



Research article

Does competition support integrated care to improve quality?

Feng Chong^{a,c}, Zhu Jianping^{b,c,d}, Liang Zhenjie^{c,e}, Lin Wenxing^f, Yumin Li^{g,*}^a School of Mathematics and Statistics, Xiamen University of Technology, Fujian, Xiamen, China^b School of Management, Xiamen University, Fujian, Xiamen, China^c Data Mining Research Center, Xiamen University, Fujian, Xiamen, China^d National Institute for Data Science in Health and Medicine, Xiamen University, Fujian, Xiamen, China^e College of Economics and Management, Minjiang University, Fujian, Fuzhou, China^f Xiamen Health and Medical Big Data Center, Fujian, Xiamen, China^g School of Economics and Management, Nanjing University of Science and Technology, Jiangsu, Nanjing, China

ARTICLE INFO

Keywords:

Care quality
Integrated care
Competition
Compatibility

ABSTRACT

Introduction: This work investigates the compatibility of integrated care and competition in China and analyses the impact of integrated care on regional care quality (DeptQ) within a competitive framework.

Method: The study was built on multivariate correspondence analysis and a two-way fixed-effects model. The data were collected from Xiamen's Big Data Application Open Platform and represent nine specialised departments that regularly performed inter-institutional referrals between 2016 and 2019.

Results: First, care quality for referred patients (ReferQ) and the relative scale of referred patients (ReferScale) and competition have an antagonistic but not completely mutually exclusive relationship. Second, ReferQ and competition both have a significant effect on DeptQ, but only when competition is weak can ReferQ and competition act synergistically on DeptQ. When competition is fierce, competition will weaken the impact of ReferQ on DeptQ.

Conclusion: Changes in the intensity of integrated care and competition ultimately affect care quality.

1. Introduction

Around the world, the main contradictions in healthcare systems are currently shifting. The changing demographics represented by ageing, and the changing trends of prevalent diseases – especially the increased incidence of chronic disease – have produced a constant conflict between healthcare needs and the existing healthcare system [1]. Advances in medical technology mean that the global population over the age of 65 years is expected to double in the next 30 years [2]. Unfortunately, longer lifespans are accompanied by increasingly common complications [3], and patient care must inevitably address a combination of illnesses involving physiological function, psychological state, and social dimensions. This signals a growing burden on patients with chronic diseases and disabilities [4] and a greater impact on healthcare systems worldwide [1]. To address society's complex health needs, active, full-scale, continuous care service has become the natural goal of healthcare systems [5]. However, many healthcare systems still focus their efforts on passive clinical treatment, with consumer demand satisfaction rendered discontinuous, fragmented, and inefficient.

* Corresponding author. Nanjing University of Science and Technology, Nanjing, Jiangsu Province 210094, China.
E-mail address: liyumin95@163.com (Y. Li).

Policymakers, service providers, medical consumers, and payers unanimously believe that current healthcare systems emphasise increasing the quantity of services over improving the quality of care [6].

To improve care quality, healthcare research has begun to focus on integrated care [7]. Integrated care is a consumer needs-centred approach to health service delivery and management that provides medical services, including diagnosis, treatment, long-term care, and rehabilitation via the collaboration of institutions at different levels and locations within the healthcare system [8]. The development of integrated care suggests that countries want to provide a 'one-stop-shop' centred on the needs of the healthcare consumer while also improving care quality by reducing redundancies and services duplication [9]. According to several studies, integrated care enhances patient access to healthcare [10,11] and enables patients to recover more quickly from illness [12]. Proietti et al. (2018) validated the notion that integrated care can reduce the risk of adverse outcomes in patients with cardiac fibrillation [13], and Chang et al. (2020) found that Taiwan's Family Practice Integrated Care Project improved care quality for participating patients [14]. However, a systematic review conducted by Baxter et al. (2018) revealed inconsistent results on the role of integrated care on care quality [15]. Although the principles of integrated care are clear, many factors influence its implementation [16]. Essentially, integrated care is a multi-professional issue that emphasises collaboration between different levels and interdependent institutions [17]. Integrated care requires designing health services based on the multidimensional needs of the individual and the collaboration of multi-professional providers [18]. However, the practice of integrated care sees healthcare organisations choose competing or collaborating strategies based on conflicting interests between organisations or changes in the environment. Without incorporating competition, it is not possible to yield accurate information on the impact of integrated care on care quality.

That is, the practice of integrated care happens within existing policy frameworks, which include competition [19–21]. In many national healthcare markets, integrated care and competition have emerged simultaneously. Examples include the introduction of an integrated delivery system [22] and managed care [23] in the United States under a framework of privatisation and competition and the introduction of integrated care in quasi-market or regulated markets in the United Kingdom [20,21], Sweden, and Germany [24]. In 2009, China launched its healthcare reform, emphasising the establishment of medical alliances in order to achieve graded diagnosis and treatment and orderly collaboration between community hospitals and large general hospitals. However, because hospitals are self-financing, the relationship between different hospitals in China is mainly competitive. Exploring the relationship between integrated care and competition is a global issue. The coexistence of integrated care and competition raises two key questions, namely, whether integrated care and competition are compatible and whether integrated care differentially impacts care quality in distinct competitive contexts. The answers to these two key questions will influence the programme and effectiveness of integrated care policy implementation. If integrated care and competition are not compatible, introducing integrated care in a competitive context would be futile. Ham (2012) identified three reasons for the switch between the two pathways of competition and integrated care in UK healthcare reforms: first, the two pathways are not necessarily in mutual conflict; second, both pathways feature uncertainty about the improvement of healthcare performance; third, policymakers are divided regarding which pathway works better [25]. This makes it worth exploring the implications of integrated care for care quality in a competitive framework.

However, the mechanism by which integrated care operates on care quality within a competitive framework is unclear. The improvement in care quality via integrated care and competition involves different logical mechanisms, and scholars and policymakers often view the two in opposition [25]. Competition promotes care quality by empowering patients to freely choose their healthcare providers [26]. Meanwhile, integrated care relies on the formation of an organic complex system through collaboration between institutions to meet the medical needs of a certain region or population [24,27]. Within this type of system, improved service quality at certain nodes influences overall care quality [28], thus, impacting a broad range of hospital activities [29]. However, in an integrated care network, the providers are usually predetermined, and the incentive of a capitation payment system impels integrated care networks to compete to obtain and retain patients [30,31]. Consequently, when integrated care networks feature high levels of market concentration, patient care choices are reduced to a certain degree [32]. Thus, the different logics of the roles of integrated care and competition have led to most existing studies independently considering either competition and care quality or integrated care and care quality. Only a few studies have discussed the compatibility of integrated care and competition [25,32,33] or addressed the level at which integrated care should compete [19,34]. However, in business relationships, competition and cooperation often occur simultaneously [35], exhibiting an antagonistic but not completely mutually exclusive relationship [36]. In healthcare, there is also a lack of incentive to improve the performance of integrated care when the market is completely free of competition [34]. Although studies have found that competition promotes referrals among general practitioners [37], there has been little research into how integrated care affects care quality within a competitive framework.

As such, this study discusses the issue of compatibility between integrated care and competition in the Chinese context and investigates the mechanism by which integrated care influences regional care quality within a competitive framework. Formally classified, the Chinese medical alliance fits the definition of vertically integrated care, emphasising cooperation between healthcare institutions at different levels. However, China's exploration of the medical alliance continues to be dominated by top-down administrative interventions [38], and the fragmentation of services between institutions is yet to be addressed effectively. Compared to inpatient service, outpatient service is less costly and provides greater health returns [39]. In China, because large general hospitals must manage large volumes of outpatients, doctors are under great pressure when diagnosing and treating patients. Consequently, cooperation between large general hospitals and community hospitals in achieving staged outpatient referrals has become a key element of China's integrated care system. Therefore, this study first examines the compatibility of integrated care and competition, that is, whether integrated care and competition are mutually exclusive when both exist in the market. On this basis, this study uses outpatient regional care quality in departments conducting steady inter-institutional referrals as a measure of regional care quality to examine whether integrated care can act synergistically with competition on regional care quality. Given the systemic logic of integrated care, in this study, the measure of outpatient regional departmental care quality (DeptQ) does not refer to the state of care

quality at specific institutions and departments but rather defines it as the average care quality of a specialised department in the studied region. For example, the DeptQ for internal medicine represents the average care quality for internal medicine across all institutions in the study area. This also renders this study's conclusions more robust.

The following sections present a review of the relevant literature and a detailed explanation of the models used, the selection of variables, and the estimation results.

2. Literature review

2.1. Integrated care and care quality

Although integrated care is widely considered an effective means of improving care quality and reducing costs [27,40], the mechanism by which integrated care affects care quality remains unclear. More than any other field, research related to integrated care has focused on the perceptions and experiences of patients, related service providers, and purchasers of healthcare. For example, Van and Van (2019) proposed using a reflective paradigm and a reference paradigm to make judgements about the value proposition and quality of integrated care [41]. Berntsen et al. (2018) constructed a quality measurement framework encompassing patient-personalised medicine goal setting, treatment planning, treatment delivery, and goal assessment [42]. In a systematic review of the impact of integrated care, different integrated care practices were found to significantly improve patient satisfaction and perceived care quality [15]. Elsewhere, it has been shown that patients perceive that in receiving integrated care services, personal needs are facilitated by good communication with providers [12,43], with timely information and health monitoring giving patients a greater sense of security and patient-physician interaction promoting coordination and continuity of care [43,44]. Liu et al. (2012) showed that the use of data from integrated care systems can achieve awareness of the early severity of a patient's disease, which can significantly reduce mortality [45]. Notably, most studies focused mostly on specific environments or patient groups have drawn partially inconsistent conclusions [46]. For example, an evaluation of medical care for an elderly population found that integrated care did not significantly improve patient satisfaction compared to conventional care [47,48]. This inconsistency may be attributed to differences in integrated care practice scenarios. Furthermore, integrated care relies on collaboration between healthcare system institutions at different levels and in different locations to provide services such as diagnosis, treatment, long-term care, and rehabilitation [8], and some mechanisms and structures remain beyond patients' knowledge and understanding [49]. Due to factors such as cross-sectional designs, small sample sizes, high costs, and limited measurement instruments, this means that studies undertaken using questionnaires and interviews cannot easily realise a large-scale assessment of integrated care and the continuous tracking of its results [50,51].

In fact, in integrated care practices, inter-agency conflicts of interest may cause practice to deviate from policy. From the perspective of complex systems theory, a system's performance depends on the dynamic interaction between its constituent agents [52]. In fact, despite the continued emphasis on the value of person-centred care, there is currently little bottom-up practice of integrated care, and policies related to integrated care remain focused on inter-organisational relationships [53]. A systematic review summarised common values in integrated care research and identified 'collaboration', 'coordination', 'empowerment', 'integration', and 'shared governance' as the most common [54]. Inter-organisational collaboration and shared responsibility are widely recognised [55,56], and inter-professional cooperation is seen as contributing to service efficiency [57]. The emphasis on 'coordination' and 'shared governance' reflects the current tendency to prioritise inter-organisational relationships over patient needs in integrated care. Integrated care involves collaboration between different levels of institutions, which fits the characteristics of a complex system [58]. The overall performance of a complex system depends on the dynamic interactions between the constituent agents [52], which are non-linear [59]. This results in the differentiated performance of different integrated care systems. In terms of practice outcomes, because practice contexts for integrated care vary widely, participating organisations can choose the extent and manner of collaboration based on their own interests [60]. As the two main pathways affecting care quality, integrated care and competition and the impact of competition on the relationship of interest between healthcare providers is undoubtedly significant [34,61]. However, the impact of integrated care on care quality in different competitive contexts is still not widely discussed.

2.2. Competition and care quality

Many countries rely on competition as an important mechanism for controlling healthcare expenditures and improving care quality and efficiency. For example, countries including the UK [20,21], Germany, and Sweden [24] expect the introduction of competition in healthcare markets to promote efficiency gains. It is widely believed that competition improves care quality by allowing patients to freely select their care providers [26]; consequently, purchaser-provider models are widely used to promote competition in healthcare markets [62]. Within this type of model, the purchaser of care services is invariably a government agency or health insurance company, and the patient is the ultimate consumer of services. Because the care service purchaser pays the care provider based on factors such as the number of people served and the nature of services provided [63], when patients have the right to freely select their provider, the profit motive will impel care providers to adjust their services according to patient needs [61], ultimately driving unprofitable care providers from the market [34]. Although care service providers in intensely competitive healthcare markets invariably record low costs and good management performance, this does not necessarily imply a high level of care quality [64]. Beneficial competition harnesses the mechanics of competition to meet patient needs and should not focus solely on factors such as the organisation's costs, bargaining ability, or market share [65]. Nevertheless, the effect of competition on care quality has been found to be inconsistent [66]. Because uncertainty in care quality is much greater than that observed for most other products and services [67], no

purely competitive healthcare market exists in any country.

2.3. Compatibility of competition and integrated care

Although both integrated care and competition aim to improve care quality in the region, there are differences in the logic of how they achieve this. Some studies consider integrated care and competition incompatible [25]. However, based on their common goals, integrated care and competition often coincide in national practices, with integrated care necessarily implemented within the existing policy framework, which includes competition [19–21]. Furthermore, integrated care and competition do not exhibit a completely antagonistic relationship. Consider the extreme scenario where the market is completely free of competition: Integrated care will not be incentivised to improve performance [34], and users may be unable to influence the service methods and quality provided by integrated care networks [68]. However, when healthcare markets place an excessively high premium on competition and are subject to a profit motive, the provision of care services may become inequitable [19], anarchic, and fragmented [69]. This fragmentation will prevent care service personnel at different institutions from sharing the same values, further impeding inter-institutional cooperation [70]. This further indicates that competition and integrated care are not mutually exclusive.

However, the discussion of how integrated care acts on care quality within the existing competition framework remains inadequate in the available research. Indeed, the relationship between collaboration and competition is an important research topic in the field of management [71,72]. Collaborative and competitive relationships between firms often exist simultaneously [35], with the main goal being technological innovation based on risk and cost reduction [73]. At this point, collaboration and competition demonstrate oppositional but not completely mutually exclusive relationships [36]. The formation and changes in the relationship between corporate cooperation and competition are mainly influenced by factors such as firm resources, degree of market similarity, and opportunism [74]. Changes in the relative strength of cooperation and competition will also ultimately impact the effectiveness of governance mechanisms [71]. Discussions of the compatibility of integrated care and competition in existing research chiefly focus on determining the level at which integrated care networks should compete. Although one approach involves allowing competition between service providers within an integrated care network, the need for repeated registration and excessively short registration times may weaken the motivation for investment in care services [33] and hinder cooperation between different institutions [32]. This has led to widespread recognition of the conduct of competition between integrated care networks [19,24,34]. However, there has been little discussion of the effect of integrated care on care quality under an existing competitive framework. If integrated care and competition are completely mutually exclusive, it is reasonable to discuss the impact of both on care quality independently. However, if there are compatible contexts for integrated care and competition, it is extremely valuable to explore how integrated care can operate on care quality under different competitive conditions.

2.4. Integrated care in the Chinese context

Despite its different practices and conditions, China faces problems similar to those of other countries. According to data from China's Seventh National Census, the number of people over the age of 60 years has reached 264 million [75], driving an annual increase in the demand for senior healthcare and recovery services. Meanwhile, in terms of the use of healthcare resources, Chinese patients are mainly concentrated in large general hospitals, with care resources at community hospitals often sitting idle [76]. The distribution of medical resources in China is extremely uneven, and the utilisation of medical services is too concentrated, a phenomenon that once made difficult and expensive medical treatment one of the main social conflicts in China.

Beginning in 2009, this context has prompted China to embark on healthcare reform, establishing medical alliances to promote tiered diagnosis and treatment in large general hospitals and community hospitals. From the perspective of achieving goals, China's medical alliances emphasise providing residents with broad-coverage, convenient, fair, and continuous healthcare services. Broadly speaking, the Chinese medical alliance model focuses on ensuring cooperation between different levels of medical institutions to deliver phased and continuous healthcare to residents in the service region, which aligns with the characteristics of vertically integrated care. However, to date, pilots for medical alliances and tiered diagnosis and treatment have largely focused on top-down policy interventions [38]. Because of significant differences in available medical technology and quality levels between community hospitals and large general hospitals, when residents can freely choose healthcare providers, the effectiveness of policy measures and economic incentives is limited. Public hospitals in China are responsible for their profits, making outpatient volumes and hospitalisation numbers extremely important to a hospital's survival. Under these circumstances, patients tend to be concentrated at large general hospitals [76]. Among the models implemented in pilot cities for China's tiered diagnosis and treatment system, Xiamen's 'joint care by three specialists' model has proven very successful. In 2010, Xiamen was selected as one of the first pilot cities for public hospital reform. The Xiamen medical alliance first considered diabetes and hypertension cases, with specialists giving treatment plans, general practitioners providing continuous treatment, and health managers providing monitoring and assessment of the patient's health status. Following this, the types of diseases involved in the collaboration between different medical institutions in Xiamen were expanded, enabling the quality of healthcare services – measured in terms of outpatient revisit rates and inpatient bed occupancy rates – to be assessed for performance.

The implementation of integrated care in China necessarily takes place within the context of existing institutional competition. This makes it critical to understand whether integrated care, and competition are compatible and whether integrated care can synergise the effects of healthcare competition on regional care quality. Notably, the findings have considerable implications for other countries pursuing integrated care.

3. Materials and methods

In view of the preceding analysis, this research is divided into two main sections. First, the study uses multivariate correspondence analysis to explore the compatibility of integrated care and competition. Examining the compatibility of integrated care and competition must address the issue of heterogeneity between samples, with different types of samples exhibiting different states of compatibility. Therefore, this study chooses to use multivariate correspondence analysis to simultaneously explore the intrinsic links between samples and between integrated care and competition. If the combination of inter-sample and inter-variate relationships reveals that integrated care and competition are not compatible, then introducing integrated care in a competitive context would be inefficient, demanding that the impact of integrated care and competition on care quality be explored separately. If integrated care and competition are not entirely mutually exclusive, further examination of how integrated care acts on care quality within a competitive framework is needed. Therefore, the second part of this study uses a two-way fixed effects model to determine the mechanism by which integrated care influences regional care quality within a competitive framework, and further validates the robustness of the model setting and estimation results. Integrated care and competition may demonstrate a mutually reinforcing or antagonistic relationship for improving care quality, and using a two-way fixed effects model can control for temporal and individual heterogeneity in the sample and answer the question of whether integrated care and competition differentially affect care quality in distinct contexts. In terms of the logical relationship between the two parts, the discussion of the compatibility of integrated care and competition determines the setting of the subsequent model. The second part of the study validates and deepens the research questions posed in the first part by examining whether integrated care and competition can act synergistically on DeptQ.

This section details the model design, the selection and measurement of key variables, and data sources and processing before presenting descriptive analyses of the paper's main variables.

3.1. Research model

3.1.1. Correspondence analysis model

In this study, compatibility refers to whether a higher level of competition can only correspond to a lower level of integrated care factors when competition and integrated care coexist in the healthcare market. When analysing the study subjects, it is important to consider not only the variable relationship between integrated care factors and competition but also whether different types of samples perform differently. While R-type factor analysis and Q-type factor analysis can only describe the intrinsic relationships between variables and between samples in isolation, correspondence analysis can combine analyses using R-type and Q-type factors. It is among the multivariate analysis methods most widely used to explore the relationship between variables and between samples. Accordingly, this study adopts the approach to investigate the compatibility of integrated care and competition.

Setting the raw data matrix as $\mathbf{X} = (x_{ij})_{n \times p}$ and performing conversion yields the matrix $\mathbf{Z} = (z_{ij})_{n \times p}$, where

$$z_{ij} = \frac{x_{ij} - x_i \cdot x_j / x_{..}}{\sqrt{x_i \cdot x_j}}$$

x_i , x_j and $x_{..}$ are the sum of the rows, the sum of the columns, and the sum of all elements of raw data matrix \mathbf{X} , that is,

$$x_i = \sum_{j=1}^p x_{ij}, x_j = \sum_{i=1}^n x_{ij}, x_{..} = \sum_{i=1}^n \sum_{j=1}^p x_{ij}$$

The between-variable covariance matrix of \mathbf{Z} is $\Sigma_c = \mathbf{Z}'\mathbf{Z}$, and the between-sample covariance matrix of \mathbf{Z} is $\Sigma_r = \mathbf{Z}\mathbf{Z}'$, verifying that the two matrices share the same non-zero characteristic roots

$$\lambda_1, \lambda_2, \dots, \lambda_m, m \leq \min\{n, p\}$$

In setting $\mu_1, \mu_2, \dots, \mu_m$ as eigenvectors of $\lambda_1, \lambda_2, \dots, \lambda_m$ relative to the variable covariance matrix Σ_c , for an arbitrary μ_i ,

$$\sum_r (\mathbf{Z}\mu_i) = \lambda_i (\mathbf{Z}\mu_i)$$

implying that R-type factor analysis can directly generate the results of Q-type factor analysis.

Accordingly, the characteristics of variables and samples of a matrix \mathbf{X} can be represented on the same plane by the eigenvectors of the corresponding eigenvalues, and the distances between different points can be used to assess the strength and direction of connections between points. This will increase the visualisation of the results. If the distance between the variables related to integrated care and competition is very small on the plane, integrated care and competition are closely related; otherwise, the relationship between the two is weak. Also, whether competition and integrated care are compatible can be obtained based on the location of the corresponding point sets for integrated care factors and the level of competition.

3.1.2. Econometric model design

Building on the investigation of the compatibility of integrated care and competition, this study also examines the mechanism by which integrated care influences DeptQ within a competitive framework. In China, integrated care mainly takes the form of medical alliances, with large general hospitals as the core contracting with community hospitals to form collaborative networks. In this study, the scale of patients referred (ReferScale) and their care quality (ReferQ) are the focal factors describing integrated care. Based on the

systemic logic of integrated care, this study establishes the following model (1):

$$DeptQ_{it} = \beta_0 + \beta_1 ReferQ_{it} + \beta_2 Competition_{it} + \beta_3 ReferQ_{it} \times Competition_{it} + \beta_4 ReferScale_{it} \times Competition_{it} + \beta_5 \mathbf{Control}_{it} + \gamma_t + \mu_i + \varepsilon_{it} \tag{1}$$

where $DeptQ_{it}$ is the regional care quality of a specialised department i in the entire region studied during time t ; $ReferQ_{it}$ is the care quality for referred patients of a specialised department i during time t ; $ReferScale_{it}$ is the relative scale of referred patients of department i during time t ; $Competition_{it}$ is the level of competition faced by department i during time t . The interaction terms in the model are designed to examine the mechanisms by which integrated care operates on DeptQ in a competitive framework. $\mathbf{Control}_{it}$ represents the control variables vector, whose elements chiefly include the scale of care of department i within the region, and the mean age and sex composition of the patients receiving care.

It should be noted that in the presence of considerable heterogeneity between different specialised departments and unobservable variables that change only with time, the estimation results of model (1) are inconsistent. To mitigate endogenous problems that may affect the model’s estimation results, this study further decomposes the random perturbation term ξ_{it} of model (1), yielding $\xi_{it} = \mu_i + \gamma_t + \varepsilon_{it}$. Here, μ_i is the level of heterogeneity between different specialised departments, and γ_t depends solely on time, satisfying $\varepsilon_{it} \sim i.i.d.N(0, \delta_\varepsilon^2)$ and $E(X_{it}|\varepsilon_{it}) = 0$. In this case, using panel data and a two-way fixed effects model enables controlling for the time and individual heterogeneity factors associated with the study departments, making the results more robust.

It is critical to determine whether this model’s specifications and the estimation results are robust. To verify the effectiveness of the model specification, this study uses a Hausman test and F-test to examine model selection issues. Next, this study examines whether DeptQ is influenced only by the factors of integrated care during the current period. Furthermore, to verify the robustness of the estimation results, this study controls for patient age, gender, disease diagnosis results, and medical insurance type to construct a control group of patients who have not participated in the referral. Because this section’s findings may be affected by endogeneity issues such as potential omitted variables, producing an artefact of pseudo-correlation between the independent and dependent variables, this section draws on the study by Zhao et al. (2020) and uses a dynamic panel model for regression [77]. According to a study by Guo and Xiao (2016), dynamic panel regressions more effectively address the endogeneity problem of models due to mutual causality and omitted variables [78]. Subsequent sections of this study discuss this in detail.

3.2. Selection of variables

3.2.1. Measurement of independent and control variables

This study has selected ReferScale and ReferQ as the main integrated care factors of interest. Theoretical research on integrated care can be divided into two main approaches. Some scholars tend to strip away the application scenarios of integrated care and focus on generalising the unifying features of integrated care, as in the case of the conceptual framework proposed by Valentijn et al. (2013) [79]. However, a unified framework of integrated care is not sufficient in itself to explain the complexity of different contexts and processes [55,80]. This has prompted some scholars to explore the interplay between context and outcome based on practice [80]. Most of the studies in this domain involve evaluating integrated care structures and processes [55,81]. This includes, for instance, measuring concepts such as ‘patient-centred care’, ‘healthcare continuity’, ‘healthcare collaboration’, ‘integrated quality of care’ and ‘chronic disease management’ [55]. Given the diversity of scenarios for the application of integrated care and the lack of practice norms [82], various models of integrated care practice exist around the world [83]. Therefore, this study focuses on outcome measures of integrated care and not on measuring its structure and process. Because the cost of integrated care is higher than the cost of traditional care [84], a long operation period is needed to offset the initial investment in the construction of integrated care [85]. To measure the scale and status of integrated care operations, this study uses ReferScale to measure integrated care outcomes. Meanwhile, because care quality represents one of the widely discussed outcome measures in the domain of integrated care [86,87], this study uses ReferQ to measure the output quality of integrated care.

Meanwhile, most research on competition between medical institutions employs the number of hospitals [88] or the Herfindahl-Hirschman index – calculated based on hospital market share [89] – to assess the level of competition within a regional healthcare market. Because the Herfindahl-Hirschman index is chiefly used to calculate the degree of market concentration and is a negative indicator of the degree of market competition, this study employs I_i to assess the level of interdepartmental competition within a region as follows:

$$I_i = \sum_{j=1}^{k_2} p(X_i \cap Y_j)p(X_i - Y_j), i = 1, 2, \dots, k_1$$

where $p(X_i \cap Y_j)$ is the market share of department X_i of institution Y_j and $p(X_i - Y_j)$ is the market share of department X_i of other institutions within the region. Assuming that there are k_2 medical institutions in a region, the level of interdepartmental competition will be in the range of $\left[0, \frac{k_2-1}{k_2}\right]$. If there is no competition within the studied region, I_i will be 0; conversely, the closer the value of I_i gets to 1, the greater the level of competition. For example, if X_i represents cardiology, when all cardiology patients in the study area are concentrated in healthcare institution Y_j , the degree of competition for department X_i in the study area is 0. Meanwhile, the more dispersed the distribution of cardiology patients across healthcare institutions, the stronger the competition for department X_i .

It is also necessary to control for department characteristics and department patient characteristics before performing estimations

using model (1). Most studies have used patient sex and age compositions as patient-level control factors [23,88]. Accordingly, this study uses departments' mean patient ages and proportions of male patients to control for patient characteristics. The limited nature of healthcare resources may lead to outpatient volumes influencing regional care quality. In addition, because some medical institutions in China employ approaches such as increasing the number of care visits to control per capita/per time expenses to manage administrative and performance assessments [90], this study does not consider patient medical expenditure.

3.2.2. Measurement of care quality

Healthcare markets are characterised by high degrees of information asymmetry and quality uncertainty [67], and existing studies involving the measurement of care quality have tended to adopt measurement approaches based on the given focus. Care quality can generally be broken down into three aspects: input quality, process quality, and output quality [91]. Although mortality rate is the most commonly used quality indicator and has frequently been employed to study the relationship between competition or integrated care and care quality [45,92], because mortality is generally low, the patient mortality rate cannot be used to represent the overall quality of the care that patients receive. Some studies have used wait times [93] or inpatient complications [23] to assess care quality, with indicators of care quality in other studies mostly chosen based on the focus of the application scenario.

Notably, patient revisit numbers are an important measure of both process care quality and output care quality [94]. It should be noted that follow-up visits generally refer to proactive visits and observations of the patient's condition by the healthcare provider following a diagnosis. By contrast, the concept of patient revisit emphasises the patient taking the initiative to seek healthcare based on medical advice or their health condition. Revisits reflect the healthcare needs of patients that were not met during the initial visit or follow-up visit, and a high number of revisits exacerbates the resource constraints of healthcare institutions [95]. Some scholars have argued that patients are less likely to revisit the same provider when the care quality is low, meaning that revisits represent a higher level of care quality [96]. However, such studies have mostly focused on exploring patient willingness to make revisits. When it comes to patients making multiple revisits, a reduction in the total number of revisits has been observed to reflect an improvement in the process of care [94,97]. In the Chinese context, assessing care quality is also more focused on indicators such as outpatient revisit rates and inpatient bed occupancy rates.

Therefore, this study uses the mean number of outpatient revisits to indicate DeptQ and ReferQ. Because integrated care responds to the challenges of regional healthcare needs primarily through a dynamic system comprising inter-institutional collaboration [24], $DeptQ_{it}$ in this study refers to the regional average care quality of a specialised department i during time t , which is the average number of patient revisits for a specialised department i at time t . Using this measure improves the robustness of the findings by controlling for regional differences in the distribution of service groups and diseases across different healthcare providers. Schwartz et al. (1999) reported a high degree of heterogeneity in the interval between revisits for patients with different diseases, ranging from 1 week to 1 year but mostly 12–16 weeks [98]. Therefore, considering the data characteristics of the referral patient sample, which is relatively sparse with a narrow time window, the study sets the revisit interval to six months. Furthermore, because patients are heavily concentrated in large general hospitals, this study uses the average number of departmental revisits in all tertiary hospitals in Xiamen as a proxy for DeptQ. However, it should be noted that the average number of revisits is a negative measure of care quality, meaning that the higher the value of $ReferQ_{it}$ and $DeptQ_{it}$, the lower the care quality.

3.3. Data sources and descriptive statistics

This study uses data from outpatient departments in Xiamen that engaged in consistent referrals from 2016 to 2019. The data used here were obtained from Xiamen's Big Data Application Open Platform, which did not enter use until 2015. In addition, given the sparsity of referred patient data, this study divides the data into half-year periods.

Data were obtained for 7,874,985 outpatients and 45,585 referred patients at nine specialised departments that regularly provided referrals between 2016 and 2019. The referred patients include those referred from community hospitals to large general hospitals (one-way referrals) and those referred back to community hospitals after their condition stabilised or treatment plans were formulated

Table 1
Descriptive statistical analysis of variables.

| Variable | Description | Mean | Std. Dev. | Min | Max |
|--------------|---|----------|-----------|-----------|---------|
| DeptQ | Regional departmental care quality; assessed as the mean number of outpatient revisits to a specialised department consistently engaging in inter-institutional referrals within a half-year period in the studied region. | 1.444 | 0.248 | 1.125 | 2.102 |
| ReferQ | Care quality for referred patients; assessed as the number of revisits performed per referred patient of a specialised department consistently engaging in inter-institutional referrals within a half-year period in the studied region. | 1.568 | 0.568 | 1 | 3.773 |
| Competition | Level of competition faced by a specialised department in the studied region. | 0.514 | 0.358 | 0 | 0.852 |
| ReferScale | The relative scale of referred patients; assessed as the proportion of referred patients of all outpatients. | 0.006 | 0.013 | 5.011e-06 | 0.093 |
| DeptScale | The number of outpatient visits to a specialised department. | 109374.8 | 78566.6 | 315 | 296,065 |
| DeptAveAge | Mean age of a specialised department's patients. | 44.366 | 7.108 | 26.412 | 58.92 |
| DeptSexratio | Sex composition of a specialised department's patients assessed as the proportion of male patients. | 0.432 | 0.168 | 0.001 | 0.652 |

(two-way referrals). Due to major differences in care procedures between the two-way referral patients and non-referral patients, this study retains data for only the 43,073 one-way referral patients. Table 1 displays the results of a descriptive analysis of the key variables. All study data have been standardised.

4. Results

4.1. Compatibility of integrated care and competition

The results of the multivariate correspondence analysis indicate that when competition is low, integrated care factors and competition are not significantly antagonistic, while when competition is high, there is a negative correlation between integrated care factors and competition. The multivariate correspondence analysis was performed after the raw data were discretised based on clustering analysis. Figs. 1–3 show the intrinsic link between the integrated care factors and competition within the study time window, with the distance between the points measuring the strength of the intrinsic link between the different factors. Fig. 1 shows that departments characterised by higher levels of competition tend to record lower ReferScale and higher ReferQ, however, departments characterised by lower levels of competition do not record significantly higher ReferScale or lower ReferQ. This means that the integrated care factor and competition are not entirely mutually exclusive.

To verify the robustness of the conclusions visualised in Figs. 1, Figs. 2 and 3 control for the scale of departmental outpatient visits (DScale_Compe) and the departmental age composition of patients (DeptCA),¹ respectively. The results show that when DeptScale is small and competition is low, departments generally record a higher level of ReferQ, meaning patients in that department receive a higher average number of revisits. The results in Figs. 2 and 3 show that the different DeptScale or patient age composition of departments does not affect the relationship between competition, ReferQ, or ReferScale. This means that when competition is low, there is no antagonistic relationship between integrated care factors and competition. However, when competition is high, departments usually record lower ReferQ and ReferScale, suggesting the incompatibility of competition and integrated care.

Figs. 1–3 demonstrate that integrated care and competition are not completely mutually exclusive from the perspective of the sample characteristics, suggesting the possibility that integrated care and competition act synergistically in terms of care quality. The next section examines the impact of integrated care on care quality and analyses whether integrated care factors impact care quality through different mechanisms in different competitive contexts.

4.2. Integrated care and regional care quality within a competitive framework

To control for individual and time fixed effects associated with a specialised department, this study uses a two-way fixed effects model to investigate the influence of ReferQ on DeptQ within a competitive framework. The results of Hausman's test reveal that the P value of the chi-square distribution is 0.005, and the P value of the F distribution comparing the pooled regression and fixed effects is less than 0.01. This finding supports the model settings applied in this study. Table 2 shows the econometric model's estimation results.

Employing hierarchical regression to perform a sequential analysis enabled a test of the influence of ReferQ and competition on DeptQ. Column (1) shows that after controlling for a specialised department's individual and time effects and other variables, ReferQ has a significant positive effect on DeptQ. However, ReferScale does not have a significant effect on DeptQ, implying that there is no incentive for departments to simply pursue more referrals to improve care quality. This also suggests that ReferScale and competition cannot act synergistically on DeptQ. As such, Table 2 does not show the results of the interaction term between competition and ReferScale. Column (2) includes only the level of competition and control variables and suggests that an increased level of competition can significantly enhance DeptQ. Comparing the adjusted goodness-of-fit values of columns (1) and (2) indicates that competition remains among the chief methods of improving care quality. Column (3) demonstrates the mechanism by which ReferQ acts on DeptQ within a competitive framework. Because collaboration between community and large general hospitals in China is a product of competition, the level of competition may moderate the effect of ReferQ on DeptQ. The results of column (3) verify our conjecture that competition negatively moderates the influence of ReferQ on DeptQ.

An analysis of the effect of ReferQ on DeptQ at different levels of competition required charting the moderating effect of competition. According to the left panel of Fig. 4, ReferQ may have opposite effects on DeptQ under different levels of competition. Meanwhile, the right panel shows values of DeptQ corresponding to the level of competition and ReferQ that are one standard error above or below the corresponding mean values. Notably, this study has determined DeptQ based on the number of patient revisits, with a lower mean number of revisits assumed to imply a higher level of DeptQ. In general, at a high level of competition, DeptQ is significantly lower than when the level of competition is low. Completely eliminating competition between hospitals while expanding ReferScale and enhancing ReferQ would be impractical. Furthermore, as Fig. 4 shows, when the level of competition is limited, DeptQ and ReferQ will change in the same direction. Improving care quality for referred patients under such circumstances can significantly improve departmental regional care quality, with competition and ReferQ acting synergistically on DeptQ. However, when the level of competition is high, ReferQ will have a negative influence on DeptQ. At this point, the interaction between competition and ReferQ will weaken the effect of ReferQ on DeptQ.

¹ In reference to the approach of Bloom et al. (2015), this study discretises patient ages into 11 groups of 0–15, 16–45, 46–50, 51–55, 56–60, 61–65, 66–70, 71–75, 76–80, 81–85, and >85 years.

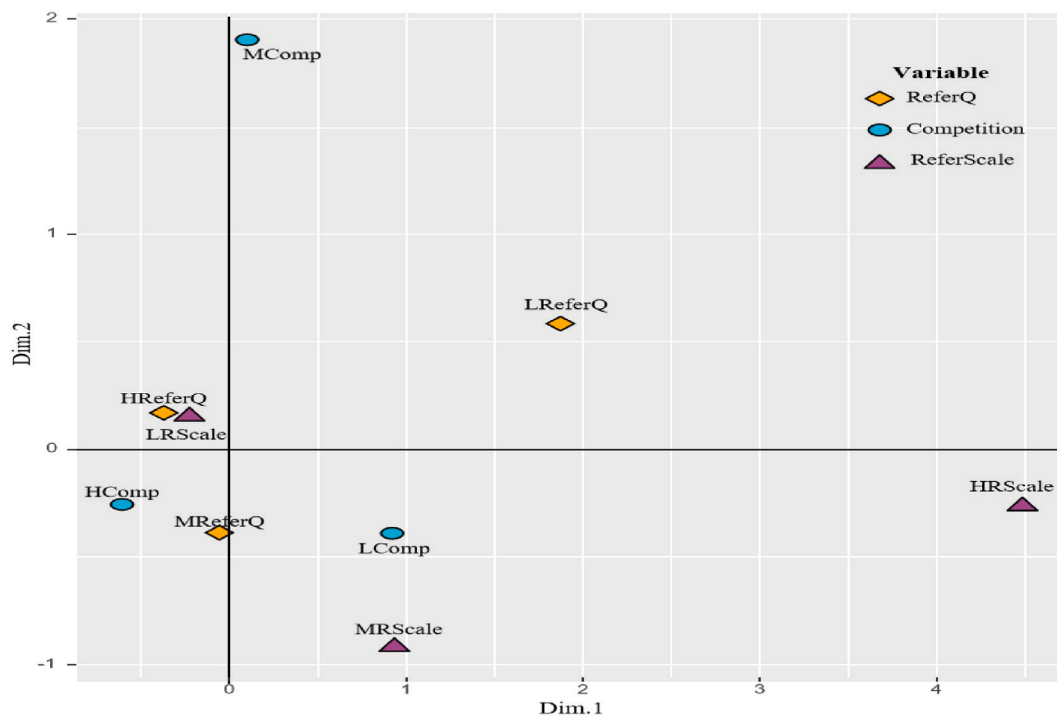


Fig. 1. Compatibility of integrated care and competition.

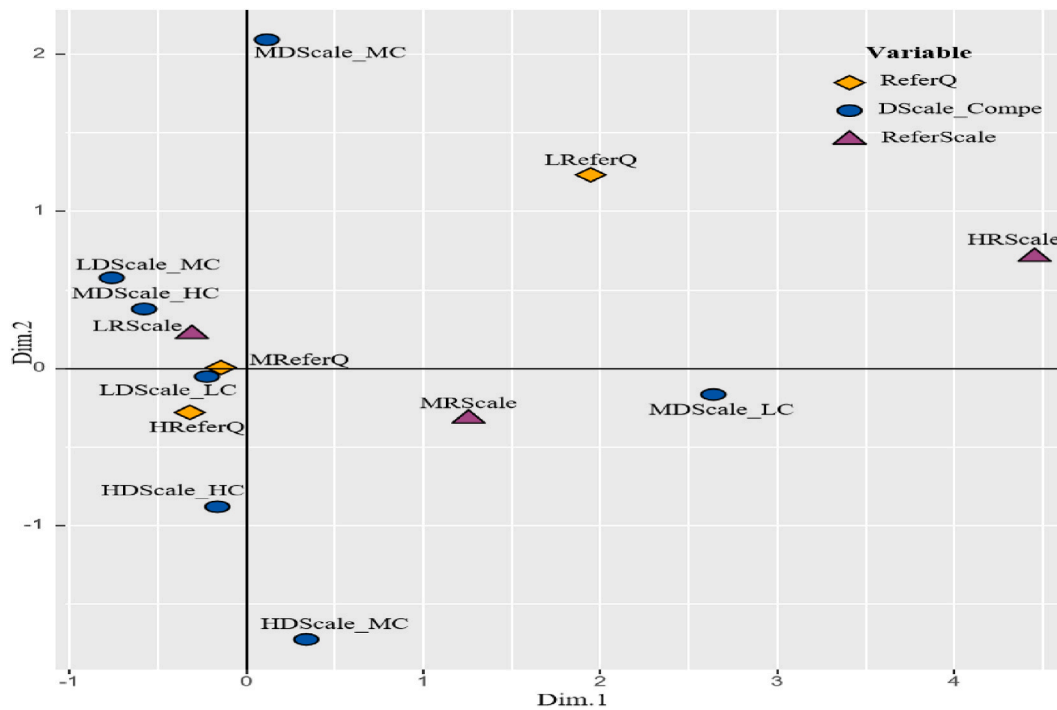


Fig. 2. Robustness of compatibility of integrated care and competition after controlling DScale_Compe.

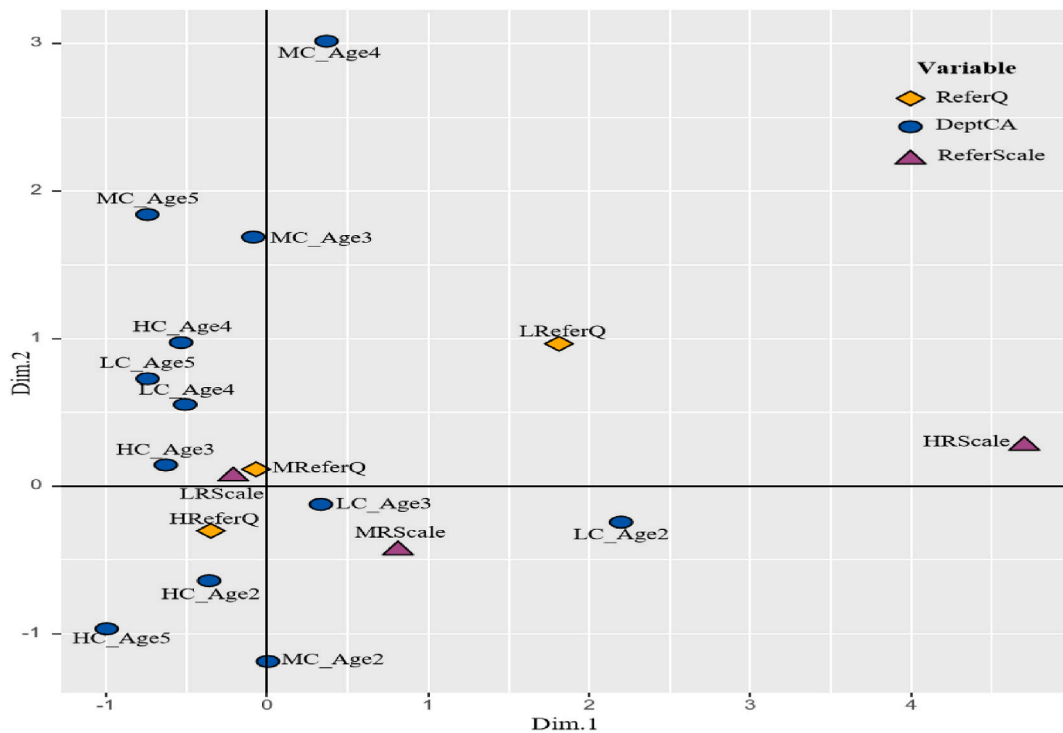


Fig. 3. Robustness of compatibility of integrated care and competition after controlling DeptCA.

Table 2
Estimation results for quality.

| Independent variables | Coefficients and (t statistics) | | |
|-----------------------|---------------------------------|--------------------|--------------------|
| | (1) | (2) | (3) |
| ReferQ | 0.173** (0.046) | | 0.060 (1.068) |
| ReferScale | 0.047 (0.588) | | -0.044 (-0.836) |
| Competition | | -1.702*** (-8.367) | -1.559*** (-7.425) |
| ReferQ × Competition | | | -0.115** (-2.546) |
| DeptScale | 0.505* (1.775) | 0.151 (0.768) | 0.165 (0.878) |
| DeptAveAge | 0.552 (1.207) | -0.283 (0.861) | -0.230 (-0.726) |
| DeptSexratio | 3.741*** (3.909) | 3.050*** (4.725) | 2.729*** (4.268) |
| Dept&Year | Yes | Yes | Yes |
| Adj. R-Squared | 0.040 | 0.559 | 0.600 |
| F Value | 6.204 | 27.281 | 18.351 |

Notes: All regressions are based on a two-way fixed effects model. *** indicates significance at the 1 % level; ** indicates significance at the 5 % level; * indicates significance at the 10 % level.

4.3. Robustness of model specifications and results

To verify the robustness of the econometric model setting – that is, whether DeptQ is influenced only by the current ReferQ – columns (1) and (2) of Table 3 use data on ReferQ with a lag of one period (LagReferQ) to test for its correlation with current-period DeptQ. Taking the moderating effect of competition into consideration, column (2) demonstrates that LagReferQ itself and the term for interaction between competition and LagReferQ do not significantly influence current-period DeptQ. Columns (1) and (2) indicate that the settings of the econometric model are robust.

Based on previous research, we also conducted a placebo test involving a control group sample of patients who had not been referred to test the robustness of the effect of ReferQ on DeptQ. To ensure patients in the control group had similar characteristics to the referred patients, this study used the variables of patient age, gender, disease diagnosis results, and medical insurance type to match patients and explore the impact of the care quality in the control group (ContrQ) on DeptQ. As column (3) demonstrates, ContrQ does not significantly impact DeptQ, and the coefficient of the term for interaction between ContrQ and competition was not observed to be significant. Column (3) indicates that the econometric model settings and estimation results are robust, suggesting that ReferQ can indeed significantly affect DeptQ and, at low levels of competition, ReferQ and competition can act synergistically on DeptQ.

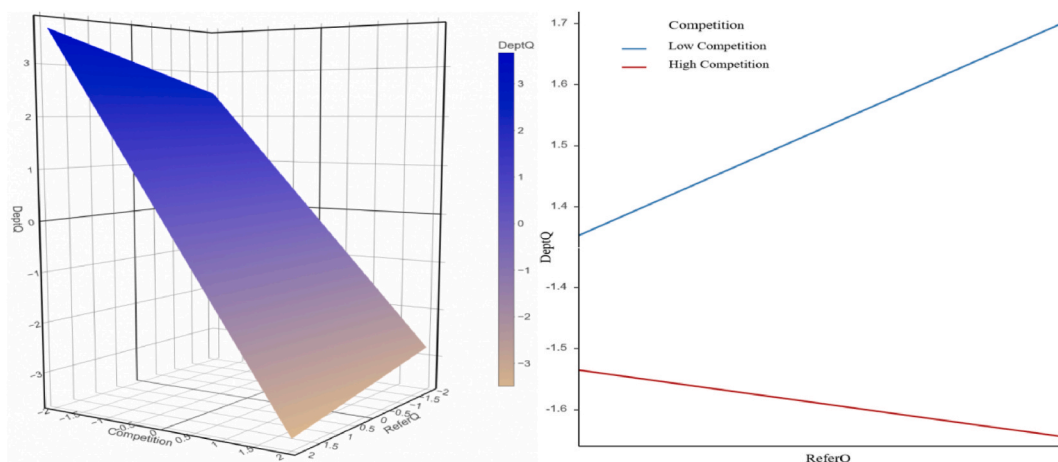


Fig. 4. The moderating effect of competition on ReferQ and DeptQ.

Table 3
Model robustness testing.

| Independent variables | Coefficients and (t statistics) | | | |
|-------------------------|---------------------------------|-----------------------|-----------------------|----------------------|
| | (1) | (2) | (3) | (4) |
| LagDeptQ | | | | 0.523** (3.015) |
| ReferQ | | | | 0.195** (3.287) |
| LagReferQ | -0.082 (-1.499) | -0.081 (-1.469) | | |
| ReferScale | -0.033 (-0.648) | -0.029 (-0.577) | -0.040 (-0.735) | 1.377 (0.434) |
| ContrQ | | | -0.188 (-1.259) | |
| Competition | -1.726*** (-8.751) | -1.758*** (-8.855) | -1.458*** (-5.929) | 0.487** (2.355) |
| ReferQ × Competition | | | | -0.418** (-2.967) |
| LagReferQ × Competition | | 0.047 (1.138) | | |
| ContrQ × Competition | | | -0.165 (-1.670) | |
| DeptScale | -0.038 (-0.203) | -0.010 (-0.050) | 0.055 (0.277) | 0.000 (1.146) |
| DeptAveAge | -0.274 (-0.852) | -0.287 (-0.893) | -0.253 (-0.779) | 0.005 (0.964) |
| DeptSexratio | 3.106*** (4.797) | 3.232 *** (4.936) | 2.960*** (4.611) | -0.370 (-1.484) |
| Dept&Year | Yes | Yes | Yes | Yes |
| Adj. R-Squared | 0.618 | 0.621 | 0.572 | 0.677 |
| F Value | 20.068 | 17.507 | 16.717 | - |

Notes: All regressions are based on a two-way fixed effects model. *** indicates significance at the 1 % level; ** indicates significance at the 5 % level; * indicates significance at the 10 % level.

Finally, it is critical to consider the possible endogeneity of the model using a dynamic panel model. This study includes departmental regional care quality with a one-period lag (LagDeptQ) in the model for dynamic panel regression. Column (4) of Table 3 shows that after adding LagDeptQ to alleviate the endogeneity problem, the coefficient of the cross-product term between ReferQ and competition remains significantly negative at the 5 % level, indicating that this study’s findings are robust after eliminating endogeneity problems such as omitted variables.

5. Discussion and conclusion

Although integrated care is widely considered an effective means of improving care quality and reducing costs [27,40], the conditions under which it can perform better remain unclear. Increasing competition and technology-driven interconnectedness have

stimulated organisational consolidation across an array of industries. In many national health systems, integration has been introduced in competitive contexts. Similar to the healthcare market in most countries, integrated care in the Chinese context has been introduced on the basis of competition between healthcare providers. Xiamen represents one of the most successful integrated care pilot cases in China. Across the city's healthcare market, most community hospitals have signed cooperation agreements with nearby tertiary hospitals. Although, to a certain degree, this has ensured the stability of integrated care networks to a certain degree, a first examination at a community hospital is not required, meaning that different hospitals continue to exist in primarily competitive relationships. Because medical institutions in China are responsible for their profits, they continue to prioritise increasing the number of outpatient visits, and there is an urgent need to consider methods for improving care quality. This logically invites the question of whether integrated care and competition are compatible and, if so, whether the impact of integrated care on care quality behaves differently in different competitive contexts.

Accordingly, this study has investigated the mechanism by which integrated care affects regional departmental care quality within a competitive framework. Multivariate correspondence analysis produced the finding that, at low levels of competition, neither ReferQ nor ReferScale demonstrate a significant antagonistic relationship with competition. Meanwhile, the two-way fixed effects model showed that although both ReferQ and competition significantly impacted regional departmental care quality, but they could act synergistically on regional departmental care quality only at low levels of competition. Our study has several important implications for improving the care quality of integrated care, thus offering various managerial insights. Notably, this study differs from the previous literature in three distinct ways.

First, the study findings were obtained on the basis of data for the period 2016–2019 from the Big Data Application Open Platform of Xiamen. This allows us to track the ongoing impact of competition on the relationship between integrated care and care quality. This panel data approach reduces the number of possible omissions and controls for the heterogeneity that exists in different departments. Meanwhile, it also makes the findings more robust.

Second, this study extends the limited literature on the relationship between integrated care and competition and validates the notion that integrated care and competition are not entirely mutually exclusive. Our multivariate correspondence analysis indicates that departments facing high levels of competition typically tend to receive few referrals and record lower ReferQ, which is consistent with the conclusions of Ahgren (2007) [70] and Ham (2012) [25]. This implies that competition and integrated care are in opposition to some degree and that a high level of competition can impede the scale and quality of cooperation among hospitals. However, departments experiencing lower levels of competition do not record significantly higher ReferScale or ReferQ. Research by Fernandez et al. (2014) suggests that inter-firm cooperation and competition are antagonistic but not completely mutually exclusive [36]. The research in this study confirms that integrated care and competition in healthcare markets exhibit the same characteristics, with integrated care and competition antagonistic when there is a high level of competition between institutions and compatible when there is a low level of competition between institutions. This means that integrated care may have different impacts on care quality in different competitive contexts.

Third, this study examined the impact of integrated care on care quality in the context of competition and explored whether integrated care and competition can have a synergistic effect on care quality, addressing gaps in the current research. The continued tracking conducted in this study verifies that both ReferQ and competition can significantly improve regional departmental care quality, but they can only have a synergistic effect when the level of competition is low. Within the collaborative systems of medical institutions, improving the quality of some processes can significantly improve overall quality [28,29]. Nevertheless, we found that an opposite effect is possible depending on the level of competition that a specialised department faces. The synergy between competition and ReferQ only occurs at low levels of competition. At high levels of competition, competition weakens the effect of ReferQ on regional departmental care quality. This relates to previous observations recognising that the practice of integrated care is dominated by top-down administrative interventions, but the impact of integrated care on care quality is inconsistent [46]. When institutional resources and target markets are more similar, collaboration and competition may co-exist [74]. Aligning with the findings of Bouncken et al. (2016) [71], this study confirms that changes in the intensity of integrated care and competition will ultimately affect regional departmental care quality. The deviation between policy expectations and practice outcomes may be caused by ignoring the competitive relationship between integrated care providers. This study's results suggest that integrated care and competition do not act independently on care quality and that introducing integrated care when there is a high level of competition between institutions may not produce the intended goals. Therefore, policymakers should adjust their integration strategies according to the level of competition extant in the target city or region.

Despite this study's fruitful observations, several limitations remain. Although integrated care has been introduced in competitive contexts at the national level in various countries, integrated care models vary considerably in practice. Integrated care in China has been formally classified as vertically integrated care, with a high degree of similarity in resources and target markets between healthcare providers. Accordingly, this study's conclusions may be more applicable to this type of integrated care model. As acknowledged, this study has used integrated care data from Xiamen, a pilot city in China where integrated care implementation has been relatively successful. Although the conclusions based on these data are representative, there remain large differences in integrated care models across the country, and further discussion of the relationship between integrated care and competition in different integrated care models is needed. In terms of indicator measurement and selection, while this study assessed care quality based on the mean number of patient revisits, a single indicator may not provide a comprehensive assessment of care quality. Consequently, further research should use a broader and more dynamic system for indicating quality to investigate the influence of integrated care and competition on care quality at different levels. Methodologically, this study has employed a two-way fixed effects model to explore the mechanism of the effect of integrated care on care quality in a competitive framework. It is limited in its capacity to explore the issue of model endogeneity in more detail by data availability. Future studies should use a wider range of data for analysis to make the

conclusions more robust. In addition, the discussion of the relationship between integrated care and competition in this study does not control for competition between different integrated care networks, and the impact of network-level competition on care quality could be further explored by future research.

Author contributions

Yumin Li: Writing – review & editing, Validation, Supervision, Conceptualization. Lin Wenxing: Resources, Data curation. Liang Zhenjie: Writing – original draft, Visualisation, Conceptualization. Zhu Jianping: Validation, Methodology, Funding acquisition. Feng Chong: Writing – original draft, Visualisation, Resources, Methodology, Formal analysis, Data curation, Conceptualization

Ethical approval

Ethical approval for this type of study is not required by our institute.

Data availability

The authors do not have permission to share data.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

References

- [1] G. Manfredi, L. Midao, C. Paul, C. Cena, M. Duarte, E. Costa, Prevalence of frailty status among the European elderly population: findings from the survey of health, aging and retirement in Europe, *Geriatr. Gerontol. Int.* 19 (8) (2019) 723–729.
- [2] I. Bellantuono, R. de Cabo, D. Ehninger, C. Di Germanio, A. Lawrie, J. Miller, S.J. Mitchell, I. Navas-Enamorado, P.K. Potter, T. Tchkonja, J.L. Trejo, D. W. Lamming, A toolbox for the longitudinal assessment of healthspan in aging mice, *Nat. Protoc.* 15 (2) (2020) 540–574.
- [3] J.R. Beard, A. Officer, I.A. de Carvalho, R. Sadana, A.M. Pot, J.P. Michel, P. Lloyd-Sherlock, J.E. Epping-Jordan, G.M.E.E. Peeters, W.R. Mahanani, J. A. Thyagarajan, S. Chatterji, The World report on ageing and health: a policy framework for healthy ageing, *Lancet* 387 (10033) (2016) 2145–2154.
- [4] J. Erskine, M. Castelli, D. Hunter, A. Hungin, The persistent problem of integrated care in English NHS hospitals: is the Mayo model the answer? *J. Health Organisat. Manag.* 32 (4) (2018) 532–544.
- [5] G. Browne, J. Roberts, A. Gafni, C. Byrne, J. Kertyzia, P. Loney, Conceptualizing and validating the human services integration measure, *Int. J. Integrated Care* 4 (2004).
- [6] A. Bitton, C. Martin, B.E. Landon, A nationwide survey of patient centered medical home demonstration projects, *J. Gen. Intern. Med.* 25 (6) (2010) 584–592.
- [7] B. Ahgren, R. Axelsson, A decade of integration and collaboration: the development of integrated care in Sweden 2000–2010, *Int. J. Integrated Care* 11 (e007) (2011) 1–8.
- [8] World Health Organization, WHO Global Strategy on People-Centred and Integrated Health Services: Interim Report, World Health Organization, 2015. No. WHO/HIS/SDS/2015.6).
- [9] P. Leatt, G.H. Pink, M. Guerriere, Towards a Canadian model of integrated healthcare, *HealthcarePapers* 1 (2) (2000) 13–35.
- [10] M. Battersby, P. Harvey, P.D. Mills, E. Kalucy, R.G. Pols, P.A. Frith, C. McGowan, SA HealthPlus: a controlled trial of a statewide application of a generic model of chronic illness care, *Milbank Q.* 85 (1) (2007) 37–67.
- [11] A. Mason, M. Goddard, H. Weatherly, M. Chalkey, Integrating funds for health and social care: an evidence review, *J. Health Serv. Res. Pol.* 20 (3) (2015) 177–188.
- [12] M. Hu, The impact of an integrated care service on service users: the service users' perspective, *J. Health Organisat. Manag.* (2014).
- [13] M. Proietti, G.F. Romiti, B. Olshansky, D.A. Lane, G.Y. Lip, Improved outcomes by integrated care of anticoagulated patients with atrial fibrillation using the simple ABC (Atrial Fibrillation Better Care) pathway, *Am. J. Med.* 131 (11) (2018) 1359–1366.
- [14] J.C.J. Chang, S.J. Hwang, T.J. Chen, T.Y. Chiu, H.Y. Yang, Y.C. Chen, C.F. Jan, Team-based care improves quality of diabetes care-family practice integrated care Project in taiwan, *BMC Fam. Pract.* 21 (1) (2020) 1–10.
- [15] S. Baxter, M. Johnson, D. Chambers, A. Sutton, E. Goyder, A. Booth, The effects of integrated care: a systematic review of UK and international evidence, *BMC Health Serv. Res.* 18 (1) (2018) 1–13.
- [16] M. Goddard, A.R. Mason, Integrated care: a pill for all ills? *Int. J. Health Pol. Manag.* 6 (1) (2017) 1.
- [17] S.J. Singer, M. Kerrissey, M. Friedberg, R. Phillips, A comprehensive theory of integration, *Med. Care Res. Rev.* 77 (2) (2020) 196–207.
- [18] World Health Organization, ROADMAP. Strengthening People-Centred Health Systems in the WHO European Region: A Framework for Action towards Coordinated/Integrated Health Services Delivery (CIHSD), World Health Organization, 2013.
- [19] G. Schrijvers, Competition supports integrated care (?), *Int. J. Integrated Care* 7 (2007).
- [20] B. Hudson, Competition and Collaboration in the New NHS, Centre for Health and the Public Interest, 2013.
- [21] R.Q. Lewis, More reform of the English national health service: from competition back to planning? *Int. J. Health Serv.* 49 (1) (2019) 5–16.
- [22] P.W. Park, R.D. Dryer, R. Hegeman-Dingle, J. Mardekian, G. Zlateva, G.G. Wolff, L.E. Lamerato, Cost burden of chronic pain patients in a large integrated delivery system in the United States, *Pain Pract.* 16 (8) (2016) 1001–1011.
- [23] N. Sari, Do competition and managed care improve quality? *Health Econ.* 11 (7) (2002) 571–584.
- [24] K. Leichsenring, R. Rodrigues, J. Winkelmann, R. Falk, Integrated Care, Competition and Choice-Removing barriers to care coordination in the context of market-oriented governance in Germany and Sweden, *Int. J. Integrated Care* 16 (6) (2016).
- [25] C. Ham, Competition and integration in health care reform, *Int. J. Integrated Care* 12 (2012).
- [26] L. Levaggi, R. Levaggi, Is there scope for mixed markets in the provision of hospital care? *Soc. Sci. Med.* 247 (2020) 112810.
- [27] D.L. Kodner, All together now: a conceptual exploration of integrated care, *Healthc. Q.* 13 (2009) 6–15.
- [28] C. Propper, Competition, incentives and the English NHS, *Health Econ.* 21 (1) (2012) 33–40.
- [29] M. Goddard, Competition in healthcare: good, bad or ugly? *Int. J. Health Pol. Manag.* 4 (9) (2015) 567.
- [30] K. Baxter, C. Glendinning, I. Greener, The implications of personal budgets for the home care market, *Publ. Money Manag.* 31 (2) (2011) 91–98.
- [31] A. Cameron, R. Lart, L. Bostock, C. Coomber, Factors that promote and hinder joint and integrated working between health and social care services: a review of research literature, *Health Soc. Care Community* 22 (3) (2014) 225–233.

- [32] C. Ham, J. Smith, Removing the Policy Barriers to Integrated Care in England, Nuffield Trust, London, 2010.
- [33] S. Leatherman, D. Berwick, D. Iles, L.S. Lewin, F. Davidoff, T. Nolan, M. Bisognano, The business case for quality: case studies and an analysis, *Health Aff.* 22 (2) (2003) 17–30.
- [34] B. Ahgren, Competition and integration in Swedish health care, *Health Pol.* 96 (2) (2010) 91–97.
- [35] W. Hoffmann, D. Lavie, J.J. Reuer, A. Shipilov, The interplay of competition and cooperation, *Strat. Manag. J.* 39 (12) (2018) 3033–3052.
- [36] A.S. Fernandez, F. Le Roy, D.R. Gnyawali, Sources and management of tension in co-opetition case evidence from telecommunications satellites manufacturing in Europe, *Ind. Market. Manag.* 43 (2) (2014) 222–235.
- [37] T. Iversen, C.T.A. Ma, Market conditions and general practitioners' referrals, *Int. J. Health Care Finance Econ.* 11 (4) (2011) 245–265.
- [38] J.F. Ye, X. Jiang, Q. Jing, Y. Lei, International comparison and enlightenment of integrated health services models, *Bus. Rev.* 31 (6) (2019) 199–212 (in Chinese).
- [39] J.W. McGuire, Basic health care provision and under-5 mortality: a cross-national study of developing countries, *World Dev.* 34 (3) (2006) 405–425.
- [40] C. Ham, N. Walsh, Lessons from Experience: Making Integrated Care Happen at Scale and Pace, King's Fund, London, 2013.
- [41] E. Van Kemenade, W. van der Vlegel-Brouwer, Integrated care: a definition from the perspective of the four quality paradigms, *J. Integrated Care* 27 (4) (2019) 357–367.
- [42] G. Berntsen, A. Høyem, I. Lettrem, C. Ruland, M. Rumpfeld, D. Gammon, A person-centered integrated care quality framework, based on a qualitative study of patients' evaluation of care in light of chronic care ideals, *BMC Health Serv. Res.* 18 (1) (2018) 1–15.
- [43] M. Hjelm, G. Holst, A. Willman, D. Bohman, J. Kristensson, The work of case managers as experienced by older persons (75+) with multi-morbidity—a focused ethnography, *BMC Geriatr.* 15 (1) (2015) 1–11.
- [44] R. Sheaff, R. Boaden, P. Sargent, S. Pickard, H. Gravelle, S. Parker, M. Roland, Impacts of case management for frail elderly people: a qualitative study, *J. Health Serv. Res. Pol.* 14 (2) (2009) 88–95.
- [45] V. Liu, P. Kipnis, N.W. Rizk, G.J. Escobar, Adverse outcomes associated with delayed intensive care unit transfers in an integrated healthcare system, *J. Hosp. Med.* 7 (3) (2012) 224–230.
- [46] G. Smith, D. Clarke, Assessing the effectiveness of integrated interventions: terminology and approach, *Med. Clin.* 90 (4) (2006) 533–+.
- [47] W.M. Looman, I.N. Fabriccotti, R. Huijsman, The short-term effects of an integrated care model for the frail elderly on health, quality of life, health care use and satisfaction with care, *Int. J. Integrated Care* 14 (2014).
- [48] F. Béland, H. Bergman, P. Lebel, A.M. Clarfield, P. Tousignant, A.P. Contandriopoulos, L. Dallaire, A system of integrated care for older persons with disabilities in Canada: results from a randomized controlled trial, *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 61 (4) (2006) 367–373.
- [49] P. Sargent, S. Pickard, R. Sheaff, R. Boaden, Patient and carer perceptions of case management for long-term conditions, *Health Soc. Care Community* 15 (6) (2007) 511–519.
- [50] E.G. Epstein, A. Miles, V. Rovnyak, M. Baernholdt, Parents' perceptions of continuity of care in the neonatal intensive care unit: pilot testing an instrument and implications for the nurse-parent relationship, *J. Perinat. Neonatal Nurs.* 27 (2) (2013) 168–175.
- [51] S. Kumpunen, N. Edwards, T. Georgiou, G. Hughes, Evaluating integrated care: why are evaluations not producing the results we expect, *Briefing* November (2019) 11.
- [52] P.E. Plsek, T. Greenhalgh, The challenge of complexity in health care, *BMJ* 323 (7313) (2001) 625–628.
- [53] A. Kaehne, Reconciling practice, research and reality of integrated care. Critical reflections on the state of a discipline, *J. Integrated Care* 28 (3) (2020) 311–318.
- [54] N. Zonneveld, N. Driessen, R.A. Stüssgen, M.M. Minkman, Values of integrated care: a systematic review, *Int. J. Integrated Care* 18 (4) (2018).
- [55] M.A.C. Bautista, M. Nurjono, Y.W. Lim, E. Dessers, H.J.M. Vrijhoef, Instruments measuring integrated care: a systematic review of measurement properties, *Milbank Q.* 94 (4) (2016) 862–917.
- [56] A.N. Hald, M. Bech, V. Burau, Conditions for successful interprofessional collaboration in integrated care—lessons from a primary care setting in Denmark, *Health Pol.* 125 (4) (2021) 474–481.
- [57] M.J. Harris, F. Greaves, L. Gunn, S. Patterson, G. Greenfield, J. Car, Y. Pappas, Multidisciplinary group performance—measuring integration intensity in the context of the North West London Integrated Care Pilot, *Int. J. Integrated Care* 13 (1) (2013).
- [58] N. Goodwin, Understanding integrated care: a complex process, a fundamental principle, *Int. J. Integrated Care* 13 (2013).
- [59] C.A. Anderson, A.L. Whall, A philosophical analysis of agent-based modelling: a new tool for theory development in nursing, *J. Adv. Nurs.* 67 (4) (2011) 904–914.
- [60] L. Edgren, The meaning of integrated care: a systems approach, *Int. J. Integrated Care* 8 (2008).
- [61] L. Nordgren, Value creation in health care services—developing service productivity: experiences from Sweden, *Int. J. Public Sect. Manag.* (2009).
- [62] R. Rodrigues, K. Leichsenring, J. Winkelmann, The 'Make or Buy' Decision in Long-Term Care: Lessons for Policy, European Centre for Social Welfare Policy and Research, Vienna, 2014.
- [63] R. Axelsson, The organizational pendulum - healthcare management in Sweden 1865-1998, *Scand. J. Publ. Health* 28 (1) (2000) 47–53.
- [64] T.C. Tsai, A.K. Jha, Hospital consolidation, competition, and quality: is bigger necessarily better? *JAMA* 312 (1) (2014) 29–30.
- [65] M.E. Porter, E.O. Teisberg, Redefining competition in health care, *Harv. Bus. Rev.* 82 (6) (2004) 64–76, 136.
- [66] G. Bevan, M. Skellern, Does competition between hospitals improve clinical quality? A review of evidence from two eras of competition in the English NHS, *BMJ* 343 (2011).
- [67] K.J. Arrow, Uncertainty and the welfare economics of medical care. World Health Organization, *Bull. World Health Organ.* 82 (2) (2004) 141.
- [68] M.E. de Campo, Exit and voice: an investigation of care service users in Austria, Belgium, Italy, and Northern Ireland, *Eur. J. Ageing* 4 (2) (2007) 59–69.
- [69] A. Fraser, E. Stewart, L. Jones, Editorial: the importance of sociological approaches to the study of service change in health care, *Sociol. Health Illness* 41 (7) (2019) 1215–1220.
- [70] B. Ahgren, Thesis summary: creating integrated health care, *Int. J. Integrated Care* 7 (2007).
- [71] R.B. Bouncken, T. Clauß, V. Fredrich, Product innovation through cooptation in alliances: singular or plural governance? *Ind. Market. Manag.* 53 (2016) 77–90.
- [72] J.H. Dyer, H. Singh, W.S. Hesterly, The relational view revisited: a dynamic perspective on value creation and value capture, *Strat. Manag. J.* 39 (12) (2018) 3140–3162.
- [73] P. Ritala, Cooptation strategy—when is it successful? Empirical evidence on innovation and market performance, *Br. J. Manag.* 23 (3) (2012) 307–324.
- [74] B.J.R. Park, M.K. Srivastava, D.R. Gnyawali, Walking the tight rope of cooptation: impact of competition and cooperation intensities and balance on firm innovation performance, *Ind. Market. Manag.* 43 (2) (2014) 210–221.
- [75] Chinese National Bureau of Statistics, Seventh National Census Bulletin, 2021. http://www.stats.gov.cn/tjsj/tjgb/rkpcgb/qgrkpcgb/202106/t20210628_1818824.html (in Chinese).
- [76] H.R. Gao, Health management and the graded treatment system in China, *Journal of Public Management* 14 (2) (2017) 139–144+159 (in Chinese).
- [77] T.J. Zhao, C. Li, B.S. Zhang, Industrial network and the information efficiency of capital market: an evidence based on stock price synchronicity, *Accounting Research* (10) (2020) 136–149.
- [78] L. Guo, Y.Z. Xiao, Does government regulatory reform enhance social public welfare - empirical evidence from panel data on the dynamics of China's inter-provincial urban water industry, *Journal of Management World* (8) (2016) 73–85 (in Chinese).
- [79] P.P. Valentijn, S.M. Schepman, W. Opheij, M.A. Bruijnzeels, Understanding integrated care: a comprehensive conceptual framework based on the integrative functions of primary care, *Int. J. Integrated Care* 13 (2013).
- [80] G. Hughes, S.E. Shaw, T. Greenhalgh, Rethinking integrated care: a systematic hermeneutic review of the literature on integrated care strategies and concepts, *Milbank Q.* 98 (2) (2020) 446–492.
- [81] S. Shaw, R. Rosen, B. Rumbold, What Is Integrated Care, vol. 7, Nuffield Trust, London, 2011, pp. 1–23.
- [82] L. Garattini, A. Padula, N. Freemantle, Do European pharmacists really have to trespass on medicine? *Eur. J. Health Econ.* 22 (1) (2021) 1–4.
- [83] K.V. Stein, A. Rieder, Integrated care at the crossroads—defining the way forward, *Int. J. Integrated Care* 9 (2009).

- [84] D. Gray, C.D. Armstrong, S. Dahrouge, W. Hogg, W. Zhang, Cost-effectiveness of anticipatory and preventive multidisciplinary team care for complex patients: evidence from a randomized controlled trial, *Can. Fam. Physician* 56 (1) (2010) e20–e29.
- [85] S. Serxner, K. Baker, D. Gold, Guidelines for analysis of economic return from health management programs, *Am. J. Health Promot.* 20 (6) (2006) 1–18.
- [86] A. Gowing, C. Dickinson, T. Gorman, L. Robinson, R. Duncan, Patients' experiences of a multidisciplinary team-led community case management programme: a qualitative study, *BMJ Open* 6 (9) (2016) e012019.
- [87] P. Kasteridis, A. Mason, A. Street, Evaluating integrated care for people with complex needs, *J. Health Serv. Res. Policy* 26 (1) (2021) 46–53.
- [88] N. Bloom, C. Propper, S. Seiler, J. Van Reenen, The impact of competition on management quality: evidence from public hospitals, *Rev. Econ. Stud.* 82 (2) (2015) 457–489.
- [89] C.H. Liao, N. Lu, C.H. Tang, H.C. Chang, K.C. Huang, Assessing the relationship between healthcare market competition and medical care quality under Taiwan's National Health Insurance programme, *Eur. J. Publ. Health* 28 (6) (2018) 1005–1011.
- [90] J. Ning, X. Gu, Can intensified supply-side competition contain the growth of China's health expenditures?—evidence from Provincial Panel Data, *J. Public Adm.* 11 (6) (2018), 30-50+209-210. (in Chinese).
- [91] D. Dranove, W.D. White, Recent theory and evidence on competition in hospital markets, *J. Econ. Manag. Strat.* 3 (1) (1994) 169–209.
- [92] M. Gaynor, K. Ho, R.J. Town, The industrial organization of health-care markets, *J. Econ. Lit.* 53 (2) (2015) 235–284.
- [93] K.R. Brekke, O.R. Straume, Competition policy for health care provision in Norway, *Health Pol.* 121 (2) (2017) 134–140.
- [94] R.K. Wadhwa, K.E.J. Maddox, D.S. Kazi, C. Shen, R.W. Yeh, Hospital revisits within 30 days after discharge for medical conditions targeted by the Hospital Readmissions Reduction Program in the United States: national retrospective analysis, *BMJ Br. Med. J. (Clin. Res. Ed.)* 366 (2019).
- [95] G.R. Martsof, T.K. Nuckols, K.R. Fingar, M.L. Barrett, C. Stocks, P.L. Owens, Nonspecific chest pain and hospital revisits within 7 days of care: variation across emergency department, observation and inpatient visits, *BMC Health Serv. Res.* 20 (1) (2020).
- [96] M.A. Lee, Y.H. Yom, A comparative study of patients' and nurses' perceptions of the quality of nursing services, satisfaction and intent to revisit the hospital: a questionnaire survey, *Int. J. Nurs. Stud.* 44 (4) (2007) 545–555.
- [97] M.M. Nakamura, S.L. Toomey, A.M. Zaslavsky, J.G. Berry, S.A. Lorch, A.K. Jha, M.A. Schuster, Measuring pediatric hospital readmission rates to drive quality improvement, *Academic pediatrics* 14 (5) (2014) S39–S46.
- [98] L.M. Schwartz, S. Woloshin, J.H. Wasson, R.A. Renfrew, H.G. Welch, D.P.C.C.R. Network, Setting the revisit interval in primary care, *J. Gen. Intern. Med.* 14 (4) (1999) 230–235.