The Roles of Reputation in Organizational Response to Public Disclosure of Health Care Quality

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Borwornsom Leerapan

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Dedication

To my parents

Abstract

Policy analysts have argued that public disclosure of health care quality stimulates quality improvements in health care delivery organizations. One proposed mechanism for such an effect is the organization's reputation: Provider organizations improve their quality after public reporting because the reported information affects their reputation. However, research evidence to date is mixed on whether and how reputation affects an organization's response to public disclosure of health care quality data. Drawing from organizational theory and social psychology literature, this dissertation examines the role of reputation in organizational response to public reporting of health care quality. In particular, it examines whether quality improvement is more likely in organizations whose performance ranking are inconsistent with their prior reputations.

The study employs observational data sets and a non-equivalent control group quasi-experimental research design. The unit of analysis is the primary care clinic. The sample includes 156 clinics in the state of Minnesota that publicly disclosed quality performance information on the Minnesota Community Measurement (MNCM) Health Care Quality Reports from 2007 to 2010. The dissertation improves on previous studies by using longitudinal data and by adopting more comprehensive measures of reputation. Optimal Diabetes Care (ODC) is used as a proxy measure of clinical quality performance, and the data are drawn from MNCM Health Care Quality Reports of 2007-2010. The reputation measures are constructed from several other sources of data that

represent the reputation of clinics during the period of 2000-2006, including endorsement from Minneapolis-St. Paul Magazine's Top Doctors 2000-2005 and recipients of Buyer Health Care Action Group's PatientChoice Excellence in Quality Awards 2000-2006. Analysis examines the effects of reputation and public performance ranking on subsequent quality improvement, as well as the interaction effects between reputation and public performance ranking. The fixed effects (FE) estimator and the two-stage least squares (2SLS) estimator are used to address the endogeneity issues in the data set. The findings are also compared with those obtained from the traditional ordinary least square (OLS) estimator.

The results show that an organization's low ranking on public performance reports leads to a greater degree of quality improvement, and public performance ranking has heterogeneous effects on quality improvement based on the prior reputations of organizations. Health care organizations do not only learn about their quality performance relative to peers and competitors, but also relative to their organization's prior reputation. The dissonance between prior reputations and public performance rankings of organizations is a predictor of quality improvement. The findings expand the empirical evidence on the influence of organizational reputation on subsequent change in health care quality. The findings also advance knowledge of the role of an organization's reputation in quality management theories and practices and have implications for how policymakers and health care administrators can more effectively make use of public reporting to promote quality improvement in health services organizations.

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1. Introduction

1.1. Background

The Institute of Medicine's report, *To Err Is Human: Building a Safer Health System*, estimates that as many as 98,000 people die in any given year from medical errors that occur in U.S. hospitals (Kohn, 1999). Its follow-up report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, suggests that the U.S. health care system needs to be improved in six dimensions of quality to meet patient's needs—health care should be safe, effective, patient-centered, timely, efficient, and equitable (Institute of Medicine, 2001). These two landmark reports ignited efforts to improve quality and patient safety in the U.S. and worldwide. Consequently, in the last decade, health services organizations have attempted to implement various types of quality improvement initiatives to address quality gaps (Dentzer, 2011).

Researchers have argued that the current quality movement in health care organizations is mostly driven by the intrinsic motivation of professionalism to improve the patients' health as "a human desire to do the right thing" (Bodenheimer, 1999), and partially driven by the understanding that increasing quality of care may also lead to the decreasing health care expenditures (Galvin & McGlynn, 2003). However, public policies also could create an environment that facilitates quality improvement initiatives in provider organizations as well. After *Too Err Is Human* was published, reducing medical errors became a national agenda item that is too important to be ignored by any health care

organization (Leape & Berwick, 2005), and since then stronger regulations along with additional financial incentives have supported early improvements in information technology and in workforce organization and training (Wachter, 2004).

Public reporting and ranking of organizations' quality performance also has been proposed as one of the mechanisms for monitoring and stimulating improvements of health care quality at the national level (Lansky, 2002; McGlynn, 2003). Public disclosure of health care quality can be seen as a public policy or a complex social intervention that affects organizations in many aspects. Its impacts on health care organizations are conditional upon the causal mechanisms of change and the contexts in which the policy is implemented (Pawson, 2003; Pawson & Tilley, 1997). The features of the pubic reports that effectively stimulate quality improvement in health care organizations can be considered the mechanisms of change in this particular setting.

Measuring and reporting health care quality to the public provides a unique context to study organizational factors that motivate delivery organizations to improve quality of care. However, the empirical evidence on the effectiveness of public reporting on health care organizations has been mixed, and research to date has not yet established a clear understanding of why public reporting affects positive change in some organizations, no change in others, and negative change in some others (Fung, Lim, Mattke, Damberg, & Shekelle, 2008; Marshall, Shekelle, Leatherman, & Brook, 2000).

1.2. Specific Problems

Scholars have conceptualized how public disclosure of health care quality can influence behaviors of consumers and providers in several ways. These causal pathways are interconnected. First, armed with better quality information, patients could opt for better providers and could potentially drive poor-performing providers out of their practices. Second, with the knowledge of their quality deficits and the presence of better-informed consumers, health care providers could be more motivated to improve their quality performance by changing care processes within the delivery organizations (Berwick, James, & Coye, 2003). Lastly, reporting poor quality performance to the public also could affect the reputation of health care organizations. Even if the reports do not effectively influence consumer's choices, the concerns of their quality perception in the public could create an institutional pressure that drives improvement work within provider organizations (Hibbard, Stockard, & Tusler, 2005a).

The notion that information can drive consumers' selection and providers' quality improvement originates from the application of market theory to health care, which believes providing comparative quality information to consumers can reduce asymmetric information in the market and increase competition (Galvin & McGlynn, 2003). Hence, literature related to public reporting of health care quality performance has traditionally seen this public policy as an intervention to empower health care consumers. The focus has been consumers rather than providers or provider organizations. In this traditional framework,

the impacts on providers depend on the quality information being widely disseminated, easy to understand, relevant to health care consumers, and used by health care consumers (Shaller et al., 2003).

However, empirical evidence shows that health care consumers often continue to select their providers based on personal opinions or the opinions of family and friends rather than the information from the performance reports, and they may be not fully informed about their choices of providers (Shaller et al., 2003). Moreover, among the mixed empirical findings, there appears to be more supportive evidence for the change of care by providers than the change of providers by consumers. Only three in nine studies that investigated market share and volumes of hospitals after public reports of hospital performance show positive selection effects (Chassin, 2002; Mennemeyer, Morrisey, & Howard, 1997; Mukamel & Mushlin, 1998), while six of them demonstrate no effects (Baker et al., 2003; Chassin, 2002; Hannan, Kumar, Racz, Siu, & Chassin, 1994b; Hibbard et al., 2005a; Jha & Epstein, 2006; Romano & Zhou, 2004; Vladeck, Goodwin, Myers, & Sinisi, 1988).

In contrast, seven studies that looked at performance at the hospital level suggest that public reports stimulate quality improvement through the changes of care process in hospitals (Bentley & Nash, 1998; Chassin, 2002; Dziuban, McIlduff, Miller, & Dal Col, 1994; Ghali, Ash, Hall, & Moskowitz, 1997; Hannan, Kilburn, Racz, Shields, & Chassin, 1994a; Hannan et al., 1994b; Peterson, DeLong, Jollis, Muhlbaier, & Mark, 1998). This suggests that provider organizations may

use publicly reported quality data to evaluate their performance relative to their peers and their competitors, despite the limited use of such information by health care consumers.

The mixed evidence on the change of market share raises the question of which motivating factors besides professionalism drive provider organizations to improve quality of care in this context. Some empirical evidence points to concerns about reputation on the part of providers and provider organizations. Research has shown that press reports of bad outcomes such as untoward deaths in hospitals can negatively impact health care organizations' reputations and influence consumers' selection (Mennemeyer et al., 1997). Researchers also found hospitals included in a public performance report believed that the report would affect their public image, but not their market share (Hibbard, Stockard, & Tusler, 2003), and hospitals whose performance had been publicly reported were more likely to improve quality more than the ones whose providers only received confidential performance reports (Hibbard et al., 2005a). From the perspective of providers, reputation and public perception of their quality of care could be a primary concern even if it does not affect consumers' choices. Provider organization could be worried about loss of reputation after the quality information has been public reported, and as a result are motivated to improve quality of care.

Organization theory literature suggests that the reputation of an organization can be seen from several perspectives. On the one hand, reputation

can be defined within a rational decision-making framework. For instance, from an economics perspective an organization's reputation is "the expectations or estimations of a particular attribute of an organization, particularly the ability to produce quality products or services" (Rindova, Williamson, Petkova, & Sever, 2005). On the other hand, from a sociology perspective, reputation can be seen as "a global impression that represents how stakeholders collectively perceive the organization" (Rindova et al., 2005), so reputation can be established by information exchanges and social influence among various actors interacting in an organizational field. For instance, both "organization's image" (Bernstein, 1984) or how external stakeholders such as consumers see an organization, and "organization's identity" (Albert & Whetten, 1985) or the perception of internal stakeholders such as employees of the organization, can contribute to an organization's reputation. Thus, from this view, organizational reputation is considered a collective perception from all stakeholders' perspectives (Brown, Dacin, Pratt, & Whetten, 2006; Fombrun & Shanley, 1990; Fombrun, 1996; Hatch & Schultz, 1997).

To date only few studies have directly investigated reputation of health care organizations after public disclosure of health care quality data. Thus, the relationship between organizational reputation and motivation for health care quality improvement is not well understood. Previous studies also have some limitations. Most importantly, the definition of organization's reputation used in those studies was not comprehensive. These studies defined and measured organizational reputation in different ways, varying from having no explicit

definition but implying that bad outcomes can create bad reputations that lead to low utilization (Mennemeyer et al., 1997), to measuring reputation as how accurately consumers recall the relative quality of local hospitals on the public report (Hibbard et al., 2005a). Other aspects of reputation were not taken into account.

Although previous research has identified a greater quality improvement efforts in health care organizations whose performance has been publicly disclosed than those that have not (Hibbard et al., 2003, 2005a), it has not explicitly explained or predicted how provider organizations respond over time when most organizations have already disclosed quality performance to the public. Moreover, those studies usually considered good performance on public reports to enhance an organization's reputation and poor performance to diminish reputation, but the studies failed to acknowledge that over time organizations' reputations might be changing due to other causes. Other potential antecedents of reputation were not included in the previous studies. For example, health care organizations' responses to public performance ranking could be contingent on the prior reputations of the organizations.

To accurately predict reputation effects of public performance ranking, the relationship between reputation gain or loss from relative quality performance on public reports and from prior reputation has to be reconciled. However, we know little about how a health care organization's reputation is reconciled when the reported quality level conflicts with the prior reputation of the organization.

For instance, if a highly reputable health care organization receives a poor quality performance ranking, we do not know the impact on its reputation and how we should predict its quality improvement responses in that context. Therefore, further research that takes into consideration the prior reputations of organizations based on a broad definition of organizational reputation is needed.

1.3. Research Questions

This dissertation makes a contribution to the body of knowledge on organization's reputation and quality management practices by developing a better understanding of how the reputation effects of public reporting can explain the variation in quality improvement among those organizations. Drawing from organizational theory and social psychology literature, the study examines the relationship between organizational performance ranking based on publicly disclosed quality data and the subsequent quality performance in primary care clinics settings, and the role of prior reputations in organizations' quality improvement responses to public reporting.

Therefore, the two research questions of this dissertation are:

1) Do organizational rankings on public reports of health care quality performance predict subsequent quality improvements?

2) Do prior reputations of health care organizations influence the relationship between public performance rankings and subsequent quality improvements?

The study employs clinical quality as shown on the Minnesota Community Measurement (MNCM) Health Care Quality Reports, a voluntary public report of performance in preventive care and chronic disease treatments of primary care clinics in the state of Minnesota (MNCM, 2011). The quality data are drawn from Minnesota Community Measurement Health Care Quality Reports of 2007-2010. The reputation measures are constructed from several other sources of data that represent the reputation of clinics during the period of 2000-2006, including recognition from Minneapolis-St. Paul Magazine's Top Doctors, Buyer Health Care Action Group's PatientChoice Excellence in Quality Awards, and involvement in establishing the Institute for Clinical System Improvement's clinical practice guidelines. Optimal Diabetes Care is used as a proxy measure of clinical quality performance of each clinic. The relationship between public performance ranking of diabetes care in primary care clinics and subsequent quality performance is determined. The moderating effect of prior reputations of primary care clinics, as defined by their prominence and perceived quality in the organizational field, on the relationship between public performance ranking of diabetic care and subsequent quality performance is also estimated.

This dissertation addresses the shortcomings of existing literature by integrating the theoretical concepts related to reputation of health services organizations into the analysis. The conceptual model provides an insight into health care organizations' incentives to publicly disclose quality data, and the determinants of organizational responses to measuring and public reporting of

quality data. This research also improves on previous studies by using longitudinal clinical data, and by adopting measures of reputation that are relevant to various stakeholders of health care organizations. The unique longitudinal quality data of primary care clinics from MNCM allows for analyses of clinical quality of small provider organization such as primary care clinics.

The results of this empirical analysis provide a better explanation of the variation of quality improvement that occurs after organizations learn about their quality performance relative to the others. The understanding of how reputation plays roles in organizational response to public perforamnce rankings has major implications for how policymakers and health care administrators can more effectively make use of public reporting to promote quality improvements in health services organizations, as well as other kinds of organizations.

The rest of this dissertation is organized as following. Chapter 2 reviews the literature related to the topics of this dissertation, including literature from organizational studies, quality management research, and health services research. In Chapter 3, I discuss and propose the theoretical model and hypotheses of this study. The study methods and the empirical models are discussed in Chapter 4. The results from the data analysis are presented in Chapter 5. The discussion and conclusions are presented in Chapter 6.

2. Literature Review

The literature related to the topic of this dissertation is presented in this chapter. First, the literature on health care quality and quality improvement is reviewed. It is followed by a discussion of public disclosure of heath care quality and empirical evidence on its effectiveness. Lastly, the literature on organizational reputation and organizational response to signals in the environment is reviewed.

2.1. Health Care Quality

2.1.1 Definitions of Quality

A universal definition of quality does not exist in the literature (Reeves & Bednar, 1994). Definitions of quality range from "standardization of organizational process" (Deming, 1986) or "the fitness for use of products or services" (Juran & Godfrey, 1998) in the quality management literature, to "features or differentiation of products or services" in the economics and strategic management literature (Garvin, 1987; Porter, 1985). Different definitions are probably the result of different bodies of knowledge, different contexts of studies or industries, and also different histories of each academic field.

Literature on quality management and operations research has identified conformance and reliability as the most dominant and important aspects of quality. For instance, based on a statistical knowledge background, Deming (1986) primarily views quality as a standardization of organizational processes.

Thus, quality is limited by two types of process variations: "variation from special causes" that can be identified and fixed without chaining current processes, and "variations from common causes" that cannot be eliminated without changing the whole system (Deming, 1986). From this view of quality, improvement would require a systematic approach to problem solving and continuous process improvement.

More recently, literature on quality management has steered toward strategic quality management. The concept of quality management has been broadening from the industrial notion of quality control to a broad performance excellence perspective. For instance, the recent criteria framework for major quality awards, such as the Malcolm Baldridge National Quality Award (MBNQA) and the European Quality Award, is based on the notion of performance excellence in multiple aspects of organizations, including leadership, strategic planning, customer and market, human resource, process management, and business results (Evans & Lindsay, 2007). Correspondingly, the concept of quality has been more incorporated into strategic management of the firm, rather than being seen as a separate function of manufacturing or services departments. For instance, Garvin (1987) described eight dimensions of quality, namely performance, features, reliability, conformance, reliability, serviceability, aesthetics, and perceived quality (Garvin, 1987). Such concepts support the notion of strategic quality management—because of trade-offs among different dimensions of quality, firms do not need to compete in a market

on the same dimension of quality but can focus on the dimensions that can help the firms find their niches or gain strategic advantage over their competitors.

2.1.2 Health Care Quality

As in the broader management literature, a universal definition of quality in health care does not exist (Campbell, Roland, & Buetow, 2000; Heyman, 1995; McCance, McKenna, & Boore, 1997; Webb, 1996). Nonetheless, Donabedian (1966) proposed the most widely adopted definition of health care quality decades ago. Donabedian's framework of quality considers health care as a system composed of structure, process, and outcomes. Hence, health care quality can be systematically assessed in these three dimensions (Donabedian, 1966, 1988). In contrast, the Institute of Medicine defines health care quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Institute of Medicine, 1990). From this view quality is a result of providing appropriate services according to professional knowledge.

A more comprehensive definition of health care quality incorporates both the systems-based framework and the appropriateness of care framework. First, structure refers to the environment in which health care is delivered, including medical facilities, equipment, qualifications of health care providers, as well as operational and financial resources of health care organizations. Most regulatory and accreditation agencies often use this structural dimension of health care quality to develop their licensure, certification, and accreditation programs.

Second, process refers to a series of activities while health services are delivered. Thus, the appropriateness of care determines process quality. Quality can be captured by measuring the overuse of services when other or no intervention would have been beneficial, the underuse of the services that would benefit the patients, and the improper use of beneficial care or prevention. Lastly, outcomes are the results of care provided, including survival, health status, and patient satisfaction.

While this systems-based framework of structure, process and outcome has been widely used, other researchers argue that additional dimensions of health care also should be used to capture other aspects of health care quality besides the delivery of effective care. Campbell et al. (2000) adopted the systems-based framework of structure, process and outcome, but proposed that health care quality should be conceptualized in two parts. At the individual level, quality of care can be studied based on two dimensions: access and effectiveness, including subcategories of clinical effectiveness and inter-personal effectiveness. At the population level, there are two additional dimensions: efficiency and equity (Campbell et al., 2000). In the Institute of Medicine's landmark report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, it is also suggested that health care quality can be considered in six dimensions: safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity (Institute of Medicine, 2001).

2.1.3 Measurement of Health Care Quality

Because there is no universal definition of health care quality, an appropriate measurement of quality in health care would depend on the purpose of measurement, and the definitions of quality that the researcher uses in each particular study. For instance, a study of health care disparity would require a measurement that captures variations of process and outcomes of the care that has been provided to different groups in a population, so that the quality of care in different patient populations can be compared.

In health services research literature, a great number of studies of health care quality have paid attention to the evaluation of both short-term and long-term effectiveness of medical interventions provided by specific types of providers or organizations. These types of studies focus on the effectiveness dimension of health care quality, and can be generally referred as "outcome research" (Kane, 2005). To capture the consequences of care process, outcomes measures are essential for the evaluation of whether health care successfully reaches its ultimate goals such as improved health status or patient satisfaction. In addition, some scholars argue that structural indicators could be excluded from the measurement of health care quality, as research shows that structural aspects of providing care are necessary but not sufficient to assure high quality (Brook, 1997; Campbell et al., 2000).

But outcome measures also have some limitations. From a quality improvement standpoint, outcome measures may not capture the consequences

of improved care processes in a timely manner. For instance, it takes time to observe a change of mortality rate after the care process has been changed, so outcome measures may provide less information about the success of quality improvement in this context. Moreover, many other factors besides health care processes can influence health outcomes (Giuffrida, Gravelle, & Roland, 1999). For instance, patient attributes such as underlying diseases or risk behaviors also can determine clinical outcomes in patients with chronic illnesses. To be able to use outcome measures to evaluate the effectiveness of care process, researchers may need to conduct risk adjustment before they can accurately compare quality outcomes across providers or organizations (Fiscella & Franks, 1999; van Ryn & Burke, 2000; Werner & Asch, 2005)

Process indicators, such as the percentage of appropriate care, can be used to evaluate the standardization of care processes, and to compare quality of care across providers or organizations. Moreover, better process quality is likely to lead to better quality outcomes, particularly if a strong evidence of the relationship between care processes and outcomes has already been established. Therefore, measures of care process are good quality measures from quality improvement standpoints.

2.2. Determinants of Health Care Quality Improvement

The determinants of health care quality and quality improvement are discussed in this section. In general, studies of health care quality improvement ask two fundamental questions: why do provider organizations want to improve

quality of care, and how can they improve quality of care? Therefore, the determinants of quality in health services organizations can be categorized into two major groups: 1) organizational factors that determine motivation for quality, and 2) organizational factors that determine ability to improve quality.

2.2.1 Motivation for Quality Improvement

Although improving health care quality has become a dominating public agenda item in recent years, both in the U.S. and abroad, it is not totally clear what drives health care organizations to improve quality of care. The potential sources of motivation for quality improvement in health care organizations can range from internal driver such as professionalism of health care providers, the attempt to retain skilled labor, the ability to secure donation, to external drivers of organizations such as competition and regulation.

Some scholars argue that the current quality movement in health care organizations is mostly driven by the intrinsic motivation of professionalism (Bodenheimer, 1999), and partially by the understanding that increasing quality of care also may lead to decreases in the cost of health care (Galvin & McGlynn, 2003). Medical professionals have long been responsible for the quality of care by monitoring practices in health care organizations and correcting the deviations from professional standards (Varkey, 2010). More recently, when rapidly rising health care expenditures have dominated the health care agenda, quality improvement activities in health care organizations also may reflect attempts to contain health care expenditures as well. The empirical evidence shows that

often lower quality leads to higher costs, especially the costs due to overuse and misuse of health services (Chassin, 1998).

However, professionalism and cost containment are not sufficient explanations of why health care organizations want to improve, or fail to improve, the quality of care. In the past decades, quality problems have been documented in health care organizations from all parts of the U.S., and as a result have negatively affected a large number of patients (Chassin & Galvin, 1998). Health care organizations cannot justify their quality improvement initiatives solely on the basis of economic incentives. Although reducing overuse and misuse of health services can decrease unnecessary health care expenditures, organizations may have to invest a significant amount of resources in order to reduce the problems of overuse and misuse, and in fact additional resources are certainly needed to address the underuse problems (Bodenheimer, 1999).

Other sources of motivation for quality improvement derive from the environment of health care organizations. The extrinsic motivations include external pressures from governmental agencies' regulation and competition in the market. For instance, after the Institute of Medicine (IOM) published the landmark report, *Too Err Is Human*, showing that as many as 98,000 people die in any given year from medical errors that occur in U.S. hospitals (Kohn, 1999), reducing medical errors have become a national agenda issue that is too important to be ignored by any health care organization (Leape & Berwick, 2005). Since then, stronger regulations along with additional financial incentives have

helped facilitate some early improvements in information technology and in workforce organization and training (Wachter, 2004). To promote quality competition in health care settings, public reporting and ranking of organization's quality performance has been proposed as one of the mechanisms for monitoring and stimulating improvements of health care quality (Lansky, 2002; McGlynn, 2003). Therefore, besides intrinsic motivations such as professionalism of health care providers, quality improvement in health care organizations also can be driven by the regulatory policies and implementation of management practices that promote quality competition among health care organizations.

2.2.2 Ability to Improve Quality

Even with the presence of the same internal and external incentives for quality improvement, health care organizations could still perform differently in terms of quality improvement. The variation of quality outcomes could be a result of different level of organizational ability to improve quality, including how quality problems are identified and how solutions are implemented in health care organizations. According to the systems-based framework of health care quality, health services organizations require a systematic approach to problem solving and process improvement.

Health care practitioners and scholars in health services research have adapted the concepts in total quality management (TQM) and continuous quality improvement (CQI) literature, and proposed a framework for quality

improvement in health services organizations (Berwick, 1989; Bodenheimer, 1999; Chassin, 1998). The principles of health care quality improvement include total employee involvement, new organizational structures, a focus on customer-supplier relationships, and understanding that the main source of quality defects is problems in the process and that variability of processes is key to improving quality and reducing cost (Berwick, 1989; Berwick, 2008). Within this framework, an organization's ability to identify problems, learn how to solve the problems, and implement management practices that solve such problems is contingent upon many organizational factors, including institutional resources, employee involvement, organizational structures, leadership, and organizational culture and climate that facilitate changes in organization (Lukas et al., 2007; McFadden, Henagan, & Gowen Iii, 2009). Providers who do not perform up to a certain professional standard are not seen as failures who are simply correctable through additional professional training, as they had traditionally been seen.

A key concept in this TQM and CQI framework is organizational learning. Literature in organizational theories suggests that organizational performance can be improved through organizational learning, specifically through adoption and implementation of best practices (Tucker, Nembhard, & Edmondson, 2007). Rapid advancement of medical knowledge can create disagreement among health care providers over the effectiveness of recommended practices and which best practices should be adopted in order to improve the care quality (Cabana et al., 1999). Process variation is common in any services organizations where there usually are demands for customization to customers' needs (Berta & Baker, 2004;

Tsikriktsis & Heineke, 2004). Thus, health services organizations have to learn how to select right interventions and how to implement them in order to reduce variation in care delivery process.

After the decision to adopt such practices has been made in the organization, implementation success still depends upon activities that ensure compliance with the new best practices. Thus, to evaluate organization's abilities to improve health care quality, it is necessary to distinguish the attributes of decision-making process to adopt new practices from that of the implementation process. Tucker et al. (2007) argue that success of the implementation of quality improvement projects is contingent upon the type of learning activities engaged in by quality improvement teams. By analyzing the frequency of specific learning activities reported by quality improvement project participants in neonatal intensive care units, they observed that quality improvement teams involved in both learning activities that identify current best practices or "learn-what", and learning activities that carry out practices in a given setting or "learn-how". Only learn-how is found positively associated with implementation success, while learn-what is not. Learn-what may be important for the decision process to adopt a new practice, but not for implementation (Tucker et al., 2007).

To make new practices fit in specific organization contexts, health care organization can create ability to learn-how by providing opportunity for providers to become familiar with new practices. Leaders can create "psychological safety climate", or a collective belief within a work unit that

members can question existing practices and admit mistakes without suffering ridicule or punishment (Edmondson, 1999; Edmondson, Bohmer, & Pisano, 2001). Psychological safety encourages organizational members to engage in disruptive changes of care processes; learn-how makes new practices fit in a specific context of each organization by providing opportunities for team members to become familiar with new practices (Tucker et al., 2007)

Therefore, in addition to the intrinsic and extrinsic motivating factors for quality improvement, organizational factors such as resources, employee involvement, knowledge of process improvement, and leadership that promotes organizational learning also could explain the variation of organization quality performance. These organizational abilities to improve quality are the modifying factors between motivation for quality improvement and subsequent quality of care. It is important to address the ability to improve quality of care in health care organizations when examining the relationship between organization's reputation and quality improvement.

2.3. Public Disclosure of Health Care Quality

Measuring, ranking, and reporting organizational quality performance to the public has been proposed as one of the mechanisms for monitoring and stimulating improvements of health care quality at the national level (Lansky, 2002; McGlynn, 2003; Shaller et al., 2003). But like many other social interventions, the impacts of this public policy on behavioral change are conditional upon the causal mechanisms and the contexts in which the policy is

implemented (Pawson, 2002; Pawson, Greenhalgh, Harvey, & Walshe, 2005). In the following sections, the causal mechanisms underlying how public disclosure of quality data can lead to health care quality improvement are discussed. This is followed by a review of the empirical evidence on the impact of public disclosure on health care quality.

2.3.1 Causal Mechanisms of Change

In the health services research literature, scholars have conceptualized that public disclosure of health care quality can influence behaviors of consumers and providers through at least three different causal mechanisms.

The first causal mechanism through which public disclosure of quality data could affect health care organizations is "Improvement Through Selection" (Berwick et al., 2003), or "the selection pathway" (Hibbard, 2008). Making information on the relative quality of providers' performance available to the public could lead consumers to choose better-quality providers. In the selection pathway, health care consumers are the primary users of such information, and quality can be improved through the consumer's selection of better providers. To the extent that patients of primary care clinics or hospitals can opt-out of lower performers and opt-in to better performers, the relative quality information on public reports will influence competition among providers. The more competition among the providers, the more organizational aspiration to improve can be expected.

The second causal mechanism is "Improvement Through Changes in Care" (Berwick et al., 2003), or "the change pathway" (Hibbard, 2008). Through this causal pathway, quality improvement works directly through providers rather than consumers. It is expected that identification of quality deficits, even if not publicly reported, should be sufficient to stimulate health care providers to improve their health care delivery process. Thus, the change pathway draws on the presumed intrinsic professionalism of the provider community. Provided the reports of undesirable level of quality, providers are expected to change the care processes in order to improve their quality of care.

Lastly, the third causal pathway for quality improvement works through the providers' concern about their reputations, namely "the reputation pathway" (Hibbard, 2008). Through this causal mechanism, health care providers whose performance has been publicly reported are more likely to improve their quality than those who receive only private or confidential reports. Thus, the more that reporting of health care quality affects the provider's reputation in the public, the larger the effects on quality improvement can be expected. Besides that reputable provider organizations are likely more attractive to health care consumers, reputation could affect organization's abilities to attract and retain skillful staffs, as well as donors or investors of those organizations. The impacts of reputation on both human and financial resources are crucial to the ability to improve quality of care in health care organizations. As a result, the relative quality performance on public reports, or public performance ranking, could play an important role in this reputation causal pathway.

Literature related to public reporting of health care quality performance traditionally views this public policy as an intervention that empowers health care consumers, which eventually could promote quality competition among providers. Hence, the focus has been consumers rather than providers or provider organizations. Based on an application of market theory to the health care contexts, it is believed that providing comparative quality information to consumers can reduce asymmetric information in market transactions, increase competition and stimulate quality improvements (Galvin & McGlynn, 2003). In this context, the mechanisms of change are the features of the pubic reports that help health care consumers identify and select better providers in the market.

From the perspective of providers, however, public disclosure of organizational quality performance can be seen as a public policy or a complex social intervention that also can affect health care organizations in many ways. In contrast to the selection pathway, the mechanisms of change in this context are the features of the public reports that effectively stimulate quality improvement in health care organizations. Therefore, understanding how organizations respond to public disclosure of quality performance and why they usually respond in such ways are the keys to a study of motivating forces behind quality improvement efforts in those organizations.

2.3.2 Empirical Evidence on Behavioral Changes

Public disclosure of health care quality provides a unique context to study organizational factors that motivate delivery organizations to improve quality of

care. Nonetheless, research to date has not yet established a clear understanding of why public reporting affects positive change in some organizations, no change in others, and negative change in some others. Overall, the empirical evidence that shows the effectiveness of public reporting on health care organizations has been mixed (Fung et al., 2008; Marshall et al., 2000).

A number of empirical research studies of public reports of health care quality, especially early studies, assumed the selection pathway is the primary mechanism of changes following the public reporting of health care data. Within this traditional framework, the impacts on providers depend on the quality information being widely disseminated, easy to understand, relevant to for health care consumers, and used by the health care consumers (Shaller et al., 2003). But empirical evidence shows that many health care consumers continue to select their providers based on personal opinions or the opinions of family and friends rather than the information from the performance reports, and they may be not fully informed about their right choices of providers (Shaller et al., 2003). A recent national survey shows that, although there was an increase in consumers' perception of variation in health care quality and willingness to change physicians or hospitals if the differences in quality is demonstrated, it was news stories about mistakes and malpractice suits that heavily influenced the consumer's view of poor health care quality, not the public performance reports (Kaiser Family Foundation, Agency for Healthcare Research and Quality, & Harvard School of Public Health, 2004)

Even if health care consumers do not use information on the public reports, other stakeholders are expected to drive quality competition among health care organizations through the selection pathway. Acting as an agent of their patients, referring physicians may use information on the public reports of hospital's quality to select a choice of referrals for their patients. Along the same lines, purchasers such as employers may use the relative quality information to negotiate their contracts with providers, and hospital administrators may use it in their contract negotiations with health plans (Werner & Asch, 2005). Nonetheless, the empirical evidence shows that public report cards have only minimally influenced physicians' referral patterns. In one study, although physicians were aware of public reports, they stated that they did not trust the reports, believing that patient risk adjustment was inadequate and that the ratings could be manipulated by the hospitals (Schneider & Epstein, 1996). Researchers also found that health plans have not used quality rankings in public reports as a major factor in their decisions to contract with physicians (Mukamel, Weimer, Zwanziger, & Mushlin, 2002; Romano, Rainwater, & Antonius, 1999).

Among nine studies that investigated market share and volumes of hospitals after public reports of hospital performance were released, only three of them show positive selection effects (Chassin, 2002; Mennemeyer et al., 1997; Mukamel & Mushlin, 1998). Six studies demonstrate no change of market share and volumes of hospitals after public reports (Baker et al., 2003; Chassin, 2002; Hannan et al., 1994b; Hibbard et al., 2005a; Jha & Epstein, 2006; Romano & Zhou, 2004; Vladeck et al., 1988). At the individual provider level, six observational

cohort studies investigated surgeon's operations volume and vitality of their practices after the release of quality rankings from the New York State Cardiac Surgery Reporting System (NYS CSRS). Five of them show positive selection effects (Hannan, 1996; Hannan, Siu, Kumar, Kilburn, & Chassin, 1995; Jha & Epstein, 2006; Mukamel, Weimer, Zwanziger, Gorthy, & Mushlin, 2004; Mukamel et al., 2002), but one study finds no substantial change in volume of operations of surgeons with mortality outlier status (Hannan et al., 1994a).

In contrast, there appears to be more supportive evidence for the change of care by providers than the change of providers by consumers. Seven studies that looked at performance at the hospital level suggest that public reports stimulate quality improvement through the changes of care processes in hospitals (Bentley & Nash, 1998; Chassin, 2002; Dziuban et al., 1994; Ghali et al., 1997; Hannan et al., 1994a; Hannan et al., 1994b; Peterson et al., 1998). This suggests that provider organizations may use publicly reported quality data to evaluate their performance relative to their peers and their competitors, despite the limited use of such information by health care consumers. Nonetheless, no study specifically explored quality improvement through the change pathway at the level of individual providers (Fung et al., 2008).

The mixed evidence on the selection effects also raises the question of which motivating factors besides professionalism drive provider organizations to improve quality of care in this context. Some empirical evidence points to the concerns about reputation by health care consumers. While hospital utilization

minimally changed after hospital mortality rates were publicly reported by the Health Care Financing Administration (HCFA), research found an average 9% reduction of hospital utilization associated with press reports of unexpected deaths in hospitals (Menemeyer et al., 1997). This suggests bad news could negatively impact providers' reputations and influence consumers' selection.

Only a limited number of previous studies directly addressed the impact of public reporting on the health care organization's reputation. Hibbard, Stockard, & Tusler (2003) studied public reporting of hospital quality and demonstrate that health care consumers exposed to the public report were much more likely than other consumers to have accurate perceptions of the relative quality of local hospitals, while hospitals included in a public performance report also believed that the report would affect their public image but not their market share (Hibbard et al., 2003). In a follow up study, Hibbard, Stockard, & Tusler (2005) found hospitals with their providers' performance publicly reported were more likely to improve quality than the hospitals where providers only received confidential performance reports (Hibbard et al., 2005a).

In the long term, organization's reputation likely affects quality of care in health care organizations by several mechanisms. Reputable organizations likely have greater abilities to attract and retain human and financial resources that are crucial to quality improvement efforts. They are also more likely to attract more patients in the future. From the perspective of providers, public perception of their quality could be a primary concern even if it has not yet affected

consumers' choices. The comparison of private versus public reporting calls for further studies of the reputation effects of public reporting. In contrast to the change pathway that emphasizes professional commitment to improve, the reputation pathway emphasizes the fact that public reports could alter the reputation of organizations, which in turn could play a crucial role in motivating providers to improve quality of care. Health care organizations may attempt to improve not only their performance relative to professional standards, but also attempt to improve the relative rankings in the public reports to protect their reputation. Even if patients do not select their providers based on quality information in the public reports, public perception of providers' quality could still be impacted after the public starts to form an opinion about high-ranked or low-ranked performers and individual consumers discuss such information with each other (Hibbard, 2008; Hibbard, Stockard, & Tusler, 2005b).

2.3.3 Unintended Consequences

From the policymaker's perspective, the primary objective of measuring and public reporting of health care quality is to create an environment that forces providers to deliver better quality of care. Poorly performing providers are expected to change their practices to improve quality, limit types of care that are rated poorly, or exit the health care market. But as already discussed, the impact of public reporting depends on both consumers and providers responding in the way that policymakers intended. Besides the fact that limited use of publicly reported quality information could curb on the effectiveness of this public policy,

there is also evidence that providers can respond to this public policy in unexpected ways. Research shows that the unintended consequences of public disclosure of health care quality include: adverse selection and gaming the system (Werner, Konetzka, & Kruse, 2009).

On the one hand, providers may turn away the most severely ill patients to avoid poor outcomes and poor ratings. On the other hand, highly rated providers may attract more severely ill patients, which could create new challenges for those organizations to keep achieving high level of quality outcomes and maintaining high ranking on the next public reports. In the economics literature, this unintended consequence is called "adverse selection", which refers to a market transaction that bad products or services are more likely to be selected because buyers and sellers have asymmetric information or can access to different information about why particular products or services are selected (Cardon & Hendel, 2001; Finkelstein & McGarry, 2006). Empirical research found that cardiac surgeons in states with Coronary Artery Bypass Graft (CABG) public reports have turned away the most severely ill patients to avoid poor outcomes and lower publicly reported ratings (Dranove, Kessler, McClellan, & Satterthwaite, 2003; Hannan et al., 1994a; Peterson et al., 1998). Moreover, without risk adjustment of data, health delivery organizations may respond to the public report in another unexpected way. A study of public reporting of nursing facilities' quality found that highly ranked nursing facilities attract sicker patients, so some of high-ranking facilities began "gaming the system" by changing the way they documented medical conditions, to make

their patients seem healthier and to maintain their rank on subsequent performance reports (Werner & Asch, 2005).

Therefore, if providers select their patients based on risk profile to avoid being reported as a poor performer or begin gaming the system instead of improving quality, patients may not receive a better quality of care, and in fact can be worse-off. Public performance ranking, if not well risk-adjusted, may cause providers to turn away the most severely ill patients to avoid poor outcomes and lower publicly reported rating. From the policymaker's perspective, this can lead to poor quality as well. To avoid these unintended consequences, publicly reported quality measures need to be risk-adjusted, particularly the report of outcomes quality measures. If providers do not trust the validity and reliability of reported quality measures, public reporting may not drive quality of care as policymakers intended.

2.4. Reputation of Health Care Organizations

As discussed earlier, the impacts of publicly reported quality on provider organization's reputation is a potential casual mechanism to explain the variation of quality improvements in health services organizations. From the perspective of provider organizations, public disclosure of quality performance data could affect their reputation if their reported quality performance is below the undesirable level. Thus, reputation could be a primary driving force for organizational quality responses after health care quality has been publicly reported. Drawing from organizational theory and management literature, the

definitions of organization's reputation and its relationship with quality are reviewed in the following section. Antecedents and consequences of organization's reputation are also discussed.

Reputation is considered a comparatively complex theoretical concept. Previous studies in the organizational theory and management literature have used many different definitions of organization's reputation. Nonetheless, scholars have conceptualized that two major schools of thought contributed to the definitions of organization's reputation: an economics perspective and a sociology perspective (Bergh, Ketchen, Boyd, & Bergh, 2010; Rindova, Williamson, & Petkova, 2010; Rindova et al., 2005).

2.4.1 Organization's Reputation as Perceived Quality

Scholars who study organization's reputation from an economics perspective usually define reputation as "expectations or estimations of a particular attribute of an organization" (Rindova et al., 2005). From this view, an organization's reputation can be established over a period of time on the basis of past actions through which the organizations signal their quality to stakeholders. Expectations and beliefs of consumers about products or services quality lead to reputation (Allen, 1984; Shapiro, 1982; Shapiro, 1983). The perception of competitors or rival organizations about the likelihood that an organization will behave in certain ways also can be considered the reputation of organization (Kreps & Wilson, 1982; Milgrom & Roberts, 1986).

From this view, an organization's reputation is defined by the organization's "perceived quality". The expectations or estimation of the ability of the organization to produce quality products or services is a primary attribute of the organization's reputation from the perspective of stakeholders. However, this relationship can be reciprocal—a direct relationship between quality and reputation also can be inferred. Not only can quality of products or services of organizations determine their reputation, but organizations may also have an incentive to improve the quality of their products or services in order to build or to protect their reputation. In fact, organizations may strategically use public reporting to signal their quality to stakeholders in order to establish or maintain reputation over a period of time, especially when the level of their quality is favorable (Dawar & Parker, 1994). Perceived quality is therefore a dimension of reputation that has implications in terms of marketing strategy of products or services, because it reflects a model of quality perception process of customers (Steenkamp, 1990). The recognition of the distinction between quality cues and quality attributes is the key to closing the gap between the quality perceptions of the marketing managers and that of the customers.

Considering an organization's reputation as perceived quality in the minds of stakeholders, organizations may send the signal of quality to the stakeholders through different channels, particularly if the true quality of their products or services is hardly observed or accessed. This may be particularly true in health care, where quality of clinical process and clinical outcomes is difficult to observe or accurately predict (Cardon & Hendel, 2001). However, there is a

cost associated with sending such signal to the public, so organizations may choose not to do so if the benefits of signaling are not worth the cost (Spence, 1973, 2002). Drawing on the Spence's (1973) signaling theory, when it is worth the cost of measuring and reporting organizations may voluntarily report such quality measures to the public. The voluntary disclosed quality information, therefore, could be seen as a signal from the organization to influence the stakeholder's perception of their service quality.

2.4.2 Organization's Reputation as Prominence

Scholars who study organizational reputation from a sociology perspective, especially those who draw on the institutional theories, tend to see reputation as "a global impression that represents how stakeholders collectively perceive the organization" (Rindova et al., 2005). Then, reputation is the prominence of an organization in the minds of stakeholders, which can be established by information exchanges and social influence among various actors interacting in an organizational field. Stakeholders' knowledge and emotional reactions toward an organization also can lead to reputation (Davies & Miles, 1998; Deephouse & Carter, 2005; Fombrun, 1996). Some organizations could become prominent or more visible than other organizations in the same organizational field, because they gain disproportionate amounts of public attention due to nonspecific impressions and beliefs about the organizations (Kuran & Sunstein, 1999). For instance, large organizations generally gain more

public attention from the public than smaller organizations regardless of other attributes of those organizations.

From this view, organizational reputation can be considered a collective perception of an organization from all stakeholders' perspectives (Brown et al., 2006; Fombrun & Shanley, 1990; Fombrun, 1996; Hatch & Schultz, 1997). Different stakeholders of the same organization can have different expectations and satisfiers. For instance, "organizational image" or how external stakeholders such as consumers see an organization (Bernstein, 1984) can be vastly different from "organizational identity" or the perception of internal stakeholders such as employees of that organization (Albert & Whetten, 1985). In fact, external image and internal identity are causally linked, and therefore one can drive the other (Davies & Miles, 1998). Prominent organizations not only have to provide reliability of products or services for consumers, but also credibility for investors, trust for employees, and responsibility for the community (Fombrun & Shanley, 1990). On the other hand, the benefits of organizations with favorable reputation from this view may include "premium price for products, lower cost of labors and capital, improve loyalty from employees, greater latitude in decision making and a cushion of goodwill when crises hit" (Fombrun, 1996).

While organizations may signal quality information to their stakeholders to influence public perceptions about the organization's abilities to produce quality products or services, the prominence of organization can be established through the collective perception of an organization from all stakeholders'

perspectives. With limited information or uncertainty conditions, stakeholders usually look to the opinions and choices of the others to come up with impressions of an organization (Davis, Greve, & Rao, 2001; Rao, 1994). In any organizational field, institutional intermediaries and high-status organizations are likely to have a particularly strong influence on the collective perception of all stakeholders (Davis et al., 2001; Kuran & Sunstein, 1999). Choices and opinions of these third parties regarding the organizations can influence the organizations' prominence in the mind of stakeholders. For example, in the same organization field where many organizations offer the same kinds of products or services to consumers, organizations that have been reported or endorsed by the mass media can become more prominent than other organizations.

2.5. Organizational Response to Signals in the Environment

Public performance rankings are expected to influence quality improvement in health care organizations through several causal mechanisms as discussed. But after their performance has been measured, ranked, and publicly reported, we still can observe quality improvement only in some organizations, no quality change in others, and even negative change in some others. Organizational factors that potentially explain variation in organizational quality improvement in response to public reporting of organizational quality are discussed in the following sections.

In the organization theory literature, several streams of research drawing on the institutional theories and managerial sense-making and cognitive process literature suggest that the interpretation of organizational ranking by managers is the key to understanding variation of organizational response to public reporting (Martins, 2005). Previous research has identified different kinds of signals, albeit interrelated, that organizations usually respond to, including: 1) signals related to competitors and peers; 2) signals related to the institutional environment; and 3) signals related to organizational reputation and status.

2.5.1 Competition and Peer Comparison

Organization studies attempt to understand and predict rivalry between firms in their search of a competitive position within a particular industry. In order make a strategic plan to compete in an industry, organizations usually perform an industry analysis and limit their attention to the actions taken by only a small number of competitors in the industry. Although organizations may compete with all other organizations that offer the same product or services in the same market, organizations that use the quality level of products or services as a strategy to compete in the market would look at organizations who also use the level of quality as a competitive strategy as a reference (Fiegenbaum & Thomas, 1995; Smith, Grimm, Wally, & Young, 1997). That is, organizations do not compare themselves to all other organizations in the market, but organizations conduct "peer comparison" to determine how well they compete within a given market (Osborne, Stubbart, & Ramaprasad, 2001).

"Strategic group" (Hunt, 1972 ; Porter, 1980) is a concept in strategic management that is commonly used for the identification of groups of peer organizations that compare their performance against each other. By definition, a strategic group consists of a number of organizations within the same industry or the same services category that make similar strategy decisions or use similar business models (Hunt, 1972 ; McGee & Thomas, 1986; Peteraf & Shanley, 1997; Porter, 1980; Reger & Huff, 1993). Because members of the same strategic group have a similar approach to compete in a given industry, they usually compete with each other and not with organizations outside their own strategic group (Reger & Huff, 1993). Although they are not necessarily an all-inclusive group of mutual competitors, members of the same strategic group that compete in the same market usually are the direct competitors of each other.

The traditional approach to studying strategic groups is to select organizational variables that capture product, market, and resource commitments, and then use quantitative analytical methods, such as "cluster analysis" (Harrigan, 1985) or the "nearest neighbor method" (Byrne et al., 2009) to group similar organizations into the same strategic groups. An alternative approach is "cognitive or perceived strategic group" (Reger & Huff, 1993). Drawing from research in cognitive and social psychology, the perceived strategic group approach considers that managers usually use grouping templates to simplify their perceptions of the industry landscape, so strategic groups can be analyzed by using the perception of managers, instead of using archival data.

Research to date has not well established a theory of how health services organizations determine their peer organizations, especially in the setting of public reports of health care quality data. It is plausible that health care organizations may not compare their performance to that of all other organizations on the same pubic reports. Instead, they may use membership in a particular strategic group as the rationale to identify their peer organizations with which they are more likely to compare themselves. From this vantage point, providers and administrators in health care organizations could interpret their organizational performance rankings and determine a need for quality improvements by comparing their performance with peer organizations within the same strategic group.

2.5.2 Institutional Environment

Institutional theorists argue that every organization consists of two essential dimensions, namely the "technical dimension" that carries on the day-to-day work, and the "institutional dimension" that is visible to the public (Meyer & Rowan, 1977). When organizations face the same set of uncertainty in the organizational environment, institutional forces can cause organizations to conform to the standards or "rules of the game," which make organizations in a similar population look alike from the institutional dimension particularly when the public is not able to observe the technical core of organizations (DiMaggio & Powell, 1983). Conforming to the institution leads to "legitimacy" that increases organization's survival chances, although the effects can vary over time

conditional upon the nature of the institutional environment at the moment (Ruef & Scott, 1998).

Because public reporting of organizational performance can influence key resource providers of organizations, including customers who are the most important stakeholders for survival (Espeland & Sauder, 2007; Sauder & Espeland, 2009), public reporting arguably is an important feature in the institutional environment of organizations. Similar to the effects of competition, organizations are likely to improve their performance if information on the public reports influences the decisions of their stakeholders or customers in an unfavorable fashion.

Organizations may conform to this institutional pressure by improving organizational performance through various organizational changes that are related to what is measured on the public reports. Organizations "react" to public reporting just like people change their behaviors in reaction to being evaluated, observed, or measured, as public measures "change expectations and permeate institutions" (Espeland & Sauder, 2007). Nevertheless, because organizations conform to the institution of public reporting in order to be "legitimate" players in an organizational field, organizational responses to public reporting are likely to be conditional upon the credentials or authority of the reporters, the nature of sanctions, the routing of information, and the nature of public disclosure and interest of mass media (Pawson et al., 2005).

There is agreement in the literature that organizational rankings on public reports can be a source of normative or coercive pressure on organizations, forcing them to conform to the criteria used by the rankings, particularly if the public reports are generated by legitimate authorities like government agencies (Martins, 2005; Sauder & Espeland, 2009). Along the same lines, in an organizational field where there are many public reporting programs, the credentials of each public report are likely to determine whether organizations will respond to the negative information on each particular report by conforming to its ranking criteria or not (Pawson et al., 2005).

However, existing studies mostly have investigated public reporting programs that are either mandatory by government agencies, after which organizations only passively react to their rankings on those reports. In the heath care context, there are emerging voluntary pubic reporting programs for organizations that actively publish and promote their results, providing a different context for quality. For those voluntary public reporting programs, in which non-participating organizations can compare their performance to that of organizations that have already been actively participating and already publicly reported, the impacts of public reporting on the non-reporting organizations is little known. Unlike mandatory pubic reporting, managers can make a decision whether their organizations should participate or actively adopt public reporting programs as an organizational practice.

Institutional theories could help predicting the impacts of public disclosure of quality on both reporting organizations and non-reporting organizations. The classic model that has been widely used in the studies that applied institutional theories to diffusion of organizational practices is the "two-stage model", which suggests that early adopters usually seek technical gains from adoption, while later adopters are primarily interested in the social benefits of appearing legitimate (Tolbert & Zucker, 1983). In health care management, a study of the diffusion of Total Quality Management (TQM) in hospitals also found that early adopters were motivated by efficiency concerns, but later adopters were instead motivated primarily by legitimacy concerns after TQM practices became institutionalized in the health care organizational field (Westphal, Gulati, & Shortell, 1997).

Kenney and Fiss (2009) have extended this two-stage model by reexamining the role of the manager's motivation in practice diffusion. Drawing on social psychology and decision- making literature to improve the classic institutional argument, they observed that legitimacy and efficiency are the concern of both early and later adopters, and the progress of diffusion does not make economic and social concerns mutually exclusive. In fact, early adopters tend to have a greater extent of practice implementation, because early adopters are driven by "opportunity" to seek economic and social gains from adopting new practices, while later adopters are driven by "threat" and more concerned with avoiding economic and social losses from not adopting new practices (Kennedy & Fiss, 2009).

Therefore, organizations participating early in voluntary public reports could be more engaged in the real quality improvement or the changes of their technical core, when compared to organizations that join the voluntary public report program in later years. From the institutional perspective, this could be an explanation of why we can observe variation of quality improvement after public disclosure of quality across organizations.

2.5.3 Organizational Reputation and Status

In addition to how long public report programs have existed and how long each organization has been participating in public reporting, the reputation and the status of organizations also can determine how public reporting programs can influence quality improvement in those organizations. While legitimacy emphasizes social acceptance from adhering to social norms and expectations, reputation and status emphasizes comparison among organizations (Deephouse & Carter, 2005).

The influence of reputation on organizational performance has long been a major focus in organizational studies, especially in the strategic management literature. As discussed earlier, reviews of research on organizational reputation found that two schools of thought have contributed to two major definitions of organizational reputation (Benjamin & Podolny, 1999; Rindova et al., 2010). Defining reputation as perceived quality, organizations can establish reputations over a period of time by signaling to the stakeholders about their quality. Defining reputation as how prominent an organization is in the minds of

stakeholders, an organization's reputation can be established through information exchanges and endorsement of socially influence actors in an organizational field.

Organizations have incentives to establish and protect their reputation. Both prominence and perceived quality help reduce the uncertainty of stakeholders that dealing with the reputable organizations, although through different mechanisms. Perceived quality may have positive effects on the prices that customers are willing to pay as it increases their confidence in the quality of an organization's products or services. Organization prominence may also have positive effects on the prices that customers are willing to pay because the collective recognition of that organization in its organizational field provide consumers the "social proof" (Rao, 1994), or provide assurance to those who evaluate consumers' choices (Rindova & Fombrun, 1999), which ultimately increases the demands for products or services of prominent organizations.

Reputation has to be distinguished from status, which is another important sociological concept. The concept of status can be traced back to Max Weber, who viewed status as "class position" or "an effective claim to social esteem in terms of positive or negative privileges" (Washington & Zajac, 2005). In contrast to reputation as described earlier, the status of organizations in any organizational field is linked to positional or relational elements of social structure that can exist independently of the organization's past actions, quality, or economic performance. The concept of status is relatively closer to the

prominence aspect of reputation, as organizations with higher status can gain more attention from mass media and the public in general (Podolny, 1993). As a result, they can enjoy a greater social influence among various actors interacting in the organizational field, which is a predecessor of organizational prominence.

Similar to reputation, an organization's status also can influence consumer's choice. However, the benefits of being in a higher status are usually described as privileges rather than as merit-based or achievement-based rewards that are suggested by the concept of reputation. As Washington and Zajac (2005) noted, "an organization having associations with high-status organizations is likely to enjoy the privileges of high status in subsequent periods, independently of its competitive performance in those periods" (Washington & Zajac, 2005). Because status is taken for granted while reputation has to be earned, a decline in organizational performance within a particular period of time would result into a smaller decline in organizational status than in reputation (Martins, 2005). In the health care context, some organizations may be given a higher status than others. For instance, academic medical centers, which are organizations that have an affiliation with universities or medical schools, enjoy privileges of higher professional status. The public may believe academic health centers provide better quality of care, although the empirical evidence does not always support that notion (Gordon & Rosenthal, 1996). Examples of "reputation-earners" might be small medical clinics that have no affiliation with academic medical centers.

It is not well known whether publicly disclosed quality performance could help health care organizations establish their reputations or how it could alter their prior reputations. It is plausible that an organization's reputation can affect how the organization would react to their public performance rankings because organizations want to protect their established reputation. In contrast, organizations with high status may care less about their rankings on public reports, so negative information on public reports may have more impact on organizations that rely on earned reputation rather than given status.

2.6. Summary of the Literature Review

The review of related literature shows that health care quality is widely defined by the systems-based framework of structure, process and outcome, and process indicators are usually considered good measures of health care quality particularly from the standpoint of quality improvement. Two major groups of the determinants of quality in health services organizations are motivation for quality and ability to improve quality. The causal mechanisms underlying how public disclosure of quality data leads to health care quality improvement are closely related to these quality determinants.

Empirical evidence to date is mixed on whether and how publicly disclosed quality affects an organization's response to public disclosure of health care quality data. The potential casual mechanisms are the impact of publicly reported quality on organizational reputation on different stakeholders of health care organizations, including patients, staffs, and donors. Further research could

pursue a finer-grained examination of the role of reputation in organizational response to public reporting of health care quality. The theoretical arguments and the conceptual model of this dissertation research were developed based on this literature review, and are presented in the next chapter.

3. Theory Development

This chapter presents the conceptual model of this dissertation research. The theoretical arguments as well as their qualifiers and limitations are discussed. The hypotheses for the empirical study are also presented.

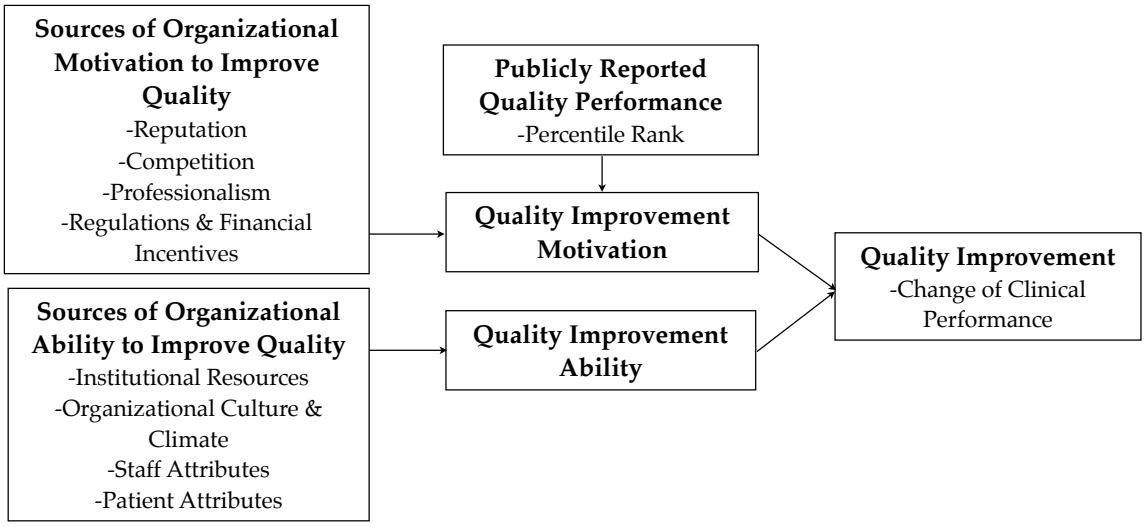
3.1. Reputation and Public Disclosure of Health Care Quality

As discussed in the literature review, the determinants of quality in health services organizations can be categorized into two major groups, including 1) organizational factors that determine motivation for quality, and 2) organizational factors that determine ability to improve quality. Hence, quality of care that we can observe at any point of time is a function of prior motivation for quality, and baseline ability to improve quality.

Literature suggests that a health care organization's ability to improve quality can be influenced by institutional resources, organizational culture, organizational climate, staff attributes, and patients' attributes. An organization's motivation for quality improvement may come from an intrinsic source, such as professionalism of providers in the organization, or from aspirations to build and protect the organization's reputation. Motivations for quality improvement also could come from external sources, such as competition with other organizations, or response to financial incentives or regulatory policies. However, the influence of an organization's performance ranking on public reports and the influence of its interaction with other motivational factors are not well known.

The conceptual framework of health care quality improvement in the context of public reporting is illustrated in Figure 1. Motivation for quality improvement potentially can explain variation in the observed quality of health care organizations. This dissertation research is focused particularly on determinants of an organization's quality response after the organization's quality performance has been publicly reported.

Figure 1: Conceptual framework of health care quality improvement



Organizational studies and health services research literature suggest that health care organizations may improve quality of care after disclosing their quality performance to the public as a response to signals related to competition and consumer selection, peer comparison and professionalism, and the institutional environment. Hibbard et al. (2005) first proposed that public disclosure of an organization's quality performance could have an impact on the organization's reputation. Their study suggests that hospitals that publicly

disclose their performance believe that public reports potentially can affect their public image but not their market share. The research found greater quality improvement efforts in organizations whose performance was publicly reported than in organizations that only obtained private performance reports and used it as an internal feedback system (Hibbard, 2008; Hibbard et al., 2005a, b). There appears to be an added value of reporting quality performance by making it affect the organization's reputation in the public, as compared to simply using quality performance reports as a feedback mechanism for providers within health care organizations.

However, while the conceptual model of Hibbard and colleagues may well explain the difference in quality improvement efforts between health care organizations whose performance has been publicly disclosed or not (Hibbard, 2008), the model does not explicitly explain how provider organizations might respond over time, particularly when most provider organizations in the market, if not all, have already disclosed quality performance to the public. Moreover, while previous studies consider good performance on public reports enhancing an organization's reputation while poor performance diminishes it, the studies fail to acknowledge that over time organizations might already have developed or improved their reputations from other sources. A health care organization's response to public performance ranking also could be contingent upon the prior reputations of the organization. Therefore, to accurately predict reputation effects from public performance ranking, prior reputation and reputation gain or loss from public reports need to be considered.

The next sections discuss the theoretical proposition for an analysis of quality improvement in health care organizations after their quality performance has been publicly disclosed over time, as well as the role of prior reputations of health care organizations in determining their quality improvement response to public performance ranking.

3.2. Organizational Response to Quality Ranking

I argue that health care organizations with a relatively low performance ranking on public reports of health care quality will have a greater degree of improved quality performance than counterparts that obtain a relatively high ranking on the same public report. There are several reasons and evidence that support my claim.

First, health care organizations evaluate their quality performance in satisficing terms. Every organization is constantly being evaluated by its stakeholders. Patents and their family, medical staffs, employees, and donors are constantly evaluating health care organizations. Under norms of rationality, organizations are expected to maximize the attainment of the organization's purposes (Thompson, 1967). However, when it is not clear what the gold standard is or when it is uncertain what technical knowledge is needed to achieve such standards, organizations under norms of rationality are driven to attain acceptable or desirable states—"satisficing" rather than "maximizing" (Cyert & March, 1963; March & Simon, 1958; Thompson, 1967). In other words, when there is no efficient measure of the fitness for the future, organizations

usually conduct self-assessment by comparing their quality performance with their past performance or with other organizations (Thompson, 1967). Many health care services have no clear-cut quality standards, especially when quality is measured at the population level rather than at the level of individual patients. After disclosing quality performance to the public, health care organizations that obtain a low performance ranking are more likely to be dissatisfied, and therefore are more driven to improve their relative quality performance on the next public reports. In contrast, health care organizations that obtain a relative high quality score or high performance ranking are more likely to be satisfied with their performance than those with lower rankings. Highly ranked organizations may also keep improving quality of care, but not necessarily with the same urgency or level of motivation as lowly ranked organizations.

Secondly, health care organizations match up their quality performance to that of other comparable organizations, particularly organizations within the same strategic group. Organizations can determine the desirable quality of their products or services by comparing to the comparable organizations, but not necessarily to all competitors in the market (Porac, Thomas, Wilson, Paton, & Kanfer, 1995). Administrators of health care organizations can use membership of the "strategic group" (Hunt, 1972 ; Porter, 1980) to identify their comparable organizations. Literature in cognitive and social psychology, particularly a stream of research related to "perceived strategic group (cognitive strategic group)" suggests that managers in organizations usually use grouping templates to simplify their perceptions of the industry landscape, and therefore strategic

groups can be analyzed by using the perceptions of managers (Reger & Huff, 1993).

Organizations that provide the same kinds of health services, such as primary care clinics that take care of patients with diabetes could be cognitively stratified as members of the same perceived strategic group. The first cohort of clinics that actively and voluntarily disclosed their quality performance on the very first report made similar strategic decisions on quality management, so they are more likely to be considered the members of the same perceived strategic group. Medical clinics that are pats of larger medial systems also could be considered the members of the same strategic group. Public performance rankings can create a concern in organizations whose comparable organizations in the same strategic group perform better in the same public report.

Thirdly, health care organizations conform to standards and norms in the professional environment, and they respond to their ranking on public performance reports to obtain legitimacy and support from their stakeholders. According to institutional theory, an organization may improve or maintain its quality performance in order to obtain legitimacy and support from the external environment. Both formal and informal social norms that govern organizational behaviors are considered the "rule of the games", or the "institution" (Meyer & Rowan, 1977). Organizational rankings on public reports can be a source of normative or coercive pressure on organizations, forcing them to conform to the criteria used by the rankings (Martins, 2005). Whether an organization is able to

obtain legitimacy also depends upon the performance of the peer organizations within the same environment, as reflected by market share, reputation, and professional standards.

When a health care organization adopts an external evaluation such as public performance ranking as their own internal evaluation, it conforms to standards and norms in the professional environment. Once public disclosure of health care quality becomes the institutional norm in health care settings, provider organizations are more likely to survive if they obtain a high ranking on the public reports. Public performance rankings relative to comparable organizations in the same strategic group could promote the tight coupling between goals or missions of organizations and the goal to improve their performance and ranking (Sauder & Espeland, 2009). When improving its quality performance and improving its rankings on the public report become the same goal, performance ranking on public reports will facilitate quality improvement responses in those organizations (Benjamin & Podolny, 1999; Fombrun & Shanley, 1990).

Hypothesis 1: *Among health care organizations that voluntarily disclose quality performance to the public, low organizational ranking will lead to a greater degree of quality improvement.*

The proposed theoretical argument has some limitations and reservations. The relationship between low performance ranking on public reports and a

greater degree of quality improvement is valid only when certain other factors are present.

The argument is valid under an assumption that health care organizations evaluate their quality performance in "satisficing" terms. But if it is relatively clear what the gold standard is or when the technical knowledge needed to achieve such standards is well known, organizations under norms of rationality would be driven to maximize the attainable of organizational purposes rather than being satisfied with an acceptable state (Cyert & March, 1963; March & Simon, 1958; Thompson, 1967).

Furthermore, improving some health care quality measures might be more related to learning activities that identify current best practices or "learn-what", rather than learning activities that carry out practices in a given setting or "learn-how" (Tucker et al., 2007). For instance, considering the improvement of immunization rate of preventable diseases in primary care clinics, the organization's goal is relatively clear: every primary care clinic wants to achieve 100% of immunization rate in the eligible population. Improving immunization rates is a relatively straightforward task that may require only learn-what activities such as exploring what population requires more immunizations, while learn-how activities such as planning how to immunize patients is probably already routine work in most clinics. Thus, public performance ranking of clinic's immunization rate would be less influential on subsequent change of

immunization rate, as it is probably more important for primary care clinics to reach the goal of 100% immunization rate.

In contrast, the technical knowledge of how to improve quality outcome measures of many complicated medical conditions is not well known yet. It could be partly because there is a more rapid advancement of medical knowledge that can create disagreement among providers over the effectiveness of recommended treatments or which best practices should be adopted, and partly because the demands of each patient can be vastly different from one another creating difficulties to standardize care process. For instance, a standard of what percentage of diabetic patients in primary care clinics should achieve the optimal care has not yet been established. Hence, in this particular context, primary care clinics would be driven to attain acceptable or desirable states by comparing their quality performance with their past performance or with other organizations.

Additionally, the proposition is valid under an assumption that the improvement of quality measures on the subsequent reports reflects the motivation for quality, rather than ability of organizations to improve quality. If ability of organizations to provide quality of care is limited by organizational resources or other managerial issues, we might not be able to observe the relationship between public performance ranking and subsequent quality improvement. Other sources of motivation for quality also can confound the effects of low ranking. As suggested by the selection pathway, provider

organizations also can be motivated to improve their quality performance if the public reports show that patients have a better choice for their health care services. The degree of competition, especially in small health care markets such as a local market for primary care clinics, is expected to affect the organization's aspiration to improve its performance. The number of competitors in a local market could moderate the relationship between the performance ranking and the likelihood of having an improved performance in the subsequent reports.

Furthermore, institutional theory assumes that individual organizations have a preference to conform to the norm in order to reduce uncertainty that threatens fitness for the future. This implies that survival of organizations depends on being perceived as a legitimate organization in that particular environment. Health care organizations would not react to their public ranking if even the lowest ranking does not negatively affect organizational legitimacy. Moreover, the institution is assumed to persist and remain relatively stable over time. If in the long run obtaining high rankings on public reports does not contribute to an organization's reputation, the relationship between low ranking and improving quality could be invalidated. Public reporting itself cannot lose its legitimacy. For instance, provider organizations have to be ensured of validity and reliability of reported quality measures. Measuring process quality and carefully risk-adjusting quality outcomes and ensuring that providers do trust the validity and reliability of reported quality measures could help prevent adverse selection and "gaming the system" behaviors.

If the credibility of the quality measures is questionable, providers are likely to focus on criticism of the measurement process of the public reporting system, rather than focus on improving the care delivery process. Evidence from one study showed that many physicians distrusted and attempted to discredit quality data, and some physicians responded defensively by demanding that their managers' performance also be judged by using report cards (Kaplan, Bauers, Beloff, & Tindall, 2000). Moreover, some measurements are not reliable for application at the level of individual providers because the limited volume of services. Hofer and his colleagues show that, in profiling individual physician's report cards for diabetes care, each physician would need to have more than 100 patients with diabetes in a panel for profiles to have a reliability of 0.80 or better. Otherwise, physicians can easily avoid or deselect patients with high prior costs, poor adherence, or response to treatments (Hofer et al., 1999). Therefore, the selection of level of analysis and appropriate measures is critical in evaluating the impact of public reporting of health care quality.

Another credibility issue is related to the source of data. Administrative data can help construct public reports of health care organization performance at a relatively low cost, so most public reports of physician performance are based on administrative data from health insurance systems. But this approach risks missing important dimensions of quality that could be addressed with more clinically oriented data sources. Moreover, the claims data or administrative data are usually based on samples of the patients. In these scenarios, providers may be less likely to agree or to believe that the performance measures represent their

overall clinical performance, particularly when the data were collected by having an external organization randomly sample their patients.

Lastly, the voluntary public disclosure of quality data provides a different context for quality management theories and practices, when compared to mandatory pubic reporting. Although we have only limited empirical evidence of what exactly are the incentives of health services organizations such as hospitals or primary care clinics to voluntarily disclose quality data, studies in the related context of health insurance markets provide some clues. Wholey et al. (1992) found that Health Maintenance Organizations (HMOs) in a more competitive market were more likely to voluntarily disclose their performance data, indicating that competition in the market is a potential incentive for organizations to voluntarily disclose their quality data (Wholey, Christianson, Sanchez, Feldman, & Peterson, 1992). Jin (2005) found that HMOs in highly competitive market had a low disclosure rate, but they were likely to disclose their data when the disclosure rate of the competitors decreased (Jin, 2005). Evidence suggests that not every organization uses quality disclosure as a strategy to differentiate itself from competitors.

Therefore, we may not observe strong effects of public performance ranking on quality improvement, if health care organizations do not actively publish and promote their quality performance to the public, but compete in the market by a different strategy. The relationship between low performance rankings on public reports and a greater degree of quality improvement is more

likely to be valid if organizations are driven by "opportunity" to seek economic and social gains from public reporting of their performance. Early adaptors are driven by "opportunity" to seek economic and social gains from public reporting of their performance, while late adopters can be driven by "threat" and more concerned with avoiding economic and social losses from not reporting (Kennedy and Fiss, 2009). For the late adopters of public reporting, we may not be able to observe any quality improvement if they join the public reporting program because they simply want to appear legitimate (Tolbert and Zucker, 1983, Westphal et al., 1997).

3.3. Prior Reputations and Contingent Effects of Quality Ranking

I argue that public performance rankings have heterogeneous effects on the degree of quality improvement in health care organizations, contingent upon the prior reputation of organizations. In other words, prior reputations of health care organizations moderate the relationship between public performance ranking on public reports of health care quality and the degree of quality improvement. There are several reasons and evidence that support my claim.

First, prior reputations give rise to stakeholders' expectations that particular health care organizations will provide high quality of care. From the perspective of providers and administrators in reputable health care organizations, a performance ranking that is not aligned with such expectations could be an additional source of motivation for quality improvement. Organizations with strong reputations are more likely to be organizations that

compete in the market by using a "differentiation strategy" (Porter, 1980; Porter, 1998). If customers and stakeholders of those organizations value high quality of service, organizations with high reputations have a strong incentive to continue improving the quality of services to maintain their advantage over their competitors. Therefore, high-reputation organizations will be more likely to respond to public reporting with positive changes in quality performance.

From this perspective, reputation is a long-term, intangible, and important asset that organizations have developed over time. An organization's high rankings on public reports likely bring about additional positive reputation to the organization. As a result, organizational members will strive to maintain the organization's high reputation by continuing to improve quality of care. Organizations that have established a quality perception or are already prominent in the mind of stakeholders, such as large organizations or organizations that often been favorably reported by mass media, have more to lose if their poor performance is publicly reported. Given a relatively lower performance score on the current pubic report, organizations with established high-quality reputations are more likely to have an improved performance score in the subsequent report.

In addition, organizational behavior and social psychology literature suggests that people can change their attitudes and behaviors after their experiences clash with expectations. Cognitive dissonance theory suggests that people usually feel uncomfortable when holding conflicting ideas

simultaneously, and when experiencing such discomfort people can reduce cognitive dissonance by changing their attitudes, beliefs and actions (Festinger, 1957). Members of high-reputation health care organizations such as medical staffs and administrators can experience cognitive dissonance when they obtain a relatively low performance ranking. The discrepancy between the new information on ranking and the old information on reputation can motivate an organization to resolve dissonance. Organizations could put more effort to quality improvement activities to obtain a high ranking on the next report, so that members in the organization could resolve cognitive dissonance between their reputation and their public ranking. Low rankings of high-reputation organizations will surprise and challenge members of the organization, and they will improve quality in order to repair the possible damage to the organization's high reputation.

As a result, public reporting of quality performance will likely stimulate a stronger response from organizations with high reputations. The status quo of the organization's reputation could influence how organizations respond to their public performance rankings, and the strength of an organization's quality improvement response to a low public performance ranking could depend on prior reputation and ranking in the reports. In other words, the interaction effects of public performance ranking and established reputation could predict the subsequent change of quality performance more precisely than the prediction by public performance ranking alone.

Hypothesis 2: *Prior reputations of health care organizations moderate the relationship between public performance ranking on public reports of health care quality and the degree of quality improvement, such that the effects of organizations' performance rankings on the degree of quality improvement in high-reputation health care organizations is different from that of low-reputation organizations.*

The proposition that organizations' performance rankings have heterogeneous effects on the degree of quality improvement in health care organizations based on the established reputation of organizations has some limitations and reservations. The moderating effects of prior reputation on the relationship between performance ranking on public reports and degree of quality improvement are valid only when the following qualifiers are present.

First of all, the interaction effects of prior reputation and public performance ranking on the degree of quality improvement are justifiable only if the direct effects of organizational ranking on quality improvement are validated. As discussed earlier, the relationship between performance ranking on public reports and degree of quality improvement requires that health care organizations evaluate their quality performance in satisficing terms, compare their quality performance to organizations within the same strategic group, conform with standards and norms in the professional environment, and respond to their ranking on public performance reports to obtain legitimacy and support from their stakeholders. Without these qualifiers for the direct effects of

public performance ranking, its heterogeneous effects based on prior reputations also can be nullified.

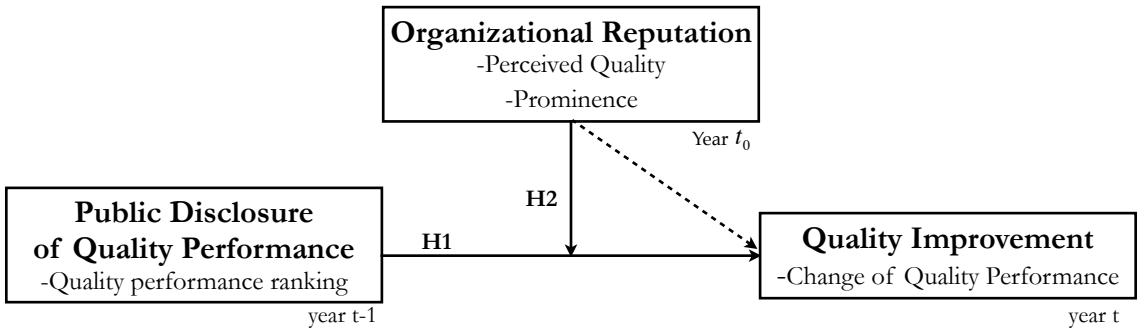
Moreover, to observe an effect of public performance ranking in organization with prior reputations, stakeholders of such organizations have to consider that low ranking on public reports can be conflicted with their established reputations, or at least consider that a low ranking on public reports can contribute to their future reputations. Few studies have directly compared public reporting of health care quality with privately distributed performance reports (Hibbard et al., 2005a, b). How rankings on public reports can affect the established reputations of health care organizations or how rankings on public reports can contribute to their future reputations are not clearly understood.

Lastly, health care quality measures usually are measured and publicly reported by diseases or by medical interventions, rather than reporting a single comprehensive health care quality measure for each organization. Organizational rankings of quality performance in various medical conditions could collectively give rise to the future reputation of health care organizations, but it is less likely that performance rankings of a single medical condition will have an immediate impact on the overall reputation of organizations. It may take time for stakeholders to reconcile the established reputation and an emerging reputation from an organization's performance rankings of various medical conditions. However, evidence shows that bad news such as unexpected deaths in hospitals can have an immediate negative impact on provider's reputation

(Mennemeyer et al., 1997). Therefore, if quality measures can capture such extreme events, public reporting could affect the reputation of health care organizations regardless of the established reputations of those organizations.

In summary, the conceptual model and the hypotheses to be tested in this study are illustrated in Figure 2.

Figure 2: Conceptual model of the study



4. Study Methods

4.1. Research Design

This dissertation research is an observational study with analysis of a secondary data. Archival data from multiple sources were obtained to create a new panel data set, including public rankings of quality performance and subsequent quality improvement in 156 primary care clinics in the state of Minnesota. This panel dataset also was used to examine the effect of organizations' prior reputations on their quality responses to public performance rankings. The study employed nonequivalent control group quasi-experimental research design (Campbell & Stanley, 1963). The degree of quality improvement in clinics with high prior performance rankings was compared with that of clinics with low prior performance rankings. In addition, the degree of quality improvement in clinics with high reputations also was compared with that of clinics without high reputations.

The study participants were 156 primary care clinics in the state of Minnesota that disclosed Optimal Diabetes Care quality performance on the Minnesota Community Measurement Health Care Quality Reports during the period of 2007-2010. The participants included only clinics that began reporting ODC score in 2007 and continuously disclosed their ODC score during the observational period of 2007-2010. The cohorts of clinics that began disclosing their ODC performance in the later years were excluded from the samples of this study, but were used for the sensitivity analysis of this study.

4.2. Study Setting

Minnesota Community Measurement (MNCM) is a voluntary public report of performance in preventive care and chronic disease treatments of primary care clinics in the state of Minnesota and its neighboring states, which has been reported clinical performance of medical practice groups since 2004 (MNCM, 2011). Besides the quality data at the medical group level, MNCM has also reported a number of quality measures by clinic sites since 2007. Unlike the data at medical group level that are based on claims data of patients in commercial health plans, the data at the clinic level are submitted directly from primary care clinics through their medical group's portal so it represents not only the patients in commercial health plans but also Medicare, Medicaid, and uninsured patients (MNCM, 2008).

Primary care clinics participating in MNCM Quality Reports established their reputation in many ways before the first MNCM Quality Report was published in 2007. Some clinics and medical groups actively pursued quality awards from third parties, such as the Buyer Health Care Action Group (BCHAG)'s PatientChoice Excellence in Quality Awards 2000-2005. That program provided financial rewards to providers who achieved optimal outcomes for patients with certain medical conditions, such as asthma, diabetes, and cardiovascular disease. The BCHAG program later has been carried on by Minnesota Bridges to Excellence Rewards. Besides those quality awards, some clinics also received recognition from third parties, such as endorsement and

listing of their physicians in Minneapolis-St. Paul Magazine's Top Doctors 2000-2006. Every year, the magazine mailed surveys to randomly selected licensed doctors and nurses and asked them to nominate recommended doctors and clinics in each of medical specialties. Thus, the study setting allows for the construction of reputation measures for participating clinics.

In addition, 2008 Minnesota health care reform legislation provides a unique setting for this research. This reform aims to improve the transparency of health care quality, cost and value in Minnesota by providing better information so that consumers, providers, purchasers and policymakers can make more informed decisions about health care. The Minnesota Department of Health (MDH) has contracted with a consortium led by MNCM to identify and develop recommended measures to be publicly reported by all Minnesota physician clinics and hospitals, and the first quality rule was adopted in December 2009 (MDH, 2010). Although clinics are required to submit data on measures established in that rule in 2010, a number of clinics decided to voluntarily report such measures to MNCM before reporting became mandatory. This allows observation of both clinics that actively engaged in the public reporting program and voluntarily disclosed the quality data in early years, and clinics that disclosed quality data later as required by the state law since 2010.

The performance measures of diabetic care at the clinic level were reported for the first time in 2007, and the number of participatory primary care clinics in this voluntary reporting program has increased over time. The most

recent MNCM Health Care Quality Report 2010, which include data from 2009 dates of services, presents quality performance of treatment and prevention of chronic diseases in 553 primary care clinics within 126 medical groups statewide (MNCM, 2010).

The Optimal Diabetes Care (ODC) was used as a proxy of performance of clinical quality of each primary care clinic. The ODC scores were calculated for each participatory clinic by measuring the percentage of patients with diabetes (Type I and Type II) ages 18-75 who reached all of five treatment goals: 1) hemoglobin A1c (A1c) less than 8%, 2) blood pressure (BP) less than 130/80 mmHg, 3) LDL-cholesterol (LDL) less than 100 mg/dl, 4) daily aspirin use unless contraindicated (ages 41-75 only), and 5) documented tobacco-free status. Since the 2010 report, MNCM has changed the goal for A1c control using the A1c level of less than 8% to replace the prior standard of A1c less than 7% in response to the new medical practice guideline (MNCM, 2010).

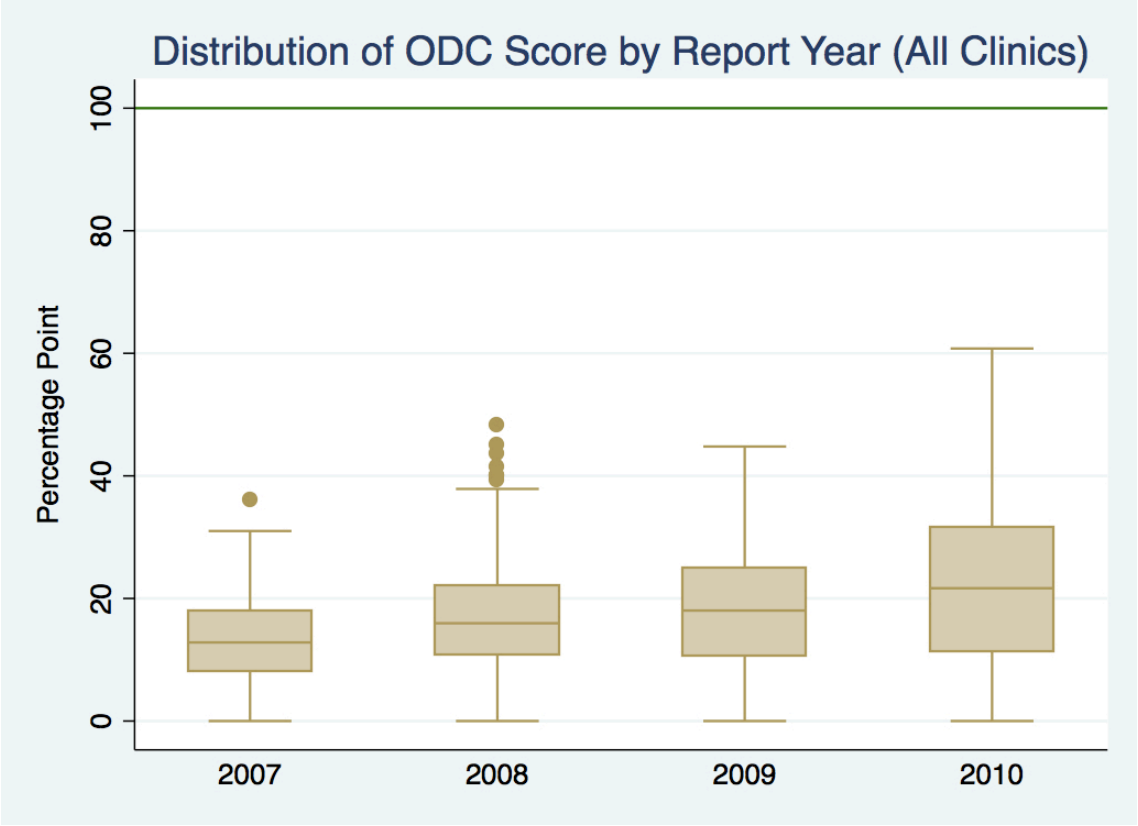
The ODC measure consists of five goals of diabetic care that are the most critical for preventing the dangerous cardiovascular complications associated with diabetes based on clinical guidelines (ICSI, 2009). The ODC measure is a composite measure of diabetic care quality, which is considered a good representative of primary care clinic's overall quality, because diabetic patients normally represent a significant portion of patients in every primary care clinic. Moreover, the evidence-based guideline and measurement of ODC were developed by the Institute for Clinical Systems Improvement and promoted by

the American Diabetes Association to be a set of comprehensive performance measures, so the measure has already been well established in the professional community (MNCM, 2009).

Because the ODC measure is less influenced by other factors such as ability to acquire new knowledge or ability to find available effective treatments for some other medical conditions, ODC is a good proxy measure of a health care organization's aspiration to improve its quality after receiving information on the public reports. Assuming organizations are driven to protect their reputation if the organizational reputation is threatened via negative public information about relative quality, it is important to choose an appropriate quality measure that is of concern to primary care clinics.

Figure 3 illustrates the longitudinal data from all primary care clinics that reported ODC performance on MNCM Health Care Quality Reports of 2007-2010. This preliminary analysis reveals the distribution of Optimal Diabetes Care performance scores. The scores show a significant variation among primary care clinics each year, and the gap between the performance scores of the top and the worst performers has become even greater in the more recent years. These findings suggest an opportunity for further quantitative analysis of the determinants of variation in quality improvement.

Figure 3: Distribution of ODC quality score of all clinics on MNCM Quality Reports 2007-1010



*Each box plot represents the interquartile range, where the bottom and top of the box is the 25th and 75th percentile, respectively, and the band near the middle of the box is the 50th percentile or the median. The potential outliers are points outside the whisker, where both ends of the whisker are the lowest data point within 1.5 interquartile range of the lower quartile and the highest data point within 1.5 interquartile range of the upper quartile.

4.3. Data

The panel dataset was constructed from several sources of archival data, including the Minnesota Community Measurement Quality Reports 2007-2010, the Buyer Health Care Action Group's PatientChoice Excellence in Quality Awards 2000-2005, and Minneapolis-St. Paul Magazine's Top Doctors 2000-2006. Table 1 summarizes the dependent and the independent variables used in this study. The control variables are shown in Table 2.

Table 1: Summary of independent and dependent variables

Concepts	Operational Variables	Data Source	Data Format
Change of quality performance (QI)	QI_{it}= Change of ODC score* of clinic i of report year t from that of report year t-1	MNCM Quality Reports 2007-2010	Continuous (Percentage Point)
Performance ranking on the public reports (P)	$P_{i,t-1}$= Percentile of ODC score on the MNCM public report in year t-1	MNCM Quality Reports 2007-2010	Ordinal
Organization's reputations (R)	RA_i = Whether the clinics have actively pursued and received quality awards before the first MNCM public report (year t_0)	BHCAG's PatientChoice Awards 2000-2005	Binary (1= Yes; 0 = No)
	RM_i = Whether the clinics have received recognition or endorsement from mass media before the first MNCM public report (year t_0)	Minneapolis-Saint Paul Magazine's Top Doctors 2000-2006	Binary (1= Yes; 0 = No)

*By definition, ODC score is the percentage of patients with diabetes (Type I and Type II) age 18-75 in each primary care clinic who reached all of the following five treatment goals: 1) Hemoglobin A1c (HbA1c) less than 7%; 2) Blood pressure less than 130/80 mmHg; 3) LDL-cholesterol less than 100 mg/dl; 4) Daily aspirin use for patients ages 41-75; and 5) Documented tobacco-free status (ICSI, 2009).

For the dependent variables, the change of diabetes care quality for each clinic was obtained from MCNM Quality Reports 2007-2010. Thus, we can observe a one-year change of ODC score for three observational periods, from 2008 to 2010. For the independent variables, the variable of performance ranking of diabetes care quality on the MNCM reports of 2007-2010 was derived from the transformation of ODC scores into percentiles. Percentile rankings of the previous year, or the lagged-one-year percentile, were used as an independent variable. Thus, we can observe the independent variable for three observation periods from 2008 to 2010, which were derived from the clinic's percentile rankings in 2007-2009.

Data measuring the variables of prior reputation of each clinic at the time before the first year of MNCM public reporting were collected from the multiple data sources. Two proxy measures were used to represent two dimensions of organizational reputation—quality awards and media endorsement. Data on clinics' prior quality awards were derived from a list of clinics and medical groups that received the Buyer Health Care Action Group's PatientChoice Excellence in Quality Awards in 2000-2005. In each year, selected provider organizations were awarded based on their excellent performance in various types of health services. For example, the winners of the 2001 Excellence in Quality Awards are organizations that improved immunization rates for varicella (chicken pox) virus, improved tobacco cessation counseling, and improved treatment for cardiovascular disease. A binary variable of organization's prior quality awards was then created. Clinics that were the

recipients of PatientChoice Excellence in Quality Awards at least once during the observational years of 2000-2005 were assigned a value of 1, while clinics that had not were received a value of 0.

Data on media endorsement were derived from Minneapolis-St. Paul Magazine's Top Doctors 2000-2006. Clinics were assigned to one of two groups: 1) the clinics with a history of media endorsement, and 2) the clinics without a history of media endorsement. City magazines that rate local services and resources have been available for years. These media usually tell readers where the good services are in the local area, including restaurants, art and performance theaters, recreational parks, and medical services. In Minnesota, the Minneapolis-St. Paul Magazine started compiling its Top Doctors list in 1992 and became the third city magazine in the U.S. after New York and San Diego that compiles such lists (Yee, 2008). The magazine annually mailed surveys to randomly selected licensed doctors and nurses and asked them to nominate recommended doctors and clinics in each of medical specialties, and had a virtual monopoly on rating doctors in Minnesota for 17 years until its competitor Minnesota Monthly Magazine started compiling its own list of Top Doctors for Women in 2006 (Yee, 2008). In the past ten years, Minneapolis-St. Paul Magazine annually has published an issue of Top Doctors, except in 2002 when it published a list of Top Clinics rather than Top Doctors, and in 2004 and 2005 when the magazine did not publish its annual issue of Top Doctors.

To measure the accumulated reputation of clinics before the first MNCM Quality Reports was published in 2007, I obtained the data from Minneapolis-St. Paul Magazine's Top Doctors lists in 2000, 2001, 2002, 2003, and 2006, and created a new variable reflecting mass media endorsement. I took a conservative approach to ensure that that the measure is relevant to quality of care on MNCM Quality Reports, so medical specialties that are irrelevant to primary care services were excluded—only clinics recognized on the Top Doctors list in family medicine, internal medicine, cardiology and cardiovascular diseases, endocrinology, adolescent medicine, and geriatric medicine practices were included.

In every year except 2002, Minneapolis-St. Paul Magazine published both the names of physicians and the names of clinics on its annual "Top Doctors" list, so the names of clinics whose physicians were recognized in selected primary care specialties were identified. In 2002, the magazine did not publish a usual "Top Doctors" list but endorsed "Top Clinics" instead. Hence, the names of clinics that were recognized in primary care specialties were identified directly from the "Top Clinics" list of 2002, as it was a direct measure of clinic's reputation in that particular year. Clinics with physicians recognized by the Minneapolis-St. Paul Magazine at least once during those years in the selected medical specialties were assigned a value of 1, while clinics without physicians named received a value of 0.

Table 2: Summary of control variables

Concepts	Operational Variables	Data Source	Data Format
Report year	τ_i = A dummy variable of report year of MNCM's ODC public reports	MNCM Quality Reports 2007-2010	Binary (1= Yes; 0 = No)
Organizational size	$Ptsize_{it}$ = Number of total eligible diabetic patients in each clinic in year t	MNCM Quality Reports 2007-2010	Count
	$Grsize_{it}$= Total number of clinics within the medical group practice that the clinic is affiliated with in year t	MNCM Quality Reports 2007-2010	Count
Data submission	$Popsubmit_{it}$ = Whether clinics submitting all of its diabetic patient-population to MNCM or sampling and submitting only a subset of diabetic patient-population in year t	MNCM Quality Reports 2007-2010	Binary (0 if clinic submitting a subset of diabetic patients; 1 if clinic submitting all diabetic patients)
Organizational resources for data collection and quality improvement	EMR_{it}= EMR utilization within clinic in year t	MNCM Quality Reports 2007-2010	Binary (0 if clinic using only paper records; 1 if clinic using electronic medical records)

The control variables were included to address other factors besides organizational performance ranking and prior reputations that can determine motivation and ability of clinics to improve their quality of care. The time-varying, observable characteristics of clinics were obtained directly from MNCM. These characteristics include size of clinic and its affiliated medical group and resources for data collection and quality improvement in each clinic. The dummy

variable of report year was created for each data point to control for possible time trends.

Size has been described in organization studies literature as an important factor that can influence structural design, and methods of internal controls of organizations. Studies in the field of organizational studies have shown that large organizations usually differ from small organizations in structural dimensions, such as formalization, centralization, and personnel ratios. Hence, organizational size potentially can influence the abilities to improve quality and efficiency perforamnce. Organizational size is addressed in this research by using the number of eligible patients with diabetes in each clinic as a proxy of clinic's size. Moreover, considering a larger unit of organization, the size of medical groups that each clinic is affiliated with also was included as another measure of organizational size.

The utilization of an electronic medical record (EMR) in each clinic was used as a proxy for organizational resources for data collection and quality improvement. Moreover, even though most of the 156 clinics in this dataset submitted all diabetic patients to MNCM, some clinics sampled eligible diabetic patients. Hence, not every clinic submitted all of their eligible diabetic patients to be used as a denominator of the ODC score in each report year. To address plausible effects of sampling patients on the ODC score, a dummy of whether clinics submitting all of its diabetic patient-population was created and included as a control variable. Lastly, the number of eligible individuals with diabetes in

each clinic in each year and the dummy of whether clinics submitted all eligible patients in each year also address the plausible confounding effects of favorable selection—if providers responded to the public reports by dropping non-compliant or severe diabetic patients from their clinic, it could be captured by the changes of these time-varying variables of clinic's size.

Besides these time-varying control variables, other factors that could determine a clinic's ability to improve quality of diabetic care, such as organizational culture, organizational climate, staff attributes, or patient's attributes, should be controlled in the analysis. Other intrinsic motivational factors such as professionalism of providers in organizations also should be controlled. Market factors such as the characteristics of primary care clinic's local market also could influence the outcomes of interest. Literature suggests patients usually travel less than 20 miles on average to receive primary care services (Billi, Pai, & Spahlinger, 2007; Schmitt, Phibbs, & Piette, 2003). In fact, a study of driving distance of diabetic patients in Vermont, New Hampshire, and northern New York found that on average diabetic patients drive only 7.6 miles or 12.2 km to their primary care clinics (Strauss, Maclean, Troy, & Littenberg, 2006). Hence, the degree of competition in the local market, which could be determined by the number of other primary care clinics on the public report that are located within the close proximity to that clinic, may affect the motivation of clinics to improve their quality performance in the subsequent years.

The data of clinic's ability to improve quality of diabetes care and the data on market factors were not available for this study. Patient attributes also could influence the degree of quality improvement in each clinic, and the ratio of patients with different types of health insurance in each clinic can be used as a proxy measure to address the change of patient characteristics over time. But such data are available only for the year 2010, so it cannot be used in fixed effects model. Therefore, assuming these factors were constant during the period of 2007-2010, these clinic characteristics were addressed in the empirical model by including clinic and time fixed effects.

4.4. Empirical Models

The panel data used in this study consisted of repeated measures of ODC performance of each primary care clinic. The analytical plan included the estimation of the relationship between the organization's public performance ranking and one-year change of diabetes quality performance, and the estimation of the interaction effects between the organization's prior reputation and performance ranking on the change in diabetes quality performance.

4.4.1 Endogeneity Issues

The relationship between organization's public performance ranking and one-year change of diabetic quality performance can be written as Equation (1).

$$QI_{it} = \alpha_0 + X_{it}\beta + P_{i,t-1}\gamma + RA_i P_{i,t-1}\delta + RM_i P_{i,t-1}\theta + \tau_t + u_{it} \quad (1)$$

where α_0 is the regression constant; β, γ, δ, θ are the regression coefficients; X_{it} is the control variables of clinic i in report year t; $P_{i, t-1}$ is the performance percentile ranking of clinic i in report year t-1; RA_i is the accumulated reputation of quality awards of clinic i before the first public report; RM_i is the accumulated reputation of media endorsement of clinic i before the first public report; τ_t is the dummy of report year t; u_{it} is the idiosyncratic shock.

The proposed reputation measures represent the accumulated reputations of each clinic at the year before the first public performance report was published. Two measures of clinic's reputation are quality awards reputation and media endorsement reputation. Both reputation measures are pre-determined: they are not correlated with clinic's ODC quality perforamnce in any report year. Therefore, prior reputations can be used as exogenous explanatory variables in the empirical model.

Time-varying clinic's characteristics were addressed by including a set of control variables as described in the section above. A fixed effects (FE) model specification was used to control for the unobserved heterogeneity at the level of primary care clinic, so the changes of independent and dependent variables of each clinic over the observational period can be identified. One major advantage of using the fixed effects model as the estimation strategy is its ability to obtain consistent estimates while allowing for time-constant, unobserved factors to be correlated with other explanatory variables (Baltagi, 2005; Wooldridge, 2002).

An alternative model for this panel data analysis is a random effects (RE) model, which assumes that the individual specific effects are uncorrelated with the independent variables. The random effects assumption would be satisfied in this context only if systematic changes associated with quality improvement activities in primary care clinics are expected over time. If the random effects assumption holds, the random effects model is more efficient than the fixed effects model. To test whether the random effects assumption holds, both fixed effects models and random effects models were estimated and tested by the Hausman specification test (Hausman, 1978). The null hypothesis that the random effects estimator provides consistent estimates was rejected, with $\chi^2\ (7) =\ 123.01$ and the corresponding p-value <0.001. Therefore, the random effects estimator is biased and the fixed effects model was used as the estimation procedure.

Lastly, as a robustness test, I attempted to address the plausible endogeneity issues of the unobserved, time-varying clinic heterogeneity, and the year-to-year persistence of quality perforamnce by the two-stage least squares (2LSL) estimator. Previous performance ranking can be an endogenous explanatory variable of quality improvement. Quality level in the past years and quality level in the current year could be correlated because of the persistent nature of quality performance. In that case, the persistence of quality performance could bias the relationship between previous performance ranking and quality improvement. Besides, there might be other unobserved, time-varying characteristics of clinics that could determine quality improvement, but

cannot be addressed by the fixed effects model. By using the difference between the observed performance ranking and the expected performance ranking as an instrumental variable (IV) of public performance ranking, the regression coefficients were estimated by the 2SLS models including clinic and time fixed effects, and compared with the estimated coefficients from the OLS models with clinic and time fixed effects.

Dynamic panel models could be considered as an alternative estimation strategy to the 2SLS models. Because the percentile ranking of the previous year is a function of quality in that report year, it can be considered as a lagged dependent variable included as a regressor of quality variable in the current report year. Dynamic panel models take into consideration that the dependent variable is driven by lagged dependent variables due to the persistent nature of quality performance. In this case, the percentile ranking of the previous year ($P_{i,t-1}$) is a function of quality in that report year (Q_{it}), and that lagged quality performance ($Q_{i,t-1}$) could be correlated with the current quality performance ($Q_{i,t-1}$). The regression coefficients in dynamic panel models can be estimated by using the Arellano-Bond (1991) estimator, which applies an appropriate lag of regressors as instrumental variables of the parameters in the first-difference model (Arellano & Bond, 1991). However, the application of Arellano-Bond estimator is limited in this dataset. Because it is a very short panel dataset with only three observational periods, there is only one panel that can be used as the instrumental variables of parameters in the first-difference model. More importantly, because the lagged interaction terms are not available, this

estimation strategy does not allow a test of Hypothesis 2 of the study. Therefore, the Arellano-Bond estimator was not used in this study, and the 2SLS estimator with clinic and time fixed effects was used as the alternative estimation procedure to the OLS estimator with clinic and time fixed effects.

4.4.2 Fixed Effects Model

The fixed effects models were used to determine if low public performance leads to a greater degree of quality improvement. The relationship can be rewritten as Equation (2).

$$QI_{it} = \alpha_i + X_{it}\beta + P_{i,t-1}\gamma + RA_iP_{i,t-1}\delta + RM_iP_{i,t-1}\theta + \tau_t + u_{it} \quad (2)$$

where α_i is individual fixed effects of clinic i; β, γ, δ, θ are the regression coefficients; X_{it} is the set of control variables of clinic i in report year t; $P_{i,\,t-1}$ is the performance percentile ranking of clinic i in report year t-1; RA_i is the accumulated prior reputation of quality awards of clinic i at the year before the first public report; RM_i is the accumulated prior reputation of media endorsement of clinic i at the year before the first public report; τ_t is the dummy of report year t; u_{it} is the idiosyncratic shock.

The unbiased estimates can be obtained by using the mean-deviation form of Equation (2). By subtracting the average over all periods of observation for each clinic from Equation (2), we can obtain the fixed effects transformed equation, or Equation (3). The individual fixed effects (α_i) was eliminated from

Equation (3) because it is constant over time, so the regression coefficients can be estimated by using ordinary least squares (OLS) estimator.

$$\ddot{Q}I_{it} = \ddot{X}_{it}\beta + \ddot{P}_{i,t-1}\,\gamma + R\ddot{A}_{\iota}P_{i,t-1}\delta + R\ddot{M}_{\iota}P_{i,t-1}\theta + \ddot{\tau}_t + \ddot{u}_{it} \quad (3)$$

The baseline model, Equation (3), was estimated by fixed effects (FE) estimator by using "xtreg" in Stata 11 (StataCorp, 2009). All standard errors were clustered to each clinic to address the repeated observations on the same clinic over time, so the test statistics are robust to heteroscedasticity. Then, the results from the FE model were compared against the traditional OLS regression.

By contrast, Equation (1) was estimated by the traditional OLS estimator without the individual fixed effects of clinic by using "regress" in Stata 11 (StataCorp, 2009). The difference between the estimates of the OLS model and that of the FE model would determine how the unobserved, time-constant characteristics of clinics could confound the relationship between public perforamnce ranking and on the degree of quality improvement.

Table 2 shows the corresponding regression coefficients considering whether the null hypotheses can be rejected and the alternative hypotheses can be accepted. The estimated coefficient of previous percentile rank (γ) was used to test Hypothesis 1. The estimated coefficients of the interaction term between the performance rank in year t-1 and the clinic's prior reputation in year t-1 (δ) was used to test Hypothesis 2.

Table 2: Tested hypotheses and corresponding regression coefficients

Testing Hypothesis	H0	Ha
Hypothesis 1	$\gamma = 0$; Low organizational rankings on public performance report lead to the same degree of quality improvement as high organizational rankings.	$\gamma \neq 0$; low organizational rankings on public performance report lead to a different degree of quality improvement than high organizational rankings.
Hypothesis 2	$\delta = 0$ and $\theta = 0$: Effects of organizations' performance rankings on the degree of quality improvement is not different between organizations with high prior reputations and organizations without high prior reputations.	$\delta \neq 0$ or $\theta \neq 0$: Effects of organizations' performance rankings on the degree of quality improvement in organizations with high prior reputations is different from that of organizations without high prior reputations.

4.4.3 Two-stage least squares model

To further explore the endogeneity issues, a two-stage least squares model was estimated. The instrumental variable of public performance ranking was constructed from the difference between the performance ranking relative to all other clinics observed on each report and the performance ranking relative to only clinics that also disclosed their performance on the previous report. The population of this study is the "early disclosers," which is a panel of 156 clinics that publicly reported ODC score at clinic level since the first year of MNCM Quality Report in 2007 and continuously disclosed their quality performance from 2007 to 2010.

The early reporting clinics can compare their quality performance to all other clinics on the same report, and could even attempt to predict how well they will perform relative to those clinics on the next reports. However, because a number of clinics started to publicly disclose their quality in the later years, clinics on the early report have no baseline information about those new clinics and cannot predict how well they will perform on the next reports relative to those new clinics. On the next report year, the early disclosers may "expect" to compare their performance against only organizations that have already publicly reported performance score in the previous year, although what we can "observe" are organization's performance rankings relative to all other clinics, including the new reporting clinics, on that report. Hence, an organization's performance ranking relative to all other clinics on each report (or the "observed" performance ranking) and the organization's performance ranking relative to only the clinics that have already been on the previous report (or the "expected" performance ranking from the perspective of the early disclosers) were used to construct an instrumental variable.

The percentile ranking that we can observe in each report year is highly correlated with the difference between the observed percentile ranking and the expected percentile ranking. Moreover, the difference between the observed percentile ranking and the expected percentile ranking is independent of quality level or the change of quality level in any report year. There is no reason to believe that such ranking difference can influence the change of quality performance by any means besides through the direct effects of performance

ranking. Therefore, the difference between the observed performance ranking and the expected performance ranking can be used as an instrumental variable for organization's performance ranking

Figure 4: The instrumental variable of percentile rankings

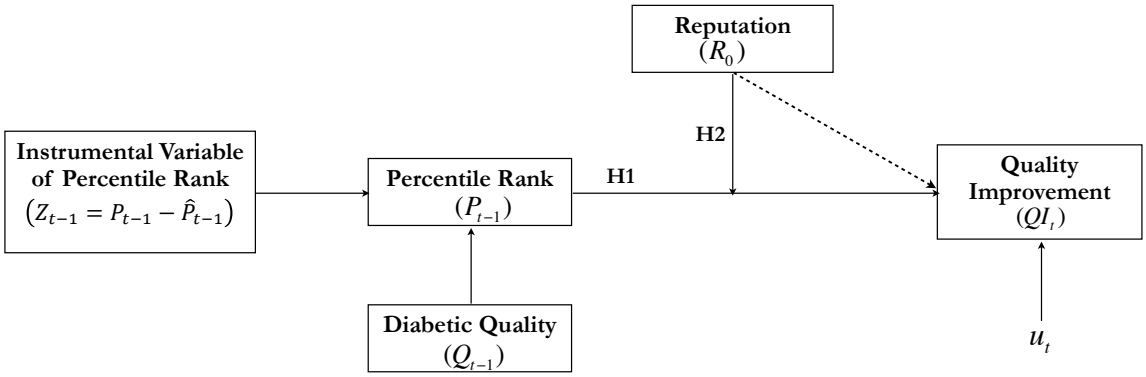


Figure 4 illustrates the conceptual model of the study with the newly constructed instrumental variable (Z). The "observed" performance ranking and the "expected" performance ranking can be written as Equation (4) and Equation (5), respectively. Then, the newly constructed instrumental variable (Z) of organization's quality performance rankings can be written as Equation (6).

$$P_{i,t-1} = f\left(Q_{i,t-1}, Q_{j,t-1} \middle| D_{i,t-1} = 1, D_{j,t-1} = 1\right) \quad (4)$$

$$\tilde{P}_{i,t-1} = f\left(Q_{i,t-1}, Q_{j,t-1} \middle| D_{i,t-1} = 1, D_{j,t-2} = 1\right) \quad (5)$$

$$Z_{t-1} = P_{t-1} - \tilde{P}_{t-1} \quad (6)$$

where i represents clinic; j represents other clinics on the public report; D_t is the dummy of disclosure in which D=1 if the clinic disclosed ODC score at report year t; P_{t-1} is the observed performance ranking at report year t-1; $\tilde{P}_{t-1}$ is the expected performance ranking at report year t-1; Z_{t-1} is the instrumental variable of performance ranking at report year t-1.

Organizations' public performance rankings were estimated by the instrumental variable (Z) and other control variables in the first-stage equation. If the interaction term between public performance ranking and prior reputations in equation (1) is disregarded, the relationship between public performance ranking and the degree of quality improvement can be estimated by using the predicted values from the following Equation (7) to estimate Equation (8).

$$P_{i,t-1} = \alpha_{i1} + X_t\beta_1 + Z_t\gamma_1 + \tau_{t1} + \varepsilon_{it} \quad (7)$$

$$QI_{it} = \alpha_i + X_{it}\beta + \hat{P}_{i,t-1}\gamma + \tau_t + u_{it} \quad (8)$$

For the estimation of the interaction effects between public performance ranking and prior reputations on quality improvement, the estimates also can be obtained from the 2SLS model. However, there is more than one endogenous variable in the estimated model, including the performance ranking ($P_{i,t-1}$), the interaction terms between performance ranking and prior reputation of quality awards ($RA_iP_{i,t-1}$), and the interaction terms between performance ranking and prior reputation of media endorsement ($RA_iP_{i,t-1}$). There must be at least as many instrumental variables as the endogenous variables so that the equation

can be identified. Interaction terms between the original instrumental variable and prior reputations were used as the additional instrumental variables.

Both the original instrumental variable ($Z_{i,t-1}$) and two additional instrumental variables ($RA_iZ_{i,t-1}, RM_iZ_{i,t-1}$) are included in the first-stage equations. Then, the regression coefficients were jointly estimated from Equation (9.1), Equation (9.2), Equation (9.3), and Equation (10).

$$P_{i,t-1} = \alpha_{i1} + X_t\beta_1 + Z_t\gamma_1 + \tau_{t1} + \varepsilon_{it1} \quad (9.1)$$

$$RA_iP_{i,t-1} = \alpha_{i2} + X_t\beta_2 + RA_iZ_{i,t-1}\delta + \tau_{t2} + \varepsilon_{it2} \quad (9.2)$$

$$RM_iP_{i,t-1} = \alpha_{i3} + X_t\beta_3 + RM_iZ_{i,t-1}\theta + \tau_{t3} + \varepsilon_{it3} \quad (9.3)$$

$$QI_{it} = \alpha_i + X_{it}\beta + \hat{P}_{i,t-1}\gamma + \widehat{RA_iP_{i,t-1}}\delta + \widehat{RM_iP_{i,t-1}}\theta + \tau_t + u_{it} \quad (10)$$

The regression coefficients in both Equation (8) and Equation (10) were estimated by two-stage least squared (2SLS) estimator using "xtivreg2" in Stata 11 (Schaffer, 2010). All standard errors were clustered to each clinic to address the repeated observations on the same clinic over time, so the test statistics are robust to heteroscedasticity.

4.5. Limitations of the Study Methods

The methods used in this study may have some limitations that potentially can undermine its findings. Several issues can threaten to the internal validity and the external validity of the study.

One of the potential problems is the threat to the internal validity of regression coefficients. To take into consideration of other factors that could influence the relationship between public perforamnce ranking and on the degree of quality improvement, the fixed effects (FE) specification was used to address the unobserved, time-constant characteristics of clinics, and the time-varying characteristics of clinics were included in the FE model as the control variables. As a robustness test, I also attempted to used the two-stage least squares (2SLS) model to explore if other unobserved, time-varying characteristics of clinics that were not addressed by the FE model would be different from the findings of the OLS model. However, the findings from 2SLS model should be interpreted with caution. Because of a small sample size of this study, the variation of the instrumented variables might not be enough large to detect statistically significant effects on the dependent variable. Particularly, the 2SLS estimates can have large standard errors, if the instrumental variables are weakly correlated with the endogenous regressors, or if there is a correlation between regressors. In such a case, the FE model would be the best procedure for estimating the consistent and unbiased estimates.

A possible confounder that can influence subsequent changes in quality is the adverse selection of patients by providers in primary care clinics. For instance, even if public reporting increases providers' motivation to improve their performance score, some providers may respond by dropping non-compliant or severe diabetic patients from their clinics rather than working with those patients. Then, the subsequent change of quality will be at least partly

explained by the favorable selection. I attempted to addresses these plausible confounding effects by including the number of eligible individuals with diabetes in each clinic in each year, and the number of submitted patients of each clinic in each year as control variables. These time-varying variables are not only a proxy measure of a clinic's size. If providers responded to the public reports by dropping non-compliant or severe diabetic patients from their clinic, it would be captured by the changes of these time-varying variables of clinic's size.

Other factors that could affect the degree of quality improvement in each clinic are patient attributes. Research shows that there are differences in severity or risk adjustment in the diabetic population among Medicare, Medicaid, and commercial health plans patients. Thus, the ratio of patients with different types of health insurance in each clinic should be used as control variables. Unfortunately, such data are available only for the year 2010, so it cannot be used in fixed effects model. This study assumed the ratio of health insurance types of patient in each clinic is constant over the four years of the study period. Future studies should include patient characteristics such as severity of illness or compliance to the treatments as a time-varying control variable for the effects of patient attributes on the quality outcomes.

Lastly, because the samples are purposefully selected to address the unique characteristics of primary care clinics in the state of Minnesota that have been participating in the MNCM reporting program, there is a plausible threat to the external validity of this study. Nonetheless, the sample size is large enough to

provide variance in the sample to afford both statistical and practical significance. In terms of power of the study assuming the clinics were drawn from a larger population, the total number of 156 clinics provides a probability of 80 percent that the study can detect a relationship between the independent and dependent variables at a one sided 5.0 percent significance level, if the true change in the dependent variables is 0.20 standard deviations per one standard deviation change in the independent variable.

5. Empirical Results

This chapter presents results of empirical models, including the descriptive statistics, and the results from the regression analysis.

5.1. Descriptive Statistics

5.1.1 Characteristics of Clinics on MNCM Reports

The population of this study is a total of 568 primary care clinics in Minnesota and neighboring states that had publicly reported Optimal Diabetic Care (ODC) performance score on the Minnesota Community Measurement (MNCM) Health Care Quality Reports from 2007 to 2010. These clinics were either stand-alone clinics, or clinics that were members of medical groups or health systems. A total of 185 clinics started reporting their ODC score on MNCM Quality Report in 2007, 309 clinics reported in 2008, 393 clinics reported in 2009, and 527 clinics reported in 2010. These clinics were part of 20, 58, 67, and 124 medical groups, respectively. Because additional clinics started to disclose their ODC performance in later years, the number of clinics reporting in the later years exceeds that of the early years.

While new clinics began to report ODC scores in later years, some clinics that reported in previous years also stopped reporting. Among 185 clinics that started to report ODC score in 2007, 28 clinics stopped reporting in 2008, while 152 new clinics started reporting ODC score in 2008. In 2009, 10 clinics that had

reported in 2008 stopped reporting, while 94 new clinics began reporting. In 2010, 26 clinics from 2009 stopped reporting, and 160 new clinics reported.

On average, the ODC performance score of all reporting clinics improved over time. The selected characteristics of all reporting clinics from MNCM Health Care Quality Reports 2007-2010 are shown on Table 3.

Table 3: Characteristics of clinics by report years

Characteristics of clinics	2007	2008	2009	2010
ODC score: percentage point (S.D.)	13.59 (7.18)	17.13 (9.00)	18.18 (9.31)	22.10 (12.92)
Size of affiliated medical groups: number of clinics per group (S.D.)	22.15 (10.97)	15.28 (10.48)	15.74 (11.09)	14.58 (12.48)
Size of diabetic patient population: number of patients (S.D.)	459.91 (460.27)	420.16 (363.84)	454.42 (436.68)	409.30 (421.27)
Number of diabetic patients submitted: number of patients (S.D.)	317.92 (333.69)	268.18 (331.94)	286.68 (346.19)	266.36 (342.46)
Clinics that submitted all patients: number of clinics (%)	92 (49.73)	177 (57.28)	241 (61.32)	326 (61.86)
Clinics that submitted sampled patients: number of clinics (%)	93 (50.27)	132 (42.72)	152 (38.68)	201 (38.14)
Clinics with EMR utilization: number of clinics (%)	N/A**	220 (71.20)	307 (78.12)	431 (81.78)
Total number of observations (N): number of clinics	189	309	393	527

*Standard Deviations are presented in the parentheses under means, unless indicated otherwise.
**Data on EMR utilization by clinics in 2007 is not available.

5.1.2 Characteristics of the Study Samples

The sample of this dissertation research is the cohort of primary care clinics that had publicly reported Optimal Diabetic Care (ODC) performance scores on MNCM Health Care Quality Reports since 2007. To obtain a variable of one-year change of ODC score, the clinics that did not report ODC scores for at least two consecutive years were excluded. As a result, among 185 clinics that started reported ODC score in 2007, we can observe one-year changes in ODC scores for only 157 clinics in 2008, 156 clinics in 2009, and 155 clinics in 2010. These clinics were part of 18, 15, and 18 medical groups, respectively. The selected characteristics of these sampled clinics are shown in Table 4, while the distribution of their ODC performance is shown on Figure 5.

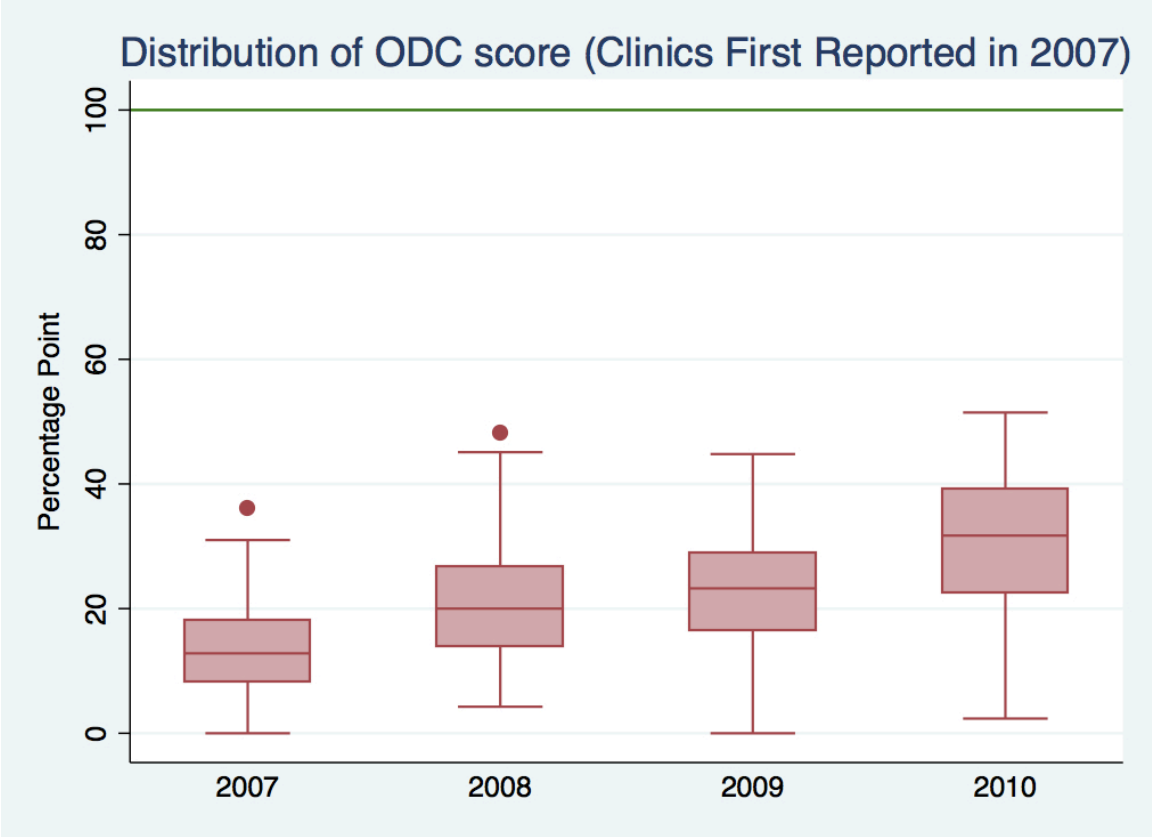
A number of clinic characteristics slightly varied during the observation period of 2008-2010. The sampled clinics had an increasing number of diabetic patients in the later years. Clinics also submitted more diabetic patients for calculating their ODC scores in the later years. In fact, most of the sampled clinics submitted all of their diabetic patient population to MNCM, rather than sampling patients and submitting only a subset of their patient population. The proportion of clinics submitting all of their patients also increased in the later years. Most of the sampled clinics reported using electronic medical records (EMRs) within the clinics. The proportion of clinics utilizing EMR also increased over time.

Table 4: Characteristics of clinics that first reported in 2007 and kept reporting for at least two consecutive years by report year

Characteristics of clinics	2007	2008	2009	2010
ODC score: percentage point (S.D.)	13.59 (7.18)	20.55 (8.52)	23.39 (8.35)	31.19 (10.95)
One-year change of ODC score: percentage point (S.D.)	N/A	5.95 (6.31)	2.83 (7.36)	8.54 (5.82)
Size of affiliated medical groups: number of clinics per group (S.D.)	22.15 (10.97)	21.73 (9.67)	22.79 (10.51)	24.14 (12.06)
Size of diabetic patient population: number of patients (S.D.)	459.91 (460.27)	446.91 (372.36)	494.26 (393.22)	514.27 (419.97)
Number of diabetic patients submitted: number of patients (S.D.)	317.92 (333.69)	371.91 (380.82)	430.38 (399.40)	474.15) (429.66)
Clinics that submitted all patients: number of clinics (%)	92 (49.73)	124 (78.98)	133 (85.26)	139 (89.68)
Clinics that submitted sampled patients: number of clinics (%)	93 (50.27)	33 (21.02)	23 (14.74)	16 (10.32)
Clinics with EMR utilization: number of clinics (%)	N/A**	134 (85.35)	137 (87.82)	142 (91.61)
Total number of observations (N): number of clinics	189	157	156	155

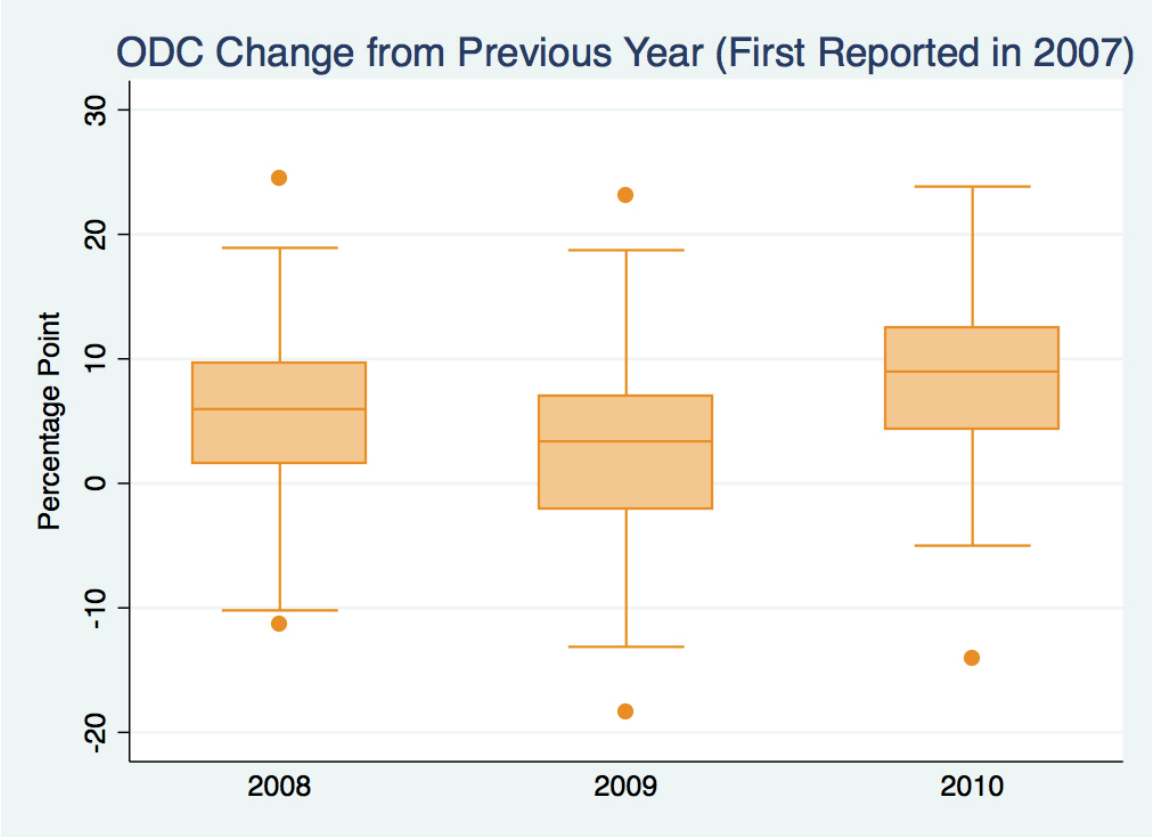
*Standard Deviations are presented in the parentheses under means, unless indicated otherwise.
**Data on EMR utilization by clinics in 2007 is not available.

Figure 5: Distribution of ODC quality score of clinics first reported in 2007 and kept reporting for at least two consecutive years by report year



Notes: Each box plot represents the interquartile range, where the bottom and top of the box is the 25th and 75th percentile, respectively, and the band near the middle of the box is the 50th percentile or the median. The potential outliers are points outside the whisker, where both ends of the whisker are the lowest data point within 1.5 interquartile range of the lower quartile and the highest data point within 1.5 interquartile range of the upper quartile.

Figure 6: Distribution of one-year change of ODC score of clinics first reported in 2007 and kept reporting for at least two consecutive years by report year



Notes: Each box plot represents the interquartile range, where the bottom and top of the box is the 25th and 75th percentile, respectively, and the band near the middle of the box is the 50th percentile or the median. The potential outliers are points outside the whisker, where both ends of the whisker are the lowest data point within 1.5 interquartile range of the lower quartile and the highest data point within 1.5 interquartile range of the upper quartile.

The average ODC score for sampled clinics was 14% in 2007, 21% in 2008, 23% in 2009, and 31% in 2010. The ODC scores of the sampled clinics tended to improve during the period of study from 2007 to 2010. However, the distribution of one-year changes in ODC score of those clinics in each report year appears to be symmetric. The average one-year increase in ODC scores for sampled clinics was 6% in 2008, 3% in 2009, and 9% in 2010. The distribution of one-year change of ODC score of clinics that publicly disclosed ODC score for the first time in 2007, as observed in 2008-2010, is shown in Figure 6.

5.1.3 Distribution of Percentile Rankings

Table 5 shows a comparison of characteristics of sampled clinics by tertiles of ODC performance from the previous year, based on pooled data from 2008 to 2010 reports. Size of the affiliated medical groups, size of diabetic patient population, and the number of submitted patients appear to be slightly larger in clinics with higher performance rankings on the previous report, but there is no statistically significant difference. The number of clinics submitting all of their patients and the number of clinics utilizing EMR seem to be higher in the higher tertiles, but there is no statistically significant difference either. Nonetheless, the ODC score of the upper third, the middle third, and the lower third are statistically different at the confidence level of $p<0.001$, and the one-year changes in ODC scores are also different across the three groups with statistically significance at the confidence level of $p<0.01$.

Table 5: Characteristics of clinics that first reported in 2007 and kept reporting for at least two consecutive years, by tertiles of ODC ranking from the previous year, pooled data of 2008-2010

Characteristics of clinics	Pooled data 2008-2010	Previous ranking in lower third	Previous ranking in middle third	Previous ranking in upper third
ODC score: percentage point (S.D.)	25.02 (10.35)	14.17 (6.35)	23.13 (7.31)	31.61### (8.63)
One-year change of ODC score: percentage point (S.D.)	5.77 (6.92)	6.02 (5.61)	7.18 (6.23)	4.66## (7.74)
Size of affiliated medical groups: number of clinics per group (S.D.)	22.88 (10.81)	21.27 (10.67)	22.35 (9.42)	24.03 (11.67)
Size of diabetic patient population: number of patients (S.D.)	485.00 (395.73)	422.58 (492.79)	496.55 (353.40)	507.24 (368.85)
Number of diabetic patients submitted: number of patients (S.D.)	425.26 (405.00)	345.35 (493.39)	445.15 (363.86)	450.16 (381.15)
Clinics that submitted all patients: number of clinics (%)	396 (84.62)	83 (79.81)	131 (87.33)	182 (85.05)
Clinics that submitted sampled patients: number of clinics (%)	72 (15.38)	21 (20.19)	19 (12.67)	32 (14.95)
Clinics with EMR utilization: Number of clinic-year observations (%)	413 (88.25)	88 (84.62)	134 (89.33)	191 (89.25)
Total number of observations (N): number of clinic-year observations	468	104	150	214

Notes: # denotes p<0.05, ## denotes p<0.01, ### denotes p<0.001

5.1.4 Distribution of Prior Reputations

Table 7 and Table 8 show clinic characteristics and compare clinics with prior high reputations and those without prior high reputations, using the pooled data from 2008-2010 report years. A comparison of sample means between selected characteristics of clinics with a history of media endorsement and those without media endorsement are shown in Table 7, while a comparison of selected characteristics of clinics with a history of receiving quality awards and those without quality awards history is shown in Table 8.

Considering a history of media endorsement as prior reputation, it appears that size of organizations with prior reputations is larger than those without. Both size of the affiliated medical groups and size of diabetic patient populations of clinics with a history of media endorsement are statistically different from clinics without a history of media endorsement, with the corresponding p-value <0.001. Other clinic characteristics are not statistically different between the two groups. The ODC score and the one-year change of ODC score are not different between the two groups either. Considering a history of receiving quality awards as prior reputation, size of the affiliated medical groups of clinics with prior quality awards and those without quality awards are not statistically different. However, clinics with prior quality awards had a larger number of patients with diabetes and submitted a larger number of diabetic patients. Moreover, the proportion of clinics submitting all patients to MNCM and clinics utilizing EMR were also larger in the group with prior

quality awards that those without prior quality awards. On average, the ODC scores were higher in clinics with prior quality awards than those without prior quality awards, with statistically significantly difference at the confidence level of p-value <0.05. The one-year change of ODC score is lower in clinics with prior quality awards, although there is no statistically difference between the two groups.

Table 6: Characteristics of clinics that first reported in 2007 and kept reporting for at least two consecutive report years by history of media endorsement

Characteristics of clinics	Pooled data 2008-2010	Without prior media endorsement	With prior media endorsement
ODC score: percentage point (S.D.)	25.02 (10.35)	24.96 (10.61)	25.24 (9.36)
One-year change of ODC score: percentage point (S.D.)	5.77 (6.92)	5.58 (7.17)	6.47 (5.86)
Size of affiliated medical groups: number of clinics per group (S.D.)	22.88 (10.81)	23.04 (11.27)	22.27 (8.85)
Diabetic patients population: number of patients (S.D.)	485.00 (395.73)	430.72 (348.39)	689.96### (488.40)
Diabetic patients submitted: number of patients (S.D.)	425.26 (405.00)	364.76 (349.71)	653.67### (507.74)
Clinics that submitted all patients: number of clinics (%)	396 (84.62)	307 (82.97)	89 (90.82)
Clinics that submitted sampled patients: number of clinics (%)	72 (15.38)	63 (17.03)	9 (9.18)
Clinics with EMR utilization: number of clinic-year observations (%)	413 (88.25)	323 (87.30)	90 (91.84)
Total number of observations (N): number of clinic-year observations	468	370	98

Notes: Standard deviation is reported in the parentheses under mean.
# denotes p<0.05, ## denotes p<0.01, ### denotes p<0.001

Table 7: Characteristics of clinics that first reported in 2007 and kept reporting for at least two consecutive report years by history of quality awards

Characteristics of clinics	Pooled data 2008-2010	Without prior quality awards	With prior quality awards
ODC score: percentage point (S.D.)	25.02 (10.35)	24.16 (11.00)	26.53# (8.93)
One-year change of ODC score: percentage point (S.D.)	5.77 (6.92)	6.22 (6.61)	4.96 (7.38)
Size of affiliated medical groups: number of clinics per group (S.D.)	22.88 (10.81)	22.88 (12.17)	22.88 (7.90)
Diabetic patients population: number of patients (S.D.)	485.00 (395.73)	468.84 (372.95)	513.34 432.46)
Diabetic patients submitted: number of patients (S.D.)	425.26 (405.00)	387.12 (376.30)	492.18## (444.24)
Clinics that submitted all patients: number of clinics (%)	396 (84.62)	238 (79.87)	158### (92.94)
Clinics that submitted sampled patients: number of clinics (%)	72 (15.38)	60 (20.13)	12### (7.06)
Clinics with EMR utilization: number of clinic-year observations (%)	413 (88.25)	243 (81.54)	170### (100.00)
Total number of observations (N): number of clinic-year observations	468	298	170

Notes: Standard deviation is reported in the parentheses under mean.
# denotes p<0.05, ## denotes p<0.01, ### denotes p<0.001

5.1.5 Distribution of the Instrumental Variable

As a robustness test, the 2SLS estimator was used to estimate the regression coefficients, using the difference between the expected prior percentile ranking and the difference between the observed prior percentile ranking and the expected prior percentile ranking as the instrumental variable of rankings. Table 6 displays means and standard deviations of the observed prior percentile, the expected prior percentile ranking, and the instrumental variable (Z). Table 8 shows that the distribution of the instrumental variable is on the positive scale in each of the two years that we can observe both the observed prior percentile ranking and the expected prior percentile ranking. This suggests that the sampled clinics usually had obtained higher observed percentile rankings than the expected percentile rankings during the observation period of 2009-2010.

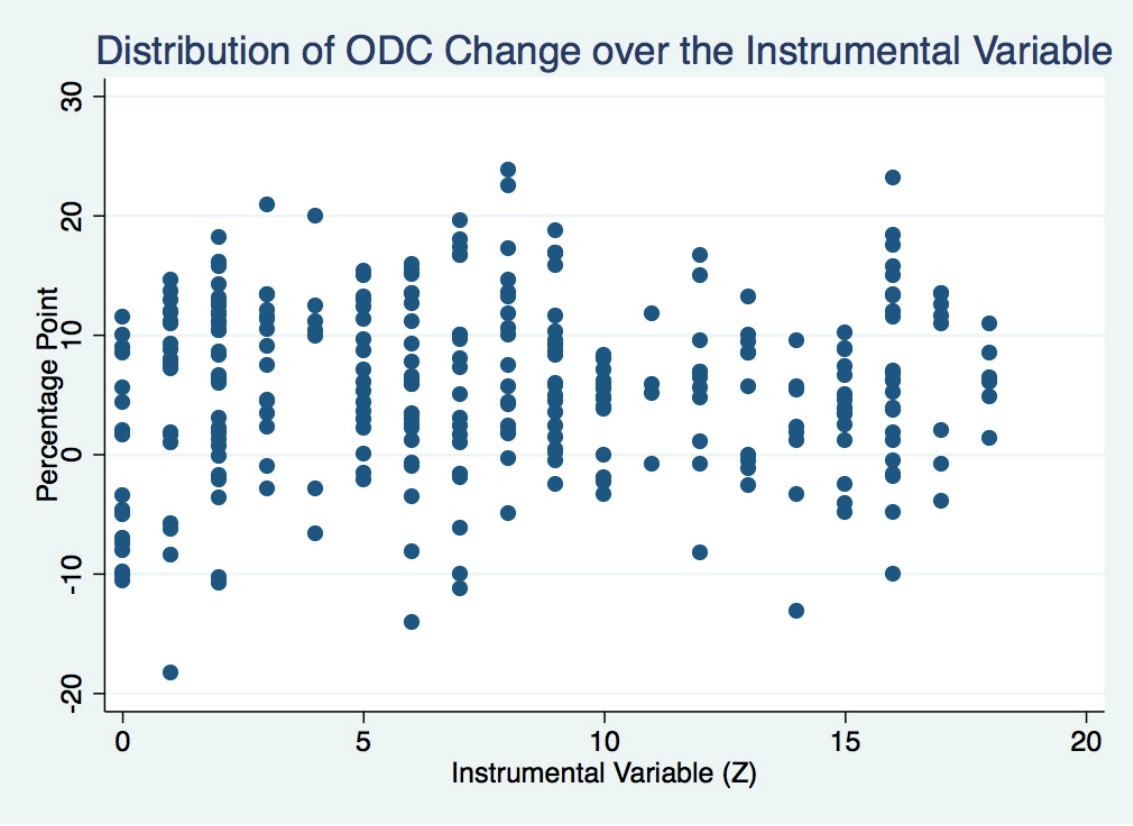
Table 8: Means and standard deviations of previous percentile rankings and the instrumental variable by report year

Characteristics of clinics	Pooled data 2009-2010	2009	2010
Observed previous percentile ranking (relative to clinics on the last year report): percentile rank	64.68 (25.20)	61.76 (25.95)	67.79 (24.07)
Expected previous percentile ranking (relative to clinics on the report two years ago): percentile rank	56.84 (27.84)	51.10 (27.88)	62.98 (26.54)
Difference between the observed percentile ranking and the expected percentile ranking (Z): percentile rank	7.83 (5.29)	10.67 (5.36)	4.81 (3.11)
Total number of observations (N): number of clinic-year observations	302	156	146

Notes: Standard deviation is reported in the parenthesis under mean

Figure 7 shows the relationship between one-year change of ODC score of the sampled clinics and the instrumental variable (Z). The one-year ODC change appears to be symmetrically distributed across the whole value range of the instrumental variable. Thus, this newly constructed instrumental variable of percentile rankings appears to be uncorrelated with the dependent variable of this study.

Figure 7: Distribution of one-year change of ODC score by the instrumental variable, pooled data of 2009-2010



Notes: The instrumental variable (Z) is the difference between the observed prior percentile ranking and the expected prior percentile ranking

5.2. Findings from the Regression Analyses

5.2.1 Effects of Prior Percentile Rankings

This section presents the results of the regression analyses of the effects of previous percentile rankings on the degree of quality improvement of the study samples, which are the clinics that began publicly reporting ODC scores in 2007. Using the data from the observational period of 2008-2010, the linear relationship between rankings and degree of quality improvement was estimated by the fixed effects (FE) estimator. The FE estimates are compared to the ordinary least squares (OLS) estimates from the pooled data of all periods of observation. The difference between the findings of the FE model and the pooled-data OLS model suggests the effects of the unobserved, time-constant variable of clinic characteristics on the degree of quality improvement.

As a sensitivity analysis, the findings from the quadratic model using the FE estimator are presented to explore a possibility of a non-linear relationship, in which case the effects of rankings on the degree of quality improvement is not constant across the range of rankings. Using the data from a shorter observational period, the FE estimates for clinics that began publicly reporting ODC scores in 2008 are also presented as a sensitivity analysis. Lastly, the findings from 2SLS models also are presented as a robustness test to further explore the endogeneity issues in this data set.

Table 9: Regression results from the pooled OLS and the OLS/FE models: Effects of previous percentile ranking on one-year change of ODC score

Variables	Model 1 OLS β (S.E.)	Model 2 OLS β (S.E.)	Model 3 OLS/FE β (S.E.)
Previous percentile ranking	-0.041***	-0.045***	-0.223***
	(0.011)	(0.011)	(0.019)
Size of affiliated medical group		0.041	-0.651**
		(0.034)	(0.184)
Size of diabetic patient population		0.002*	0.013*
		(0.001)	(0.006)
Clinic submitting all patients dummy		0.914	-2.571
		(1.631)	(2.218)
Clinic utilizing EMR dummy		1.497	6.970
		(1.591)	(4.561)
2009 dummy	-2.809**	-3.000**	-1.340
	(0.877)	(0.882)	(0.865)
2010 dummy	3.018***	2.649***	6.194***
	(0.738)	(0.738)	(1.073)
Constant	8.174***	4.714***	
	(0.785)	(1.072)	
Clinic fixed effects	No	No	Yes
Instrumental variables	No	No	No
Total number of observations (N)	468	468	458
R-squared	0.139	0.174	0.418
Kleibergen-Paap rk LM statistic			
Kleibergen-Paap rk Wald F statistic			

Notes:
1) *Denotes statistical significance at $p < 0.05$, ** at $p < 0.01$, and *** at $p < 0.001$.
2) Coefficients in Model 1 and 2 were estimated by OLS, while coefficients in Model 3 were estimated by OLS including clinic and time fixed effects.
3) The R-squared reported for the fixed-effects models are the "within R-squared" obtained by estimating the equation in mean-deviation form.
4) Standard errors are reported in the parenthesis below coefficients. All standard errors are robust-clustered by clinic.

Table 9 presents the results of the linear regression models estimating the effects of previous percentile rankings on the degree of quality improvement in the study samples. The coefficients in Model 1 and Model 2 were estimated by OLS, the coefficients in Model 3 were estimated by OLS including clinic and time fixed effects. The robust-clustered standard errors are reported in the parenthesis below the coefficients.

The empirical findings support Hypothesis 1: low organizational rankings among health care organizations that voluntarily disclose quality performance to the public leads to a greater degree of quality improvement. The results show that organizations' previous performance rankings have negative effects on the degree of quality improvement in the sampled clinics. Model 3 is the best estimation procedure as it is controlled for an unobserved, time-constant heterogeneity of each clinic. With clinic and time fixed effects, Model 3 estimated the regression coefficient of previous percentile ranking of −0.223 at the confidence level of p-value <0.001, with the R-squared of 0.418. That is, on average clinics with one lower percentile ranking had 0.22 higher percentage points of ODC quality improvement on the next report.

Comparing the FE estimates with the OLS estimates from the pooled data of all periods of observation, the FE model provided a larger magnitude of the negative effects of rankings on degree of quality improvement after controlling for the unobserved, time-constant heterogeneity of clinics. The larger R-squared of the FE model also suggests that a significant proportion of variability in

degree of quality improvement in sampled clinics is accounted for by the unobserved, time-constant clinic characteristics. Without control variables besides the time trend, Model 1 estimated the regression coefficient of −0.041 at the confidence level of p-value <0.001 with the R-squared of 0.139. Model 2 added the time-varying control variables estimated a slightly different coefficient of −0.045 at the confidence level of p-value <0.001 with the R-squared of 0.174.

As a sensitivity analysis, Model 4 also included clinic and time fixed effects, but was estimated by the 2SLS regression to address the possible endogeneity issues in the OLS/FE model. Table 10 presents the results of the 2LSL/FE model. Because previous percentile ranking is the only endogenous variable in Model 4, the model is just-identified. It passed the under-identification test at the confidence level of p-value <0.001. Kleibergen-Paap rk Wald F statistic was also used to test for weak identification. Model 4 also passed the weak identification test, as indicated by a Kleibergen-Paap rk Wald F statistic of 33.402, greater than Stock-Yogo's critical value of 10% maximal instrumental variable (IV) size. The regression coefficient of previous percentile ranking is −0.431, suggesting that on average clinics with one lower percentile ranking had 0.43 higher percentage points of ODC quality improvement on the next report. Model 4 estimated larger negative effects of previous percentile ranking than that of the OLS model with clinic and time fixed effects (Model 3). The within R-squared of 0.611 of the 2SLS/FE model is also greater than 0.418 of the OLS/FE counterpart.

Table 10: Regression results from the 2SLS/FE models: Effects of previous percentile ranking on one-year change of ODC score

Variables	Model 4 2SLS/FE β (S.E.)
Previous percentile ranking	-0.431***
	(0.064)
Size of affiliated medical group	-0.349
	(0.265)
Size of diabetic patient population	0.015
	(0.008)
Clinic submitting all patients dummy	-10.313**
	(3.381)
Clinic utilizing EMR dummy	-0.289
	(2.952)
2010 dummy	8.165***
	(0.885)
Clinic fixed effects	Yes
Instrumental variables	Yes
Total number of observations (N)	292
R-squared	0.611
Kleibergen-Paap rk LM statistic	17.900***
Kleibergen-Paap rk Wald F statistic	33.402

Notes:
1) *Denotes statistical significance at $p < 0.05$, ** at $p < 0.01$, and *** at $p < 0.001$.
2) Coefficients in Model 4 were estimated by 2SLS including clinic and time fixed effects.
3) The R-squared reported for the fixed-effects models are the "within R-squared" obtained by estimating the equation in mean-deviation form.
4) Standard errors are reported in the parenthesis below coefficients. All standard errors are robust-clustered by clinic.
5) Kleibergen-Paap rk Wald F statistic of 33.402 is greater than the critical value of 10% maximal IV size.

Nonetheless, a larger magnitude of negative effects as suggested by the 2SLS model should be interpreted with caution because of its small sample. The instrumental variable (Z) was constructed from the one-period-lagged and the two-period-lagged data, so Model 4 lost observations from the 2008 report year and used only the data from 2009 and 2010 reports to estimate the regression coefficients. In addition, the coefficients of clinic submitting all patients dummy of -10.313 is considerably larger than the estimate of -0.2571 of the OLS/FE model (Model 3), suggesting a possible multicollinearity issue after introducing the instrument variable into the model. I attempted to drop the dummy of clinic submitting all patients and re-estimated the regression coefficients of rankings. However, the model estimated the same egression coefficient of -0.431 with p-value <0.001.

The results from all linear models suggest that previous performance rankings significantly affect the degree of quality improvement in sample clinics. Nonetheless, it is possible that such effects are not homogeneous across the range of previous performance rankings. Considering a possibility of a non-linear relationship, I also ran the quadratic models as a sensitivity analysis of the corresponding linear models. Table 11 shows the regression results from the quadratic models. Corresponding to the linear models presented earlier, the coefficients of the quadratic models were estimated by the OLS estimator, the FE estimator, and the 2SLS estimator.

Table 11: Regression results from quadratic models: Effects of previous percentile ranking on one-year change of ODC score

Variables	Model 5 OLS β (S.E.)	Model 6 OLS β (S.E.)	Model 7 OLS/FE β (S.E.)	Model 8 2SLS/FE β (S.E.)
Previous percentile ranking	0.195***	0.173***	0.002	-0.580
	(0.044)	(0.044)	(0.072)	(0.588)
Previous percentile ranking squared	-0.002***	-0.002***	-0.002**	0.001
	(0.000)	(0.000)	(0.001)	(0.004)
Size of affiliated medical group		0.054	-0.631**	-0.402
		(0.036)	(0.187)	(0.242)
Size of diabetic patient population		0.001*	0.015*	0.018
		(0.001)	(0.006)	(0.011)
Clinic submitting all patients dummy		0.436	-2.919	-11.243**
		(1.655)	(2.383)	(4.162)
Clinic utilizing EMR dummy		1.302	7.224	-0.636
		(1.568)	(4.514)	(2.836)
2009 dummy	-2.868**	-3.016**	-1.566**	
	(0.852)	(0.860)	(0.848)	
2010 dummy	3.180***	2.857***	5.909***	8.400***
	(0.737)	(0.741)	(1.108)	(1.090)
Constant	3.415***	0.755***		
	(1.152)	(1.190)		
Clinic fixed effects	No	No	Yes	Yes
Instrumental variables	No	No	No	Yes
Total number of observations (N)	468	468	458	292
R-squared	0.187	0.213	0.438	0.546
Kleibergen-Paap rk LM statistic				4.717*
Kleibergen-Paap rk Wald F statistic				2.257

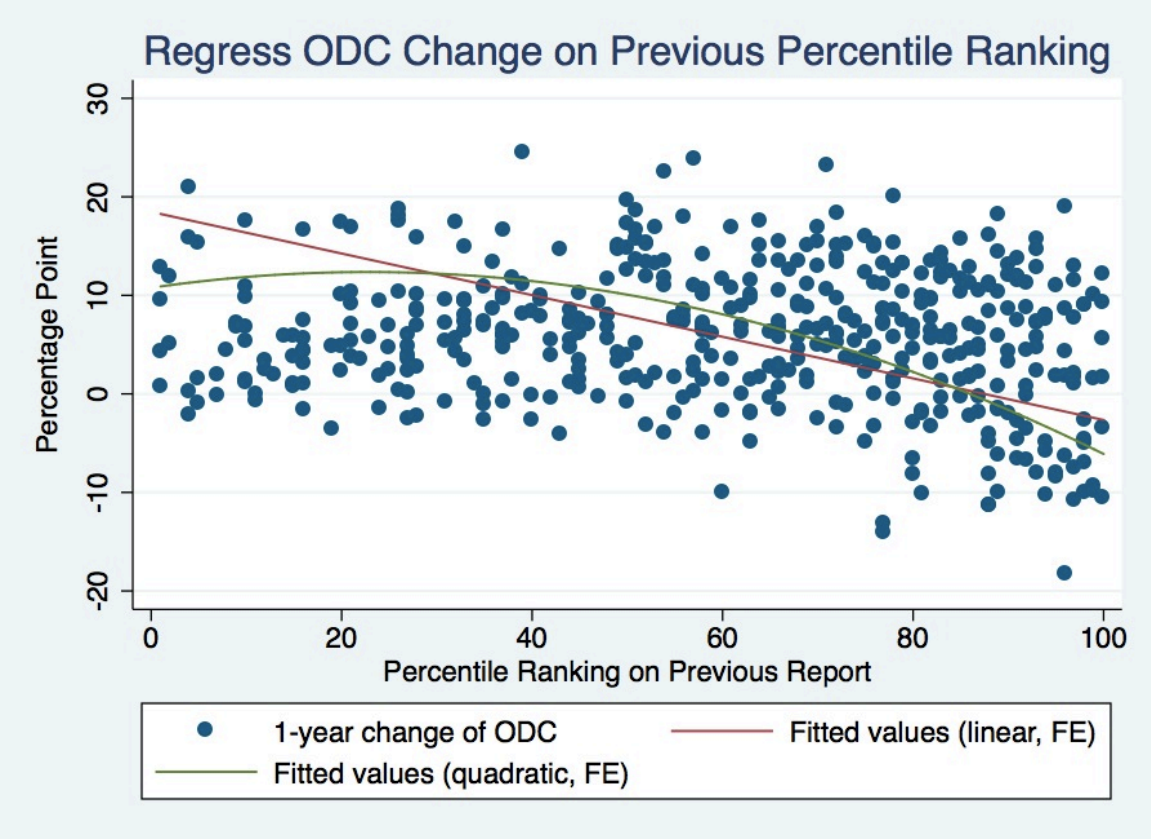
Notes:
1) *Denotes statistical significance at $p < 0.05$, ** at $p < 0.01$, and *** at $p < 0.001$.
2) Coefficients in Model 5 and Model 6 were estimated by OLS, coefficients in Model 7 were estimated by OLS including clinic and time fixed effects, and coefficients in Model 8 were estimated by 2SLS including clinic and time fixed effects.
3) The R-squared reported for the fixed-effects models are the "within R-squared" obtained by estimating the equation in mean-deviation form.
4) Standard errors are reported in the parenthesis below coefficients. All standard errors are robust-clustered by clinic.
5) Kleibergen-Paap rk Wald F statistic of 2.257 is less than the critical value of 25% maximal IV size.

The regression results from the quadratic models also show that previous percentile rankings have significant effects on degree of quality improvement. However, the size and the direction of such effects are indicated by a combination of the coefficients of both linear and quadratic terms of previous percentile rankings. With the OLS estimators in Model 5 and Model 6, the regression coefficients of both linear and quadratic terms of previous percentile ranking are statistically significant at the confidence level of p-value <0.001. With the FE estimation in Model 7, only the regression coefficient of the second order of previous percentile ranking is statistically significant at the confidence level of p-value <0.01, while the regression coefficient of the first order of previous percentile ranking is not statistically significant. Therefore, although the quadratic relationship of previous percentile ranking on the degree of quality improvement is found in the original FE model (Model 7), the quadratic relationship is rejected in the 2SLS model (Model 8).

Figure 8 illustrates the predicted values of the linear model with the OLS/FE estimator (Model 3), compared with the quadratic model with the OLS/FE estimator (Model 7). The linear model shows that the percentile rankings have incrementally negative effects on the one-year change of ODC quality score, and even have the negative net effects on quality level in clinics with very high percentile rankings. For example, by using the Delta method (Oehlert, 1992) to approximate the one-year ODC change with other covariates at their means, the linear model (Model 3) estimated that clinics with the 25^{th} percentile rank would improve the ODC score by 13.60 percentage points on the

next report year, clinics with the 50th percentile rank would improve the ODC score by 8.03 percentage points, and clinics with the 75th percentile rank would improve the ODC score by 2.46 percentage points. In fact, the predicted value of one-year ODC change becomes negative in clinics with previous percentile rankings greater than the 86th percentile, suggesting the quality level on the next report year is likely worse than that of the current year in clinics with very high percentile rankings.

Figure 8: Predicted values of one-year change of ODC score



*The fitted values of linear function are derived from Model 3, while the fitted values of quadratic function are derived from Model 7. No independent variables are instrumented. Both models were estimated with clinic and time fixed effects.

The results from all models suggest that previous organizational performance rankings significantly affect the degree of quality improvement in sampled clinics that began publicly reporting ODC scores in 2007. The same relationship was tested in clinics that began publicly reporting ODC scores in 2008 as a sensitivity analysis, using only the data from 2009 and 2010 reports. However, because the instrumental variable (Z) was constructed from the one-period-lagged and the two-period-lagged of clinic's ODC performance ranking, there are no available data to construct the instrumental variable for the 2SLS model for clinics that began reporting in 2008. The estimated models of clinics that began publicly reporting ODC score in 2008 are shown in Table 12.

For clinics that began publicly reporting ODC scores in 2008, the regression results show that previous performance rankings have negative effects on the degree of quality improvement, consistent with the findings from clinics that began publicly reporting ODC scores in 2007. Using the fixed effects (FE) estimator, Model 11 provided the regression coefficient of previous percentile ranking of −0.333, which is statistically significant at the level of p-value <0.001. The size of coefficient is slightly stronger than the coefficient of −0.223 in the corresponding fixed effects model of clinics that began publicly reporting ODC scores in 2007 (Model 3). Therefore, the negative effects of previous performance rankings on the degree of quality improvement appear to be robust across the cohorts of clinics that began publicly reporting ODC scores in 2007 and those that began reporting ODC scores in 2008.

Table 12: Regression results from the OLS/FE model: Effects of previous percentile ranking on one-year change of ODC score of clinics that first reported in 2008 and kept reporting for at least two consecutive years

Variables	Model 9 OLS β (S.E.)	Model 10 OLS β (S.E.)	Model 11 OLS/FE β (S.E.)
Previous percentile ranking	-0.036*	-0.048**	-0.333***
	(0.016)	(0.016)	(0.045)
Size of affiliated medical group		0.099	0.344
		(0.058)	(0.567)
Size of diabetic patient population		0.001	-0.006
		(0.001)	(0.004)
Clinic submitting all patients dummy		1.111	-1.262
		(0.920)	(1.399)
Clinic utilizing EMR dummy		1.052	-3.994*
		(0.885)	(1.685)
2010 dummy	4.271***	4.000***	6.323***
	(0.812)	(0.820)	(0.810)
Constant	3.654***	1.315	
	(0.685)	(0.942)	
Clinic fixed effects	No	No	Yes
Instrumental variables	No	No	No
Total number of observations (N)	278	278	270
R-squared	0.106	0.139	0.562

Notes:
1) *Denotes statistical significance at $p < 0.05$, ** at $p < 0.01$, and *** at $p < 0.001$.
2) Coefficients in Model 9 and 10 were estimated by OLS; coefficients in Model 11 were estimated by OLS including clinic and time fixed effects.
3) The R-squared reported for the fixed-effects models are the "within R-squared" obtained by estimating the equation in mean-deviation form.
4) Standard errors are reported in the parenthesis below coefficients. All standard errors are robust-clustered by clinic.

5.2.2 Effects of Prior Reputations

This section presents the findings of the interaction effects between prior reputations and previous percentile rankings on the degree of quality improvement. The study samples are the same as the earlier models, which are clinics that began publicly reporting ODC scores in 2007. Using the data from the observational period of 2008-2010, the linear regression models estimated by the FE model using the OLS estimator with clinic and time fixed effects (the OLS/FE model) are presented. The findings from the 2SLS models with clinic and time fixed effects (the 2SLS/FE model) are presented afterward as a robustness test.

The empirical findings from the FE models support Hypothesis 2: prior reputations of health care organizations moderate the relationship between public performance ranking on public reports of health care quality and the degree of quality improvement. Table 13 presents the results of the regression models that included the interaction terms between previous percentile rankings and prior reputations of clinics. The regression coefficients in Model 12, Model 13, and Model 14 were estimated by using the FE estimator, and the robust-clustered standard errors are reported in the parenthesis below the coefficients. Consistent with the models without the interaction terms, the regression findings suggest that previous performance rankings have negative effects on the degree of quality improvement in the sampled clinics. The negative effects were statistically significant at the level of p-value <0.001, consistently across the estimated models.

Table 13: Regression results from the OLS/FE models: Effects of previous percentile ranking on one-year change of ODC score allowing for heterogeneous effects based on prior reputations of clinics

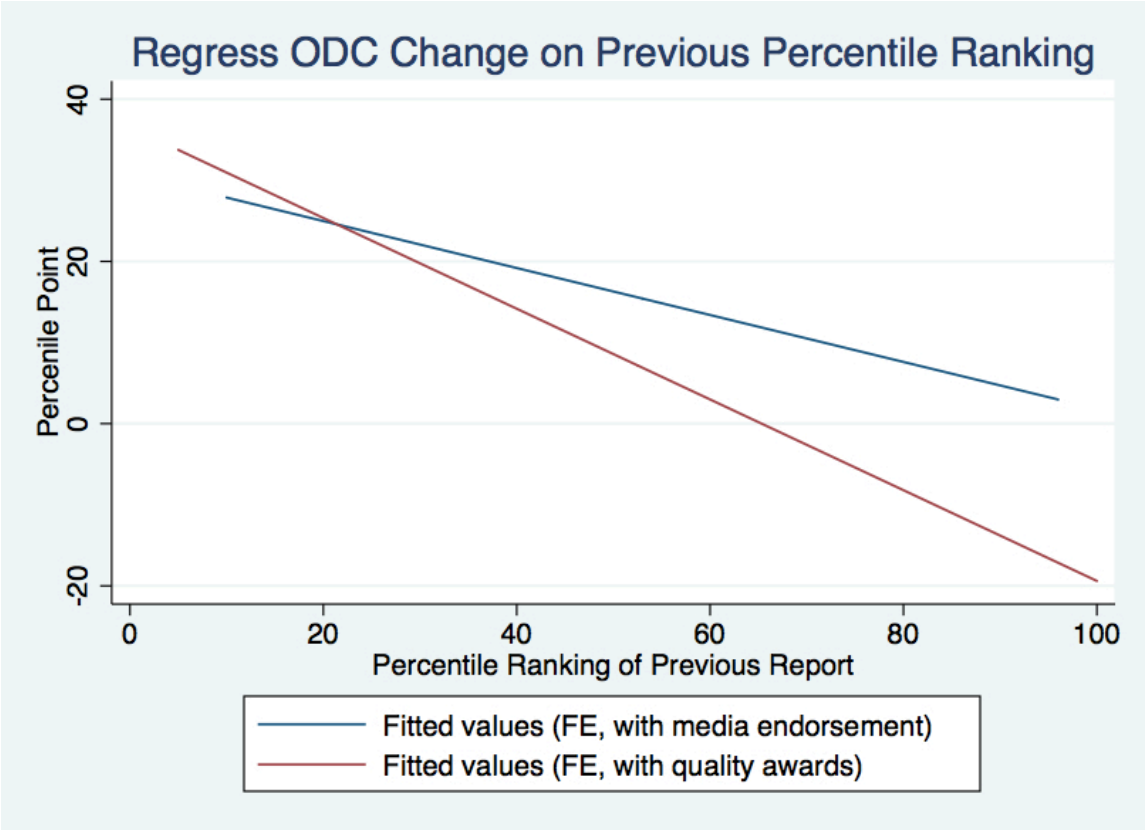
Variables	Model 12 OLS/FE β (S.E.)	Model 13 OLS/FE β (S.E.)	Model 14 OLS/FE β (S.E.)
Previous percentile ranking	-0.235***	-0.188***	-0.201***
	(0.021)	(0.023)	(0.024)
Previous ranking*Media endorsement	0.080*		0.103**
	(0.033)		(0.033)
Previous ranking*Quality awards		-0.148**	-0.163**
		(0.054)	(0.054)
Size of affiliated medical group	-0.647**	-0.865***	-0.882***
	(0.183)	(0.204)	(0.203)
Size of diabetic patient population	0.013*	0.013*	0.013*
	(0.006)	(0.005)	(0.005)
Clinic submitting all patients dummy	-2.540	-2.516	-2.47
	(2.188)	(2.073)	(2.043)
Clinic utilizing EMR dummy	7.026	6.703	6.748
	(4.535)	(4.636)	(4.602)
2009 dummy	-1.320	-1.259	-1.224
	(0.859)	(0.839)	(0.828)
2010 dummy	6.149***	6.454***	6.424*
	(1.063)	(1.038)	(1.020)
Clinic fixed effects	Yes	Yes	Yes
Instrumental variables	No	No	No
Total number of observations (N)	458	458	458
R-squared	0.423	0.434	0.442

Notes:
1) *Denotes statistical significance at $p < 0.05$, ** at $p < 0.01$, and *** at $p < 0.001$.
2) Coefficients in Model 12, 13, and 14 were estimated by OLS including clinic and time fixed effects.
3) The R-squared reported for the fixed-effects models are the "within R-squared" obtained by estimating the equation in mean-deviation form.
4) Standard errors are reported in the parenthesis below coefficients. All standard errors are robust-clustered by clinic.

The regression findings show that the effects of organizations' public performance rankings on the degree of quality improvement in high-reputation health care organizations are different from that of low-reputation organizations. In fact, the interaction effects between percentile rankings and prior media endorsement are positive, which is in an opposite direction of the direct effects of previous percentile rankings on the degree of quality improvement. By contrast, the interaction between percentile rankings and prior quality awards negatively affects the degree of quality improvement, in line with the direction of the direct effects of previous percentile rankings.

Model 12 estimated the regression coefficient of the interaction between percentile rankings and prior media endorsement of 0.080 with the confidence level of p-value <0.001. Model 13 estimated the regression coefficient of the interaction between percentile rankings and quality awards of −0.148 with the confidence level of p-value <0.001. Including both interaction terms in the same regression, Model 14 estimated the coefficient of prior media endorsement's interaction effects of 0.080 and the coefficient of quality award's interaction effects of −0.163. Both coefficients of the interaction terms from Model 14 are statistically significant different from zero at the confidence level of p-value <0.01, with the R-squared of 0.442. Therefore, it is consistent across the models that prior reputation from media endorsement mitigates the negative effects of rankings on degree of quality improvement, while reputation from quality awards moderates the negative relationship between rankings and degree of quality improvement.

Figure 9: Predicted values of one-year change of ODC score based on prior reputations of clinics.



*The fitted values of both linear functions are derived from Model 14. Both models were estimated with clinic and time fixed effects. No independent variables are instrumented.

Figure 9 illustrates the predicted values of one-year change of ODC score based on prior reputations of clinics are. The estimated linear models show that the percentile rankings have incrementally negative effects on the one-year change of ODC quality score, leading to the lower quality level on the next report year in clinics with very high percentile rankings. However, the negative effects on quality improvement are mitigated in clinics with prior media endorsement, while the negative effects on quality improvement are moderated in clinics with prior quality awards.

For example, by using the Delta method (Oehlert, 1992) to approximate the one-year ODC change with other covariates at their means, Model 14 estimated that clinics with 25th percentile rank would improve the ODC score by 12.01 percentage points on the next report year if they have prior quality awards, improve by 16.65 percentage points if they have prior media endorsement, and improve by 15.56 percentage points if they have neither prior media endorsement or quality awards. Clinics with 50th percentile rank are estimated to improve the ODC score by 3.46 percentage points on the next report year if they have prior quality awards, improve by 12.73 percentage points if they have prior media endorsement, and improve by 10.54 percentage points if they have neither prior media endorsement or quality awards. Clinics with 75th percentile rank are estimated to decrease the ODC score by -5.09 percentage points on the next report year if they have prior quality awards, but improve by 8.81 percentage points if they have prior media endorsement and improve the by 5.53 percentage points if they have neither prior media endorsement or quality awards. In fact, the predicted values of one-year ODC change are always positive in clinics with prior media endorsement regardless of their previous percentile rankings.

In an attempt to further explore the endogeneity issues, the 2SLS/FE models were used to estimate the regression coefficients in addition to the OLS/FE model as discussed earlier. The regression coefficients of the interaction between percentile rankings and prior reputations from the 2SLS estimators from Model 15, Model 16, and Model 17 are presented on Table 13. The Kleibergen-Paap rk Wald F statistic is used for weak identification test by comparing it

against Stock-Yogo's critical value of a determined maximal instrumental variable (IV) size. In Model 15, the F statistic of 18.352 is greater than the critical value of 10% maximal IV size. In Model 16, the statistic of 3.897 is greater than the critical value of 25% maximal IV size. However, Stock-Yogo's critical values for weak identification test are not available for Model 17.

Consistent with the earlier models, Model 15, Model 16, and Model 17 also support Hypothesis 1 that previous rankings negatively affect degree of quality improvement. However, the findings from these 2SLS/FE models do not support Hypothesis 2, as the estimated relationship between organizations' performance rankings and the degree of quality improvement in high-reputation clinics is not statistically different from that of low-reputation clinics. In contrast with the results from the OLS/FE models, the regression results from the 2SLS/FE models reveal no interaction effects between prior reputation and public perforamnce ranking on the degree of quality improvement. However, findings from the 2SLS models can be imprecise because of a small sample size of 156 clinics in this data set. The variation of the instrumented variables might not be enough large to detect statistically significant effects on the dependent variable. The estimates from the 2SLS models can have large standard errors if the instrumental variables are weakly correlated with the endogenous regressors, or if there is a correlation between regressors.

Table 14: Regression results from the 2SLS/FE models: Effects of previous percentile ranking on one-year change of ODC score allowing for heterogeneous effects based on prior reputations of clinics

Variables	Model 15 2SLS/FE β (S.E.)	Model 16 2SLS/FE β (S.E.)	Model 17 2SLS/FE β (S.E.)
Previous percentile ranking	-0.459***	-0.423***	-0.445***
	(0.071)	(0.064)	(0.068)
Previous ranking*Media endorsement	0.088		0.106
	(0.085)		(0.105)
Previous ranking*Quality awards		-0.034	-0.089
		(0.213)	(0.233)
Size of affiliated medical group	-0.362	-0.408	-0.518
	(0.269)	(0.536)	(0.559)
Size of diabetic patient population	0.015*	0.015	0.016
	(0.007)	(0.009)	(0.009)
Clinic submitting all patients dummy	-10.653**	-10.2713**	-10.608*
	(3.243)	(3.399)	(3.305)
Clinic utilizing EMR dummy	-0.472	-0.243	-0.388
	(2.367)	(3.115)	(2.650)
2010 dummy	8.160***	8.202***	8.259***
	(0.914)	(0.975)	(1.014)
Clinic fixed effects	Yes	Yes	Yes
Instrumental variables	Yes	Yes	Yes
Total number of observations (N)	292	292	292
R-squared	0.591	0.606	0.568
Kleibergen-Paap rk LM statistic	19.200***	5.231*	4.352*
Kleibergen-Paap rk Wald F statistic	18.352	3.897	1.970

Notes:
1) *Denotes statistical significance at $p < 0.05$, ** at $p < 0.01$, and *** at $p < 0.001$.
2) Coefficients in Model 15, Model 16, and Model 17 were estimated by 2SLS including clinic and time fixed effects.
3) R-squared reported for the fixed-effects estimation is the "within R-squared" obtained by estimating the equation in mean-deviation form.
4) Standard errors are reported in the parenthesis below coefficients. All standard errors are robust-clustered by clinic.
5) In Model 15, the F statistic of 18.352 is greater than critical value of 10% maximal IV size. In Model 16, the statistic of 3.897 is greater than the critical value of 25% maximal IV size. Stock-Yogo's critical values for weak identification test are not available for Model 17.

Even though the coefficients of the interaction terms from the 2SLS/FE models have no statistical significance, the signs of these regression coefficients are consistent with the findings from the OLS/FE models—the interaction effects between rankings and prior quality awards appear to be in the same direction of the direct effects of rankings, while the interaction effects between rankings and prior media endorsement appear to be in a opposite direction of the direct effects of rankings. The sizes of these 2SLS/FE estimates are slightly different from that of the OLS/FE counterparts. This suggests that larger standard errors could be a result of a limited variation of the instrumented variables in this small sample size. Hence, the OLS/FE models are more appropriate for estimating the consistent and unbiased coefficients in this setting.

5.3. Summary of the Empirical Results

The descriptive statistics show that, on average, the ODC score of the sampled clinics tended to improve during the period of study of 2008-2010. Nonetheless, the one-year change of ODC score of those clinics in each report year appears to be symmetrically distributed. This suggests that not every clinic improved the ODC score in each year. The descriptive statistics also show that a number of clinic characteristics varied slightly during the observation periods. Thus, they can be used as the control variables in the fixed effects models.

The regression findings suggest that lower previous performance rankings lead to a larger subsequent quality improvement in the sampled clinics. The predictive values from the estimated model show that pubic performance

rankings incrementally negatively impact the change of quality level, and have negative net effects on subsequent quality level in clinics with very high rankings. The negative effects of previous performance rankings on quality improvement are statistically significant and consistent across all linear models. Using the fixed effects estimation, the regression coefficient of previous percentile ranking is −0.223. This suggests that on average clinics with one lower percentile ranking had 0.22 higher percentage points of ODC quality improvement on the next report. In addition, a robustness test using the two-stage least squares model also conform the significant negative effects of rankings on degree of quality improvement.

The regression models that allowed for the heterogeneous effects of previous percentile rankings based on prior reputations of clinics provided a couple of interesting findings. The fixed effects model estimated the regression coefficient of prior media endorsement's interaction effect of 0.080 and the regression coefficient of the quality award's interaction effect of −0.163. Both coefficients are statistically significant different from zero. The interaction between percentile rankings and prior quality awards moderates the negative effects on the degree of quality improvement, in line with the direction of the direct effect of previous percentile rankings. In contrast, the interaction effects between percentile rankings and prior media endorsement is positive, which is opposite to the direction of the direct effect of previous percentile rankings. Nonetheless, a robustness test using the two-stage least squares model did not confirm significant interaction effects between rankings and prior reputations.

6. Discussion

Although public disclosure of health care quality data has been widely used as a policy intervention to promote quality improvements in health services organizations, the issue of how it can effectively influence quality improvements has not been resolved. While a number of empirical studies suggest that health care organizations increase their quality improvement efforts when their quality performance has been publicly disclosed, determinants of quality improvement efforts in the long run, when most organizations have already disclosed quality performance to the public, are not well known. Moreover, even though literature in health services research considers organizational reputation as a determinant of quality improvements after public reporting of health care quality (Hibbard et al., 2003, 2005a; Mennemeyer et al., 1997), the role of prior reputations on organizations' quality responses has not been addressed.

This dissertation addressed two research questions related to those unresolved issues: 1) Do public performance rankings of health care organizations predict subsequent quality improvements? 2) Is the relationship between public performance ranking and subsequent quality improvements contingent upon prior reputations of health care organizations? By using a unique longitudinal data set of publicly reported health care quality and comprehensive measures of organizations' reputations, the empirical analysis specifically tested whether low organizational rankings on public performance report lead to a greater degree of quality improvements among health care

organizations that voluntarily disclosed quality performance to the public, and whether such quality improvements are more likely in organizations whose performance ranking is inconsistent with their prior reputations.

The empirical analyses suggest an answer to the two research questions. The findings support Hypothesis 1 of this dissertation—public performance rankings of health care organizations predict subsequent quality improvements. This study has demonstrated that low organizational rankings lead to a greater degree of quality improvement in health care organizations that voluntarily disclose quality performance to the public. This result persisted after adjusting for clinic and time fixed effects and after further addressing the endogeneity issues by using the two-stage least squares estimator. The findings also support Hypothesis 2 of this dissertation—the relationship between public performance ranking and subsequent quality improvements is contingent upon prior reputations of health care organizations. After adjusting for clinic and time fixed effects, it is found that the interaction between percentile rankings and prior media endorsement positively affects on the degree of quality improvement, while the interaction between percentile rankings and prior quality awards negatively affects the degree of quality improvement. Therefore, the effects of organizations' public performance rankings on the degree of quality improvement in high-reputation health care organizations are different from that of low-reputation organizations based on history of media endorsement. Organizational performance rankings lead to a greater degree of quality improvement in prominent organizations with a history of media endorsement.

6.1. Major Findings

The major findings from the empirical analysis are three-fold. First, it is found that the degree of quality improvement as measured by one-year change of Optimal Diabetes Care quality score are negatively associated with organizations' rankings in the previous observational period. After controlling for the time trend and individual fixed effects of each clinic, relative quality performance in the previous observational period negatively affects the degree of quality improvement as observed on the current report. The negative coefficient of previous percentile ranking is consistently significant across all linear regression models. The lower an organization's quality rankings on the public reports, the greater degree of quality improvement that can be expected. The higher an organization's quality rankings on the public reports, the less degree of quality improvement that can be expected.

The significant findings from the linear models suggest the homogeneous effects of rankings on degree of quality improvement. In an attempt to explore whether the effects are heterogeneous across the range of previous performance rankings, the relationship was also estimated from the quadratic models as a sensitivity analysis. With the FE estimation, only the negative coefficient of the second order of previous percentile ranking is statistically significant at the confidence level of p-value <0.01, while the regression coefficient of the first order of previous percentile ranking is not statistically different from zero. This suggests that the magnitude of ranking effects on degree of quality improvement

could be larger in clinics with high rankings than clinics with low rankings. Nonetheless, because of non-significant effects of the first order in the quadratic models, the linear models with clinic and time fixed effects are the best estimation procedure in this study.

In the linear models, the interpretation of the negative effects of public performance rankings of health care organizations on the subsequent quality improvements should be differentiated from the phenomenon of "regression to the mean", in which a variable that is extreme on its first measurement tends to be closer to the average on a second measurement. It is unlikely that regression to the mean can explain the empirical findings of this study by itself. Although the very top-ranked clinics show a smaller degree of quality improvement than the low-ranked clinics, performance scores of the majority of clinics improved more than the offsets leading to the increasing trend. The negative effects of rankings on the additional motivation to improve quality, especially in clinics with previous high performance rankings, suggest the regression to the mean. Yet, the increasing trend suggests improvements of medical practices in all sample clinics over time.

The findings of this study may help explain why the evidence supporting quality improvement effects of public reporting has been mixed. This study attempted to explain how provider organizations respond over time when most organizations in that market have already disclosed quality performance to the public. It is possible that simply disclosing health care data to the public has only

limited impacts on health care organizations' motivation to improve quality afterward. Specifically, the action of disclosing quality data by itself might not be enough to influence providers' quality improvement efforts. All clinics in this study actively disclosed quality data to the public, but only some clinics continued improving quality over the periods of observation.

Previous research mostly used administrative data and focused on comparing performance of organizations that disclosed quality data to the public relative to organizations that did not (Hibbard et al., 2003, 2005a). But the comparison of quality performance between the disclosers and the non-disclosers implies an assumption that the action of disclosure by itself can influence quality improvement efforts. The relatively weak evidence of consumers selecting providers based on information on the public report points to a limited impact of public disclosure. The supportive evidence of the changes of care process in health care organizations after public disclosure of quality data raised a question of what other motivating factors besides the concern of market share can drive such quality improvement efforts. Similar to Hibbard et al. (2005, 2003), this study shows that organization's quality performance ranking relative to other disclosers and organizations' prior reputations could be important motivating factors of quality improvements.

Second, the empirical analysis suggests that the effects of performance rankings on the degree of quality improvement appear to be greater in high-reputation organizations than in low-reputation organizations. However, this is

empirically valid only when taking into consideration an organization's reputation from mass media endorsement, but not the reputation derived from history of receiving quality awards. Therefore, Hypothesis 2 of the study is partially confirmed.

The empirical analyses shed some light on how different dimensions of an organization's reputation could have different influences on the efforts for quality improvement. Prior reputations of healthcare organizations give rise to stakeholder's expectations that particular organizations usually deliver high quality of care, so that reputable organizations make an effort to maintain their reputation by continuing to improve quality of care. When quality performance rankings are not aligned with such expectations, providers and administrators in those organizations have an additional source of motivation for quality improvement—to resolve the discrepancy between the new information of organization's ranking and the old information of the organization's reputation. However, the empirical findings point out that two dimensions of an organization's reputation do not have similar influences on the efforts to resolve such cognitive dissonance. Prominent organizations or organizations with a greater visibility because of history of mass media endorsement appeared to keep improving quality of care even though they received high quality performance rankings. The effects of organizations' performance rankings on the degree of quality improvement are greater in prominent health care organizations. In contrast, organizations with perceived high quality based on

prior quality awards did not keep improving quality of care when they already received high quality performance rankings.

Why do the effects of prior media endorsement differ from the effects of prior quality awards? From sociology point of view, organizational reputation is a collective perception of an organization from all stakeholders' perspectives. As a result, different stakeholders of the same organization can have different expectations and satisfiers of reputable organizations. It is possible that each dimension of organization's reputation is more related to a different group of stakeholders, so that different dimensions of reputation have a different effect on quality improvement efforts in health care organizations. Moreover, the quality awards based on disease-specific quality performance measures may capture only a part of perceived quality of provider organizations, while the recognition by influential third-parties such as mass media may provide a more global view of organization's reputation and how stakeholders collectively perceive health care organizations.

An organization's reputation from being a recipient of the Buyer Health Care Action Group (BHCAG)'s PatientChoice Excellence in Quality Awards could be more meaningful to employees and heath plans that established the quality awards to promote quality improvement in medical practices. Donors to health care organizations likely would be satisfied if the organization that they gave money to have received the quality awards. The BCHAG awards were not be publicized widely in the public during 2000-2005, so they may be less

influential on the public perception of organizations. In contrast, an organization's reputation from being endorsed by mass media would be more important to health care consumers. Moreover, because Minneapolis-St. Paul Magazine created the Top Doctors list by surveying physicians and nurses in the community, an organization's reputation from being endorsed by the Top Doctors list could be more meaningful to the providers than other stakeholders of health care organizations. Because physicians and clinics on the Top Doctors list are more visible in the community, physicians likely want to be affiliated with reputable organizations. Therefore, provider organizations could be more motivated to improve quality of care to gain peer recognition from other provider organizations in the community.

Being known as health care organizations that have received quality awards could influence the perception of quality of care in those organizations. Thus, a history of receiving quality awards potentially contributes to the perceived quality dimension of organization's reputation. But many quality awards use quality measures that are specific to medical illness or interventions as criteria for selecting the recipients rather than awarding organizations based on a comprehensive measure of organization's quality. For the data used in this study, the criteria for awarding the Buyer Health Care Action Group's PatientChoice Excellence in Quality Awards was based on quality performance on specific quality measures such as improved care and outcomes for people with asthma or improved screening for colon cancer. Therefore, it is possible that an organization's history of receiving such awards can lead to the perception of

quality, but only to the perception of quality in those specific areas and not really public perception of overall quality of those organizations. These disease-specific quality measures may not necessarily be related to quality measures on the public reports, thus organizations with prior quality awards may not necessarily remain motivated to improve quality of care when they receive high quality performance rankings.

Being known as health care organizations that have been endorsed in the mass media could influence the perception of quality of care in those organizations. However, if the endorsement is a result of surveying randomly selected health care providers in the local areas, and not focusing on how provider organizations deliver specific care to patients with certain medical conditions, the recognition could provide a more global view of provider organizations rather than only quality of a particular type of care. Hence, being named in a local magazine such as Minneapolis-St. Paul Magazine's Top Doctors could have effects beyond an organization's perceived quality, also increasing the organization's visibility in the community. When reputation is established through information exchanges and social influence of actors in the organizational field such as mass media, an organization's reputation depends on how prominent an organization is in the minds of stakeholders. Because of its visibility to the public, these prominent organizations could be more concerned about their organizational perforamnce rankings on the public reports. Therefore, organizations with a greater visibility because of a history of mass

media endorsement may be more motivated to keep improving quality of care even if they receive high quality performance rankings.

Finally, the empirical findings from this study suggest a similarity between reputation from receiving quality awards and that from obtaining a high ranking on the public report. Hence, it is possible that public disclosure of health care quality has more potential to influence an organization's perceived quality than its prominence in the community. The empirical analysis shows the same negative effects of organizational performance rankings on the public reports and organizations receiving quality awards. While organizational prominence or visibility from media endorsement positively affects quality improvement over time, both the direct effects of quality performance rankings and its interaction effects with prior quality awards support the hypothesis that lower organizational ranking are associated with greater subsequent quality improvement in health care organizations.

6.2. Implications of the Study

This dissertation research contributes to the literature in organizational studies, quality management, and health services research, particularly the body of knowledge on the causal mechanisms of how organizational environment can influence organizational perforamnce. Specifically, the findings from this empirical study provide a better understanding of the roles of public reporting of quality performance on the self-assessment of organizational quality

perforamnce and the motivation for organizational quality improvement. There are several implications from this empirical study.

First, this dissertation makes several contributions to reputation research by improving our understanding of organizational reputation, particularly the reputation of health care organizations in the context of public reporting of health care quality. This study found a similarly negative effect of reputation from receiving quality awards and reputation of high ranking on the public report on the degree of quality improvement. Because quality awards likely affect the perceived quality of those recipients, this may suggest that quality performance rankings on the public reports likely contribute to the perceived quality dimension of organizations' reputations as well.

This study also found that reputation could mean different things to different stakeholders, as suggested by the opposite direction between the effects of prior quality awards and the effects of prior media endorsement on subsequent quality improvement. Organizations may send the signal of quality to different stakeholders through different channels to establish the perceived quality of the organization. Future research should investigate the effects of global quality measures, such as patient satisfaction, and compare findings to the results of this study. Organizations' rankings on comprehensive performance measures could provide a greater incentive for organizations to keep improving their quality of care than their rankings on a certain medical care treatment. This empirical study is focused only on the effects of publicly reported quality

performance, particularly the treatment of diabetes. The reputation effects of public disclosure of other kinds of health care organization's performance, such as organizational efficiency, would be a promising area for the future research. Another area for future research is the examination of performance rankings of the recipients of quality awards that are based on a global view of organizations, such as the Malcolm Baldrige National Quality Award (MBNQA). The criteria for selecting the MBNQA recipients are not based on only the performance of some particular health services. However, such an award is commonly given to large health care organizations such as hospital or health systems, not small organizations such as medial clinics.

Second, policymakers and health care administrators who want to use public disclosure of quality to promote quality improvements in provider organizations should not only demand provider organizations to disclose quality data to the public, but also should publicly report such data in a comparative manner so that organizations can conduct self-assessment by comparing their quality performance with other organizations. Health care organizations that obtain a relatively low quality score or ranking are more likely to be dissatisfied with their performance than those with higher rankings. Thus, they would be more driven to improve their relative quality performance.

It is also crucial to compare organizations' quality performance within a group of similar organizations. Public performance rankings relative to organizations in the same strategic group could be more influential on quality

improvement efforts. For instance, clinics that actively and voluntarily disclose their quality performances are more likely to be considered the members of the same perceived strategic group. Even though these early disclosers are organizations that have already been actively engaged in quality improvement activities, improving its quality performance and improving its rankings on the public report could become one of the organization's goals, and therefore low performance rankings relative to comparable organizations would facilitate quality improvement responses in those organizations.

Future research should examine the relationship between public performance rankings and subsequent quality improvement in a subgroup of comparable organizations such as clinics that are parts of large medical group practices, comparing to that of standalone clinics or clinics that are parts of small medical group practices.

Third, the findings from this study suggest that, when a standard of health care quality at the population level is not available, organizations under norms of rationality are driven to "satisficing" with an acceptable level of quality measures—clinics that obtain a relative high quality score are more likely to be satisfied with their performance, and even if they continue improving quality they may not necessarily be motivated to improve quality as much as the lower ranked organizations.

Should minimal standards of quality measures at the population level be available, future research could examine whether provider organizations that

have reached an acceptable level of quality would be motivated to improving quality of care, particularly when organizations have already obtained a high quality score relative to others. If the quality standards are clear and the technical knowledge needed to achieve such standards is available, organizations under norms of rationality could be driven to "maximizing" their quality rather than stopping improvement when they attain "satisficing" levels of quality. Public disclosure of quality measures that focus on whether organizations have reached an acceptable level of quality could influence organizations that perform below quality standards to continue improving quality of care, and not putting less effort into quality improvement even if they have obtained a relatively high quality score.

6.3. Limitations of the Empirical Findings

This empirical analysis has several limitations. First, although MNCM Quality Reports provide a unique data set of quality performance at the level of primary care clinics rather than larger provider organizations such as medical group or hospitals, medical clinics in Minnesota could have some characteristics that differ from those in other geographic areas. Thus, caution is needed in generalizing the findings to different contexts, either to medical clinics in other locations or to different kinds of health care organizations besides medical clinics. Furthermore, because the sampled clinics in this study voluntarily reported ODC on MNCM Quality Reports, caution also is needed in generalizing

the results to health care organizations that do not voluntarily disclose quality data but report it as required by law.

Second, the time-varying characteristics of clinic and the persistent nature of quality perforamnce in each clinic over time could be threats to the internal validity of the empirical findings from this research. I attempted to address these endogeneity issues in this data set by constructing an instrumental variable from the difference between the observed performance ranking relative to all other clinics and the expected performance ranking relative to only clinics that disclosed their performance on the previous report. Using this instrumental variable in two-staged least squares model with one endogenous variable, the empirical models passed the tests for under-identification and weak identification. However, models with interaction terms between percentile ranking and prior reputations have more than one endogenous variable and require more than one instrumental variable. Because some of the models with interaction terms suffer from weak identification and the regression coefficients of the interaction effects of reputation are not statistically significant, the interpretation of the interaction effects from these instrumented models is limited. A caution is needed about inferring a causal relationship from these the 2SLS estimates.

To verify the internal validity of the interaction effects, future studies should attempt to use other appropriate instrumental variables of percentile ranking and compare findings to the results of this study. To obtain a more

precise estimation of the relationship, researchers should consider using a different measure of organization's reputations, additional control variables, and a larger sample size.

Third, the interpretation of the effects of prior reputation of clinics is limited by the reputation measures used in this study. The Minneapolis-Saint Paul's "Top Doctors" list is used as a proxy measure of clinic's prior reputation, because the "Top Clinics" list that is a direct measure of clinic's reputation was available only in 2002. The impacts of the Top Doctors list on organization's reputation can be constrained as of a plausible disconnection between reputation of doctors and reputation of their clinics from the perspective of the readers, even though both the names of physicians and the names of clinics were reported on the list. Future research should consider using only a direct measure of reputation at clinic, while the Top Doctors list could be an important data set for future researchers who would like to investigate the reputation effects at the individual provider level.

Finally, the empirical findings from this study should not be generalized beyond the contexts of chronic illness care. Quality of care of chronic illnesses needs to be captured by multiple measures of care processes and intermediate outcomes, and also requires a long-term follow up of patients in order to observe the time trends of those quality measures. Thus, the Optimal Diabetes Care score, which is used as a proxy measure of health care quality in this study, also can be a good representation of health care quality of other chronic illnesses. The

findings from this empirical analysis may be applicable not only to quality of diabetes care, but also chronic illness care such as hypertension or cardiovascular disease. However, the findings are unlikely applicable to quality perforamnce in acute illness settings, such as acute asthmatic attacks or traumatic injuries.

Moreover, quality performance scores of primary care clinics that publicly reported on MNCM Quality Reports are available for only four years. In fact, Optimal Diabetes Score is the quality measure of medical clinics that has been collected by MNCM for the longest time. Other measures on MNCM Quality Reports have been collected and reported for an even shorter period. Moreover, because the previous percentile ranking of ODC performance is used as the dependent variable, we can observe the effects of ODC performance rankings on the degree of ODC quality improvement for only three observational periods. To observe the change of quality over time, this panel data set is also limited by its sample size, as there are only 156 clinics that started reporting ODC scores since the very first report year and kept reporting for at least two consecutive years.

Future research should employ the new data sets from the future years of MNCM Quality Reports and investigate whether the findings found in this study would be changed if we have a longer period of observation. With additional years of observation, the effects of quality rankings in cohorts of clinics that started reporting ODC scores in the later years could be evaluated and compared with results of this study that focused on clinics that started reporting ODC scores in the early years. Researchers should consider analyzing quality

measures besides the ODC score that will be available for panel data analysis in the future, particularly a more global measure of quality of care.

6.4. Conclusions

The purpose of this study is to develop a better understanding of how organizational reputation can explain the variation in quality improvement among health care organizations that disclose quality performance to the public. The study investigated whether public performance ranking of heath care organizations can predict subsequent quality improvements, and whether prior reputation of health care organizations influences the relationship between public performance ranking and subsequent quality improvements. The two research questions are empirically tested by using the panel data set constructed from Minneapolis-St. Paul Magazine's Top Doctors 2000-2006, Buyer Health Care Action Group's PatientChoice Excellence in Quality Awards 2000-2005, and Minnesota Community Measurement Health Care Quality Reports of 2007-2010.

This dissertation found that the degree of quality improvement as measured by one-year change of Optimal Diabetes Care quality score can be predicted by organizations' rankings in the previous observational period. Organizations' quality performance relative to other comparable organizations on the current public report negatively affects the degree of quality improvement as observed on the next report. Moreover, the effects of organizations' performance rankings on the degree of quality improvement are greater in high-reputation health care organizations than in low-reputation organizations,

although a different dimension of organizations' reputation differently affects quality improvement efforts in health care organizations. Similar to the effects of organizations' performance rankings, public perception of organizations' quality negatively influences quality improvement efforts in health care organizations. In contrast, organization's prominence positively influences quality improvements in provider organizations.

On the one hand, the empirical results from this study are consistent to previous studies that demonstrate the reputation effects of publicly disclosed quality data on subsequent quality performance (Hibbard, 2003, 2005). This research contributes to the limited empirical evidence on causal mechanisms influencing the subsequent change of health care quality, which is crucial for the related policymaking process. Established reputation of health care organizations, specifically the prominence dimension of reputation, potentially is a driving force of quality improvement. An organization's reputation influences motivation to improve quality of care as a response to public reporting of health care quality.

On the other hand, the results from this study are different from previous research that suggests health care organizations pursue quality improvement efforts simply because their quality performance has been publicly disclosed. This study found that public disclosure by itself is not a predictor of quality improvements. In fact, the relative performance rankings among comparison organizations that have been publicly disclosed is a major driving force of

quality improvements, particularly in the long run when most organizations have already disclosed quality performance to the public.

Public disclosure of health care quality data has been widely used as a policy intervention to promote quality improvements in health services organizations and has the potential to influence quality improvements. This research contributes to limited evidence on the influence of organizational reputation on subsequent change in health care quality in the context of public disclosure of health care quality. Organizations do not only learn about their quality performance relative to peers and competitors, but also relative to their organization's prior reputation. The knowledge from this empirical research could help policymakers and health care administrators to promote health care quality improvement. By focusing on the measures of organization's quality performance in a comparative manner, and making the information on the public reports more visible in the community and within reach of different stakeholders of health care organizations, public disclosure of health care quality could have greater impacts on quality improvement in health care organizations.

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