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Working Papers in Economics and Statistics

2013-06

University of Innsbruck
Working Papers in Economics and Statistics

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Hospital specialisation within a DRG-Framework: The Austrian Case

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Abstract

Evaluation of the true relationship between costs and specialisation in hospitals is hindered by the lack of a standard measure. Specialised hospitals might produce at lower costs because their staff builds expertise and care is better organised. On the other hand specialised hospitals might be more costly because they systematically attract sicker patients within each diagnosis-related group (DRG) or have special equipment available. We compare three common measures of specialisation and introduce an alternative, which builds on the widely used Gini coefficient, and investigate the influence of the Austrian provincial health-policy making on specialisation. Although the four measures differ in definition, they show high concordance and prove to assess hospital specialisation in a robust way. With the exception of university hospitals, measured specialisation complies with the different hospital types as defined by legislation in Austria. We find no significant time trend towards more specialisation and legislation on provincial level seems to have a small impact on hospital specialisation. However, caution should be paid to skewness, so that outliers do not inappropriately influence the results when evaluating the true relationship between costs and the specialisation of hospitals. Overall, the Austrian DRG framework introduced in 1997 and regional regulation by the Provinces have not led to more specialised hospitals. This finding challenges the expected impact of activity based funding on specialisation, but it may reflect the lack of incentives set by the Austrian DRG framework and the Provinces.

Keywords: Hospital specialisation, Hospital financing, Herfindahl-Hirschman index, Information theory index, Gini coefficient, Decomposition of Inequality, Austria

JEL Classification: I12, I18, L10, L23, L25, L32

1. Introduction

Inpatient health care is the backbone of any health care system. In 2010, health care expenditure in the OECD countries corresponded to 9.5% of GDP [1]. From that, on average 35.0% are spent for hospital care (range: 15.6% in Mexico to 47.2% in Japan). Therefore, it is of great importance that (financial) resources devoted to inpatient health care are distributed fairly across hospitals according to their case mix. To enable this, diagnosis-related groups (DRGs) and other patient classification systems have been developed and implemented [2,3]. Ideally, such classification systems together with their supplementary framework provide an unbiased tool for reimbursement of inpatient activity. No hospital should either systematically benefit or be discriminated against by this type of financing.

It has often been argued, that because specialised hospitals provide a different set of services to a different set of patients, their production costs are different from that of a '*normal' (i.e. non-specialised)* hospital. Indeed, a number of studies show that more specialised hospitals have lower average costs [4-8]. On the other hand, other studies find contradicting evidence and providers of specialised care often demand higher reimbursement rates; their main arguments are higher costs for personnel with more expertise, more expensive equipment and attraction of sicker patients within each DRG [9-11]. From hospital perspective, specialisation might mean focusing more on fewer product lines that appear profitable [7]. But this might also involve having to compete with other hospitals and being financially (more) dependent on this narrowed set of services.

The other important aspect of specialisation of hospitals is its impact on quality of care. Empirical evidence suggests that specialisation has a positive effect on the outcome of care [8,12-15]. The main reason is that (more) specialised hospitals undertake higher volumes of similar treatments. Staff therefore gains experience in treating certain kinds of patients, and the care needs to be well organised. Both effects may improve the quality of care. Additionally, some authors have argued that the introduction of DRGs and case-based payment mechanisms give hospitals incentives to specialise [7,8,12,16,17], which could threaten the comprehensive supply of secondary care for patients, especially in rural areas.

In summary, previous research – which is mostly from the US – indicates that hospital specialisation has some effect on costs and quality. However, the discussion about its true impact has been hindered by the lack of a commonly accepted definition of hospital specialisation. Beyond problems of definition, there is currently no ‘gold standard’ available. Generally speaking, there exist at least two concepts of specialisation. First, specialisation is regarded as the focus or scope of a hospital on certain diseases, also called product lines [5]. In this way, hospitals that provide care for a very limited set of diseases are considered as specialised (e.g. maternity clinics), while hospitals that cover a wider range of diseases are not (e.g. university hospitals). Second, specialisation can be understood as the ability to provide services to patients who have complex medical needs. The reasons for this could be that necessary specialised equipment is available or the staff is trained to apply the latest available treatment techniques.

There is some degree of overlap between the two concepts. They both consider specialisation as deviation from the kind of services *non-specialised* hospitals are able to offer, in the first case by focusing only on certain diseases, and in the second case by being able to provide more sophisticated services. Therefore, for the remainder of the paper we regard hospital specialisation as deviation in case mix from the average case mix and consider the degree of specialisation as the extent of this deviation.

Previous research has used different methods to evaluate the effect of specialisation. The simplest option has been to use a dichotomous variable to identify specialised and non-specialised hospitals [18,19]. However, most studies have used more sophisticated indicators. These include the Herfindahl-Hirschman Index [17,20,21]; a statistical measure of distance [17,21]; and the Information Theory Index [5,6,21,22]. All of them measure specialisation in the first sense. The challenge in measuring hospital specialisation is that one has to take into account that hospital morbidity is unequally distributed among diseases. This is so because prevalence differs and because certain diseases do require hospital admission while others do not. For example, hospital admission for cancer treatment happens by far more often than admission because of HIV / AIDS. The Herfindahl-Hirschman Index does not account for this, while the other two measures do. Additionally, all three measures tend to be highly skewed, so that a small number of outliers could bias the results. Therefore, Daidone and D’Amico propose a measure based on the Gini coefficient [23], which is widely used to measure inequality of income between individuals [24-26]. We refine their measure further to take into account above-mentioned particularities of the hospital sector.

In the context of income distribution, inequality measures not only quantify the degree of inequality, but also offer ways to identify different sources of inequality, e.g. ethnicity vs. education, by being decomposable. In the context of hospital specialisation, this would allow to distinguish between different levels of health policy making, i.e. national and regional level. To our knowledge, this has never been used for hospital markets before.

The objective of this work is to compare the three traditional measures of hospital specialisation with the Gini coefficient, using data on Austrian hospitals to examine the degree of specialisation. We also investigate three additional questions: (i) Have Austrian hospitals become more specialised over time? (ii) Does specialisation correspond to hospital types defined by Austrian national legislation? (iii) Does regulation by the Austrian Provinces influence the degree of specialisation of hospitals?

The remainder of this paper is organised as follows. In the next section we describe our data and the methods used. In the third section, our results are presented. A discussion follows in section four.

2. Data and methods

2.1. Organisation of inpatient care in Austria

In Austria, the National (Central) Government and the nine Provinces are jointly responsible for inpatient health care legislation. The National Government sets the general framework and is responsible for nationwide capacity planning. National legislation also defines several types of hospitals according to their mandate of care (*Bundesgesetz über Krankenanstalten und Kuranstalten (KAKuG)*[1]). Generally speaking, these regulations define minimum standards of provision in terms of equipment, personnel and the departments. The nine Provinces are responsible for implementation of health care related legislation. Since 1997 inpatient health care is provided and financed within the LKF framework[2]. It consists of a patient classification system (*core area*) administered at the national level and a supplemen-

[1] Bundesgesetz über Krankenanstalten und Kuranstalten (KAKuG, BGBl. Nr. 1/1957 i.d.g.F.) can be found at http://www.ris.bka.gv.at/GeltendeFassung.wxe?Abfrage=Bundesnormen&Gesetzesnummer=10010285

[2] LKF - Leistungsorientierte Krankenanstaltenfinanzierung is the name of the Austrian activity based funding system, the Austrian version of a DRG system, for details see [3].

tary framework (*steering area*). The *steering area* enables the Provinces to set fees (administrative prices) for the DRGs and adjust budget allocation to hospitals by structural factors, e.g. personnel, hospital size, mandate of care. For a detailed description see [27,28].

2.2. Data

We use admission data from all Austrian public or not-for-profit hospitals covering the years 2002 to 2010 provided by the Austrian Ministry of Health. Together these hospitals account for approximately 90% of all hospital admissions and comprise more than 2 million admissions per year. We exclude all cases with a length of stay equal zero. This is justified, because organisation and reimbursement of these cases differ between the nine provinces [28,29]. They are either treated as day-cases or as hospital outpatients. While both are actually treated in a hospital, the former are formally admitted and the latter are not [30]. The Provinces have established their own rules on this matter, and therefore admission data for cases with a length of stay equal zero are not comparable across provinces. Additionally, we exclude all non-acute cases[3] since we were only interested in acute inpatient care activity.

For the purposes of categorisation, we used the patient's main diagnosis grouped into one of the 130 categories of the International Shortlist for Hospital Morbidity Tabulation (ISHMT) established by the European Data Project [31] and officially adopted by Eurostat, the OECD and the World Health Organization (WHO)[4]. The ISHMT was developed for hospital activity comparison and has the benefit of being comparable across countries. It is available for ICD-9 and ICD-10 codes. Additionally, it represents a convenient level of aggregation from a medical viewpoint. Generally, any categorisation based on payment systems, Major Diagnostic Groups or DRGs, has the disadvantage of being neither comparable over time as patient classification systems are subject to adjustments over time nor across countries.

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[3] As non-acute we considered all hospitalizations that were completely accounted for on a per-diem basis. This is the case in acute geriatrics, remobilization, palliative departments or neuro-psychiatric departments for children and youths [28].

[4] Online available at http://apps.who.int/classifications/apps/icd/implementation/hospitaldischarge.htm

2.3. Definition of measures

The first measure is the Herfindahl-Hirschman Index (HHI). Originally, it was developed to measure market concentration within an industry. It has been used as measure of hospital specialisation in a number of studies [17,21]. In line with the original concept, the HHI measures the concentration of discharges within a given hospital. The calculation is as follows:

$$HHI_h = \sum_{i=1}^{N} {p_{ih}}^2$$

p_{ih} represents the share of patients in category i relative to all patients treated in hospital h. The value of hospital h, HHI_h, is the sum of the squared proportional discharges p_{ih} of all categories. N represents the total number of categories. The Herfindahl-Hirschman Index takes its minimum at $1/N$ and the maximum is 1. The HHI does not take into account disease specific differences in hospital morbidity across categories (see Table 1).

The second measure, the statistical measure of distance (Distance), evaluates the difference between the case mix of hospital i and the average case mix of a group of hospitals, e.g. the national average [17,21]. It is calculated as follows:

$$D_h = \sum_{i=1}^{N} (p_{ih} - \varphi_i)^2$$

p_{ih} is defined as before and φ_i represents the national average share of patients in category i relative to all patients being treated. We take φ_i as the Austrian average. D_h, the value of hospital h, is the sum over all categories N of the squared differences between the hospital's discharges p_{ih} and the average discharges φ_i. The distance D_h ranges between 0 and 2 (see Table 1).

Originally, the Information Theory Index (ITI) was designed to quantify information gains [32,33]. But it also has a history as a measure of hospital specialisation as it enables comparisons of two distributions [5,6,21,22]. It is calculated as follows:

$$ITI_h = \sum_{i=1}^{N} p_{ih}\, ln\left(\frac{p_{ih}}{\varphi_i}\right)$$

p_{ih} and φ_i are defined as before. ITI_h measures the sum of logged differences for all categories of hospital h compared to the average, weighted by the share of patients in each category i. The Information Theory Index is only bounded from below by 0 (see Table 1).

A special characteristic of the ITI is that it is additive, as demonstrated in detail by Theil and Cowell [33,34]. That is, overall inequality can be decomposed into inequality originating from differences within or between different groups or subgroups. In the context of income distribution, this is frequently used to identify different sources of income inequality, such as education, ethnicity or other [34,35]. One key difference however between measuring income inequality and hospital specialisation is the clear distinction between population and income. In measuring hospital specialisation, this can be done by using observed hospital admissions and expected hospital admissions based on the national average, within each category. In this way, p-values correspond to income and φ-values correspond to population.

Let p_{ijh} be the observed share of patients in category i, Province j and hospital h compared to all patients being treated nationally and let φ_{ijh} be the expected share of patients based on the national average. Furthermore, let $p_{\_j\_} = \sum_i \sum_h p_{ijh}$ and $\varphi_{\_j\_} = \sum_i \sum_h \varphi_{ijh}$. Then ITI, the overall value of hospital specialisation, can be calculated as

$$ITI = \sum_i \sum_j \sum_h p_{ijh}\, ln\left(\frac{p_{ijh}}{\varphi_{ijh}}\right)$$

Among others, this can be decomposed in the following way

$$ITI = \sum_j p_{\_j\_} ITI_j + \overline{ITI}(J)$$

Then $ITI_j = \sum_i \sum_h p_{ijh}/p_{\_j\_}\ ln\left(\frac{p_{ijh}/p_{\_j\_}}{\varphi_{ijh}/\varphi_{\_j\_}}\right)$ is the within group effect for Province j, and $\overline{ITI}(J)$ represents the between group effect for Provinces.

The Gini Index was first introduced by Corrado Gini [36]. Most frequently, this index is used to measure and compare income inequalities between individuals and across countries [24-26,37]. As a measure of hospital specialisation, it has been used by Daidone and D'Amico, who apply a simplified version, and by Street et al., who used a different categorisation [23,38]. The basic idea behind the Gini Index is to compare the area under the Lorenz curve, defined by the points (φ_i, p_{ih}), with the area below the diagonal. Here, the diagonal represents the national average case mix. In particular, p_{ih} and φ_i are defined as before. First, the categories have to be ordered so that the ratio between p and φ is increasing in i.

$$\frac{p_{ih}}{\varphi_i} \geq \frac{p_{i-1h}}{\varphi_{i-1}}$$

Then, the value G_h is calculated as follows:

$$G_h = 1 - 2\sum_{i=1}^{N}\left(\sum_{j=1}^{i} p_{jh} - 0.5\, p_{ih}\right)\varphi_i$$

For a more detailed description see [39].

Table 1 about here

2.4. Statistical methods

Due to the nature of the data, we use nonparametric descriptive statistics, i.e. median and quartiles [Q_1; Q_3]. For statistical testing we use Kruskal-Wallis tests, for pairwise comparisons Wilcoxon-Mann-Whitney tests, and measure correlation by Spearman's rank correlation coefficient. We consider p-values smaller than 0.05 as significant.

We investigate primarily admission data of 2010. For time trend analyses for the time period 2002 – 2010 we recalculate all values separately for each year.

3. Results

In 2010, there were 131[5] public or not-for-profit hospitals in Austria providing approximately 7.63 beds per 1,000 inhabitants. Hospital size was on average 366.4 beds, ranging from less than 100 to more than 1,000 beds. Per 100 inhabit-

[5] This sample reduces to 129 hospitals when applying our exclusion criteria, see Data section.

ants, Austrian hospitals admitted 33.3 patients. Average length of stay was 5.5 days (excluding day-cases and non-acute care). Hospitals differed not only in size, but also by their mandate of care according to legislation. Special hospitals (n=28) are hospitals for the treatment of patients with particular medical needs, e.g. age groups or diseases. General hospitals provide care to all patients. Depending on their equipment, general hospitals provide either basic care (n=62) or extended care (n=31). The remaining hospitals are maximum care general hospitals (n=5) and university / teaching hospitals (n=3).

Table 2 about here

The upper part of Table 2 shows the results for all four measures of specialisation. The statistical measure of distance has the lowest median of 0.0098 [Q_1 0.0057; Q_3 0.0315], while ranging from 0.0015 up to 0.7926. Similarly, median specialisation in terms of the Herfindahl-Hirschman Index is 0.0236 [Q_1 0.0199; Q_3 0.0468], ranging from 0.0149 to 0.7977. The ITI has a higher median, 0.3480 [Q_1 0.2282; Q_3 0.7362], and a range between 0.0642 and 4.3455. The highest median specialisation can be observed using the Gini Index. It is 0.4481 [Q_1 0.3621; Q_3 0.6345], ranging from 0.1893 to 0.9892. Figure 1 depicts the distributions in greater detail. On the left side of each subgraph box plots show the overall distribution of specialisation. While all three traditional measures are highly skewed, the Gini Index is considerably less skewed and it does not identify any hospital as an outlier.

Interestingly, although all measures differ in the calculation method, the results show high rates of (Spearman) correlation, ranging from 0.93 (HHI with ITI and Gini Index respectively) to 1.00 (Gini with ITI). Figure 2 illustrates this using a matrix of scatter plots.

Figure 1 about here

As mentioned, case-based payment regimes are thought to incentivise specialisation [7,8,12,16,17]. To investigate the effect of the Austrian LKF framework, we analyse a possible trend in the years 2002 to 2010 by recalculation of all values separately for each year. For all four of measures, only slight annual changes in degree of specialisation are observed. In total, these changes range from a decrease in median of HHI (-2.6%) to an increase in median of ITI (+12.2%) in eight years. None of the changes is statistically significant.

Austrian national legislation defines several types of hospitals. In Figure 2, the distributions for all four measures are depicted separately for the different hospital types. Independently of the measure used, special hospitals have a much higher degree of specialisation than all types of general hospitals. Second highest are general hospitals providing basic care, followed by general hospitals providing extended care. The lowest degree of specialisation have general hospitals providing maximum care. University hospitals, which are basically maximum care hospitals that also carry out teaching and research, show a level of specialisation very similar to that of general hospitals providing extended care. Using pairwise statistical testing, the differences between almost all hospital types, with the exception of university hospitals, are found to be significant for all measures. The results are mixed for university hospitals. Specialisation of university hospitals differs significantly from that of special hospitals (all measures), general hospitals providing basic care (ITI and Gini) and general hospitals providing maximum care (HHI).

Figure 2 about here

Applying above mentioned decomposition technique to inpatient data of 2010, we find that the overall ITI value for Austrian inpatient care is 0.3819. Furthermore, we find that the between group effect of the nine Austrian Provinces amounts to 0.0297, which corresponds to 7.8% of the overall value. The median within group effect however is 0.3128 [Q_1 0.2778; Q_3 0.3935].
Compared to previous years we observe a slight annual increase in overall ITI value (0.3583 in 2002), between group effect (0.0268 in 2002), and within group effect (0.2860 [Q_1 0.2713; Q_3 0.3700] in 2002). In all years the between group effect of the nine Austrian Provinces corresponds to 7.5% to 8.2% of the overall value.

4. Discussion

The results for all four measures of specialisation (HHI, Distance, ITI and Gini) applied to Austrian inpatient data support findings from previous research. We find high levels of concordance between all four measures. This is surprising as the measures differ substantially in their conceptual bases. The Herfindahl-Hirschman Index measures concentration of categories within a hospital, while the other measures evaluate deviation from some average. In particular, all four measures rank hospital types identically (from highest to lowest): special hospital, general hospital providing basic care, general hospitals providing extended care and general hospitals providing maximum care. University hospitals have similar values to extended care hospitals. In this way, the types defined by Austrian legislation coincide with the measured degree of specialisation. Consultations with policy makers revealed that it is not unusual for hospitals to (almost) fulfil the minimum requirements for the next higher mandate of care. This can especially be observed for ITI and Gini in Figure 1.

To verify our findings, we perform a number of robustness checks using different categorisations (i.e. Major Diagnostic Groups, DRGs, ICD-10 chapter), alternative weights for hospital resource use (i.e. length-of-stay, DRG weights) and make separate calculations including or excluding certain hospital types (i.e. without university hospitals, only general hospital providing basic or extended care). All these investigations confirm our results and only small differences are observed.

Unexpectedly, we do not find any significant time trend in hospital specialisation in Austria using any of the four measures. Only slight median changes are observed. When changes in the mean are considered instead, changes tend to be slightly larger, but still insignificant. This finding challenges previous results by Farley and Hogan who find a statistically significant time trend in the US [6]. Since Distance, ITI and Gini Index, all use national average hospitalisations φ as baseline we wonder if our results are influenced by the fact that the national average also changes over time due to medical advancements or modifications in policy. Therefore, we recalculate specialisation using φ as the national average of all years 2002 – 2010 as baseline. However, this shows only negligible differences. There could be a number of reasons for this observation. Eastaugh [5] finds that specialisation (in the US) is higher in competitive West Coast states than in rate-regulated states. Since regulation in Austria is rather strict, incentives for specialisation might be lower. In addition, the Austrian DRG system was introduced in 1997. It is possible that hospitals did specialise in the first 5 years, which we are not able to observe because our data starts only in 2002. It could also be that previous studies have used the mean value in their comparisons although the data were highly skewed.

It is also surprising that only 7.5% to 8.2% of overall specialisation can be identified as between Province effect. In practice, the National Government sets only the general framework while the Provinces are responsible for implementation. The Provinces are the key stakeholders in inpatient health-care related legislation. However, they do not seem to take full advantage of their constitutional tasks.

5. Conclusion

In this paper, we investigated four different measures as means to quantify hospital specialisation in a sense of deviation from the national average. All four measures show high levels of concordance and are able to reflect Austrian hospital types. However, all three traditional measures are highly skewed, but the Gini Index is considerably less skewed. Therefore the Gini Index constitutes an useful alternative for data analyses.

We found no significant trend towards more hospital specialisation in Austria and only a small part is explained by regulations at Provincial level. This either implies that the Austrian DRG framework and the Provinces have not had a strong effect on structural changes in Austrian hospitals or indicates that previous results from other countries were highly influenced by outliers.

Acknowledgements We would like to thank Anne Mason and Jeff Hatcher for their suggestions and helpful comments. This research was partly conducted within the research project `EuroDRG - Diagnosis Related Groups in Europe: towards efficiency and quality' which was funded by the European Commission under the Seventh Framework Programme. Research area: HEALTH-2007-3.2-8 European system of Diagnosis-related groups, Project reference: 223300.

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Fig. 1 Box plots for each measure of specialisation; overall (left) and by hospital type (right)

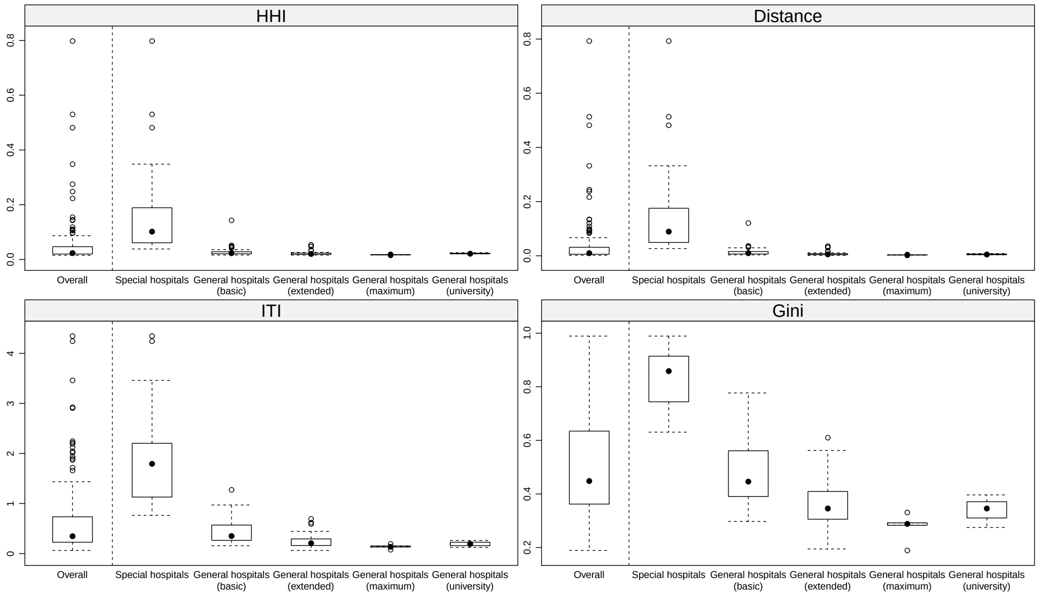

Fig. 2 Scatter plot matrix (lower triangular), histograms (diagonal), and Spearman correlation coefficients (upper triangular)

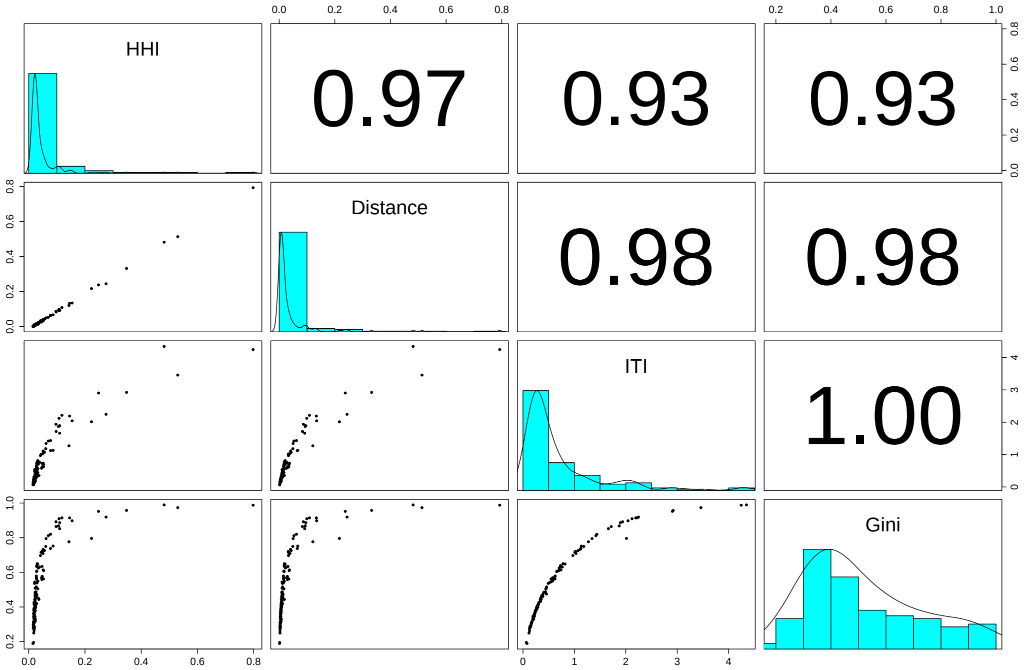

Table 1 Key characteristics of the four specialisation measures

	HHI	Distance	ITI	Gini
Range	$\left[\frac{1}{N}, 1\right]$	$[0, 2)$	$[0, \infty)$	$\left[0, \frac{N-1}{N}\right]$
Hospital morbidity included	no	yes	yes	yes
Basic idea	Concentration of activity within hospital	Sum of squared differences from average case mix	Weighted sum of logged differences from average case mix	Difference from the average case mix

Table 2 Degree of specialisation in 2010; overall (top) and by hospital type (bottom)

		Minimum	1st Quartile	Median	Mean	3rd Quartile	Maximum
Overall	HHI	0,0149	0,0199	0,0236	0,0562	0,0468	0,7977
	Distance	0,0015	0,0057	0,0098	0,0423	0,0315	0,7926
	ITI	0,0642	0,2282	0,3480	0,6912	0,7362	4,3455
	Gini	0,1893	0,3621	0,4481	0,5167	0,6345	0,9892
Special hospitals	HHI	0,0384	0,0611	0,1017	0,1668	0,1717	0,7977
	Distance	0,0268	0,0497	0,0892	0,1537	0,1550	0,7926
	ITI	0,7648	1,1321	1,7938	1,9087	2,1978	4,3455
	Gini	0,6307	0,7469	0,8586	0,8385	0,9141	0,9892
General hospitals (basic)	HHI	0,0163	0,0207	0,0231	0,0274	0,0283	0,1430
	Distance	0,0033	0,0068	0,0098	0,0138	0,0158	0,1208
	ITI	0,1585	0,2667	0,3512	0,4259	0,5647	1,2735
	Gini	0,2973	0,3905	0,4459	0,4740	0,5582	0,7768
General hospitals (extended)	HHI	0,0163	0,0182	0,0202	0,0237	0,0233	0,0529
	Distance	0,0016	0,0041	0,0052	0,0086	0,0077	0,0356
	ITI	0,0642	0,1618	0,2088	0,2595	0,2946	0,6956
	Gini	0,1949	0,3058	0,3457	0,3675	0,4091	0,6097
General hospitals (maximum)	HHI	0,0149	0,0166	0,0172	0,0171	0,0176	0,0190
	Distance	0,0015	0,0028	0,0032	0,0031	0,0035	0,0045
	ITI	0,0772	0,1323	0,1368	0,1385	0,1523	0,1939
	Gini	0,1893	0,2832	0,2885	0,2768	0,2924	0,3309
General hospitals (university)	HHI	0,0203	0,0206	0,0210	0,0220	0,0229	0,0247
	Distance	0,0034	0,0041	0,0049	0,0055	0,0066	0,0082
	ITI	0,1253	0,1594	0,1935	0,1938	0,2280	0,2625
	Gini	0,2749	0,3104	0,3458	0,3390	0,3711	0,3964

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Hospital specialisation within a DRG-Framework: The Austrian case

Abstract
Evaluation of the true relationship between costs and specialisation in hospitals is hindered by the lack of a standard measure. Specialised hospitals might produce at lower costs because their staff builds expertise and care is better organised. On the other hand specialised hospitals might be more costly because they systematically attract sicker patients within each diagnosis-related group (DRG) or have special equipment available. We compare three common measures of specialisation and introduce an alternative, which builds on the widely used Gini coefficient, and investigate the influence of the Austrian provincial health-policy making on specialisation. Although the four measures differ in definition, they show high concordance and prove to assess hospital specialisation in a robust way. With the exception of university hospitals, measured specialisation complies with the different hospital types as defined by legislation in Austria. We find no significant time trend towards more specialisation and legislation on provincial level seems to have a small impact on hospital specialisation. However, caution should be paid to skewness, so that outliers do not inappropriately influence the results when evaluating the true relationship between costs and the specialisation of hospitals. Overall, the Austrian DRG framework introduced in 1997 and regional regulation by the Provinces have not led to more specialised hospitals. This finding challenges the expected impact of activity based funding on specialisation, but it may reflect the lack of incentives set by the Austrian DRG framework and the Provinces.

ISSN 1993-4378 (Print)
ISSN 1993-6885 (Online)