.	2421	2421	2421	2421

No. groups	841		841		841		841	
R-sq:within	0.514		0.510		0.703		0.700	
between	0.388		0.419		0.170		0.057	
overall	0.430		0.401		0.255		0.114	
corr(u_i, Xb)	0.224		0.381		-0.689		-0.678	
	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.	Coeff.	
Year	0.092	***	0.092	***	0.094	***	0.092	***
ln(NC)	0.050				0.107			
ln(NC) * public	-0.360				-0.397			
ln(NC) * non-profit	0.083	*			0.086	*		
HI, output			0.076				-0.010	
HI, output * public			-0.252				0.087	
HI, output * non-profit			0.002				-0.276	
log output	-0.470	**	-0.467	**	-1.458	***	-1.454	***
log (output)^2	0.033	***	0.032	***	0.032	***	0.032	***
City, 1=yes, 0=no	-0.116	**	-0.128	**	-0.111	**	-0.126	**
Constant	12.192	***	12.198	***	11.985	***	12.145	***
sigma_u	1.149		1.219		1.147		1.222	
sigma_e	0.402		0.404		0.402		0.404	
rho	0.891		0.901		0.891		0.902	

NC = number of competitors; HI = Herfindahl index, *** p<0.001, ** p<0.01, * p<0.05

All four indicators converge - the correlation coefficients between the rate of change and actual levels are all negative and statistically significant (table 10).

Table 10 - Convergence by year; correlation between Δy_t and y_{t-1}

Year	log productivity	N	log intensity	N	log price	N	log revenue	N
1995	-0.47	514	-0.31	544	-0.79	630	-0.38	708
1997	-0.64	570	-0.59	583	-0.78	598	-0.24	687
2000	-0.61	482	-0.56	546	-0.78	573	-0.27	686
2004	-0.71	399	-0.45	450	-0.80	476	-0.36	514

The pooled ordinary least squares regressions for the rate of change (equation 1) of the four indicators are reported in table 11. There is a convergence in all four indicators - all coefficients for y_{t-1}'s are negative and statistically significant. We studied the effect of competition by adding y_{t-1} * "competitive region" measure in the model. The region was regarded competitive if the number of providers was above the average in 1992-2004 or the Herfindahl index was below the average. The number of competitors (providers) had a statistically significant impact for convergence in all

indicators except on revenue, but the effect was opposite than what could be expected. If the number of competitors in the region was above the average it slowed down the convergence. Above average concentration in the region accelerated convergence in all indicators except revenue, again. The effect was minor compared to the coefficient for the lagged value of an indicator.

Table 11 - Convergence and the effect of competition, pooled OLS, 1995-2004

	Δ Productivity				Δ Intensity			
No. obs.	1965		1965		2123		2123	
R-squared	0.371		0.374		0.245		0.254	
	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.
y_{t-1}	-0.750	***	-0.718	***	-0.470	***	-0.443	***
y_{t-1} * ln(NC)	0.041	***			0.038	***		
y_{t-1}*HI			-0.088	***			-0.085	***
year	-0.008		-0.008		0.008		0.009	
constant	2.018	***	2.022	***	1.772	***	1.787	***
	Δ Revenue				Δ Price			
No. obs.	2595		2595		2010		2010	
R-squared	0.124		0.124		0.265		0.250	
	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.
yt-1	-0.124	***	-0.121	***	-0.625	***	-0.476	***
yt-1 * ln(NC)	0.002				0.253	***		
yt-1*HI			-0.003				-0.136	**
year	0.040	***	0.040	***	0.034	***	0.034	***
constant	1.374	***	1.366	***	0.116	**	0.137	**

NC = number of competitors; HI = Herfindahl index, *** p<0.001, ** p<0.01, * p<0.05

All four indicators are converging also in the model that includes the scale of production. Compared to the results reported in the previous table 11 there are the following differences: the convergence in productivity was not affected by region having above average number of competitors, the above average concentration still accelerated the convergence in productivity but was less significant statistically. Increase in the scale of the production decreases the growth rate for productivity and intensity and increases the growth rate for revenue and price (at the relevant output scale in this study).

Time (year) increased the growth rate for revenue and price in both models (table 11 and 12) and decreased the growth rate of productivity when the scale of production was taken into account (table 12). The explanatory power of the regression models that included also the scale of production was higher for the growth rates of all indicators than in the models without it.

Table 12 - Convergence and the effect of competition and the scale of the production, pooled OLS, 1995-2004

	Δ productivity				Δ Intensity			
No. obs.	1965		1965		2123		2123	
R-squared	0.619		0.620		0.520		0.523	
	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.
yt-1	-0.890	***	-0.877	***	-0.564	***	-0.547	***
yt-1 * ln(NC)	0.017				0.023	***		
yt-1*HI			-0.039	*			-0.049	***
year	-0.021	***	-0.021	***	-0.006		-0.005	
production	2.018	***	2.173	***	2.114	***	2.082	***
production^2	-0.088	***	-0.087	***	-0.085	***	-0.084	***
constant	-10.776	***	-10.697	***	-10.526	***	-10.349	***
	Δ Revenue				Δ Price			
No. obs.	2277		2277		2010		2010	
R-squared	0.269		0.268		0.426		0.412	
	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.	Coeff.	sig.
yt-1	-0.284	***	-0.278	***	-0.629	***	-0.452	***
yt-1 * ln(NC)	0.004				0.278	***		
yt-1*HI			-0.003				-0.213	**
year	0.040	***	0.039	***	0.044	***	0.044	***
production	-0.301	**	-0.306	**	-1.694	***	-1.694	***
production^2	0.024	***	0.025	***	0.069	***	0.069	***
constant	3.480	***	3.477	***	10.222	***	10.253	***

NC = number of competitors; HI = Herfindahl index, *** p<0.001, ** p<0.01, * p<0.05

4. Discussion

The panel data that we had at our disposal had high number of observations and covered almost all OHS providers in Finland. It included information both from a survey and from an official register. Defining the geographical market is always difficult, and we used the official classification for regions that combine several municipalities. These regions can still contain providers in very different competitive environments which can lead to measurement error in calculating Herfindahl index (Keeler, Melnick & Zwanziger 1999, 74). We tried to solve this problem by including a dummy-variable "city" in the analysis to differentiate between more and less competitive municipalities within the region.

The results for the two competition measures that we used gave slightly different results. Number of providers (competitors) had a positive and statistically significant effect on productivity and intensity, for non-profits also on revenue and price (interaction). The effect on productivity is in line with economic theory on competition, the increase in intensity might be due to higher demand in

regions with more generous supply, or supplier induced demand. Herfindahl index measures concentration, and therefore the existence of market power. It did not have a statistically significant effect on the level of the four indicators for OHS (productivity, intensity, revenue and price). The common result from the USA concentration studies is that the more concentrated the market the higher the prices, for both for-profit and other providers. Concentration has also improved productivity in the USA, but this might have been due to excess capacity that existed before the merging wave took place. Sari (Sari 2003, 1585) found out that the association between cost inefficiency and market concentration changes depending on the level of competitiveness in the market: at low levels of concentration the increase in it improves efficiency and after some range the increase in concentration causes inefficiencies.

Convergence was clearly present in the market for OHS. The convergence was muted for productivity, intensity and price in regions (markets) that had above average number of providers. When the scale of production was taken into account the effect on productivity disappeared. In regions that had above average concentration the convergence of the OHS indicators was accelerated for all indicators except for revenue. The inclusion of the scale of productions decreased the statistical significance of the concentration on productivity, but the effect still remained. The magnitude of the effect competition had on convergence was small.

Shen et al. (Shen et al. 2007, 43) criticized empirical literature on hospital ownership and performance for not addressing to economic theory: "economic theory is virtually never discussed". In our study competition is the core concept, so we should take seriously the assumptions connected to it. (Rice - Biles 2000, 865) lists the assumptions of a competitive market. Competition is driven by consumer demand, who are best judges of their welfare, have enough information to make good, rational choices and social welfare is based on individual utilities. Supply is supposed to adjust to consumer demand. Suppliers do not have impact on demand and they maximize profits without monopoly power and no increasing returns to scale. Further, there are no positive or negative externalities of consumption and the distribution of wealth is approved by the society. Dranove and Satterthwaite (2000, 1095-6) take up the problems of asymmetric information, costly search and marketability of risk and state that "No other market of substantial importance violates these three requirements of perfect competition so radically." So, competition is not only about the market structure (McNulty 1968) and could be that the number of providers and the Herfindahl index do not grasp the behaviour of the providers completely.

Competition is not only about the providers – purchasers have an important role, too (Dusheiko et al. 2007, 2):. " […] the degree to which purchasers exercise their leverage over providers will influence the responsiveness of the providers." Their own study showed that purchasers were not eager to switch providers and commissioning concentrated in the NHS. The purchasers need on incentive to do their job well. In the NHS fundholding practices were willing and able to challenge hospitals (Glennerster 1998, 408). Also the HMO experiences support the idea that purchasers' role matter. In this data most of the employers were pretty small (in number of employees) and can not be regarded as powerful in bargaining about the prices or the contents of the services.

The product market is not the only market. Competition in the labour market could also be connected to the convergence in OHS. If health care personnel prefer certain kind of arrangements they soon will be taken over in different provider types to be able to keep or recruit staff. (Vining, Boardman 1992, 216) regards the differences in ownership more an issue of competition in ownership than ownership, *per se*.

Market and competition is not the only mechanism in health care, it is politics, too (Oliver 2005, S87). Government is not the only one to exercise power - there are labour market organisations of considerable economic and political power (e.g. the British Medical Association in the NHS (Maynard 1991, 1281). In addition, the relationships between purchaser and providers might not resemble the ideal market situation but rather 'collegial or hierarchical relationships' (Oliver 2005, S87) and the contracts between purchasers and providers are not legally binding, but 'understandings' between the two parties (Maynard 1991, 1282). The Finnish OHS has very much of these same features. The legislation, funding and OHS politics is agreed upon among trade unions.

Public providers clearly changed their behaviour after the price regulation was abolished, they hired more personnel but the private providers hired even more. The public units were the only ones to be able to increase productivity which is still lower than in private units. Intensity of services increased 87% but was still far below the private providers. Also the contents of the services have changed: in 1992 the share of medical care was less than one fifth of the CWA output - in 2004 it was already half of the output. The rise in prices in public units was much higher than in private units, but the price level is still much lower than in the private units.

So, the public providers remind more and more the non-profit, and especially the for-profit providers. Likely the development continues. Property rights theorists would claim them to have

different incentives (Hart, Shleifer & Vishny 1997); and the soft budget constraint, or at least a backup the municipal health care centre offers with taxpayer money differs from that of for-profit companies. The three provider groups are different and have different client segments. OHS market resembles monopolistic competition. High search costs can lead to monopolistic competition (Grytten 2000, 448). Monopolistic competition is competition on explicit quality attributes that the competitors possess and, within limits manipulate (Dranove - Satterthwaite 2000, 1102).

6. Conclusions

Public providers seem to mimic private providers when they operate is similar environments (without price regulation in this Finnish OHS case). During the study period 1995-2004 the public providers were catching up with the private for-profits and non-profits in productivity, intensity, revenue and price.

Competition was measured as the number of providers and Herfindahl index in the region. Higher number of providers was connected to higher productivity and intensity, in non-profits also to revenue and price. Concentration did not have significant effect on any of the four indicators.

There was convergence in productivity, intensity, revenue and price in the OHS market in 1995-2004. The convergence was muted for productivity, intensity and price in regions (markets) that had above average number of providers. When the scale of production was taken into account the effect on productivity disappeared. In regions that had above average concentration the convergence of the OHS indicators was accelerated for all indicators except for revenue. The inclusion of the scale of productions decreased the statistical significance of the concentration on productivity, but the effect still remained. The magnitude of the effect competition had on convergence was small.

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