

Industry structures in private dental markets in Finland

E. Widström^{1,2} and H. Mikkola^{1,3}

¹National Institute for Health and Welfare (THL), Helsinki, Finland; ²Institute of Clinical Dentistry, University of Tromsø, Norway; ³KELA, Social Insurance Institution of Finland, Helsinki, Finland

Objective: To use industrial organisation and organisational ecology research methods to survey industry structures and performance in the markets for private dental services and the effect of competition. **Design:** Data on practice characteristics, performance, and perceived competition were collected from full-time private dentists (n=1,121) using a questionnaire. The response rate was 59.6%. Cluster analysis was used to identify practice type based on service differentiation and process integration variables formulated from the questionnaire. **Results:** Four strategic groups were identified in the Finnish markets: *Solo practices* formed one distinct group and group practices were classified into three clusters *Integrated practices*, *Small practices*, and *Loosely integrated practices*. Statistically significant differences were found in performance and perceived competitiveness between the groups. Integrated practices with the highest level of process integration and service differentiation performed better than solo and small practices. Moreover, loosely integrated and small practices outperformed solo practices. Competitive intensity was highest among small practices which had a low level of service differentiation and was above average among solo practices. **Conclusions:** Private dental care providers that had differentiated their services from public services and that had a high number of integrated service production processes enjoyed higher performance and less competitive pressures than those who had not.

Key words: dental health services, private sector; economic competition, group practice, private practice, industry structures

Introduction

In Finland over recent decades, dental services have been provided by the public and private sectors. Public services have been widely offered in health centres run by municipalities. Half of the dentists worked in the Public Dental Service (PDS) and the other half in the private sector concentrated in the densely populated areas. Traditionally, the division of duties between the two sectors has been clearly defined, as only children, young adults, and some special needs groups have been entitled to dental care in the PDS. Most adults have had to use private services and pay all costs out-of-pocket. In 2001-2002, the dental care provision system was reformed and the age limits restricting adults' use of the PDS were abolished. Reimbursement of private dental care (excluding prosthetic treatment) from the National Health Insurance was also extended to cover all adults (Niiranen *et al.*, 2008). Implementation of the reform put the PDS under heavy pressure and long waiting lists emerged in the health centres, partly due to their substantially lower fees compared with private services. Difficulties in the PDS have had a lot of publicity, but so far little is known of how the changes in the external environment affected the private dental care market which, after the dental reform, found itself in competition with the public sector.

In this paper, we focus on the subsequent industry structures in the private sector and build our analysis on a specific stream of industrial organisation research that focuses on strategic groups and complement it with insights from organisational ecology research (Hannan

and Freeman, 1977, 1989). Strategic group research assumes that industries contain subgroups of companies with differing structural characteristics. The stability of strategic groups is explained by mobility barriers, which inhibit the movement of firms in one group to a position held by another group. Mobility barriers can enable some companies to be persistently more profitable than their rivals (Caves and Ghemawat, 1992). Another way to see the role of industry structure is to consider strategic groups as viable strategic positions in the market space (Hatten and Hatten, 1987). They represent the strategic choices potentially available to firms in a given industry and reflect different approaches to operating in the competitive arena. Competition between strategic groups is driven by three factors: number and size of groups, distance between the groups and their market interdependence. The more numerous and more equal in size the strategic groups are, the higher is the strategic asymmetry in the industry, which generally increases rivalry. Strategic distance refers to the degree to which the groups differ in terms of their strategies. Market interdependence is the extent to which different strategic groups are competing for the same customers (Porter, 1979).

In organisational ecology research, populations of organisations are the main constituent units of industry structure. Hannan and Freeman (1977) assert that populations of organisations have to have a unitary character, which gives them a common dependence on material and social environments. The most usual approach has been to cluster organisations according to some organisational core features (Carroll and Hannan, 2000). Organisational ecologists focus on the changing nature of competition

spurred by changes in the external environment (Carroll, 1984) and competition is the natural consequence of scarcity in resources. As the density of organisations increases, the struggle for resources intensifies, creating pressure for selection (Hannan and Freeman, 1989). For the purpose of analysing competitive processes, ecologists use the concept of the niche - a set of conditions, in which the population can grow or at least sustain its numbers (Hannan *et al.*, 2003). Competition emerges when the fundamental niches of populations overlap.

The concept of niche width has special significance in the market for dental services. In Finland, the PDS focuses on providing basic care and its services cover just the core clinical treatments. In the private sector, solo practices have also traditionally focused on basic care (Mikkola *et al.*, 2007) but group practices have started to develop their service offerings, by providing treatments not generally available in the PDS. Service differentiation by private dental care providers reduces their relative niche overlap with the PDS and, consequently, the potential for competition is reduced. Therefore, we hypothesise that:

H1: Private dental care providers that have differentiated their services from public dental services face ceteris paribus fewer competitive pressures and enjoy higher performance.

In many group practices, dentists share common premises, but otherwise operate independently, whereas in other practices, dentists have integrated most of their support functions, including e.g. the purchase of materials, appointment making and auxiliary personnel. Dentists can also have common fee lists and patient registers. The benefits of these investments may come in the form of scale economies or improved service quality. Process integration can also serve as a mobility barrier, providing protection from competitive pressures. Accordingly, we hypothesise that:

H2: Dental care providers with more integrated service production processes face ceteris paribus fewer competitive pressures and enjoy higher performance.

This paper aims to identify the industry structure in the Finnish market for private dental services and to survey how the different strategic groups performed in business. In order to gain understanding of the role of the major national dental care reform and the changes the industry was going through, we also analysed dentists' perceptions of competition and the perceived effects of the reform.

Material and Methods

The data of this study were gathered using a questionnaire survey conducted among private dentists although the actual object of interest was the firms responsible for private dental services. It has been shown that many group practices did not operate in a co-ordinated manner and did not necessarily have a representative responsible for the management of the whole practice (Mikkola *et al.*, 2007). Therefore, we targeted the questionnaire to private dentists, who were asked questions regarding their practices. The questionnaire had 6 sections covering practice characteristics, treatments provided, treatment fees, competition, experience of the reform and background information. Closed questions were favoured to obtain quantitative and categorical data.

Based on earlier research on strategic groups and organisational ecology and our interviews with industry experts and dental practice managers, two strategic dimensions were constructed for use in this study: service differentiation and process integration. Indicators of service differentiation included opening on weeknights and at weekends, hygienist services and recall practices. The out-of-hours availability of public services has been poor and thus we considered that the greater the number of days a private practice was open during weeknights or weekends, the greater its service differentiation. Provision of hygienist services indicated that a practice had developed its service profile. Furthermore, because the PDS did not normally offer recall services for adults, a high proportion of recall visits implied service differentiation. Indicators of process integration included patient register, fee list, integrated functions and practice size. A shared patient register and fee list enabled integrated marketing activities and appointment booking and practice-wide profitability accounting. Furthermore, information on the number of services included in the overheads of the practice (facilities, materials, office services, equipment, auxiliary personnel, and appointment scheduling) was collected. The higher the number of such services, the more integrated the operations of a practice were assumed to be. Finally, the number of dentists operating in the same premises was assumed to reflect the potential for economies of scale that were attainable from process integration.

Fees for items of dental treatment had to be used as the primary indicator of business performance because typical measures of financial performance such as revenue, profitability or net profit were neither available, nor familiar to dentists. A price index was constructed from the 7 questions regarding prices of usual treatments. Five questions and two statements were used to form a measure of perceived competition: *How much competition (in general, price competition, marketing competition, competition relating to service profile) was there between providers of dental services. Were there sufficient private dentists in the town and Did the supply of private dental services meet the demand?* The respondents were asked to give their answers on a 5-point scale. Answers to each question and statement were then scored, and individual scores were summed to form an overall score for each respondent.

The questionnaire was pretested with a focus group and, based on that, some questions were omitted or changed. A list with names and postal addresses of all full time private dentists working in the ten biggest cities was obtained from the membership register of the Finnish Dental Association (98% of dentists were members). Questionnaires (to be answered anonymously) were sent to them in September and re-mailed in November in 2005. Altogether 668 persons answered, of them 28 had to be excluded for various reasons. The response rate was 59.6%. Of the 640 included respondents, 73.6% worked in group practices (Widström *et al.*, 2011).

A two-step cluster analysis was used (Jauhiainen, 2006). The 169 solo practitioners were treated as a separate group because, in a solo practice, scale advantages from the integration of operations were not attainable. The 471 dentists working in group practices were included in

the cluster analysis. The algorithm initially pre-clustered elements into many small sub-clusters and then used a hierarchical clustering method to cluster the sub-clusters. Only variables relating to practice characteristics were selected for cluster analysis. One-way analysis of variance (ANOVA) was used to measure differences in means between groups when Levene's test first had indicated that the variances for the groups did not differ significantly, and ANOVA could be applied. In order to examine differences in performance between pairs of groups, we also carried out Scheffé's post hoc tests. The χ^2 test was used in some comparisons.

Results

Industry structure in the market for dental services

The cluster analysis deleted all cases with missing data and reduced the number of dentists working in group practices to be analysed to 399 (Table 1). Three clusters

were identified and 44.6% of the cases were allocated in Cluster 1, 22.6% in Cluster 2, and 32.8% in Cluster 3. Table 2 shows the clustering results based on service differentiation variables and process integration variables.

On basis of their main distinguishing characteristics, the clusters were named: 1, Integrated practices;

Table 1. Identification of clusters among dentists working in group practices and excluded cases

Cluster	Dentists <i>n</i>	% of clustered dentists	% of all dentists
Clustered cases			
Cluster 1	178	44.6	37.8
Cluster 2	90	22.6	19.1
Cluster 3	131	32.8	27.8
All clusters	399	100	84.7
Excluded cases	72		15.3
All cases	471		100

Table 2. Clustering of dentists operating in group practices based on service differentiation and process integration variables

Panel A: Categorical service differentiation variables

Variable	Items	Cluster 1 (Integrated)		Cluster 2 (Small)		Cluster 3 (Loosely integrated)		All Clusters	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Weeknight opening	Not at all	21	11.8	32	35.6	41	31.3	94	23.6
	1 day	18	10.1	9	10.0	12	9.2	39	9.8
	2 days	13	7.3	19	21.1	13	9.9	45	11.3
	3 days	13	7.3	10	11.1	8	6.1	31	7.8
	4 days	88	49.4	17	18.9	39	29.8	144	36.1
	5 days	25	14.0	3	3.3	18	13.7	46	11.5
Weekend opening	Not at all	137	77.0	74	82.2	106	80.9	317	79.4
	Occasionally	32	18.0	15	16.7	19	14.5	66	16.5
	Every Sat or Sun	6	3.4	1	1.1	3	2.3	10	2.5
	Every Sat & Sun	3	1.7	0	0.0	3	2.3	6	1.5
Hygienist services	No	0	0	90	100	0	0	90	22.6
	Yes	178	100	0	0.0	131	100	309	77.4

Panel B: Continuous service differentiation variables

Variable		Cluster 1	Cluster 2	Cluster 3	All Clusters
Proportion (%) of recall patients	mean (sd)	66.9 (25.4)	58.2 (31.7)	70.2 (25.9)	66.0 (27.4)

Panel C: Categorical process integration variables

Variable	Answers	Cluster 1		Cluster 2		Cluster 3		All Clusters	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Patient register	Dentist specific	0	0.0	45	50.0	112	85.5	157	39.3
	Practice wide	178	100	45	50.0	19	14.5	242	60.7
Fee list	Dentist specific	0	0.0	20	22.2	75	57.3	95	23.8
	Practice wide	178	100	70	77.8	56	42.7	304	76.2

Panel D: Continuous process integration variables

Variable		Cluster 1	Cluster 2	Cluster 3	All Clusters
Integrated functions	mean (sd)	4.3 (2.4)	3.1 (2.4)	3.3 (2.2)	3.7 (2.4)
Practice size	mean (sd)	7.5 (4.7)	4.1 (2.4)	8.0 (5.5)	6.9 (4.8)

2, Small practices; and, 3, Loosely integrated practices. *Integrated practices* possessed the highest levels of process integration and service differentiation. They had a common patient register and fee list, large numbers of integrated functions, hygienist services and often opened extended hours. In terms of size, they were above average but slightly behind the *Loosely integrated practices* of Cluster 3. *Integrated practices* could be considered the most advanced in service differentiation though the difference from *loosely integrated practices* was marginal. Their proportion of recall patients was above average, but slightly lower than in the *loosely integrated practices*. *Small practices* were characterised by small size and low service differentiation. In terms of all process integration variables, they fell clearly behind *integrated practices*. However, with the exception of size, their level of process integration seemed to be somewhat higher than that of *loosely integrated practices*. Dentist-specific and practice-wide patient registers were equally common but fee lists tended to be practice wide. Their number of integrated functions was approximately the same as for *loosely integrated practices*. In terms of service differentiation, *small practices* were clearly behind all other group practices, providing no hygienist services and were mostly not open on weeknights or at weekends. The proportion of recall patients was lowest in this group. *Loosely integrated practices* were fairly large in size and had a relatively high level of service differentiation. The key differentiating factor of this cluster was the low level of process integration. The number of integrated functions was low and an overwhelming majority these practices had dentist specific patient registers and fee lists indicating that, despite the shared premises, dentists in this group operated almost completely independently.

Figure 1 provides a rough illustration on the strategic positions of the four groups of dental practices in terms of process integration and service differentiation. The size of the bubble reflects the number of dentists in the group. *Solo practices* and *Integrated practices* represented extreme strategic positions with respect to both strategic dimensions.

Performance of the different strategic groups of practices

Panel A in Table 3 shows the differences in performance between the clusters. Fees for dental services were lowest in *solo practices*, second lowest in *small practices*, third lowest in *loosely integrated practices*, and highest in the *integrated practices*. Differences in performance between pairs of groups are shown in panel B of Table 3. They provided support for both H1 and H2. *Integrated practices* with the highest level of process integration and service differentiation performed significantly better than *solo practices* and *small practices*. Moreover, *loosely integrated* and *small practices* outperformed solo practices.

Perceived competitive pressures

Table 4 (Panel A) shows that the intensity of competition perceived by dentists was highest among *small* and *solo practices*. *Integrated* and *loosely integrated practices*, on the other hand, enjoyed below average competitive intensity. Although ANOVA showed that the result

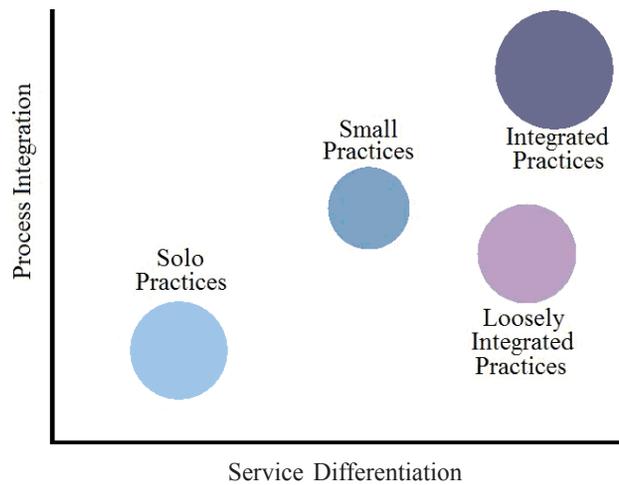


Figure 1. Strategic positioning of dental group practices in terms of process integration and service differentiation

was statistically significant ($p < 0.05$) the differences in competitive intensity between pairs of groups were not statistically significant (Table 4, Panel B). The biggest differences were between *integrated* and *small practices*. These results were also in line with hypotheses H1 and H2. *Integrated practices* with the highest level of process integration and service differentiation faced the lowest level of competitive intensity. Competitive intensity was highest among *small practices*, which had a low level of service differentiation in comparison to *integrated* and *loosely integrated practices*. Intensity of competition was also above average among *solo practices*, even though it falls short of the levels experienced by *small practices*.

Most dentists (63.7%) operating in *Small practices* considered the PDS to compete for the same patients as they were. For *Solo practices*, *Loosely integrated practices* and *Integrated practices* the corresponding proportions were 41.1, 41.8, and 45.2 respectively. Moreover, private dentists' general attitudes towards the national dental care reform varied between groups. Dentists operating in *Integrated* and *Loosely integrated practices* were substantially more positive to the reform than dentists operating in *solo practices* and *Small practices* ($p < 0.01$).

Discussion

This study aimed to provide a new interpretation of the existing research on dental care markets that were previously based solely on industrial organisation research with a focus on effectiveness and competition (Grembowski *et al.*, 1988; Grytten and Sorensen, 2000) and the effects of industry structural characteristics on these (Conrad and Emerson, 1981; Conrad and Sheldon, 1984; Freund and Schulman, 1984). One reason why strategic groups have not received much attention in dental care in the past may be that the bulk of the research on dental care markets has been based on the implicit assumption that all service providers operating in an industry are alike (Grembowski *et al.*, 1988; Grytten and Sorensen, 2000). This has been justified because the dental care industry in Finland and internationally has been dominated by solo practices with virtually identical strategies and resources. More recently, increasing numbers of group practices

Table 3. Differences in performance between identified categories of private dental practices

Panel A: Analysis of variance (Levene's test; p=0.230)		
<i>ANOVA: F=22.007, p<0.001</i>		
<i>Groups</i>	<i>Number of dentists</i>	<i>Price index (sd)</i>
Solo practices	125	93.27 (13.17)
Integrated practices (Cluster 1)	149	104.33 (10.89)
Small practices (Cluster 2)	71	98.42 (8.15)
Loosely integrated practices (Cluster 3)	93	102.31 (13.26)
<i>All the above practices</i>	<i>438</i>	<i>99.78 (12.57)</i>

Panel B: Post hoc tests (Scheffé)				
		<i>Mean difference in price index</i>	<i>Significance p</i>	<i>95% confidence interval</i>
Solo practices	Integrated	-11.065 ***	<0.001	(-15.064, -7.065)
	Small	-5.155 *	0.035	(-10.055, -0.254)
	Loosely integrated	-9.041 ***	<0.001	(-13.557, -4.525)
Integrated practices	Solo	11.065 ***	<0.001	(7.065, 15.064)
	Small	5.910 **	0.007	(1.155, 10.665)
	Loosely integrated	2.024	0.638	(-2.334, 6.381)
Small practices	Solo	5.155 *	0.035	(0.254, 10.055)
	Integrated	-5.910 **	0.007	(-10.665, -1.155)
	Loosely integrated	-3.886	0.223	(9.083, 1.311)
Loosely integrated practices	Solo	9.041 ***	<0.001	(4.525, 13.557)
	Integrated	-2.024	0.638	(-6.381, 2.334)
	Small	3.886	0.223	(-1.311, 9.083)

n=438; *p<0.05; **p<0.01; ***p<0.001

Table 4. Differences in perceived intensity of competition between different categories of private dental practices

Panel A: Analysis of variance (Levene's test; p=0.454)		
<i>ANOVA: F=2.702, p=0.045</i>		
<i>Groups</i>	<i>Number of dentists</i>	<i>Competition index (sd)</i>
Solo practices	165	23.65 (4.59)
Integrated practices (Cluster 1)	173	22.72 (4.90)
Small practices (Cluster 2)	86	24.33 (4.65)
Loosely integrated practices (Cluster 3)	127	23.02 (4.77)
<i>All the above practices</i>	<i>551</i>	<i>23.32 (4.76)</i>

Panel B: Post hoc tests (Scheffé)				
		<i>Mean difference</i>	<i>Significance</i>	<i>95% confidence interval</i>
Solo practices	Integrated	0.938	0.348	(-0.509, 2.385)
	Small	-0.683	0.760	(-2.451, 1.085)
	Loosely integrated	0.639	0.728	(-0.930, 2.208)
Integrated practices	Solo	-0.938	0.348	(-2.384, 0.509)
	Small	-1.620	0.083	(-3.374, 0.133)
	Loosely integrated	-0.299	0.962	(-1.852, 1.254)
Small practices	Solo	0.683	0.760	(-1.085, 2.451)
	Integrated	1.620	0.083	(-0.133, 3.374)
	Loosely integrated	1.321	0.264	(-0.535, 3.178)
Loosely integrated practices	Solo	-0.639	0.728	(-2.208, 0.930)
	Integrated	0.299	0.962	(-1.254, 1.852)
	Small	-1.321	0.264	(-3.178, 0.535)

n=551

with different business concepts have made the market structure more diverse (Mikkola *et al.*, 2005).

About 60% of the Finnish private dentists worked in the 10 biggest cities when the study was performed. We did not think there would be much competition in smaller municipalities with fewer dentists. The respondents did not differ from the original sample regarding age, sex and specialisation (Widström *et al.*, 2011). However, because the number of cases was further reduced in the analysis the results have to be interpreted with some caution.

Four strategic groups in the Finnish market for dental services were found with statistically significant differences in performance so validating the strategic group structure we identified.

Group practices with high service differentiation and process integration seemed to have outperformed the rest of the industry and seemed to benefit from less intense competition. Theories on strategic groups and organisational ecology provide two possible explanations for this. It is possible that there are static differences in performance and intensity of competition within the industry due to mobility barriers. Alternatively, the industry may also be going through a period of evolutionary selection where new organisational forms thrive.

Dentists' perceptions of the public sector's role as a competitor and national dental care reform shed additional light on the evolutionary processes taking place within the industry. The results indicated that small group practices with a low level of service differentiation were most vulnerable to competitive pressures arising from the reform of national dental care. This is in line with the ecological theory, according to which service differentiation reduces niche overlap, and thus the potential for competition between private dental practices and public services. Private dentists seemed to be increasingly shifting to the resource space outside the niches occupied by the public dental service. In the long run, this could result in a further increase in the provision of, for example, cosmetic and advanced prosthetic treatments that are not widely available in the PDS.

Dentists operating solo practices formed a special group of industry participants. Despite their lower performance compared with, for example, integrated group practices, solo practitioners appeared to be quite indifferent to the effects of the reform. One possible explanation is that these mostly aging solo practitioners have established a loyal clientele of regular patients.

Conclusions

Based on an analysis of the private dental care market, we found that both differentiation and integration helped alleviate the competitive pressures and contribute to improved performance.

Acknowledgements

The study was supported by the Academy of Finland, Health Services Research Grant Terttu. We also thank Mr Sami Jauhiainen for his help with analysis and Professor Tomi Laamanen from the Helsinki University of Technology and Aalto University for useful guidance.

References

- Carroll, G.R. (1984): Organizational ecology. *Annual Review of Sociology* **10**, 71-93.
- Carroll, G.R. and Hannan, M.T. (2000): *The demography of corporations and industries*. New Jersey, Princeton University Press.
- Caves, R.E. and Ghemawat, P. (1992): Identifying mobility barriers. *Strategic Management Journal* **13**, 1-12.
- Conrad, D.A. and Emerson, M.L. (1981): State dental practice acts: Implications for competition. *Journal of Health Politics, Policy and Law* **5**, 610-633.
- Conrad, D.A. and Sheldon, G.G. (1984): Competition as a means to contain dental care costs. *Advances in Health Economics and Health Services Research* **5**, 181-211.
- Freund, D.A. and Shulman, J.D. (1984): Regulation of the professions: Results from dentistry. *Advances in Health Economics and Health Services Research* **5**, 161-180.
- Grembowski, D., Conrad, D., Weaver M. and Milgrom, P. (1988): The structure and function of dental care markets. A review and agenda for research. *Medical Care* **26**, 132-147.
- Grytten, J. and Sorensen, R. (2000): Competition and dental services. *Health Economics* **9**, 447-461.
- Hannan, M.T. and Freeman, J. (1977): The population ecology of organizations. *The American Journal of Sociology* **82**, 929-964.
- Hannan, M.T. and Freeman, J. (1989): *Organizational Ecology*. London: Harvard University Press.
- Hannan, M.T., Carroll, G.R. and Pólos, L. (2003): The organizational niche. *Sociological Theory* **21**, 309-340.
- Hatten, K.J. and Hatten, M.L. (1987): Strategic groups, asymmetric mobility barriers and contestability. *Strategic Management Journal* **8**, 329-342.
- Jauhiainen, S. (2006): *Competition as a driver of industry evolution in dental services*. Master Thesis. Helsinki University of Technology.
- Mikkola, H., Widström, E., Jauhiainen, S. and Vesivalo, A. (2005): [Private dental care services in the UK, Sweden and Finland - development and success of the industry and its challenges]. *Yhteiskuntapolitiikka* **70**, 15-27.
- Mikkola, H., Vesivalo, A., Jauhiainen, S. and Widström, E. (2007): An outlook of dental practices – drivers, barriers and scenarios. *Liiketaloudellinen aikakauskirja [The Finnish Journal of Business Economics]* **56**, 167-192.
- Niiranen, T., Widström, E., Niskanen, T. (2008): Oral Health Care Reform in Finland - aiming to reduce inequity in care provision. *BMC Oral Health* **8**, 3.
- Porter, M.E. (1979): The structure within industries and companies' performance. *The Review of Economics and Statistics* **61**, 214-227.
- Widström, E., Väisänen, A. and Mikkola, H. (2011): Pricing and competition in the private dental market in Finland. *Community Dentistry and Oral Epidemiology* **28**, 123-127.