



# Taiwan quality indicator project and hospital productivity growth

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## ABSTRACT

The Taiwan Quality Indicator Project (TQIP) is a quality management program that measures and monitors the healthcare quality of hospitals in Taiwan. This paper examines the impact of TQIP participation on hospital productivity growth with the application of the Malmquist productivity change index based on data envelopment analysis (DEA). Analyzing operations data from 31 TQIP regional hospitals over the period 1998–2004, we find that TQIP hospitals improved their productivity in the post-TQIP period. This improvement is attributable to quality change and relative efficiency progress. The simultaneous enhancement in both quality and relative efficiency coincides with the philosophy of total quality management (TQM) spirit, and confirms the efficiency improvement and quality assurance functions of TQIP.

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## 1. Introduction

The growing trends of rising healthcare costs and increasingly aging population have forced the government and healthcare providers to be more concerned with healthcare resources productivity [1,2] and quality [3–8]. However, an inefficient utilization of healthcare resources has been one of the major reasons for inflated spending on healthcare services [9]. This inefficient use of resources, in conjunction with a greater consciousness of the importance of healthcare system reform has led to more scrutiny of the cost effectiveness of healthcare delivery services [4,10]. To promote cost-effectiveness, nearly 70% of US hospitals have implemented total quality management (TQM) and continual quality improvement (CQI) programs [11]. Bosworth et al. [12] validated that progress in quality improvement contributed to the productivity growth.

In 1999, the Department of Health of Taiwan established the Taiwan Joint Commission on Hospital Accreditation (TJCHA) whose ultimate goal is to integrate and upgrade the healthcare quality system. Based on the successful experience and international benchmarking of the Maryland Quality Indicator Project (MQIP) and International Quality Indicator Project (IQIP), TJCHA initiated the Taiwan Quality Indicator Project (TQIP) in 2000 to pursue its mission of excellence in healthcare quality. In particular, TJCHA adapted the following three types of quality

indicators for TQIP: acute care indicators, psychiatric care indicators, and long-term care indicators [13]. The Department of Health of Taiwan also encouraged hospitals to collect and utilize the acute care indicators to facilitate improvements in healthcare quality and productivity.

In this study, we evaluate the productivity changes of Taiwanese hospitals after joining the TQIP in 2000 using the Malmquist [14] productivity change index based on non-parametric data envelopment analysis (DEA). Prior studies have shown the flexibility of DEA over traditional parametric methods in estimating hospital productivity [15,16]. The Malmquist productivity change index can be used to track the specific position corresponding to each hospital and to examine changes in productivity and quality [17]. Färe et al. [18] advanced the Malmquist productivity index to measure changes in the following three components of productivity growth: quality change, efficiency change, and technical change. The use of the Malmquist productivity change index enables us to identify individual components of changes in hospital productivity, especially changes in efficiency and quality [17].

Prior studies on healthcare productivity have focused on organizational determinants, technology involvement and policy intervention [7,9,19,20]. They estimated the input–output correspondence and typically ignored the potential impact of healthcare quality indicators such as outcomes on productivity measurement due to lack of quality indicators. We attempt to overcome this problem by incorporating the quality indicator in our estimation. Specifically, we examine productivity change and its three components (quality change, relative efficiency change, and technical change) from the pre-TQIP period to the post-TQIP period.

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Analyzing operations data from 31 TQIP regional hospitals in Taiwan from the pre-TQIP period (1998) to the post-TQIP period (2002 and 2004), we find that TQIP hospitals demonstrated significant productivity growth in the post-TQIP period. This growth is attributable to quality change and relative efficiency progress, meeting the TJCHA's expected goal. Our results also indicate that efficiency and quality improve simultaneously after TQIP participation, which coincides with the philosophy of total quality management (TQM) and confirms the efficiency improvement and quality assurance functions of TQIP.

The remainder of this paper is presented as follows. Section 2 provides background, including the definition of healthcare quality, description of the Taiwan Quality Indicator Project (TQIP), and a brief review of related literature on healthcare quality and hospital productivity to motivate research hypotheses. Section 3 presents the research design including description of sample data and construction of the Malmquist productivity change index using DEA models. Section 4 presents and discusses the empirical results and Section 5 concludes the paper.

## 2. Background and research hypotheses

### 2.1. Healthcare quality

According to the US Institute of Medicine (IOM), the definition of quality is “the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge”. The US Office of Technology Assessment (OTA) also indicates that the quality of care should focus on ideal patient healthcare by applying contemporary healthcare knowledge and decrease the degree of malpractice. Donabedian [21] further defined quality care as being that which is expected to maximize patient welfare, after taking into account the expected gains and losses attendant to the process of care in all its parts, by constructing a patient-centered concept of healthcare quality.

The most commonly adopted model in healthcare quality measurement is the three-step framework, *structure–process–outcome*, proposed by Donabedian [22]. This framework is similar in spirit to the *input–process–output* framework used in a manufacturing setting. The procedure of healthcare is logically divided into the above-mentioned three steps with individual indicators for performance evaluation and comparison. Traditional healthcare quality evaluation has focused on structural perspectives, such as hospital size, the quantity of facilities and equipment, and the quantity of services provided. Until 1986, the US Health Care Financing Agency (HCFA) presented the mortality of each hospital as a quality indicator and this outcome indicator subsequently became a new trend in healthcare quality evaluation [23].

### 2.2. Taiwan Quality Indicator Project (TQIP)

In 1995, the Department of Health in the Executive Yuan of Taiwan implemented the National Health Insurance (NHI) program, which introduced a uniform payment system within a given category of homogeneous hospitals. The Department of Health further established the Taiwan Joint Commission on Hospital Accreditation (TJCHA) in 1999. There are four stated missions for the TJCHA, comprising of: (1) assisting and promoting national medical quality policies; (2) determining medical quality certification standards; (3) consulting with healthcare

organizations; and (4) promoting the relationship between the hospitals and the patients. The ultimate goal is to integrate and upgrade the overall quality of the healthcare system. There have been several programs implemented by TJCHA, including Hospital accreditation, Healthcare Quality Improvement Circle (HQIC), and Healthcare Quality Learning Organization. Making successful experience and international benchmarking reference to the International Quality Indicator Project (IQIP), TJCHA initiated the Taiwan Quality Indicator Project (TQIP) in 2000 to meet the requirements of its fourfold mission. By 2004, there had been 72 hospitals joined TQIP.

The IQIP developed quality performance indicators to facilitate participating hospitals' efforts to benchmark and improve performance. In 2007, 575 healthcare organizations in 13 countries used the IQIP tools to collect, analyze, and compare clinical and administrative healthcare data. IQIP participants receive quarterly data reports, which allow for longitudinal trending and comparison to national, regional, and international aggregate rates. The motivating factor behind the IQIP is not just the collection of data, but in analyzing the underlying causes that lead to certain outcomes. The aims of the IQIP are to develop educational materials, to conduct user groups and educational sessions in the field, to learn from the efforts of IQIP participants to understand and put their data to work, and to assist in participants' benchmarking and networking activities.

According to TJCHA [13], based on prior international quality assessment practices, those hospitals joining the International Quality Indicator Project (IQIP) would move through a three-stage transition process: (1) establishing documentary quality indicators, (2) assessing and improving these indicators, and (3) attaining continuous healthcare quality improvement and enhancement. Due to such changes in organizational adjustment over time, short-term performance impact may differ from longer-term impact. For example, treatment cost may increase initially following quality improvement adoption because of changes in long-standing organizational routines and investment in data systems and other elements of QI infrastructure. However, organizational performance may, over a sufficiently long period of time, result in net savings and improved economic efficiency [24].

For TJCHA, the TQIP is an independent and objective benchmarking platform for healthcare in Taiwan. Through IQIP, successful and international experience is applied and local regular and periodic monitoring indicators are established. For participants, there are several benefits to join TQIP including: TQIP task force to healthcare professional consulting, continuous educational trainings, various related seminars and consortiums to share and learn, quarterly quality reports released, data collection database, and quarterly report feedback. There are objective performance evaluations and ad hoc continuous improvement programs for participants. The local healthcare providers enable to apply TQIP data and information to develop their own quality improvement approaches and meet the national and international norms for accreditation.

### 2.3. Healthcare quality and productivity

The major goal of healthcare or healthcare reform should be the maximization of the welfare of treated patients, in pursuit of better healthcare quality. Quality of healthcare should derive from the dedication and good intent of well-trained and motivated healthcare providers [25]. However, quality is an abstruse term. With limited financial resources and growing patient demands, cost-efficiency concerns tend to prevail over

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