ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

EXAMINING THE CAPACITY EXPANSION OF HOSPITALS IN THE TRANSFORMED TURKISH HEALTH SYSTEM

DÖNÜŞEN TÜRKİYE SAĞLIK SİSTEMİNDE HASTANELERİN KAPASİTE ARTIŞININ İNCELENMESİ

İsrafil BOYACI[*] (ID)

Abstract

This article empirically analyzes the determinants of capacity expansion in the local hospital markets in Türkiye. The aim of the paper is to explain changes in bed capacities of privately – and publicly-owned hospitals in local districts of Türkiye over the late stages of health reforms under the Health Transformation Program (2003-2013). The empirical analyses rely on the yearly countrywide data on hospitals, demand conditions and local market characteristics over the period of 2010-2014. The estimation results did not show evidence for the presence of local market competitive pressure on the growth in hospital bed capacity of local districts in Türkiye. Thus, based on the findings of the article, it cannot be concluded that the local competition among hospitals led to a rivalry to expand their bed capacities. It appears more appropriate to interpret the capacity expansion of private hospitals as a consequence of the increased inclusion of the private sector in healthcare provision within the publicly-funded universal health insurance system and favorable market environment thanks to the health reforms.

Keywords: Hospital Capacity, Market Structure, Hospital Ownership, Health Reform
JEL Classification: I11, I18, K23, L11

Öz

Bu makale, Türkiye yerel hastane piyasalarındaki kapasite artışının belirleyicilerini ampirik olarak analiz etmektedir. Makalenin amacı, Sağlıkta Dönüşüm Programı (2003-2013) kapsamındaki sağlık reformlarının son aşamalarında Türkiye'nin yerel ilçelerindeki özel ve kamu hastanelerinin yatak kapasitelerindeki değişiklikleri açıklamaktır. Ampirik analizler, 2010-2014 döneminde hastaneler, talep koşulları ve yerel pazar özellikleriyle ilgili yıllık ülke çapındaki verilere dayanmaktadır. Tahminleme sonuçları Türkiye'nin

*   Assist. Prof. Dr., Department of Economics, Faculty of Business, İstanbul Ticaret University, Türkiye. E-mail: iboyaci@ticaret.edu.tr, ORCID: 0000-0002-5327-0499

yerel ilçelerinin hastane yatak kapasitesindeki büyüme üzerinde yerel piyasadaki rekabet baskısının varlığına dair kanıt göstermemektedir. Dolayısıyla, makalenin bulgularına dayanarak hastaneler arasındaki yerel rekabetin yatak kapasitelerini artırma yarışına yol açtığı söylenememektedir. Özel hastanelerin kapasite artışının, kamu tarafından finanse edilen genel sağlık sigortası sistemi kapsamında özel sektörün sağlık hizmetleri sunumuna daha fazla dâhil edilmesinin ve sağlık reformları sayesinde elverişli piyasa ortamının bir neticesi olarak yorumlanması daha uygun görünmektedir.

Anahtar Kelimeler: Hastane Kapasitesi, Piyasa Yapısı, Hastane Sahipliği, Sağlık Reformu
JEL Sınıflandırması: I11, I18, K23, L11

1. Introduction

Health reforms under the 2003-2013 Health Transformation Program (HTP) in Türkiye have resulted in improved access to healthcare with the convergence towards universal health coverage. Hospital care in the country's health system has faced a rapidly increasing demand during the HTP. The number of hospital visits per capita has remarkably risen from 1.9 in 2002 to 4.1 in 2010, and 5.1 in 2014. The number of inpatient hospitalization has increased from 5,508,263 in 2002 to 10,528,173 in 2010, and 13,034,273 in 2014. The total number of days stayed in hospitals has risen from 32,215,516 in 2002 to 42,922,416 in 2010, and 51,861,464 in 2014 (Health Statistics Yearbook of the Ministry of Health, 2014).

With the goal of improving access to healthcare nationwide during the HTP, the Ministry of Health (MoH) has increasingly embraced health policies that promote market competition. The private provision of healthcare has been included within the publicly-funded universal health insurance system.[1] As a natural outcome of such health policies under HTP, a countrywide surge in the number of private hospitals happened during the program. In the earlier years of the reform period between the years 2002 and 2006, the rise in the number of private hospitals was modest, from 271 to 331 hospitals (22%); followed by a sharper rise from 331 in 2006 to 489 in 2010 (48%); and reached 556 in 2014 with a 14% growth rate from 2010 to 2014. On the other side, compared to the private sector during the reform years, there was a moderate increase in the number of public MoH hospitals from 774 in 2002 to 843 in 2010 and 866 in 2014 (Table 1).[2]

The growth of the hospital market at the earlier phases of HTP reforms was followed by the introduction of restrictive regulations on new private hospital openings in 2008 (Certificate of Need-type regulations). Afterward, region-based planning-oriented national health policies that embraced all health-related resources of the country were introduced in 2010. Thus, in the later phases of HTP reforms between the years 2010 and 2014, the growth of the hospital market continued with capacity expansions of hospitals. The number of private hospital beds has risen 44% from 2010 to 2014. On the public side, what was observed was a transformation of existing hospital beds into other more equipped forms of hospital beds. While the total number of publicly-owned MoH hospital beds has slightly risen at a rate of 3%,

---

1   For a full description of the reform program, see Ministry of Health's (2012) assessment report.

2   In the later years after the completion of the HTP reforms, the rise in the number of hospitals was slight from 556 privately-owned hospitals and 866 publicly-owned MoH hospitals in 2014 to 577 private hospitals and 889 public hospitals in 2018 (Health Statistics Yearbooks of the Ministry of Health, 2014, 2018).

there has been a sharp growth in the numbers of both qualified beds and intensive care unit beds in public hospitals. Thus, the market share of the private sector in hospital beds has increased from 14% to almost 20%, as the portion of public MoH hospitals remains about 60%. On the other hand, there occurred a moderate level of growth in the aggregate number of physicians. The rise in the number of physicians was the highest in the private sector, among others, with 17% growth rate, but it was still less than half of the 44% growth in the private hospital beds (see Table 1).

Table 1: Changes in the Number of Hospitals, Their Capacities, and Market Shares by Ownership Types, 2010-2014

		Ministry of Health	University	Private	Other	Total
Number of hospitals						
2010		843	62	489	45	1,439
	%	58.58	4.31	33.98	3.13	100.00
2014		866	69	556	37	1,528
	%	56.68	4.52	36.39	2.42	100.00
% Change		2.73	11.29	13.70	-17.78	6.18
Number of hospital beds						
2010		120,180	35,001	28,063	16,995	200,239
(market shares in beds)	%	60.02	17.48	14.01	8.49	100.00
2014		123,690	36,670	40,509	5,967	206,836
(market shares in beds)	%	59.80	17.73	19.59	2.88	100.00
% Change		2.92	4.77	44.35	-64.89	3.29
Number of qualified beds						
2010		35,747	11,501	21,235		68,483
	%	52.20	16.79	31.01		100.00
2014		50,587	18,651	29,283		98,521
	%	51.35	18.93	29.72		100.00
% Change		41.51	62.17	37.90		43.86
Number of intensive care beds						
2010		8,239	3,726	6,344		18,309
	%	45.00	20.35	34.65		100.00
2014		11,874	5,129	11,569		28,572
	%	41.56	17.95	40.49		100.00
% Change		44.12	37.65	82.36		56.05
Number of physicians						
2010		72,435	25,445	24,077	1,490	123,447
	%	58.68	20.61	19.50	1.21	100.00
2014		77,876	28,228	28,245	1,267	135,616
	%	57.42	20.81	20.83	0.93	100.00
% Change		7.51	10.94	17.31	-14.97	9.86

Source: Author`s tabulations with data collected from the MoH Health Statistics Yearbooks.

The increased role of the private sector in the provision of healthcare is also seen in hospital service utilization indicators including the numbers of hospital visits, inpatients, surgical operations, bed

occupancy rates, and days stayed in hospitals (see Table 2). Particularly, the number of private hospital visits in both level and per capita terms has risen about 50% from 2010 to 2014, along with an increasing private sector share of hospital visits among three main ownership types (public MoH, university, and private hospitals).

However, when the data on the changes in hospital capacities and utilization of hospital services in Tables 1 and 2 are considered together, the utilization patterns shown in Table 2, especially the low private bed occupancy rates, do not seem to point to a 'more hospital beds needed' explanation for the expansion of private hospital bed capacities observed from 2010 to 2014 as indicated in Table 1. Therefore, all these descriptive statistics guided the paper to explore further the factors behind the capacity expansion of hospitals in Türkiye during the later years of the HTP reforms.

Table 2: Changes in the Utilization of Main Hospital Services by Ownership Type, 2010-2014

		Ministry of Health	University	Private	Total
Number of Hospital Visits					
2010		235,172,934	20,098,754	47,712,540	302,984,218
	%	77.62	6.63	15.75	100.00
2014		292,100,331	32,143,930	72,333,383	396,577,644
	%	73.66	8.11	18.24	100.00
% Change		24.21	59.93	51.60	30.89
Per capita hospital visits					
2010		3.2	0.3	0.6	4.1
	%	78.05	7.32	14.63	100.00
2014		3.8	0.4	0.9	5.1
	%	74.51	7.84	17.65	100.00
% Change		18.75	33.33	50.00	24.39
Number of inpatients					
2010		6,361,116	1,509,484	2,657,573	10,528,173
	%	60.42	14.34	25.24	100.00
2014		7,396,239	1,737,627	3,900,407	13,034,273
	%	56.74	13.33	29.92	100.00
% Change		16.27	15.11	46.77	23.80
Number of surgical operations					
2010		2,039,021	576,547	1,215,159	3,830,727
	%	53.23	15.05	31.72	100.00
2014		2,445,424	765,549	1,587,973	4,798,946
	%	50.96	15.95	33.09	100.00
% Change		19.93	32.78	30.68	25.28
Number of days stayed in hospitals					
2010		28,193,909	9,317,978	5,410,529	42,922,416
	%	65.69	21.71	12.61	100.00
2014		32,078,874	10,260,691	9,521,899	51,861,464
	%	61.85	19.78	18.36	100.00
% Change		13.78	10.12	75.99	20.83

Bed occupancy rate (%)				
2010	64.3	72.9	50.8	63.8
2014	71.10	76.70	56.10	68.70
% Change	10.58	5.21	10.43	7.68
Average length of stay (days)				
2010	4.4	6.2	2.0	4.1
2014	4.3	5.9	2.4	4.0
% Change	-2.27	-4.84	20.00	-2.44

Source: Author`s tabulations with data collected from the MoH Health Statistics Yearbooks.

Furthermore, over the study period, the total population of Türkiye increased from 73,722,988 in 2010 to 77,695,904 in 2014 with a growth rate of 5.39%. Therefore, it also seems difficult to argue for the change in population as the main factor for the massive expansion of the hospital market. The achievement of publicly-funded universal health insurance coverage upon the completion of HTP reforms may have resulted in a lesser degree of price sensitivity of patients; in turn, this may have resulted in the possibility of non-price competition among hospitals, such as competition in larger buildings, hotel services, and amenities. Therefore, the competition among hospitals in local markets may have led them to engage in a medical-arms-race that resulted in overinvestment in bed capacity. Or it can simply be a natural consequence of the favorable market environment thanks to the improvements towards universal health insurance coverage and the inclusion of private provision of healthcare within the publicly-funded insurance system during the HTP. In this aspect, the empirical model tests primarily the hypothesis of whether there was a medical arms race in the form of an expansion in bed capacity among hospitals during the HTP reform period in Türkiye.

Motivated by all these descriptive statistics, this article aims to investigate the growth of the hospital market in the transformed Turkish health system during the period 2010-2014 in which bed capacity expansion of the existing hospitals in the market was prominent. The considerable expansion of hospital capacity appeared to be a salient feature of the industry over the study period. The empirical analysis explored the determinants of the bed capacity expansions of privately – and publicly-owned hospitals by employing countrywide data on hospitals, demand conditions and local market characteristics over the sample period 2010 and 2014. With a particular focus on the impact of local market structure on the changes in hospital capacity, the estimations explained the changes in the bed capacity of hospitals in local districts of Türkiye as dependent variables.

To sum up, the article examines the relationship between the changes in hospital capacity and the local market characteristics. Particular focus is on the relationship of market structure with the capacity expansion of hospitals in Türkiye where capacity is represented by hospital bed numbers. The empirical model tests the impact of hospital competition on the capacity growth of hospitals. Dataset on the local hospital market environment, the demographic market characteristics, and the

individual hospital characteristics for the years 2010-2014 were employed. The model specifically aims to explore how local market competition and other market conditions have effects on the change in hospital capacity for each ownership type, so it provides insights into whether there appears to be a medical-arms-race behavior in the Turkish hospital industry in which market structure results in a rivalry in the form of capacity expansion. Thus, the regression analyses in the article identified the impact of changing local market conditions on hospital capacity.

The remainder of the paper is organized as follows. Section 2 positions the work to the related literature. Section 3 presents the empirical model for the change in hospital market capacity of local districts in Türkiye over the study period. Section 4 describes the data. Section 5 provides the estimation results. Section 6 is the conclusion.

2. Related Literature

Competition among hospitals is supposed to be more in the quality of healthcare (Joskow, 1980; Held & Pauly, 1983; Robinson & Luft, 1985; Noether, 1988; Dranove et al., 1992; to name a few seminal works from the market structure and quality competition literature).[3] Also, healthcare production is highly dependent on physicians and other healthcare professionals. Therefore, with the presence of an extensive public insurance coverage system under scarce physician resource constraints, hospitals facing the same regulated prices have a tendency to employ excessive 'quality' of healthcare (including bed capacity, amenities, costly services and facilities, and high-tech medical devices) as a result of the competition with nearby hospitals to attract both patients and physicians.[4] Thus, the competition among hospitals in local markets may lead them to overinvest, which results in a Medical Arms Race (MAR).[5]

Joskow (1980) analyzed the impact of local hospital competition on the supply of hospital beds and the hospital reserve capacity (i.e., unoccupied beds), which was assumed to indicate quality in the U.S. hospital market context during the 1970s. He argued that the market environment with extensive insurance coverage, in which patients face effective prices far below marginal cost, along with the stochastic characteristic of hospital demand, incentivizes hospitals to supply excess capacity

---

[3] In the literature, 'quality' is used as a broad set of hospital services including skilled physicians, high-tech medical equipment, excess bed capacity as well as 'hotel' services. Since 'quality' cannot be directly observed or measured, various indicators that capture different aspects of hospital quality are used in the literature; for example, it is proxied by a hopsital`s reserve bed capacity of in Joskow (1980) and hospital expenses in Noether (1988). In terms of Donabedian's (1980) textbook framework on healthcare quality, the measure of hospital capacity in this paper can be assumed to be related to 'input/structure quality' (e.g., physical facility, equipment, human resources); rather than 'process quality' (e.g., diagnosis tests, treatment operations, length of stay), or 'output/outcome quality' (e.g., mortality rates, patient satisfaction).

[4] In his review of the literature related to competition and quality in healthcare markets, Gaynor (2006) explained the intuition behind the hospital quality competition under regulated prices as follows. When the regulated prices are generous, then hospitals choose to invest more in quality to gain more market share. However, while doing this, if they do not consider the market share 'stealing effect', then the resulting equilibrium quality level can be excessive.

[5] Robinson and Luft (1985) argued the seminal statement of the MAR hypothesis as "increased competition among hospitals for patients will take the form of inflationary increases in the technological intensity of hospital services or a 'medical arms race', rather than the form of price reductions aimed at patients."

measured by the total number of licensed beds in a hospital. As the measure of the intensity of competition among hospitals, he used the Herfindahl index based on the size distribution of hospital beds within the local market in which a hospital was located. Joskow (1980) suggested evidence that competitive forces could result in uneconomic expansions of the quantity and quality of healthcare supplied.

Held and Pauly (1983) examined the impact of competition on quality in the U.S. dialysis markets. They treated the quality, indicated by the level of amenities, as whatever caused patients to choose one facility over another. The maximum capacity of a facility indicated by the number of dialysis machines per patient was used as a proxy measure for the amenity. They found that competition, measured by the Herfindahl index, led dialysis facilities to hold more backup machine capacity, which suggests evidence for excess amenity competition.

Dranove et al. (1992) addressed whether competition between hospitals determined service supply. They measured competition by the number of providers of specialized services in local markets. Employing data on California hospitals in Bresnahan and Reiss's (1991) firm entry model framework, they tested the MAR hypothesis, i.e., duplication of capital-intensive services, against the alternative that the extent of the local market determines the number of providers of a particular service. Their analysis provides minimal support for the MAR hypothesis while suggesting scale economies as the alternative explanation for the observed differences in hospital costs and service supply across local markets in the U.S. California State.

Beyond the effect of competition on the supply of hospital services, early theoretical studies on hospital nonprice competition focus on various dimensions, including the relationship between the quality-enhancing aspect of nonprice competition and reimbursement policy (Pope, 1989), the stochastic nature of hospital demand and excessive hospital capacity investments (Gal-Or, 1994), hospitals' response to payment method change on volume and intensity of health care (Hodgkin & McGuire, 1994), the impact of reimbursement system on incentives for cooperation among hospitals in quality improvement (Kesteloot & Voet, 1998), and optimal reimbursement system with hospital competition under labor scarcity (Brekke, 2000).

Gal-Or (1994) characterized the equilibrium capacity level in local markets that was determined by the profit-maximizing decision of hospitals whose reaction functions depended on the decision of nearby hospitals. If there was a positive relationship between the extent of capacities of nearby local hospitals, then their reaction functions were upward-sloping. On the other hand, the reaction functions of hospitals might be downward-sloping; that is, hospitals invest less in capacity if the neighboring hospital invests in a larger capacity. Kesteloot and Voet (1998) theoretically argued the market-expansionary effect with the possibility of quality-improvement spillovers to rival hospitals.[6]

Considering the fact that healthcare production is very labor-intensive, Brekke (2000) argued that increased production of a hospital could induce a negative spillover on rival hospitals due to scarcity

---

6   In the literature, 'neighbor influence' is also addressed for other industries; however, for the purpose is this study, only works related to hospital industry were briefly surveyed.

of labor. When health personnel are scarce, an increase in the output of a hospital does not only lead to a rise in its own cost but also in the cost of its rivals. Within a prospective payment setting, Brekke (2000) found that hospitals provided too much output and quality of healthcare in the Cournot-Nash equilibrium in case there was a sufficiently large scarcity of labor. In the mixed hospital industry setting of China within a game-theoretical duopoly model, Wang and Chen (2017) investigated the impact of government reimbursement of public hospitals on the quality of private hospitals. They argued that the presence of a dominant public sector had stimulating effects on the quality of private hospitals.[7]

Based on the conceptual frameworks and arguments of the earlier studies reviewed above, this paper closely follows another set of recent empirical works on the supply response of hospitals of different ownership types to the changes in demand over a period of years. Hansmann et al. (2003) investigated the impact of ownership forms on the bed capacity choice of hospitals. Employing the U.S. hospital data in 1985 and 1994, they found differential supply responses (the rate of capacity adjustments) of nonprofit and for-profit hospitals to changes in demand. In a more recent similar study employing data on the German hospital industry, Schwierz (2011) addressed how hospitals of different ownership forms respond to the changes in demand for hospital services with the changes in hospital bed capacity in Germany between 1996 and 2006.

The focus of Hansmann et al. (2003) and Schwierz (2011) is more on the supply response to the demand changes while this article focuses more on examining the relationship between the changes in hospital capacity and the local market characteristics. From this aspect, this study is also closely related to Conlin and Kadiyali (2006), which empirically examined how market concentration and market presence affect firms' incentives to make entry-deterring capacity investments. Using data on lodging properties in Texas from 1991 to 1997, they tested whether investments in (idle) capacity depend on market concentration and market presence. They found that more concentrated markets (with a larger Herfindahl index) had higher idle capacities (i.e., investments in capacity relative to demand). They also found that firms with a greater market presence made more capacity investments.

Relying on this literature, this paper investigates the relationship of market structure with the capacity expansion of hospitals in Türkiye. Inspired by the models of Hansmann et al. (2003) and Schwierz (2011), in the next section, the paper provides estimations of regression models that relate the changes in hospital capacity of the local districts (*ilçe*) of Türkiye over the period 2010 and 2014 to the characteristics of local markets in 2010.

3. Empirical Model

The changes in the hospital bed numbers were used as a measure of hospital capacity. A hospital's response to changes in market conditions might happen within several years and the year 2010 is a critical year in terms of hospital sector-related reforms as discussed in the introduction section;

---

7   On the other hand, it can also be argue that, in a mixed public-private hospital market environment, the presence of public hospitals in a local market gives the opportunity to private hospitals for 'cream-skimming', that is, selection of less severe and more profitable patients, leaving other patients to public hospitals as 'last resort'.

therefore, in the empirical analysis, the year 2010 was eligible to be selected as a pre-reform base year for the hospital capacity change until 2014, which is the year that represents the post-reform period. The baseline market characteristics were measured in 2010. Under the data unavailability constraint, the four-year period provides reasonably sufficient time for hospitals to be able to adjust their capacity and for the effects of the healthcare reforms to become evident.[8]

The unit of analysis is a local geographic market and the scope of the product is the general hospital care services. Districts (*ilçe*, second-level administrative divisions) of Türkiye represent the geographically isolated local markets in the analysis.[9] It was assumed that the relevant local markets for the product of general hospital services at the secondary care level are districts (*ilçe*). For every district *m = 1,2,…,M* of Türkiye in 2010 and 2014, the number of hospital beds was used as a measure of the hospital capacity for both public and private hospitals.[10]

The empirical model to test the impact of hospital competition on the capacity growth of hospitals was formulated as $\Delta y = f(COMP, X)$, where Δy represents the change in hospital bed sizes as hospital capacity measure, *COMP* variable indicates the intensity of hospital market competition, and *X* is a vector of control variables that may influence the hospital capacity choice. The typical measure of market concentration, the Herfindahl–Hirschman Index (HHI), was employed to characterize the intensity of competition in the local hospital markets along with the variables on the market presence of public hospitals, tertiary level of care institutions, and national chain hospitals. Variables describing the local hospital market environment, the demographic market characteristics, and the individual hospital characteristics were employed.

The model specifically aims to explore how local market competition and other market conditions have effects on the change in hospital capacity for each ownership type, so it provides insights into whether there appears to be a *Medical Arms Race* in the Turkish hospital industry in which market structure results in an arms race in the form of capacity expansion.

The changes in hospital capacity were modeled as a function of changes in the residential population of districts from 2010 to 2014 that proxy demand changes for hospital services and some other baseline hospital market characteristics of each district in 2010, including demographic variables and competition measures. Privately – and publicly-owned Ministry of Health hospital capacity variables were defined as $C_{m,t}^{PHOSP}$ and $C_{m,t}^{MoHHOSP}$ for $t = \{2010, 2014\}$.

---

8   The latest year that the data on hospitals available for the research were 2014. For this reason, more longer-term effects of healthcare reforms on hospital market structure could not be further revealed in this study.

9   The procedure for the delineation of the relevant market applied in the article is taken from Boyacı (2022). To put it briefly, at the outset, all districts of Türkiye were identified as potentially geographically local markets; then, the application of market selection procedures resulted in a sample local districts of Türkiye where the possibility of market overlap is sufficiently minimal.

10   Initially, the paper also attempted to investigate changes in hospital capacity by the source of change in dependent variable via categorizing capacity changes as entry and exit of hospitals, and changes in bed size of established hospitals, similar to Hansmann et al. (2003) and Schwierz (2011). However, it was observed from the preliminary data analysis that the salient feature of the hospital industry during the sample period of 2010-2014 was an expansion in hospital capacity, and the main source of the expansion in terms of hospital beds was the growth of existing hospitals more than entry and exit.

The basic model specifies the log change in the hospital capacity within a district m as

$$\Delta ln C_m^i = \alpha + \beta_2 \Delta ln P_m^+ + \beta_3 \Delta ln P_m^- + \Phi \vec{X}_{m,2010} + \Phi \overrightarrow{COMP} + \varepsilon^i$$

where Δ denotes changes in value between 2010 and 2014 and $i = \{PHOSP, MoHHOSP\}$ represents the ownership forms. Hospital capacity may asymmetrically respond to population increases and decreases: $\Delta ln P_i^+$ is the log change in district m`s population if it increased, zero otherwise; $\Delta ln P_i^-$ is the log change in district $m$`s population if it decreased, zero otherwise. $\vec{X}_{m,2010}$ is a vector of baseline hospital market characteristics denoting variables on the fraction of the elder population, socio-economic development variables, the market shares in beds of private and publicly-owned MoH hospitals, the log of public and private beds per capita; and dummy variables on whether the district has a teaching and research hospital, whether the district has a university hospital, whether there is a hospital that belongs to national chain hospital groups in the district, and whether there happened new private hospital entry in the district; ε^i's are independently distributed error terms.

The $\overrightarrow{COMP}$ is a vector of market structure variables. A simple count of the number of competing hospitals does not capture the relative sizes of hospitals. When there appear variations in the sizes of competing firms, both the numbers and relative size of competing firms can be captured with the commonly used Herfindahl-Hirschman index (HHI). Therefore, the log of the level of market concentration was used as typically measured by the Herfindahl–Hirschman index, which is the squared market shares in terms of beds of private hospitals serving a district. Furthermore, a dummy variable for recent past entry into the local markets between 2008 and 2010 and a dummy variable for new hospital entry between 2010 and 2014 were included in the analysis.

4. Data

The empirical analyses rely on the yearly countrywide data on all the public and private hospitals at general hospital status, teaching and research hospitals, and university hospitals over the period of 2010-2014. The hospital dataset comes from the Ministry of Health (MoH) of Türkiye, and market-level data are from various sources. The hospital data consists of lists of all hospitals of different ownership forms for all levels of healthcare. This allows for taking into account the presence of competition between the private and the publicly-owned MoH hospitals, as well as the impact of the presence of tertiary-level care institutions in a local market.

The relevant local markets for the product of general hospital services at the secondary care level are assumed as districts (*ilçe*). At the outset, all 927 districts of Türkiye as of 2010 were identified as potentially geographically local markets; then, the application of market selection procedures resulted in a sample local districts of Türkiye where the possibility of market overlap is sufficiently minimal. The market elimination rules leave a sample, which is used in the estimations, of 85 local districts as geographically isolated markets with 214 privately-owned and 114 MoH publicly-owned general hospitals in 2010 and 234 private and 111 public hospitals in 2014.[11]

---

11   For further information on dataset preparation before estimations, interested readers can refer to Boyacı (2022) from

Despite the restrictive market selection rules that made the sample for the empirical analysis smaller, there still appears to be variation in hospital capacity over the sample local markets to exploit in econometric analysis. Table 3 includes the descriptive statistics for the hospital capacity of the districts in the sample for the years 2010 and 2014. The total hospital bed capacity of the sample districts has grown 22% on average; among them, the private hospital bed capacity of the sample districts has risen 51% on average while their mean public hospital bed capacity has increased only 13%. Hospital bed share of private ownership in the sample districts has increased from 22% in 2010 to 27% in 2014. However, the growth in the sample mean population has become only 6%.

Table 3: Descriptive Statistics for the Hospital Capacity of the Sample Districts

District level variables	2010		2014	
	Mean	Std Dev	Mean	Std Dev
Bed capacity				
Total	643.41	535.87	780.98	653.54
Private	141.34	163.38	213.86	256.92
Public (MoH)	502.07	404.22	567.12	441.95
Population	302,307	315,929	320,182	339,387

Source: Author`s tabulations.

Table 4 shows how local hospital capacity by different ownership forms has changed over the 2010-2014 period in the sample districts and the sources of those changes. The table decomposes total changes in the number of total hospital beds in the sample districts into two categories: changes due to changes in hospital bed sizes and changes due to hospital entry and exit.[12] The considerable expansion in hospital size appears to be a salient feature of the hospital industry during the sample period. In percentage terms, the sample private hospitals experience the higher expansion in mean bed capacity of the sample districts with 51%; the MoH public hospitals are far behind with a 12% change.

In Table 4, the growth of existing hospitals appears as the primary source of expansion of MoH public hospitals in the sample districts. Differently, changes in the number of beds contributed 33% of the total 51% net gains in private hospital beds in the sample districts; on the other hand, there seems relatively less considerable contribution to capacity expansion by means of new private hospital entry to the market.[13] In sum, these statistics suggest that larger amounts of hospital capacity expansions in our sample districts come from the growth of existing hospitals.

---

which the dataset and the procedures for the delineation of the relevant market applied in the article are borrowed. See also Hansmann et al. (2003) and Schwierz (2011) for alternative approaches that can be used to define geographic market areas in case data on patient flows and admission were available for the purpose of research.

12   Unlike Hansmann et al. (2003) and Schwierz (2011), which employed data from the U.S. and Germany, the change due to conversions among private and public ownership forms is not a relevant issue for the hospital industry environment in Türkiye. In addition, mergers and acquisitions of private hospitals are rare, and there is no available data for research to study the effect of mergers and acquisitions on changes in hospital capacity.

13   One explanation for this could be that the study covered a four-year data period, but the relatively slow growth in the number of private hospitals in the subsequent years does not point out this. The total number of private hospitals in the

Table 4: Sources of Changes in the Hospital Bed Capacity of the Sample Districts

	Beds			Facilities		
	Total	Private	Public	Total	Private	Public
Total						
2010 total	54,720	12,014	42,706	328	214	114
2014 total	66,373	18,178	48,195	345	234	111
Net change	11,653	6,164	5,489	17	20	-3
Net change in % of 2010	21.30	51.31	12.85	5.18	9.35	-2.63
2010-2014 entry and exit						
Gains	3,604	3,187	417	29	28	1
Losses	1,682	933	749	12	8	4
Net change	1,922	2,254	-332	17	20	-3
Net change in % of 2010	3.51	18.76	-0.78	5.18	9.35	-2.63
2010-2014 changes in beds						
Gains	11,088	3913	7,175			
Losses	1,357	3	1,354			
Net change	9,731	3,910	5,821			
Net change in % of 2010	17.78	32.55	13.63			

Source: Author`s tabulations.

Table 5 shows how the hospital capacity of the sample districts responds to changes in population. It reports the 2010-2014 percentage change in hospital capacity for the two ownership types by district size in terms of residential population for fast-growing and slow-growing districts. First, districts were grouped according to the quartile of the 2010 district population, with 21 or 22 districts in each quartile. Then, within each quartile, each district is classified into one of the two groups as a fast-growing or slow-growing district, depending on each district's 2010-2014 population growth.

As seen in Table 5, capacity for all ownership types increased in each group of districts, as might be expected in an industry with favorable market conditions thanks to the achievement of universal public health insurance coverage nationwide with the health reforms. Moreover, interestingly, for all population quartiles except the fourth quartile, the percentage rise in private hospital capacity is noticeably greater in the slow-growing districts in terms of population than in the fast-growing districts. For example, private hospital capacity in the sample districts of the third population quartile has expanded by 48.12% in beds in the fast-growing districts, but it has increased by 65.85 % in beds in the slow-growing districts. Furthermore, the rates of private bed capacity expansions in both fast – and slow-growing sample districts are markedly higher than the public bed capacity expansion rates.

As one moves from the less populous first quartile to the most populous fourth quartile, the gaps between the rates of expansion in the fast – versus slow-growing districts first increase until the third quartile, then they become almost equal at the fourth quartile. Also, the change rate becomes the highest for the fast-growing districts in the most populous fourth quartile, but it appears to

country showed a less considerable increase from 556 in 2014 to 577 in 2018.

be the highest for the slow-growing districts in the third population quartile. Here, it needs to be remarked that the comparisons among quartiles should be made cautiously because the quartile of most populous districts contains dramatically higher numbers of hospitals, hospital entry, and hospital beds than the other quartiles. Hospital capacity is remarkably higher in the quartile of the most populous districts than in the other three quartiles. Also, the change rate in the number of facilities in the fourth quartile is 14.78%, the highest among the district quartiles. New hospital entry is a considerable source of capacity change in the fourth population quartile, while the number of facilities in the first three quartile remains almost the same.

Table 5: Percentage Change in Sample Hospitals' Bed Capacity for Fast – and Slow-growing Districts in terms of Population Change by Population Quartile and Ownership, 2010-2014

	All Beds	Private	MoH Public
All districts			
Fast-growing 2010	31,949	7,720	24,229
Fast-growing 2014	39,047	11,400	27,647
Change in %	22.22	47.67	14.11
Slow-growing, 2010	22,771	4,294	18,477
Slow-growing, 2014	27,326	6,778	20,548
Change in %	20.00	57.85	11.21
Number of facilities 2010	328	214	114
Number of facilities 2014	345	234	111
Change in facilities %	5.18	9.35	-2.63
Least populous districts, 1st quartile			
Fast-growing 2010	3,825	788	3,037
Fast-growing 2014	4,084	906	3,178
Change in %	6.77	14.97	4.64
Slow-growing, 2010	2,412	669	1,743
Slow-growing, 2014	2,689	849	1,840
Change in %	11.48	26.91	5.57
Number of facilities 2010	51	29	22
Number of facilities 2014	49	28	21
Change in facilities %	-3.92	-3.45	-4.55
Districts in the 2nd population quartile			
Fast-growing 2010	4,054	605	3,449
Fast-growing 2014	4,989	857	4,132
Change in %	23.06	41.65	19.80
Slow-growing, 2010	3,401	655	2,746
Slow-growing, 2014	4,023	1,004	3,019
Change in %	18.29	53.28	9.94
Number of facilities 2010	55	32	23
Number of facilities 2014	55	33	22
Change in facilities %	0.00	3.13	-4.35

Districts in the 3rd population quartile

Fast-growing 2010	5,936	1,008	4,928
Fast-growing 2014	7,113	1,493	5,620
Change in %	19.83	48.12	14.04
Slow-growing, 2010	6,773	1,019	5,754
Slow-growing, 2014	7,964	1,690	6,274
Change in %	17.58	65.85	9.04
Number of facilities 2010	64	38	26
Number of facilities 2014	66	41	25
Change in facilities %	3.13	7.89	-3.85
Most populous districts, 4th quartile			
Fast-growing 2010	14,345	4,274	10,071
Fast-growing 2014	18,501	6,699	11,802
Change in %	28.97	56.74	17.19
Slow-growing, 2010	13,974	2,996	10,978
Slow-growing, 2014	17,010	4,680	12,330
Change in %	21.73	56.21	12.32
Number of facilities 2010	158	115	43
Number of facilities 2014	175	132	43
Change in facilities %	10.76	14.78	0.00

Notes: Population quartile cutpoints are based on the 2010 district population of 127,100; 170,240; and 334,893. Fast-/ slow-growing cutpoints, which were determined by the median within each group of observations, are 7.09 percent for the overall sample, 7.00 percent for the least-populous, 5.99 percent for the 2nd quartile, 5.94 percent for the 3rd quartile, and 9.16 percent for the most populous.
Source: Author`s tabulations.

However, by only looking at the patterns among these quartiles, it is difficult to argue for a monotonic rise in the bed capacity change of sample districts between population quartiles. During the study period, the main features of the industry environment have become the price and entry regulations applied to the private hospitals and the centrally allocated nature of the capacity planning of the publicly-owned MoH hospitals based mainly on the residential population. Hence, motivated by the fact that hospitals of various ownership types respond differently to the changing market environment over the study period, the regression models aim to identify the impact of changing local market conditions on hospital capacity. Table 6 presents the summary statistics of the variables used in the regressions. The next section provides the results of the regression estimates of the impact of hospital market characteristics on the change in local districts' hospital capacity.

Table 6: Summary Statistics of the Variables Used in Regression Analyses

Variables	Mean	S.D.	Min	Max
Log change in bed capacity, 2010-2014				
Total	0.18	0.21	-0.25	0.82
Private bed capacity	0.37	0.34	-0.29	1.45
Public bed capacity	0.13	0.26	-0.34	1.13
Log change in population, 2010-2014				

All districts	0.05	0.09	-0.34	0.22
Positive change	0.07	0.05	0	0.22
Negative change	-0.01	0.06	-0.34	0
Ln (beds per capita in 2010)				
Total	0.81	0.42	-0.51	1.57
Private	-0.87	0.58	-2.26	0.39
Public	0.55	0.50	-0.99	1.49
Market concentration in 2010				
Total beds HHI	5,739	1,902	1,844	9,376
Private beds HHI	6,645	3,181	1,191	10,000
Market shares in beds in 2010				
Private	0.22	0.12	0.03	0.55
Public	0.78	0.12	0.45	0.97
Teaching and research MoH hospitals dummy	0.15	0.36	0	1
University hospitals dummy	0.35	0.48	0	1
Fraction of district children, population aged 0-14 years	0.26	0.06	0.16	0.41
Fraction of district population over 65 years	0.07	0.02	0.03	0.14
Fraction of dependent population	0.32	0.04	0.24	0.44
Rate of district urban population	0.99	0.01	0.93	1.00
Metropolitan district dummy in 2010	0.15	0.36	0	1
Metropolitan district dummy in 2014	0.29	0.46	0	1
Become a metropolitan district dummy, 2010-14	0.14	0.35	0	1
Pivotal district dummy, MoH`s Health Service Area identification	0.95	0.21	0	1
National chain hospital dummy in 2010	0.24	0.43	0	1
National chain hospital dummy in 2014	0.34	0.48	0	1
Entry of national chain hospital dummy, 2010-2014	0.11	0.31	0	1
Change in national chain hospital dummy, 2010-2014	0.11	0.31	0	1
Socioeconomic development SEGE-2004 index	1.63	1.43	-0.78	7.95

Source: Author`s tabulations.

5. Estimation Results

The estimation results explain the changes in bed capacity of public and private hospitals in the districts of Türkiye over the sample period 2010 and 2014. A rich set of explanatory variables is employed to capture the various effects of changes in demand and local hospital market characteristics on the capacity changes of hospitals. Further, with the help of additional sets of estimations, a robustness investigation is conducted in this section by using alternative variables for income, which can be considered overall indicators of the districts' wealth level.

Tables 7-9 present estimates of the effect of population changes, some baseline demand conditions, and hospital market characteristics on the changes in the number of hospital beds for the two ownership types. The bed capacity growth rates of both private and public hospitals seem not responsive to the changes in demand proxied by district population variables. The responsiveness of hospitals in terms

of hospital bed capacity to both increases and decreases in population does not appear statistically significant. Also, the elder population variable does not appear to have statistically significant effects on the bed capacity of hospitals. During the study period, while the population grew by only about 5%, the total hospital bed capacity of the sample districts increased by about 20%. Consistent with such descriptive statistics tabulated in Tables 1–6, the estimation results do not provide evidence for the argument that the growth in population is the main factor behind the massive capacity expansion of Turkish hospitals.[14]

Higher levels of the socioeconomic development index (SEGE) are associated with higher increases in the private hospital bed capacity of the local districts while public hospitals tend to expand their bed capacity more in the districts with lower levels of the SEGE development index. The estimation results therefore support the argument that private hospitals under regulated healthcare prices may have a higher propensity in more affluent districts to employ excess capacity, such as bed capacity, luxury amenities and facilities, and high-tech medical devices. On the public hospitals' side, with the aim of achieving publicly-financed universal equal access to healthcare upon the completion of HTP reforms, the MoH introduced region-based planning-oriented national health policies in 2010, which naturally resulted in more public hospital investments in the less wealthy local districts.

Hospital capacity expansion is weaker in local districts with a formerly higher hospital bed per capita of the same ownership type (see Table 7). There appears to be a significant negative effect of high baseline hospital capacity in their own type for both public and private hospitals on their capacity growth. Interestingly, the baseline public hospital bed capacity variable does not appear to have a statistically significant effect on the bed capacity expansion of private hospitals, and vice versa. Thus, the estimations provide support to the argument that the favorable market environment with universal publicly-financed insurance coverage in which patients are less sensitive to the pricing, along with the stochastic characteristic of healthcare demand, facilitated the supply of higher hospital bed capacities in the local districts over the years. However, the results do not provide evidence that the insufficiency of public hospital beds promoted the growth of private bed capacities in the local districts of the country and that the presence of the dominant public sector has stimulating or deterring effects on the private bed capacity changes.

Moreover, in Table 7, there seem to be no significant effects of the presence of tertiary-level care institutions (namely, teaching and research hospitals and university hospitals) on the change of hospital capacities. The exception is that the presence of public teaching and research hospitals positively affects the public bed capacity expansion. Further, Table 7 shows that the presence of private hospitals owned by a national chain hospital group in a local market does not have a statistically significant effect on the rate of growth in private or public hospital bed capacity. Hence, the estimations suggest that the presence of public teaching and research hospitals in local districts

---

14   The empirical model in this article explains the changes in the hospital bed capacity in local districts of Türkiye as the dependent variable, but does not aim to address the level of bed capacity or the number of hospitals in the local districts. Interested readers are referred to Boyacı (2023) whose focus is on explaining the number of hospitals in the local districts of Türkiye during the pre – and post-reform periods.

had a stimulating effect only on the public general hospitals; on the private sector side, the presence of corporatized private chain hospitals in the local districts did not lead to an expansionary effect on the private hospital bed capacity of local districts in Türkiye.

Table 7: Effect of Changes in Demand and 2010 Hospital-Market Characteristics on Changes in Bed Capacity of Public and Private Hospitals, 2010–2014, Including Baseline 2010 Beds Capacity Variables

Dependent Variable: ΔLn(hospital bed capacity)	Private Beds	Public MoH Beds
Δln(district population) if increases	-0.704	0.373
	(0.813)	(0.640)
Δln(district population) if decreases	-0.353	-0.471
	(0.673)	(0.530)
Fraction of elder population	2.025	-0.193
	(1.880)	(1.480)
Socioeconomic development index (SEGE)	0.068**	-0.061***
	(0.030)	(0.024)
Ln(private hospital beds per capita in 2010)	-0.185***	0.012
	(0.063)	(0.049)
Ln(public MoH hospital beds per capita in 2010)	-0.089	-0.236***
	(0.077)	(0.061)
Teaching and research MoH dummy	-0.093	0.151*
	(0.111)	(0.088)
University hospital dummy	0.084	0.058
	(0.086)	(0.067)
National chain hospital dummy	0.029	-0.011
	(0.105)	(0.083)
Constant	0.024	0.307
	(0.171)	(0.134)
Observations	85	85
R2	0.27	0.26
AdjustedR2	0.19	0.17

Notes: The dependent variables are the log change of private or public hospital bed capacity within a district. Standard errors are shown in parentheses. ***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

As seen in Table 8, lower levels of the market concentration HHI appear not to be associated with greater growth in the bed capacity of hospitals. It does not have a statistically significant impact on the changes in the hospital bed capacity of local districts. Also, there is no evidence of a statistically significant difference between the metropolitan districts and the other more local districts in the capacity changes of hospitals. The estimation results show that the market structure variables do not have statistically significant influences on the bed capacity change of both public and private hospitals. Therefore, the article does not find evidence that the local competition among Turkish hospitals led them to engage in a kind of 'medical arms race' of rivalry in the form of bed capacity expansion.

Table 8: Effect of Changes in Demand and 2010 Hospital-Market Characteristics on Changes in Bed Capacity of Public and Private Hospitals, 2010–2014, Including Baseline 2010 Beds Capacity and Market Structure-Competition Variables

Dependent Variable: ΔLn(hospital bed capacity)	Private Beds	Public MoH Beds
Δln(district population) if increases	-0.755	0.262
	(0.817)	(0.654)
Δln(district population) if decreases	-0.403	-0.272
	(0.661)	(0.529)
Fraction of elder population	2.036	-0.685
	(1.923)	(1.539)
Socioeconomic development index (SEGE)	0.070**	-0.050*
	(0.035)	(0.028)
Ln(private hospital beds per capita 2010)	-0.206***	-0.006
	(0.072)	(0.058)
Ln(public MoH hospital beds per capita 2010)	-0.086	-0.199***
	(0.075)	(0.060)
Ln(HHI, private hospital beds)	-0.057	-0.038
	(0.081)	(0.072)
Metropolitan*Ln(HHI, private hospital beds)	-0.007	0.004
	(0.016)	(0.013)
Constant	0.529	0.661
	(0.753)	(0.602)
Observations	85	85
R2	0.26	0.22
AdjustedR2	0.18	0.14

Notes: The dependent variables are the log change of private or public hospital bed capacity within a district. Standard errors are shown in parentheses. ***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

According to Table 9, the variable on whether there happened a recent-past private hospital entry to a district between the years 2008 and 2010 has no significant effect on the changes in hospital bed capacity for both ownership types. On the other hand, the dummy variable on new private hospital entry between 2010 and 2014 has statistically significant effects on the changes in private beds capacity. The districts with new private hospital entry during the years between 2010 and 2014 had 33% more private bed capacity change than the districts with no new private hospital entry during this period of years. This reflects the fact that the new private hospital entry is a substantial source of the change in the private bed capacity. On the other side, the new private hospital entry variable has no statistically significant effect on the public bed capacity change. Hence, it can be concluded that the empirical analysis in this article does not provide evidence for the well-argued medical arms race hypothesis (i.e. overinvestment due to local competition) in the literature while suggesting new hospital entry as the main explanation for the observed differences in the growth of private hospital bed supply across the local districts of Türkiye over the years 2010 and 2014.

Table 9: Effect of Changes in Demand and 2010 Hospital-Market Characteristics on Changes in Bed Capacity of Public and Private Hospitals, 2010–2014, Including Baseline 2010 Beds Capacity, Market Structure-Competition, and Hospital Entry Variables

Dependent Variable: ΔLn(hospital bed capacity)	Private Beds	Public MoH Beds
Δln(district population) if increases	-0.523	0.267
	(0.750)	(0.661)
Δln(district population) if decreases	-0.524	-0.245
	(0.610)	(0.538)
Fraction of elder population	2.012	-0.685
	(1.755)	(1.548)
Socioeconomic development index (SEGE)	0.029	-0.052*
	(0.032)	(0.028)
Ln(private hospital beds per capita 2010)	-0.224***	-0.004
	(0.068)	(0.060)
Ln(public MoH hospital beds per capita 2010)	-0.013	-0.199***
	(0.071)	(0.063)
Ln(HHI, private hospital beds)	-0.065	-0.050
	(0.083)	(0.073)
RecentPastEntry3Yr dummy, 2008-2010	0.025	-0.020
	(0.078)	(0.069)
New hospital Entry4Yr dummy, 2011-2014	0.331***	0.031
	(0.082)	(0.072)
Constant	0.495	0.787
	(0.714)	(0.630)
Observations	85	85
R2	0.39	0.22
AdjustedR2	0.32	0.13

Notes: The dependent variables are the log change of private or public hospital bed capacity within a district. Standard errors are shown in parentheses. ***, ** and * represent statistical significance at the 1%, 5% and 10% level, respectively.

5.1. Robustness Analysis

Different 'income' variables instead of the socioeconomic development (SEGE04) index were considered. Firstly, data from the Bank Association of Türkiye (TBB) on the number of bank branches per 100,000 population in 2010 within each district of Türkiye, BANKBRANCH, was used. Banks are likely located more in wealthier areas, so the economic activity can be supposed to be greater in areas with more bank branches. Secondly, data on the fraction of the district population that benefits from the Green Card (*Yeşil Kart*) Insurance scheme, FGREENCARD, was used. The Green Card insurance scheme, which continued until 2011, aimed to provide access to healthcare without payment for uninsured poor citizens; thus, the districts with more residents who benefit from the Green Card insurance can be expected to be poorer than others.

These supplemental estimation results show that the BANKBRANCH variable has a negative and statistically significant effect only on the bed capacity expansion of MoH public hospitals as seen

in Table 10; the FGREENCARD variable has a robustly negative and statistically significant effect only on the bed capacity expansion of private hospitals.[15] Remember that the SEGE-index variable has a statistically significant and positive impact on the change in the private bed capacity, and it has a statistically significant and negative impact on the change in the public bed capacity. These additional results can be interpreted as the main estimation results are almost robust to considering alternative 'income' variables instead of the socioeconomic development index.

6. Conclusion

This article examined the growth of the hospital market in the transformed Turkish health system during the period 2010-2014 in which the hospital care market expanded saliently. The study empirically analyzed the relationship between the changes in hospital capacity of local markets and the market characteristics. To explore the determinants of capacity expansion of hospitals in terms of hospital beds, data on hospitals in the local districts of Türkiye over the sample period 2010-2014 was used. The focus of the empirical analyses is particularly on the impact of local competition along with some other market characteristics on the changes in hospital capacities of local markets. Thus, this article explains hospital capacity expansion during the health reform period of Türkiye in the 2010s.

The estimations explained the differences in private and public hospital bed capacities in Türkiye's local districts between the years 2010 and 2014, paying particular attention to how the local market structure affected these differences. A rich set of explanatory variables was used to capture the various effects of changes in demand and local hospital market characteristics on their hospital bed capacities. Hence, the regression analyses in the article identified the impact of changing local market conditions on the local market's hospital bed capacity.

The estimation results robustly reveal that the changes in the hospital bed capacity of local markets did not respond to the population variables, therefore, it appeared difficult to argue that the changes in their population contributed to the massive expansion of the local hospital markets. There appeared statistically significant negative impact of local districts' existing private (public) hospital bed capacities on the change in bed capacity of private (public) hospitals over the study period; however, the existing public hospital capacity did not have a statistically significant effect on the change in private hospital bed capacities, and vice versa. Variables related to the presence of teaching and research hospitals, university hospitals, or hospitals of a national chain hospital group in local districts did not have statistically significant impacts on the change in hospital bed capacities of local districts.

In the estimations, among the market structure variables, the variables on market concentration HHI and the recent-past private hospital entry between the years 2008 and 2010 appeared to have no statistically significant impact on the hospital bed capacity growth rates of local districts. The

---

15   Due to page limitations, the tables containing the estimation results using the BANKBRANCH and FGREENCARD variables could not be documented in the text of the article. It is available upon request.

variable on the new hospital entry between 2010 and 2014 had a statistically significant positive impact on the growth of the private hospital bed capacities of local districts, but it did not have a statistically significant influence on the change in their public bed capacities.[16]

To conclude, as an overall interpretation of the empirical analyses throughout the article, it appears more appropriate to interpret the capacity expansion of private hospitals as a natural consequence of the favorable market environment thanks to the health reforms under the HTP transformation program. After the HTP reforms were implemented, universal health insurance coverage was achieved and the private provision of healthcare was included within the publicly-funded insurance system. Also, the main characteristics of the industry environment during the study period were regulations on healthcare prices and market entry that have been imposed on private hospitals along with the centrally designated capacity planning of the public hospitals. All of these together may have led to more room for non-price rivalry among hospitals (in areas like larger buildings and hotel-like services) that may have resulted in capacity overinvestment.

During the early years of the HTP reform program, market-oriented policies on the healthcare delivery that aim to promote competition among the healthcare providers helped to ease the burden of the public sector. Afterward, in the final stages of the reforms, the restrictive regulations on hospital prices and entry enacted. In the 2010s, the rapid progress has been achieved in universal health coverage, access to health services, and citizen satisfaction, then the Ministry of Health has focused more on longer-term region-based planning-oriented health policies to ensure the regional accessibility and quality of health services countrywide. With the completion of the Transformation Program in 2013, there has been a hospital market environment consisting of a mixture of public and private sectors in the delivery of health services in the Turkish health system with a mixture of health policies consisting of competition, regulation, and planning practices together.[17]

As Boyacı (2024) revealed, although the role of privately-owned hospitals in the country's health system has expanded over the last two decades, the delivery of hospital services in Türkiye remains primarily a responsibility of the public sector. There has been a rapid increase in the presence of private hospitals in all regions of the country during the Transformation Program; however, the public sector continues to hold the primary responsibility for the provision of hospital services after the reforms as well.[18] In the health system of the country where universal health insurance coverage is achieved thanks to the reforms, the countrywide diffusion of private hospitals that can provide services within the social security financing has helped to increase the country's healthcare capacity and so physical access to hospital services, but how the presence of private hospitals may

---

16 The sample dataset used in the empirical analysis covered local districts of Türkiye that are geographically isolated from each other. In more contiguous districts of metropolitan cities, different forces may be at work in the relationship between the nature of local competition among hospitals and their capacity expansions.

17 For complete investigations of the Turkish hospital market environment from the perspective of the field of Industrial Organization, see Boyacı (2021, 2022, 2023, and 2024).

18 Before the HTP reforms, 23.4% of hospitals in Türkiye were private hospitals in 2002, increased to 36.4% in 2014 and remained around 37% in the following years. The share of private hospital beds increased from 7.5% in 2002 to 19.6% in 2014 and remained around 21% in the following years. Interested readers are referred to Boyacı (2024) for an examination of the public-private mix in the Turkish hospital market.

affect the existence and functioning of public hospitals is a key health policy issue that is open to debate. From this aspect, this article contributes to the broader discussion on the public-private mix in healthcare by finding that existing private (public) hospital bed capacities in local districts do not have a deterrent or stimulating effect on changes in public (private) hospital bed capacities.

An intriguing fact that calls for further cross-country comparative analysis is that all these developments in the transformed Turkish health system over the last two decades have not resulted in higher shares of health expenditures in the economy. Health spending in Türkiye has remained around 4-5% of GDP over the last two decades, far below the OECD countries average of 8-9% of GDP in the 2010s. Despite its relatively lower healthcare spending, there has been remarkable progress in the overall capacity of the Turkish health system including healthcare utilization, citizen satisfaction, and health outcomes when the HTP reform period was completed. There is a need for in-depth investigations of whether Türkiye has developed a more cost-effective healthcare model thanks to the Health Transformation Program, whether there has been underspending in healthcare, or whether there are hidden unmet healthcare needs in the population. This interesting aspect of the Turkish health system awaits to be explored.

As a final remark, in order to guide future research, it can be pointed out that the analysis in the paper focused on explaining the growth of local markets' hospital bed capacity but not on asymmetric relationships in the capacity choice between rival hospitals within local markets. The size asymmetry among local hospitals is worth to be investigated properly in its own research framework to be adequately addressed.[19] The analysis in this article has the potential to inspire additional research on the topic.

References

Boyacı, İ. (2021). Türkiye sağlık sisteminin dönüşümü (2003-13): sağlık hizmet bölgeleri planlaması ve şehir hastaneleri. *İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi*, 20(40), 358-376. Doi:10.46928/iticusbe.769087

Boyacı, İ (2022). *Essays on Turkish private hospital industry: dynamics of market structure, health reforms and regulations*. Unpublished Ph.D. thesis, Department of Economics, Boğaziçi University, Türkiye.

---

19   For example, larger hospitals, relative to their local competitors, may choose to invest in capacity more to sustain their dominant positions in the market; or smaller hospitals may make more capacity investments to gain a greater proportion of the market. According to Spence (1979), this situation is an example of preemptive investments: "Just as potential entrants may be deterred by the capacity that established firms have installed; smaller firms may be deterred from expanding by the existing capacity of their larger rivals." In addition to the importance of excess capacity as a strategic deterrent before potential entry, incumbents may invest strategically in the factors that may limit ability of new firms to enlarge their post-entry market shares. This is named in the literature as 'barriers to mobility' between industry subgroups (Caves & Porter, 1977; Lieberman, 1987). In this strand of literature, 'firm entry' in a growing industry is considered as a process involve multiple investments over a period of years. A smaller newcomer may invest in capacity in subsequent post-entry years to alter its position within the market; on the other hand, post-entry capacity expansion of the established firms may serve as 'mobility barriers' to deter continued growth and "mobility" of the entrant minimize the possible adverse impact of entrant firm on their profits (Caves & Porter, 1977). Rhoades (1995), which employs banking market data, provides some measures (in addition to the HHI) for market share inequality and firm composition.

Boyacı, İ. (2023). Healthcare reforms and competition in private hospital markets in Türkiye. *Bogazici Journal: Review of Social, Economic and Administrative Studies*, 37(2),118-146. Doi:10.21773/boun.37.2.4

Boyacı, İ. (2024). Dönüşen Türkiye sağlık sisteminde özel hastanelerin yayılımı. *Yönetim Bilimleri Dergisi*, 22(53), 1017-1037. Doi:10.35408/comuybd.1407511

Brekke, K. R. (2000). *Hospital reimbursement in an oligopolistic industry*. Department of Economics, University of Bergen 0200, University of Bergen, Norway.

Bresnahan, T., & Reiss, P. (1991). Entry and competition in concentrated markets. *Journal of Political Economy*, 99(5), 977-1009.

Caves, R., & Porter, M. (1977). From entry barriers to mobility barriers: conjectural decisions and contrived deterrence to new competition. *The Quarterly Journal of Economics*, 91(2), 241-261.

Conlin, M., & Kadiyali, V. (2006). Entry-deterring capacity in the Texas lodging industry. *Journal of Economics & Management Strategy*, 15(1), 167-185. Doi:10.1111/j.1530-9134.2006.00096.x

Donabedian, A. (1980). *Explorations in quality assessment and monitoring, volume i: the definition of quality and approaches to its assessment*. Ann Arbor, MI: Health Administration Press.

Dranove, D., Shanley, M., & Simon, C. (1992). Is hospital competition wasteful? *The RAND Journal of Economics*, 23(2), 247-262.

Gaynor, M. (2006). *What do we know about competition and quality in health care markets?* Doi:10.3386/w12301

Gal-Or, E. (1994). Excessive investment in hospital capacities. *Journal of Economics Management Strategy*, 3(1), 53-70. Doi:10.1111/j.1430-9134.1994.00053.x

Hansmann, H., Kessler, D., & Mcclellan, M. (2003). *Ownership form and trapped capital in the hospital industry*. The Governance of Not-for-Profit Organizations, 45-70.

Held, P. J., & Pauly, M. V. (1983). Competition and efficiency in the end-stage renal disease program. *Journal of Health Economics*, 2(2), 95-118.

Hodgkin, D., & McGuire, T. G. (1994). Payment levels and hospital response to prospective payment. *Journal of health economics,* 13(1), 1-29.

Joskow, P. (1980). The effects of competition and regulation on hospital bed supply and the reservation quality of the hospital. *The Bell Journal of Economics*, 11(2), 421-447.

Kesteloot, K., & Voet, N. (1998). Incentives for cooperation in quality improvement among hospitals: the impact of the reimbursement system. *Journal of Health Economics*, 17(6), 701-728. Doi:10.1016/s0167-6296(98)00026-5

Lieberman, M. (1987). Excess capacity as a barrier to entry: an empirical appraisal. *The Journal of Industrial Economics*, 35(4), 607-627. Doi:10.2307/2098590

Ministry of Development of the Republic of Türkiye. 2004. *İlçelerin sosyo-ekonomik gelişmişlik sıralaması araştırması (2004) [Research on socio-economic development index of districts SEGE]*. Ankara, Türkiye: Bülent Dincer, Metin Özaslan.

Ministry of Health of the Republic of Türkiye. (2002-2019). *Health statistics yearbook*. Ankara.

Ministry of Health of the Republic of Türkiye. (2012). *Turkey Health Transformation Program Assessment Report (2003-2011)*. Ankara, Türkiye: Recep Akdağ.

Noether, M. (1988). Competition among hospitals. *Journal of Health Economics*, 7(3), 259–284.

Pope, G. C. (1989). Hospital nonprice competition and Medicare reimbursement policy. *Journal of Health Economics*, 8(2), 147–172. Doi: 10.1016/0167-6296(89)90001-5

Rhoades, S. A. (1995). Market share inequality, the HHI, and other measures of the firm-composition of a market. *Review of Industrial Organization*, 10(6), 657-674.

Robinson, J. C., & Luft, H. S. (1985). The impact of hospital market structure on patient volume, average length of stay, and the cost of care. *Journal of Health Economics*, 4(4), 333-356. Doi:10.1016/0167-6296(85)90012-8

Schwierz, C. (2011). Expansion in markets with decreasing demand-for-profits in the German hospital industry. *Health Economics*, 20(6), 675-687. Doi:10.1002/hec.1624

Spence, A. (1979). Investment strategy and growth in a new market. *The Bell Journal of Economics*, 10(1), 1-19. Doi:10.2307/3003316

Wang, C., & Chen, Y. (2017). Reimbursement and hospital competition in China. *Economic Research-Ekonomska Istraživanja*, 30(1), 1209-1223. Doi:10.1080/1331677x.2017.134.0177