SPECIALIZATION AND COMPETITION IN DENTAL HEALTH SERVICES

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SUMMARY
The number of specialists within dental health services has increased over the last few years. This raises the issue of how the services should be organized and funded. We describe the effect of one way of organizing the services, which is by relying on competition. In Norway, some oral specialists face real competition with general dental practitioners for the same patients (prosthetists, periodontists and endodontists), while other specialists do not (orthodontists and oral surgeons). The latter specialists have skills that give them exclusive possibilities to practice their profession. We find that competition can be effective for the specialists who experience real competition with general dental practitioners for patients. In situations where real competition does not exist, specialists can obtain market power and raise their fees. Our results are based on an analysis of a representative set of data from general dental practitioners and specialists in Norway. The specialities in which practitioners can exercise market power raise challenges related to the type of public policy that can reduce this market power in an appropriate way, and without involving too large costs for the authorities. Copyright © 2008 John Wiley & Sons, Ltd.

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1. INTRODUCTION
During the last 10–20 years, there has been an increase in the number of dental specialities in most Western countries (Anderson et al., 1997). The EU has authorized orthodontics and oral surgery as specialities. In addition, several countries have authorized additional specialities, such as prosthetics, periodontics and endodontics (Anderson et al., 1997).

The increase in the number of new dental specialities raises issues about how specialist services should be organized and funded. A particularly important issue is the interface between dental specialities and general dental practice. In Norway, in accordance with the Health Personnel Act, general dental practitioners can perform the same tasks as specialists (Ministry of Health and Care Services, 1999). General dental practitioners assess when a patient, on the basis of their professional judgement, should be referred to a specialist. In other words, specialists have no legislative right to be the only ones who can carry out diagnosis and treatment within their professional field. This may promote competition, which limits their possibilities to obtain a monopoly in the market.

An important issue for dental services in the Nordic countries is how competition between general dental practitioners and specialists works. In these countries fees for dental services are meant to be
determined by market forces, which is by competition. Dental providers do not need to abide by a fee schedule determined by the state or by insurance companies. General dental practitioners and specialists also have the freedom to establish a practice where they want (Try, 1995; Swedish Competition Authority, 2004).

The number of general dental practitioners per capita is high in Norway (Table I). There is also a marked variation in the number of general dental practitioners per capita by region (Statistics Norway, 2006a, 2007). The number of specialists per capita is low (Table I). In some regions with nearly half a million inhabitants there are only 1–2 specialists within each speciality (Mid and Northern Norway). The low number of specialists per capita is likely to limit the possibilities for competition among specialists. These providers may obtain local monopoly power.

However, the large number of general dental practitioners per capita gives the possibility for competition between general dental practitioners and specialists. Therefore, the aim of this article is to describe how competition between general dental practitioners and specialists works. We find that such competition exists, but it is dependent on the type of specialist. Competition is not very effective for specialists who have skills that general dental practitioners do not have (orthodontists and oral surgeons). However, competition is effective for specialists who do not have skills that give them exclusive possibilities to practice their profession (prosthetists, periodontists and endodontists).

Below we present a short description of dental services in Norway, with special emphasis on specialist dental services. We then describe the analysis model and the data. Finally, the results are presented and discussed.

2. DENTAL SERVICES IN NORWAY

Dental services in Norway are divided into a public sector and a private sector. The public dental service has responsibility for providing dental care for all children and young people up to the age of 18, mentally handicapped people and elderly people who receive care in an institution or home nursing care (Ministry of Health and Care Services, 1984). About 27% of dentists work in the public dental service (Statistics Norway, 2006a,b). Dental treatment provided by the public dental service is free for patients. Public dental officers are employed by the county municipalities, and receive a fixed salary.

Adults receive dental treatment from private general dental practitioners. There are approximately 3.5 million people in Norway aged 20 years and over, of which nearly 80% say that they have been to the dentist during the last year (Statistics Norway, 2007; Holst et al., 2005). Fees are determined by market forces. There are no regulated fees for dental services. Private general dental practitioners have the freedom to establish a practice where they want. Private dental services for adults are almost entirely financed by patient fees. Reimbursements from the National Insurance Administration are limited.

In Norway, the authorities have authorized the following specialities: orthodontics, oral surgery, prosthetics, periodontics and endodontics (Lyngstad, 2006). Specialists are private practitioners. Their fees are also determined by market forces, and they have the freedom to establish a practice where they want.1 Orthodontists provide treatment mainly for children and adolescents.2 The other specialists provide treatment mainly for adults. With the exception of orthodontic treatment, reimbursements from the National Insurance Administration for specialist treatment are extremely limited. Patients are reimbursed on average about 50% of the cost of orthodontic treatment from the National Insurance Administration (Grytten and Skau, 2006; Ministry of Health and Care Services, 2006).

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1Training of specialists takes place at the Dental Faculties in Oslo and Bergen. With the exception of oral surgery, the training is of 3 years duration. The training for oral surgery takes 5 years. A dentist must have practised for 2 years before he or she can take up specialist training (University of Oslo, Dental Faculty, 2007).

2About one-third of all 12-year-olds in Norway receive orthodontic treatment. Very few adults receive orthodontic treatment (Grytten and Skau, 2006).
### Table I. Dentists in Norway according to region

<table>
<thead>
<tr>
<th>Region in Norway</th>
<th>Number of inhabitants</th>
<th>General dental practitioners Number per 100 000 inhabitants</th>
<th>Orthodontists Number per 100 000 inhabitants</th>
<th>Oral surgeons Number per 100 000 inhabitants</th>
<th>Prosthetists Number per 100 000 inhabitants</th>
<th>Periodontists Number per 100 000 inhabitants</th>
<th>Endodontists Number per 100 000 inhabitants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eastern</td>
<td>2 329 675</td>
<td>1501 64.43</td>
<td>79 3.39</td>
<td>22 0.94</td>
<td>33 1.42</td>
<td>27 1.16</td>
<td>32 1.37</td>
</tr>
<tr>
<td>Southern</td>
<td>268 461</td>
<td>144 53.64</td>
<td>9 3.35</td>
<td>4 1.49</td>
<td>2 0.74</td>
<td>2 0.74</td>
<td>1 0.37</td>
</tr>
<tr>
<td>Western</td>
<td>1 212 856</td>
<td>668 55.08</td>
<td>50 4.12</td>
<td>13 1.07</td>
<td>11 0.91</td>
<td>23 1.90</td>
<td>9 0.74</td>
</tr>
<tr>
<td>Mid</td>
<td>407 905</td>
<td>159 38.98</td>
<td>11 2.70</td>
<td>2 0.49</td>
<td>1 0.25</td>
<td>2 0.49</td>
<td>0 0.00</td>
</tr>
<tr>
<td>Northern</td>
<td>462 237</td>
<td>183 39.59</td>
<td>15 3.25</td>
<td>2 0.43</td>
<td>2 0.43</td>
<td>4 0.87</td>
<td>1 0.22</td>
</tr>
<tr>
<td>Total</td>
<td>4 681 134</td>
<td>2655 56.72</td>
<td>164 3.50</td>
<td>43 0.92</td>
<td>49 1.05</td>
<td>58 1.24</td>
<td>43 0.92</td>
</tr>
</tbody>
</table>
Specialists can obtain patients from referral from general dental practitioners, but patients can also contact a specialist directly, without a referral. There is no national overview of how many patients receive specialist treatment. The distribution of specialists according to speciality is shown in Table I. The largest group is orthodontists, the smallest groups are oral surgeons and endodontists.

3. DESIGN AND METHODS

3.1. Background and theory

Orthodontists and oral surgeons have a clearly defined area of competence in relation to general dental practitioners (The Norwegian Dental Association, 2007). From their basic dental education, general dental practitioners have very limited knowledge and skills to diagnose and treat malocclusions. Orthodontic treatment is therefore left to orthodontists. Similarly, diagnosis and treatment of pathological conditions in the jaws and oral soft tissues (for example, tumours) demand knowledge and skills possessed by oral surgeons, but not by general dental practitioners. Therefore, orthodontists and oral surgeons do not compete with general dental practitioners for the same patients. This means that orthodontists and oral surgeons can have a monopoly position in their respective fields. They almost have a natural monopoly.

Prosthetists, periodontists and endodontists do not have such a clear demarcation of their area of competence in relation to general dental practitioners (Norwegian Dental Association, 2007). Only the most serious conditions of periodontitis, tooth loss and periapical lesions require specialist treatment. Milder conditions can be treated by general dental practitioners. Therefore, these specialists do not have skills that give them exclusive rights to practice their speciality. In contrast to orthodontists and oral surgeons, they do not have a monopoly in their respective fields. They operate in a market in which they partly compete with general dental practitioners for the same patients.

We investigated whether the behaviour of specialists in determining their fees is influenced by competition with general dental practitioners. The behaviour, in economic terms, of the different specialists can be understood according to a model of monopolistic competition. Such a model has been used previously in studies of the importance of market conditions for the service production of physicians and psychologists (Pauly and Satterthwaite, 1981; Klevorick and McGuire, 1987; Satterthwaite, 1985). According to the model, it is expected that specialists’ fees are determined by marginal practice costs (MC) and by the demand elasticity (\( e \), where \( e < -1 \)) for services provided by the individual specialist:

\[
FEE = MC \left[ \frac{e}{1 + e} \right]
\]

(1)

Orthodontists and oral surgeons have the most market power. It is expected that they can raise their fees more than specialists in prosthetics, periodontics and endodontics can, without losing their patients. Demand elasticities are, therefore, lowest for services provided by orthodontists and oral surgeons, and highest for services provided by prosthetists, periodontists and endodontists. According to Equation (1), we therefore expect that orthodontists and oral surgeons can set higher fees than prosthetists, periodontists and endodontists. This also means that orthodontists and oral surgeons have higher net income per hour (adjusted for practice costs) than the other specialists.

3.2. Sample and variables

The data for this study were collected using a questionnaire that was sent out to general dental practitioners and specialists in orthodontics, oral surgery, prosthetics, periodontics and endodontics in the winter of 2007. In cooperation with the leaders of each specialist association, a registration form was
developed to collect information about the respondents’ gender, age, type of practice (solo practice, group practice), working hours (time spent on treating patients and administration), gross income (all income from patient treatment) and practice running costs (all costs, including salary for auxiliary personnel, rent, insurance, etc.).

The registration form was sent out to all specialists. Table II presents an overview of the respondents according to the type of speciality. The response rate was well over 70% for orthodontists, oral surgeons, periodontists and endodontists. Only prosthetists had a response rate that was markedly lower than for the other groups. Altogether 1426 general dental practitioners received the registration form. The response rate was 59%. An analysis of the non-responders showed that the material was representative of the population of general dental practitioners and specialists with respect to gender and age (Grytten and Skau, 2007) (Table II).

3.3. The regression model

We specified the following regression model (ordinary least squares):

\[
\text{NETINCOME} = z + \beta_1 \text{orthodontics} + \beta_2 \text{oral surgery} + \beta_3 \text{prosthetics} + \beta_4 \text{periodontics} + \beta_5 \text{endodontics} + \text{control variables} + \text{error term}
\]

where \(\text{NETINCOME}\) is a measure of the respondents’ net income per hour.\(^3\) It is calculated as the difference between dentists’ gross turnover and practice costs, divided by the number of working hours.\(^4\) Each speciality is represented by a dummy variable (general dental practitioner = reference category). Since orthodontists and oral surgeons do not have competition from general dental practitioners, we expect that the regression coefficients \(\beta_1\) and \(\beta_2\) are positive. The regression coefficients \(\beta_3\), \(\beta_4\) and \(\beta_5\) are expected to have an effect almost equal to 0.

Relevant control variables are the respondents’ gender and age. Whether or not they work in a group practice (more than one dentist) is included to capture any economies of scale in production (Grytten and Dalen, 1997). Part-time providers have lower throughput but face many of the same fixed costs as full-time providers (for example, rent and equipment). The net income of part-time providers may therefore be lower than for full-time providers because of differences in working hours. Whether the providers work 15 h per week or less is included in the analyses to take into account the effect that working time might have on net income. Norway is divided into five geographic regions. We include them as dummy variables to take account of local conditions that may influence demand for and supply of specialist services.

4. RESULTS

Table III presents descriptive statistics for the data material. Oral surgeons have the highest net income per hour, with NOK 1110 (€ 138) and orthodontists have the next highest, with NOK 923 (€ 115). The net income per hour of oral surgeons is 44% higher than that of general dental practitioners. Prosthetists and endodontists earn 7–8% more than general dental practitioners, and periodontists earn only slightly more.

Over half of endodontists are women (Table III). About one-quarter of orthodontists and periodontists are women. The proportion of women oral surgeons is low. The age distribution also varies for the different specialists. Very few endodontists are aged 60 years or older, but almost

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\(^3\)This is a standardized variable that is adjusted for variation between specialists and general dental practitioners in both practice costs and working hours.

\(^4\)Variation in fees, according to whether specialists have market power or not, will be reflected in the figures for gross turnover.
one-third of orthodontists, oral surgeons and periodontists are 60 years or older. The number of specialists working in a group practice is lowest for orthodontists – about half of them work in group practice. Ninety per cent or more of prosthetists and endodontists work in group practice.
Table IV shows the results of the regression analyses. The results shown in Table III are verified. The net income of orthodontists and oral surgeons is higher than that of general dental practitioners ($p < 0.0001$). When all the control variables are included in the analysis, oral surgeons earn almost NOK 500 (€ 62) more per hour than general dental practitioners. Orthodontists earn a little over NOK 300 (€ 37) more than general dental practitioners.

The regression coefficients show that periodontists and endodontists have slightly higher net income per hour than general dental practitioners. However, the differences are so small that they are not statistically significant at the conventional level ($p < 0.05$).

In Table IV, column (2), we also present the results when non-significant control variables from Equation (2) are excluded. The $T$-values for orthodontists and oral surgeons are slightly higher, otherwise the differences in the size of the regression coefficients are negligible.

In Table V we present $F$-values with significance probabilities ($p$-values), where we test regression coefficients for each speciality against each other. The results are as expected from the differences in effects that we observed in Table IV. Net income per hour for both orthodontists and oral surgeons is

<table>
<thead>
<tr>
<th>Table IV. Effect of type of speciality on net income per hour</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td><strong>Constant</strong></td>
</tr>
<tr>
<td><strong>Type of speciality</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Orthodontics = 1</td>
</tr>
<tr>
<td>Oral surgery = 1</td>
</tr>
<tr>
<td>Prosthetics = 1</td>
</tr>
<tr>
<td>Periodontics = 1</td>
</tr>
<tr>
<td>Endodontics = 1</td>
</tr>
<tr>
<td>Dentist’s gender (Man = 1)</td>
</tr>
<tr>
<td>Dentist’s age&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>45–59 years = 1</td>
</tr>
<tr>
<td>≥ 60 years = 1</td>
</tr>
<tr>
<td>Group practice = 1</td>
</tr>
<tr>
<td>Part time = 1&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Region&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>Eastern Norway = 1</td>
</tr>
<tr>
<td>Southern Norway = 1</td>
</tr>
<tr>
<td>Western Norway = 1</td>
</tr>
<tr>
<td>Mid Norway = 1</td>
</tr>
<tr>
<td>$R^2$</td>
</tr>
<tr>
<td>($N$)</td>
</tr>
</tbody>
</table>

<sup>a</sup>Reference category: general dental practitioners.
<sup>b</sup>Reference category: <45 years.
<sup>c</sup>Reference category: Northern Norway.
<sup>d</sup>Reference category: >15 working hours per week.
different from the other three specialists ($p < 0.0001$). Net income per hour for prosthetists, periodontists and endodontists is not significantly different. However, oral surgeons have a net income per hour that is almost NOK 150 (€ 18) higher than that of orthodontists (Table IV). This difference is statistically significant ($p < 0.0001$) (Table V). An explanation for this difference is that the specialist training for oral surgeons is 2 years longer than for orthodontists. Higher income compensates for the lost income associated with longer specialist training.

5. DISCUSSION

The results support our hypothesis that the specialists who have skills that give them exclusive possibilities to practice their profession have market power. They use this power to raise their fees, which is reflected in the fact that they have a higher income per hour than general dental practitioners and other specialists. The specialists who do not have exclusive possibilities to practice their profession experience real competition with general dental practitioners for patients. This competition has the effect that these specialists do not raise their fees above the level of fees for general dental practitioners. This can be interpreted in the following way: that they have not been able to obtain market power. However, there is another potential interpretation. The reference group for our analyses is general dental practitioners. If general dental practitioners charge monopoly prices, then it is also likely that periodontists, endodontists and prosthetists do the same. There are few studies that have examined how the market for general dental practitioners in Norway operates. These few studies do not provide sufficient evidence that general dental practitioners in Norway charge monopoly prices (Grytten and Sørensen, 2000; Grytten and Skau, 2007). Our findings can thus be interpreted in the following way: general dental practitioners give periodontists, endodontists and prosthetists so much competition that the market power of these specialists is limited.

In the long run, the income level of orthodontists and oral surgeons has an influence on the geographic location of these specialists, and thus on availability of the services they provide. The result of market failure may be that the specialists do not need to establish themselves in, or move their practice to, places where demand and need for their services are high. There can be an uneven distribution of supply, to the advantage of people who live in central areas of the country. The current monopoly profit among orthodontists and oral surgeons may also reduce the demand for training for the professions where there is limited or no monopoly profit potential. Thus, it can be argued that some sort of regulation is necessary for services provided by orthodontists and oral surgeons.

However, it is not certain which is the most appropriate policy for regulating dental specialities in Norway. There are several alternatives, for example, provision of specialized services in public hospitals, or publicly run specialist clinics. In these cases, specialists are employees with a fixed salary. Another alternative is that specialists are independent and self-employed, but that their fees are regulated by the
authorities. However, on the other hand, there are costs associated with such regulation (Abbott, 1995). For example, information about the level of costs in specialist practices would have to be collected regularly, and the authorities would have to have regular negotiations with specialist associations to determine the correct level of fees. In addition, regulated fees presuppose that specialists adhere to the fees that are determined. This may require the authorities to control that this happens. In other words, a policy based on regulation of fees for orthodontists and oral surgeons requires an administrative system, and follow-up of the implemented policy. This in itself would raise the cost of the services. Thus, the benefits of public regulation could be less than expected when the costs of such a policy are taken into account. We do not have data that can be used to measure the costs of regulation of fees; therefore, it is difficult for us to give concrete advice about whether this is an appropriate policy or not.5

Male dentists earn slightly more per hour than female dentists. The difference is statistically significant at the conventional level \((p < 0.05)\). This finding is in accordance with findings from another study from Norway (Grytten and Skau, 1999). There is no statistically significant difference in net income per hour for dentists who work in a group practice and dentists who work in a solo practice. We can interpret this in the following way: that there are no economies of scale for dental services. This is also a finding that has been found in a previous study from private dental practice in Norway (Grytten and Dalen, 1997).

6. CONCLUSION

This study is important, since specialization within dental services has increased over the last few years. With increasing technological progress and new treatment methods we can expect the number of specialists to continue to increase in the future. This raises the question of how these services should be organized and funded. We have described the effects of one way of organizing these services, in relation to competition. We find that competition can be effective for the specialties for which there is real competition with general dental practitioners for patients. For the specialties for which there is no real competition, the specialists can achieve market power, and can raise their fees. In the latter case, this raises challenges about the public policy that is most appropriate for reducing the market power of these specialists without incurring too high costs for the authorities.

The reference group for our analyses is general dental practitioners, who we have assumed do not charge monopoly prices. If this assumption is incorrect, then it is also likely that periodontists, endodontists and prosthetists do the same. There are few studies that have examined how the dental care market operates, and how dental care prices are determined. Therefore, this is an important area for future research. A better insight into the way general dental practitioners and dental specialists set their prices is important for deciding which type of regulation may be needed in order to reduce the market power of the dental profession.

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5Another issue is that the costs of orthodontic services are subsidized by 50%. This may make it easier for orthodontists to raise their fees compared with the other specialties. One type of policy might therefore be to reduce the level of state subsidy for orthodontic services. However, this is an unlikely policy at the moment. In a newly published document from the Norwegian Government in which future dental care policies in Norway are outlined, it is recommended that orthodontic treatment should still be subsidized by about the same amount as today (Ministry of Health and Care Services, 2007).
support for the project and to Linda Grytten for translating the Norwegian manuscript to English. We obtained the necessary permission from the Norwegian Data Inspectorate to perform the study.

REFERENCES


