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What Cost Hospital Quality: Performance Uncertainty Under Market Reform

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WHAT COST HOSPITAL QUALITY: PERFORMANCE UNCERTAINTY UNDER MARKET REFORM

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy at Virginia Commonwealth University.

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Abstract

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Healthcare is an organizational field that has undergone profound change in the last few decades, an era characterized by market reform. Healthcare production has revealed both economic and quality problems in past eras, and reporting on these problems can be seen to have contributed to pressures for social reform. Yet, the move toward more market-oriented governance structures and design solutions also reflects a wider isomorphic institutional tendency for organizing social order.

The conceptual frame work of this study takes a pessimistic stance on whether the market reform has achieved the intended goals with respect to advancing organizational

quality performance. The framework draws on institutional theory and complementary collective action notions in organization theory concerned with boundedly rational decision-making to reason that healthcare evidences certain contextual characteristics that are not a good fit with the market enterprise model of organizing organizations. Specifically, hazards to the efficient market thesis were considered to include uncertain outcomes, a high degree of technical and coordination complexity, and the need to account for intertemporal process transformations of significant duration.

A longitudinal design was used to test efficient market thesis propositions. Inpatient administrative data was used to develop two latent hospital quality performance variables, a Mortality quality indicator and an Errors quality indicator. The two latent variables were derived from three selected AHRQ patient safety indicators and an inpatient mortality rate. The measurement model was validated as evidencing significant systematic between-hospital variation. Audited survey data, along with inpatient discharge data was used to develop hospital economic performance variables and process control variables.

A set of predictive supply-and-demand models were used to test: 1) whether there is evidence of any trend in quality performance, and how market competition relates to observations of improvement; 2) whether quality cost more; and, 3) whether preferences for better quality outcomes related to hospital economic performance. A hierarchical linear model growth-curve design was employed to assess the predicted relationships and to account for unmeasured organizational dependent relations determinant of hospital quality performance. The unaccounted for systematic between-hospital variance was taken to estimate an "unspecified" hospital-specific institutional effect, independent of material-resource factors.

The measurement model results for each of the quality indicators selected evidenced construct validity for patient-level risk-adjustment. Each quality indicator demonstrated a significant systematic between-group variance component in all of the four years studied. The two latent hospital quality performance variables also demonstrated systematic between-hospital variance in growth trajectories in the linear growth-curve model.

The predictive models evidenced no significant growth rate trend for either of the quality indicators, indicating the competitive bar on quality performance was unaffected during this period of market reform. Neither was there any evidence that pricing mechanism were able to price the utility of better outcomes, as higher quality did not cost more. Neither was there evidence that consumer preferences for better quality related to better hospital economic performance, as measured by hospital operating margins.

CHAPTER 1—INTRODUCTION

"Markets and other economic institutions do more than allocate goods and services: they also influence the evolution of values, tastes, and personalities. Economists have long assumed otherwise…" Samuel Bowles (1998, p. 75).

This research intends to improve understanding about the economics of hospital quality performance by not ignoring that resource exchanges are always embedded within an institutional context. The fact there is only sparse information available about how pricing and market competition relate to hospital quality performance (Morrisey, 2001) makes the industry an anomaly in our consumer-oriented culture. This simple incongruity calls for more inquiry.

The three-decade long controversy as to the need and the means to transform healthcare into a more accountable and market efficient private sector is further reason to improve our understanding of the economics of hospital quality performance. The uncertainty surrounding the value of medical care, long acknowledged (Arrow, 1963), will be offered as a lens through which to focus on the institutional reform that has been taking place in healthcare.

Professional and federal spheres of influence have given ground to business oriented objectives in healthcare (Scott et al., 2000). The importance assigned to market logic and market institutions has given new economic and institutional meaning to healthcare outcomes. However, as noted by Bowles in the lead quotation, markets, like other social institutions, affect more than just our concerns about the allocation of resources. Markets are social institutions that also influence values and tastes, and therefore our expectations about what organizational performance should achieve.

The turn toward more market-oriented approaches for organizing our social order is not only a healthcare phenomenon. In many arenas the libertarian strain in American life has trumped the more "mixed economy" approaches taken in previous eras (Kuttner, 1997). The increasing hegemony of market ideology follows in part from acceptance of the assumption that society, as an aggregate of individuals, is better off if organizations and their management are free to pursue material interest dependent only on material-resource demand (e.g., are freed from other external collective controls, be they professional obligations or governmental regulations).

If one assumes that most Americans share such market optimism and are overall satisfied with the organizational results achieved when necessities, such as hospital services, are treated as commodities for sale in private markets, one might expect the discussion need only proceed to tedious econometric technicalities that are otherwise obvious to most. Obvious in the sense that the technicalities are readily construed as familiar concepts,[1] such as: "quality costs more"; or "quality is a comparative niche in a firm's strategy to achieve market differentiation and market share". Or, more generally, that quality as an essential component of economic value (Akerlof, 1970) can be expected

[1] Such familiar cultural notions are conceived in institutional theory to be taken-for-granted facts that avoid testing and empirical confirmation.

to improve as competitive incentives invariably raise the performance bar through the dynamics of market efficiency. Adventurous cultural contrarians may even speculate that for those who pursue continuous improvement, "quality is free"—in the transplanted Japanese economic tradition that so spurred global trade.

When subjected to the rigors of research, however, healthcare's newfound preoccupation with market efficiencies, especially in relation to quality performance, has tended to generate more pessimistic appraisals (Sisk, 1998). Healthcare transactions in general, and particularly the interaction of economic factors and organizational effectiveness, have been shown to be complex and saddled with numerous economic hazards (Newhouse, 2002a).

To improve our comprehension of such intricacies, health service researchers have been admonished to pursue theoretical development that will accommodate the degree of complexity and the specific hazards that might forestall optimistic optimality (Robinson, 2001). Innovative theoretical approaches are needed, that is, if effective tools rather than stagnating rivalries are the goal.

Technical matters, such as the measurement of quality outcomes and statistical estimation of economic models, certainly do engage much of this study. However, the theoretical significance of this research relies more on putting market presumptions to the test, than on confirming what our culture appears to take for granted.

The theoretical framework guiding the study assumes that the institutional environment of organizations matter, for good and ill. The supposition that more efficient outcomes follow from transforming institutional models less driven by economic self-interest into market reformed models calls for empirical support—at least from the institutional perspective used to guide this research. Institutional theory often takes an exposé approach, and in this study proceeds to question the presumption that quality outcomes have become more "technically" determined by the two or more decades of "market reform."

The attention given to theoretical foundations, as well as technical essentials, may be received well by those who would rather exercise along such a 'slippery slope' than attend again to what they already know. Others may wince at the conceptual framework's pessimistic view of the elegantly tractable market ideals. Who in our consumer-driven culture does not want to belief "we get what we pay for," simply because we are substantively rational. For, without grounding in the eminently rational and formalized solutions of orthodox economics as embraced by bottom-line corporate ideology, social discourse inclines toward less observable constructs than quantities and prices, and concepts less systematic than Pareto welfare. Social explanations tend to comprise instead subtler and lumpier descriptive and comparative concepts of how social order is or could be achieved—such as the transmission of culture, social learning, organizational learning, or the acknowledgement that all-too-human institutions matter.

Though the research is guided by pessimism for the normative position taken by neoclassic economics and real-world support for conventional economic models, the theoretical stance offered focuses on longstanding concerns about the macro dynamics of institutional theory. Support is proposed for social construction concepts that would unify and extend the theory by tying it closer to micro organizational theories concerned with decision making and collective learning processes under conditions of bounded rationality. Specifically, the framework aims to reduce the need for institutional theorists having to default to the abstract formalism of market mechanisms when they observe positive institutional/organizational outcomes. Institutional research has struggled with explaining the benefits of collective action, and has tended to take the path of least energy by primarily focusing on the unintended consequences of collective action or the "loose coupling" achieved by social construction.

The theoretical stance is not offered as a formal rebuttal to the nomological deductive paradigm of mainstream neoclassical economics, other than to simply assert it simplifies too much to achieve very general explanations (Perrow, 1993). Essentially it will be argued that orthodox economics, to the extent it supports free market ideology and is critical of alternative governance structures, oversimplifies, by arguing that social institutions and social conventions are irrelevant (or, rather, can be taken as givens once market reform can be taken as a given) when attending to economic calculations on scarce resources. The universal law of equilibrating dynamics derived from the premises of normative economics has limited application, and is not sufficiently general to scientifically warrant or socially legitimate the normative thesis, carte blanche. That is, the conventional economic position requires continuous empirical support, and in practice reveals severe and important contextual qualifications that practitioners of the general theory generally do not admit to in discussions aimed to persuade social action.

The logic behind the efficient market thesis that given only an initial condition of decentralized decision making on material interest an economy can achieve a determined

Pareto-efficient end—a best-off economic scenario. The role of collective action and common interest is primarily to legitimate market institutions, rules and property rights.

Qualifying the "true" boundaries of the systemic thought embraced by neoclassic economics is not the conceptual focus in this research, as discussion along such lines would lead too far a field. Within the formalism of orthodox economics, research could pursue analysis of market-failure in health services. A path of inquiry affectively pursued decades ago (Arrow, 1963), but a path rarely followed in the current academic or cultural climate.

The conceptual focus of this research is, rather, more pragmatic. Attention is given simply to the consequences of market reform as an institutional development. The inquiry looks to whether such conventional notions that quality cost more, or that we get what we pay for are in evidence after more than two decades of market reform in healthcare. An alterative theoretical position, based on fundamentally different premises and methodology, will be offered in order to warrant pessimistic predictions for the enactment of market reform in healthcare. A theoretical argument grounded in rather simple empirical foundations (Simon, 1997). The intent is to present the research results as little more than a stylized fact, not a systematic representation of the social order realized within the organizational field of healthcare.

Attention will be drawn, however, to the fact that arguments for limiting a general notion of "market regime" optimality have been well articulated by eminent economists for decades. Despite well formulated opinions and empirical evidence to how conditional the laws that rest on individual utility maximization (Montesano, 1997), mainstream economics' uncritical support for market ideology has maintained a preeminent institutional position (Blaug, 2003; Lodewijks, 2003). The profession and academic institutions appear to blithely ignore or transform all methodological challenges (Kreps, 1999; Potts, 2003; Mayhew, 1996; McCloskey, 1995). Economics as a social science is distinctive for its relative absence of theoretical pluralism. This state of hegemony has even turned some heterodox economists rather vitriolic (Thompson, 1997; Kreps, 1999; Williamson, 2000a). The property rights established by economic orthodoxy will be taken as "data" in this institutional exposé.

In this introductory chapter an historical account is used to premise the empirical explanations investigated. The discussion accounts for the uncertainty inherent in healthcare outcomes and the complexity of the social order that has evolved to meet healthcare demands. From these accounts it will be reasoned that effective social engineering solutions are attainable, but that the real-world solutions need not have anything in common with the maximizing solutions of the neoclassical paradigm. Rather, the premises made will argue for a more empirical and micro-analytic economic perspective (Simon, 1997; Williamson, 2000a; Dosi, 2004). An empirical methodological perspective akin to that applied in other social sciences (Simon, 1997), biological science (Mayr, 1997), and the writings of Adam Smith (Khali, 1999; Simon, 1997).

Solutions in healthcare just may inevitably be complex, and require no small amount of cooperative and collective action, that tries and fails, and yet sustains a commitment to a common good that we all have interests in. Healthcare may be like education in a democracy, so important that it can enlist societal support even when confronted with evidence that we have failed to achieve an idealized end-point. It just may be that neither the market enterprise model that aims to structure institutions that free decentralized interest, nor simple trust in profession property rights is the adaptive path to be socially constructed.

The Healthcare Environment: Social Order in the Face of Uncertainty

Healthcare, more than most industrial sectors, exemplifies just how elaborate the effort can be to achieve a sense of social order in the face of uncertainty. Uncertainty, for example, was the theme of Kenneth Arrow's seminal 1963 article, "Uncertainty and the Welfare Economics of Medical Care." After comparing healthcare's obvious characteristics with the conditions of normative economics Arrow explicated the special market problems of medical care "as adaptations to the existence of uncertainty in the incidence of disease and in the efficacy of treatment" (p. 941). Arrow concludes:

> [T]he failure of the market to insure against uncertainties has created many social institutions in which the usual assumptions of the market are to some extent contradicted. The medical profession is only one example… (p. 967).

Since Arrow made these observations, market theory and market reform has tended towards a purer form of normative formalism. There is little discussion in the health economics literature today about alternative institutions as feasible solutions to market failure conditions (Arrow, 2001). Nonetheless, it is generally noted by academics and lay observers alike that the social order built around healthcare transactions differs from other social enterprises. In a time of global and impersonal trade, healthcare is a major sector in which transactions are personal and local. The treatment of patient pathologies is a challenging endeavor, recognized by all. The social responsibility carried by the organizations and individuals in medical care is immense in terms of the emotional stakes and the future effect on the quality of life. Though individual health or illness may not be quite the mystery it once was, healthcare interventions are complex and outcomes remain profoundly uncertain.

This complexity and uncertainty does not arise from biological complexity alone, but also from the social order that has evolved to handle the enduring mystery surrounding the achievement of health or long life outcomes. Much of what we expect from other large and long established private market sectors does not hold true for the organizational field of healthcare. Following the lead of Kenneth Arrow (1963), then, this investigation into outcome uncertainty seeks explanations for the absence of expected efficiencies between cost and outcomes—despite many decades of biomedical advancement and at least a few decades of market-oriented "reform."

Healthcare: A Private Sector in Search of Economic Efficiencies

The notable peculiarities of healthcare and its production outputs have not only continued but also have expanded in new directions since Arrow's 1963 observations (Arrow, 2001). The persistence and magnitude of healthcare problems in terms of both the economics and the quality of care must be considered as contributing pressure for change (Morrisey, 2001). Institutionalizing market structure upon healthcare would seem to be a good bet. It is not sure to be a winning one, however. Although the ubiquitous cultural enthusiasm for market governance no doubt fosters strategic managerial implementation, social scientists are obligated to consider that factors such as uncertainty might result in less than a best-off market scenario.

Uncertainty as to production outcomes is but one facet of the uncertainty in healthcare, though. Even more fundamental is uncertainty as to which governance structures and which organizational forms can ensure that healthcare organizations improve on social welfare. That is, how healthcare production is structured is antecedent to healthcare production outcomes.

Market governance is presented here as one of several means by which society makes decisions, allocates resources and controls behavioral routines. The current favor enjoyed by market-oriented solutions to socioeconomic problems marginalizes alternative forms of social governance such as governmental, professional, or religious authority. The resurgent ideal of self-regulating markets in preference to a more "mixed economy" approach represents: 1) reduced concern about the excesses and hazards of "free" markets as held in eras past; and 2) public opinion set rather selectively on anticipated market benefits, namely, individual choice as the most expedient route to material prosperity.

Yet the current healthcare organizational environment can also be regarded as a conflicted field of play (Scott et al., 2000), a competitive struggle among mental models that would frame the "constitutive rules that construct collective actors in addition to individual actors" (Scott, 1992, p. 282). To understand the struggle, between the monetary interlopers offering the new market enterprise model[2] and those representing

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[2] The market enterprise model is a theoretical construct covered in detail in the Conceptual Framework section.

healthcare's professional and reactionary roots, it is vital to understand the distinctive combination of actors involved in healthcare exchanges. Without demarcating their values, interests, and collective preferences, what is at stake in the conflict resolution may evade our understanding. Compared to exchange relationships in most private markets, exchanges in healthcare are a little more varied and often obscure. Certainly healthcare transactions do not resemble the self-enforcing exchanges found in the textbook "perfect market" ideal. Principal actors in the healthcare exchange processes include private employer purchasers of health insurance, government purchasers of public health insurance, professional providers of services, organizational service providers, risk-bearers and payers acting as agents or middlemen for purchasers (ranging from indemnity insurers to fully risk-bearing provider organizations contracting directly with purchasers), and the individual patients—who to varying degrees are purchasers as well (Hurley, 1993).

Few of those diverse actors appear to be content with the performance of healthcare in the U.S, or with its governance (Devers et al., 2003). Arguably, healthcare has been in a state of flux since the mid-1970s, when purchasers began to be more proactive about their financing of healthcare because they faced the new problem of uncontrolled cost increases (Enthoven, 1993; Fuchs, 1996). Before the fourth quarter of the last century, when the proportion of GDP for health expenditures was below 6%, funding for health insurance was a manageable problem with routine solutions. Most funding for health insurance was private, underwritten by businesses as a tax-deductible employee benefit. In 1965, federally mandated tax dollars were significantly added into the mix, as the government became an insurer for the elderly (Medicare), and government's role increased when taxes started paying for the insurance of vulnerable populations (e.g., Medicaid). As healthcare costs then moved past 10% of GDP in the mid-1980s and headed for 14% in the next decade, purchasers of health insurance began to perceive its funding as a problem. In a world of assumed scarce resources, the purchasers' problem with healthcare became healthcare's biggest problem, and the rules of the game came into question.

It is important to keep in mind that before the 1970s, the medical profession was the undisputed arbitrator of the rules and logic applied in healthcare. A concept central to two seminal works on the rationalizing roots of healthcare (e.g., the economic perspective of the Kenneth Arrow (1963) cited above and the social historian's perspective of Paul Starr (1982)) is that medical care transactions were, and to a lesser extent still are, taken for granted as ethically grounded, both scientifically and morally. Fundamental to the medical profession's model was that medical care was a prestigious vocation that laid claim to a higher calling than the greedy business of business (Hammer, 2001). Before the 1970s, healthcare exchanges were not notably subject to the dismal social reality of competitive economics. The guild of physicians was justified in wielding state-granted property rights to oversee the healthcare industry because they held that their imperatives were more than "just money." They were viewed as objective, scientific men (gender reference intended) entrusted with the social responsibility of caring for the sick and ailing.

Capitalism and competitive economics may have been the culturally shared model for problem solving in other private enterprises, but they did not in decades past apply to the social order of healthcare. Nevertheless, when healthcare purchasers and other actors who value the notions of competitive economics saw the costs for healthcare insurance becoming a problem, they turned to the market enterprise model for solutions.

Supported by the state,[3] purchasers pursued innovative strategies to construct corporate middlemen to control healthcare costs. In just two decades, managed care organizations (MCO) evolved from an interesting Californian oddity, to a very diverse set of organizational forms driving healthcare markets. MCOs as corporate brokers of healthcare coverage have supplanted traditional indemnity insurance companies, which had better suited the interests of the medical profession. By the mid-1990s, MCOs along with other market-oriented innovations appeared to have contained the escalation in purchasers' costs while also securing revenues for administration and for profit. That economic success, however, was not attained without political cost. Cost-cutting strategies pursued have not only antagonized providers on the supply-side (Alexander et al. 2001), but have also generated a backlash from the consumer on the demand-side (Gold, 1999; Fien, 1999).

The earlier organizational order of the medical profession's practice model made no claims to efficiency and economizing, as is the apparent aim of the market enterprise model. The organizing principals of the two models differ, and their flaws and benefits

[3] Two good examples of Federal involvement in cost accountability initiatives were: Nixon's Health Maintenance Act of 1973 and HCFA's 1983 Prospective Payment System (PPS).

need to be differentially assessed. Healthcare has not always framed transactions solely by marginal costs and benefits calculated according to rational choice, but rather by a more bounded rationality—one based on social commitments (trust and social contracts) and social institutions.

As the professional regime asserted its authority, however, the economic ante was upped. Physicians began to rely less on their patients' own recuperative powers and more on interventions using expensive biomedical technologies, charging more for the specialized and impersonal skills required. Concomitant with the costly advances in biomedical science was the rise of health insurance coverage. Health insurance became something of a "right" during the mid-twentieth century. While American corporations were doing well in the absence of global competition, their paternalism supported tax-deductible employee benefits. A growing economy and liberal politics helped to propel federal administrations toward becoming a purchaser of medical services and biomedical research. In the decades following the Second World War, U.S. culture, like in all other developed societies, accorded healthcare a special value as a public good, if in an odd sort of corporate way. In recent decades, however, as the economic burden of this quasi-public good grew, the ordering rule of competition for scarce resources has come to dominate healthcare.

The rule of market competition has a rich, if cyclical, tradition in other areas of cultural life, but the "special features of health care markets have made this competition different from most other markets" (Morrisey, 2001, p. 193). This study considers one critical difference: the role of quality outcome information, and the uncertainty of what a dollar buys in healthcare.

Healthcare: A Private Sector in Search of Measures for Quality Outcomes

Among the many fascinating aspects of organizational uniqueness in healthcare, this research addresses a particularly intransigent puzzle. Why do long recognized problems of quality care persist relatively unaffected in this sea of market change? As long as a century ago, production flaws in assessing and controlling quality in healthcare delivery were brought to light by professionals (Codman, 1914). The flaws continue to be passionately articulated by elite actors today. The strongest contemporary critique is found in recent publications by a blue ribbon panel convened by the Institute of Medicine (IOM, 1999, 2001). So strongly did this elite group feel that quality continues to be a severe problem that they have called for "fundamental change" in healthcare (IOM, 2001, p.1): radical reengineering of practices and production routines, along with new public and private investment in a *new* quality agenda. The IOM's reports echo arguments that have been made over the years by health service researchers (see Schuster, et al., 1998 for a review).

What is the significance in the persistence of quality problems even as pressures for more market governance have brought such profound change? Has the ascendancy of market governance over government and professional authority affected the measurement and improvement of quality outcomes? Would it do so if market reform were more *purely* applied in the organizational field? Does the consumer believe he/she is better off in healthcare's "more competitive" environment?

In a review on how market competition has affected hospital and health insurance markets, Morrisey (2001) reported that quality remains uncertain. Morrisey summarized that studies on competition reveal "[w]hile we have learned much about prices, and less about services, we know almost nothing about the effects on quality" (p. 193).

Certainly much of the conflict over the governance and re-structuring of healthcare stems from healthcare's long acknowledged problematic feature: the difficulty of assessing either the need for or the outcomes of medical care (Arrow, 1963; Donabedian, 1988). Who is to judge? What are the legitimate means of judging medical care processes? How are we to define the cost to benefit tradeoffs? What are the appropriate roles for education, professional norms and standards, public regulation and protection, the economics of information, and private competition in setting the criteria for judgment? In sum, the question is: Do we already know or can we determine how to assess the quality in healthcare?

In most organizational fields, answers to questions about production outcomes would begin with key government oversight agencies or organizational associations. This study begins by looking at the medical profession for clues.

One informative point is the intense research and publication attention given to "evidence-based medicine." Evidence-based medicine, a professional movement, aims to derive objective standards for medical care from statistically modeled scientific tests, not unlike the standards of engineering or other applied sciences. A Medline search on the topic in 1991 produced no citations; for the year 2000 the search produced 2,256 articles. This jump from the absence of the construct to a level of overwhelming interest represents a dramatic change in scientific and professional attitudes over just a few years. One of the two articles cited in 1992 was a JAMA editorial by the newly formed Evidence-Based Medicine Working Group, "Evidence-based medicine: A new approach to teaching the practice of medicine" (Evidence-Based Medicine Working Group, 1992). The editorial acknowledged longstanding objective deficiencies in the information that has guided practice and called for professional reform. In a conflicted fashion, physicians, who traditionally have been entrusted with judging medical care, began to examine the degree to which they could empirically support that scientific responsibility.

This increased professional concern for setting empirical standards for validating medical care processes is encouraging to those toiling in the still nascent field of healthcare quality research. Yet, the fact that this advance is happening long after quality and outcome measures had been established traditions in such fields as agriculture, manufacturing and transportation demonstrates a disquieting history of problem solving in healthcare. Notwithstanding the medical profession's utilization of scientific technology and the proclivity to ground cognitive legitimacy in the biomedical sciences, physicians have not always given the priority that other applied scientists and engineers have to developing collective standards drawn from rigorous scientific formulation and experimentation. To do so would expose individual practitioners to consensual and scientific validation. Physicians have tended to straddle the cognitive justification process by presenting medicine as being as much an art as a science (McNeil, 2001).

The decoupling of modern medicine's scientific rationale and its educational and practice routines somehow missed being effectively exposed by the first major effort in the U.S. to investigate outcomes and quality in medical care. This major but little remembered research initiative was the Practice Information Demonstration Project (MPIDP) headed by John Williamson in 1976. The MPIDP study, pursuing methodology to set standards of medical care, investigated a number of treatment conditions for data points that captured the incidence and prevalence of the condition, diagnostic test sensitivity and specificity, treatment efficacy and effectiveness, and economic costs (Neuhauser, 2003). The research design involved extensive cross-checking of expert medical opinion (based either on research, extrapolation, or assumption) with literature review. The bottom line of the study was that only 15% of the 872 data points studied were supported by direct research, and only six of the 872 were "even moderately substantiated by empirical research" (Neuhauser, 2002 p.2). The cultural punch line was that unusual steps where taken by the National Institute of Health (NIH) and the National Library of Medicine (NLM) to keep the 1979 study report from ever being published (Neuhauser, 2002).[4]

An important development has been the transfer of "best practice" knowledge out of academic medical centers and the exclusive purview of the medical profession, and into wider scientific and public domains. In 1989, for example, AHRQ (then the Agency for Health Care Policy and Research) pursued a set of ambitious research projects known as Patient Outcomes Research Teams (PORTs) to establish treatment guidelines for 14 conditions. Though AHRQ no longer directly develops individual treatment guidelines, it

[4] The evidence-based medicine movement has prospered in the last decade with considerable credit due to efforts made by the NLM and other Federal agencies, in spite of this early history.

continues to function as a clearinghouse for such information and to support public research on quality measurement and best practices in medical care through such programs as the Evidence-Based Practice Centers. These efforts complement the work by the NLM, the Robert Wood Johnson Foundation, the Foundation for Accountability (FACCT), the Cochrane Collaboration, and other organizations that focused on guidelines for specific diseases. The requisite knowledge base needed to reduce variation in treatment practice, and to establish standards of care is being built—brick by brick.

Health service delivery organizations have been assessed by researchers as either ignoring quality assessment (Eddy, 1998; Epstien, 1998), or as facing severe methodological and infrastructure barriers to obtaining performance measurements (Nelson et al., 1996)—or both (Fernandopulle et al., 2003). Currently, the increased interest and activity in healthcare quality outcomes research has led many participants, and researchers, to anticipate or even assume research results are making a difference in how the business of healthcare gets done. It is "as if" the increased volume of research demonstrating the empirical measurement of outcomes is changing the process of care and improving care results (Shortell, et al., 2001; Bodenheimer, 1999). Journalism (i.e., US News & World Report's annual publication of the 100 Best Hospitals), trade journal articles (Moore, 1998 & 1999; MacStravic, 2000); and the justification sections of health research studies (Eisenberg, 2000) allude to new and promising initiatives for quality measurement and improvement. There is reason to believe that a market for information about healthcare quality has been or is being established, but the measure of the difference being made in the healthcare delivery market has definitely not been made.

Despite the frequent though narrowly focused expressions of optimism in individual articles and studies, there does remain deep-seated ambiguity and pessimism amongst health service researchers and policy analysts who note only meager improvements have followed from the research (Ferlie & Shortell, 2001; O'Leary, 1998). This author, as well as others (Grol, et al., 2002), observes more hope in print than in actual published results showing positive comparative or intra-organizational trends. Most often hard evidence citing the quality of organizational routines and outcomes is the exception, and thus tends to prove the continuing rule of uncertainty.

The late 1990s were a watershed period for quality research in health services. A hallmark event was the convening of a National Roundtable on Health Care Quality by the IOM in October of 1997. This extraordinary assemblage of expertise did not, however, weigh in on the side of optimism or foresee ongoing or inevitable progress. Rather, the consensus was frustration over slow progress and articulation of the deep-rooted deficiencies in current practices (Coye & Detmer, 1998; Chassin & Galvin, 1998). There followed two detailed reports commissioned by the IOM: *To Err is Human* (1999) and *Crossing the Quality Chasm* (2001).

The first of the IOM reports examined hospital inpatient care, and concluded that it was fraught with avoidable errors. Extrapolating from large studies conducted in Colorado, Utah and New York, the report estimated that at least 44,000 patients die each year as a result of medical errors, and that the number could even be as high as 98,000. The numbers make hospital medical errors either the eighth or the sixth leading cause of death in the US. The total national cost of preventable adverse events was estimated in the $17 to $29 billion range, over half of which represents direct healthcare costs. Harm done in hospitals was mostly attributed to systemic problems and/or to deficits in hospital infrastructures, so 'individuals trying harder' would have little effect. Recommendations concentrated on how both public and private sectors should reorganize around the measurement and feedback of outcomes in order to reduce avoidable errors in inpatient treatment.

The second IOM report (2001) dealt with the general lack of quality control and improvement systems in healthcare as compared to technology-intense industrial sectors serving the public at large. Again, the general conclusion was that no one now is in a good position to judge or improve production quality, and the recommendation was that production and financial systems of healthcare should organize and re-structure around their interdependencies to improve patient outcomes. The recommendations called for fundamental change achievable only through collective action aimed at all components of the healthcare system: regulatory action, market strategies and professional commitment aligned with engineering systems that would improve the quality of the production functions.

While there are only limited instances of standard reporting of "acceptable" quality performance, there is increasing efforts to fill the information void. Federal agencies, like the Agency for Health Research and Quality (AHRQ) and the Centers of Medicare and Medicaid Services (CMS), and the not-for-profit foundations mentioned above (i.e., The Robert Wood Johnson Foundation, the Kaiser Foundation, and The Foundation for Accountability) that have been funding academic research and evaluation projects to investigate and develop quality measurement tools and programs. Additionally, accreditation bodies have begun important quality initiatives. The National Committee for Quality Assurance, through its Health Plan Employer Data and Information Set (HEDIS), publishes desired and undesired rates for events that occur in participating health plans. The Joint Commission on Accreditation of Healthcare Organizations has instituted the ORYX system for hospital reviews.[5]

New York, Utah, California, Massachusetts, Virginia, Pennsylvania, and Maryland publish "report cards" for condition-specific measures of quality. Other states, however, including Texas and Florida, have made stop, start and retreat efforts in their attempts at public reporting. A few local purchaser coalitions have expressed the intent to include quality performance in their contracting decisions, but they, too, have had difficulty sustaining momentum (Dudley, 2000).

While market reform is the logic dominating industry trends in general, it is the non-profit trade and professional associations and government agencies that are driving the newly instituted quality agenda. A notable iterative AHRQ project to measure and improve hospital quality has been the Healthcare Cost & Utilization Project (HCUP). Many of the quality indicators developed in the HCUP program are used in this research to assess hospital quality. Though free, they have been applied in only a hand full of state and purchaser level initiatives.

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[5] Though ORYX was designed to be sensitive to provider needs and choices, and focuses on process information and internal review, it has struggled with significant difficulties in implementation.

The point is we still know little about the performance of healthcare providers, and even less about quality competition in the marketplace (Morrissey, 2001). As David Eddy, a participant in many of the national endeavors, has noted, the fact is that we "do not have excellent ways of evaluating how well we are doing" (1998: p. 7).

Since evaluating the quality of healthcare has been shown to be relatively intractable given the uncertainty of so many relevant factors, history suggests the path to improvement will be torturous, one condition at a time amidst every changing technology. Thus, it is important to distinguish between our newfound interest and recent limited successes in measuring the quality of care as a scientific or academic research endeavor, and implementing innovations that can actually affect organizational performance as a market enterprise (Berwick et al., 2003).

Study Problems: Uncertain Value of Healthcare Outcomes as Market Exchanges

In a healthcare environment dominated by efforts to construct market-oriented change, it is possible for quality concerns to be viewed either optimistically or pessimistically. The optimistic view expects that the movement towards greater reliance on market forces will improve economic value in healthcare. While the economic analysis of Arrow (1963) related market failure and the historic prevalence of alternative institutional forces to uncertainty about health status, economic analysts more recently have tended to turn the argument around, associating the economic failings observed in the organizational field with non-market institutional forces. Market supporters generally view economic inefficiencies as the effects of governance being structured by professional and governmental hierarchies in healthcare. Supporters believe market forces to be a better solution *even* in an uncertain environment.

The simplifying focus of the decentralized market model is held to be sufficiently robust to improve both cost controls and the uncertain value of patient outcomes. Institutional differences, whether represented by the culture and practice of individual organizations or in terms of wider social collectivities like professions or trade associations, tend to be abstracted and ignored by proponents of market reform—given that market forces have sufficient support in the institutional environment. In economic parlance, market forces are presumed to be "typically sufficiently general that they will apply to many institutional contexts" (Newhouse, 2002: p. 6).

Market-oriented optimism presume competitive efficiencies result from a *rational* progression of healthcare suppliers variously innovating and adapting production functions in anticipation of consumers and purchasers selecting them as suppliers. The progression, or evolutionary selection process, however, is taken more in a determined physical science sense, than in a natural organic sense. The "invisible hand" of market mechanisms guides toward an inevitable aggregate effect, given ideal conditions. In this market competition scenario, selection is based on individual preferences and there being "adequate information" (not to be confused with the more stringent perfect information condition alluded to in economic textbooks) (Havighurst, 2001; Porter, 1980).

Taking quality as a key dimension of any sort of selection criteria, market predictions then suggest some differential competitive advantage for organizations and/or providers with superior quality results. The supply-and-demand model argues producers achieving higher quality for similar or marginally higher prices will achieve a competitive advantage in demand selection. Market equilibrium dynamics would push competitors to match or best such production efficiencies. Within the time it takes to "market" the new value-added outcomes to shopping consumers a relatively poor set of quality outcomes would be improved upon. Markets are efficient because inefficient business practices lose out in the selection process.[6]

The general argument for market reform is that competition will raise the competitive bar via pricing mechanisms. There are corollaries to this assumed market efficiency. For example, suppliers (i.e., businessmen) can frugally manage the cost of production to lower the price, while maintaining the quality of their output. Motivated management also can learn by doing and improve quality within a constant budget. We can get better goods for the same cost, over time.

Such strategies are considered to be short-lived, however, because they are realized from bits of information that can be easily acquired (e.g., purchased or rationally calculated from the signals in the market). Information is viewed as rather 'frictionless' in the idealized market. Thus, in the static state of market equilibrium, the value of quality is primarily thought to simply cost more. Better quality requires more expensive inputs into the firm-as-a-production-function. Quality differentiates a market between low-cost

[6] The market selection process as attends to 'revealed' demand side preference effects on supply side competition. Selection is treated by neoclassic economic theory as an exogenous effect, going to social welfare (see Rice, 1998). Implications that preferences are rational (read exogenous) and based on approximations of perfect information *are* important conditions to be clarified in structuring competitive games. Alternative positions that posit social institutions influence what is deemed rational and preferable will also be considered in this investigation.

leaders and high-end producers. The demand for quality is revealed as a trade-off between price and quality. In this case markets do not so much raise the bar as provide a monetary measure for the height of the bar.

Markets are efficient because they promote price competition. Suppliers compete on price, and they "signal" a value-added or competitive strategy to consumers that are rational enough to act on these market signals (Arrow, 1986). Higher prices or market share, or both, can be signaling information about quality in the marketplace.

Within the framework of market equilibrium dynamics, the concept of quality costing more takes a short-term view of economic quality. Input costs going for labor and capital stock is shared amongst suppliers, as an ecosystem fact of life. The technologies behind quality creation are priced as inputs, and the marginal cost for a given level of quality output will be similar for any supplier within a verily short timeframe—the time it takes to "clear" a market. While short-term shocks like new technologies, accidents, and management innovations can create disequilibrium in markets, market equilibrium arises from pricing mechanisms that clear the market. The everyday translation is that market pricing mechanisms are so efficient you can almost assume "you get what you pay for".

Predictions of market efficiencies through pricing mechanism are enticing. In certain respects market predictions have stood the test of time. Yet, in both theory and practice, it has also been demonstrated that the expected benefits are contingent on several theoretical assumptions and practical conditions holding true. Though there are a number of assumptions at the heart of mainstream economics that support market ideology's reliance on pricing mechanisms, critical to the present study's examination are three prerequisites: first is that information is assumed to be at least 'frictionless,' if not perfect; second, that actors are fully rational (not just "boundedly rational"); and third, that their preferences are exogenous to or independent of the competitive market process.

Thus, another optimistic market scenario particularly relevant to healthcare deals with technology and information costs. Technology and information costs are topics that have extended economic theory beyond the more traditional focus on pricing mechanism, however (Stilgitz, 2002). Inventors and entrepreneurs who create new technologies are thought to be motivated by market competition. Markets allow innovators to accrue rents and royalties, and thus encourage risk taking to achieve the "next big thing." Though new technologies are *externalities* to market pricing dynamics, market governance is held to be more flexible than alternative institutional structures—better able to embrace any achieved efficiency, and to embrace only changes that are efficient. Market mechanisms are impersonal processes by which competition rewards the winner. Markets raise the competitive bar because those who do not jump on the bandwagon are, by fiat, the losers. This is the essence of the very abstract economic notion of organizational effects, the theory of the firm as a production-function set.

Investment in any particular combination of labor, non-labor or capital cost as organizational inputs assumes and abstracts the benefits of technological as simply monetary substitutions, as exchangeable units. Such a pricing view of technology and information abstracts and ignores the coordination and teamwork of knowledge, the social learning attributes of technology, knowledge, problem-solving and organizational change (Deming, 1993). Such production process concerns as are taken up by quality control engineers are micro-analytic details that are of little concern to the more macro perspective of orthodox economics and the supporters of market ideology.

For those who accept the normative position of market efficiency, the idealized macro supply-and-demand model is a "good approximation" of the real world. While the normative position of orthodox economics as a scientific theory can be thought as maintaining an externally objective stance, it can also be viewed as having an internal position, a basis of action and a reason for enacting market ideology. For instance, despite all the nuanced discussion of health economists, they are strong supporters of market reform in healthcare. In a 1989 survey of health economist, two-thirds trained at top academic schools expressed support for the transition toward more market-like solutions (Feldman & Morrisey, 1990).

The expectation of quickly realized market efficiencies undoubtedly accounts for much of the allure for supporting health purchasers' market agenda of increasing market control over the institutional governance structures of the medical profession and government. Cost may have been the primary focus of healthcare purchasers, but quality efficiencies, as well, have been bundled into the arguments for market reform (Enthoven & Kronick, 1989; Eisenberg, 2000; Teisberg, Porter & Brown, 1994).

While many health policy makers and researchers have in principle embraced market mechanisms as a means to improve quality, they have yet to be rewarded with much evidence. Only a handful of studies have even tried to relate economic determinants to quality outcomes. The Literature Review chapter will cover this and other knotty research issues related to the cost and uncertainty of quality in healthcare. The point here is that the question is open whether we should be optimistic about our new market freedoms, given the trends this legitimization of self-interest and profit maximization have set in motion. Of course, there are theoretical[7] approaches and alternative ideological stances that conceive of a darker side to market-oriented polices. Institutional theory's alternative take on market reform is the focus of discussion in the Theoretical Framework chapter. Suffice it to say here that pessimism about the market's anticipated results in healthcare takes into account the frailty of impersonal markets and the associated promotion of self-interest in the face of environmental uncertainty. For instance, Williamson (1985, 2001) is pessimistic of markets as a means to realizing an ideal end, because, under certain conditions, opportunism is a costly hazard endemic to market governance. Generally the pessimistic view posits that there is nothing natural, spontaneous or inherently efficient about a market environment, if it entails any transactional complexity or uncertainty (Knight, 1921).

Market competition is played out on, always embedded within, constructed cultural fields and rules of play that constrain and bias the competitive outcomes, and uncertainty can only increase the likelihood that market strategies will fail to be as efficient as expected. If the competitive game is then "fixed" to some degree, competition need not necessarily progress toward an optimal state of social welfare, but may rather engender a state of greater opportunism and/or increase inertia that favors powerful elites.

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[7] Though the study's conceptual framework will be broadly framed as New Institutional Theory within an organizational perspective, the arguments draw heavily on economic schools of thought, including institutional economics and evolutionary economics.

That is, giving greater decentralized force to one-dollar-one-vote can effectively give force to more opportunism, since the distribution of wealth has become increasingly centralized.

Market responses can be burdened by historic environmental dependencies, and market progressions can lead to outcomes that are not only unfair, but also inefficient. Institutional theory will be used to argue that to improve technical efficiencies the cognitive routines, normative rules, and governance structures that interact with the material-resource environment should be aligned with production functions that *can* pragmatically achieve comparative efficiencies. That is, achieved production efficiencies are contextual and lumpy and need empirical comparison. No general and idealized social theory can ever be complete as a normative framework, because the social environment is contextual-sensitive, and does require micro-analytic empirical foundations (Simon, 1997). Policy, guided by any number of ideologies, needs to plan for the desired outcomes (Knight, 2001); even the "invisible hand of the marketplace" should leave evidence.

The two IOM reports (2000 and 2001) mentioned previously illustrate the position that leaving healthcare market reform to its natural course is not enough to advance the quality agenda. The marketing of quality remains only loosely coupled to the technical performance achieved by the production functions applied by hospitals or other healthcare organizations. The deplorable quality chasm between what we know and what we in healthcare do, as depicted by the IOM reports, suggests that effective change requires new public policy and cooperative action, which includes shifts in cultural and professional attitudes, and in the financing of collective, not only private, action. To revise a motto of institutional theory (DiMaggio & Powell, 1983), the pessimistic view is: How is it that quality can remain defective and unaffected when so many other features of the healthcare environment are undergoing so much market innovation?

Purpose of the Present Study and Research Questions

In a general sense, the pessimistic view of market theory can be cast simply as predictive support for the null hypothesis in testing the efficient market thesis offered by market reform supporters. The null hypothesis can be thought to model the general tenet that organizational aims are often conflicted and only loosely coupled to the ostensible purposes of the objectives sought, or the core technologies pursued (Myer & Scott, 1992; Powell, 1991). Such loose coupling between objectives and outcomes can even be affected in organizations managed by the market enterprise model, and which reside within an era and an organizational field governed by market reform rules.

This study reasons from the general evidence that hospitals have experienced increasing environmental pressure to adopt more market-oriented strategies and to pursue "more efficient" production-function sets, than in the past. The study proceeds to hypothesize that market expectations as they relate to quality and the improvement of quality outcomes are not in evidence. To that end, the study proposes the following research questions:

Research question 1: Is there adequate information to distinguish between healthcare organizations when the quality of their outcomes is the performance under study? That is, after accounting for patient-level determinants, is there sufficient variance in hospital quality performance to give a "true" and reliable account of how much, and why, hospitals differ?

Research question 2: Is there evidence of any trend in hospital quality performance, and do factors central to the market enterprise model and market reform account for hospital-specific performance trajectories?

Research question 3: Are equilibrating pricing mechanisms in the material-resource environment determinant of quality outcomes?

Research question 4: Are expected maximizing demand-side responses, taken as preferences for better quality outcomes, rationally related to hospital economic performance?

This study contributes to the literature in two ways. First, the research contributes needed empirical findings on how economic factors relate to hospital quality performance. The sparse information available on the pricing and other environmental determinants of patient outcomes demonstrates that a more committed research agenda is needed to assess the "Quality Chasm" so often noted in health services research (Newhouse, 2002a). The study grapples with the stylized fact that quality outcomes in healthcare are rather uncertain for the consumer, even given the certain support for market reform over the last few decades.

Second, the investigation adds to the organizational literature by applying institutional theory to analyze economic transactions and market institutions as social facts of life in organizational behavior. Organizational research guided by institutional theory has a rich exposé tradition. Theoretical constructs attend to the common revelation that seemly intentional human actions need not be tightly linked to their social repercussions. Moreover, assessment is often given to the all-to-human tendency to take a path of least energy, for organizations to deliver satisficing results. The propensity, however, has been for researchers to study organizations easily positioned in strong institutional environments featuring elaborate rules, conventions, norms and routines. Thus analytic targets then have tended to be organizations dominated by professional or government control.

Organizational theorists, in fact, early on delimited two types of organizational environments: technical and institutional. Technical environments were attached to market governance and market logic where organizations "are rewarded for effective control of the work process and are expected to concentrate attention on control and coordination of technical processes" (Alexander & D'Aunno, 1990: p. 57). In the organizational literature there has been a lack of institutional analysis applied to organizations characterized as functioning under market governance.

The conceptual framework of this study employs a New Institutional Theory approach (NIT), especially as embraced by New Institutional Economics (NIE)—a literature rarely cited in organizational analysis. By both emphasizing the pragmatic optimism of NIE and the cognitive elements of institutional theory, the framework attempts to extend macro-organization theory towards embracing a view that organizations, as institutional carriers, need not be constrained to stories of only ineffectual consequence. The conceptual effort can also be taken as an attempt to meld the macro-perspective of institutional theory with complementary collective action notions in the micro-analytic traditions of the Simon/Carnegie-Mellon program for organization theory.

Conceptual Framework

I have recited somewhat tediously the history of quality performance information and the recent history of market reform in healthcare with the following intent. Such story telling reflects the methodological form of institutional theory. Institutional theory takes a historic and developmental (or evolutionary) approach, which stands in marked contrast to orthodox economics' hypothetical deductive formalism that aims to rise above the minutia of history, and presents with an ahistoric account of the laws that explain social order as equilibrating mechanisms. Essentially the theoretical approach taken argues hospital quality performance is insufficiently explained by the equilibrating mechanisms of market dynamics; and requires, instead, alternative explanations for the problems-solving achieved by those odd institutions and organizations that are able to deliver best-practices in healthcare.

The development or evolution of problem-solving routines can be a useful metaphor in the social sciences. The scientific quest is to interpret history, to see what is reoccurring in human interaction, as to how we have solved particular problems, and how we have changed as progress has been made in problem-solution gestalts. Individuals get attached to a puzzle and attempt to solve it, or confront a challenge and attempt to overcome it. A solution is always attained, of course, in the same way that one "cannot not communicate" (Watzlawick et al., 1967). The pragmatic question is whether it is a good solution. Actually, the interesting historical question for social scientists is whether the solution is replicated as knowledge by others. Solutions replicated as shared knowledge is what is usually referenced as a process. Processes that have been replicated rather consistently over time are described in institutional theory as routines.

Mainstream economics is able to present a systematic or rather encompassing view by abstracting problem-solving into a single ahistoric problem-solution space with only one objective, maximizing self-interest. The objective is for each rational individual to maximize in a self-interested manner on the material-resource environment. All problem-solving becomes substitutable or exchangeable in the objective form of: supply-side actors maximizing on profits and demand-side actors maximizing on their utility. The problem-solution space is conceived to have a determined equilibrating end-state, and an optimum social welfare consequence, if market institutions affect material-resource allocation and something less than optimal if non-market institutions set the rules of the game.

By making strong assumptions of behavioral homogeneity, along with the treatment of pricing and quantities as perfect measures, the assumptions imposed upon the world are readily mapped to formalistic and quantitative solutions. Such economic deductions are proved in the same sense that Einstein's' theory of relativity was proved thirty years before achieving any empirical validation.

Any notion of cooperative action, as might be represented by institutions or organizational culture as denoting a sharing of knowledge process, are reduced to incentives pursued by autonomous actors (as aggregate variables estimated as fixed-point effects) caught in the dynamics of market forces. If "lumpier" collective action entities, framed by some common problem-solving interest, where to be considered as real-world objects to be mapped by scientific inquiry the methodologic consequence is a much less general theory about everything.

Some social scientists, notably Hebert Simon (1991), view the neoclassic economic system as limited by an essential dilemma: the time spent puzzling to solutions and making effective decisions is abstracted to simple assumptions about homogenous behavior. Thus, missing the point that problem-solving itself is problematic; and in fact can be what is scientifically interesting. The decades that have followed since the ascendancy of neoclassic economics have tended to minimize the importance of processes that are bigger than the individual, yet smaller and less powerful than ubiquitous equilibrating market-forces. Such midrange social processes can as easily be seen as adaptive and motivated by pride in workmanship, teamwork, social learning, as well as material-resource outcomes.

New Institutional Theory (NIT) is a context-sensitive framework that will be applied to explain organizational behavior given environmental factors such as outcome uncertainty, markets and other social institutions. The approach draws from contemporary systems analysis, which is a metatheoretical position attentive to the methodological choices in the social sciences. Systems analysis considers not only those system dynamics of structures involved in the control and constraint of outcomes (i.e., deterministic systems) that can be expressed as equilibrating dynamics, but also considers the nested coordination of organization processes guiding the development and evolutionary trajectory of social units , e.g., collectivities (Khalil, 1995, 1999 & 2002). The social units of interest in this research are hospital organizations, which are assumed to interact with other social collectivities such as households, professional guilds or the state. Emphasize is given to cooperative action of social entities, "whose participants share a common interest in the survival of the system" (Scott, 1992: p. 25).

The conceptual framework endeavors to position market ideology and the activities of market reform within an organizational theory perspective. This organizational perspective then treats the "market enterprise model" as one of four idealized mental models in a typology of organizing choices available to organizational actors. Mental models represent a cognitive component within the institutional environment that constrains organizations, and stands in contrast to neoclassic economics' notion of rationality. While the cognitive system will be emphasized in the current discussion, attention will be given to the rationale that institutions are best conceived as overdetermined systems that are conveyed by regulative and normative elements as well (Scott, 1995).

The study framework is graphically presented in Figure 1, which represents both the explanatory fixed-effects of the market enterprise model and the unspecified organizational variance components accounting for alternative nested sources of variability. The path model depicts the market logic as attentive to material-resource dynamics affecting quality performance. Though institutional effects for alternative mental models, such as professional dictates and governmental regulation, could be included in the model, it is assumed that they are constant, diminishing, or irrelevant abstractions in assessing the relative efficiency of market reform effects over time. If the

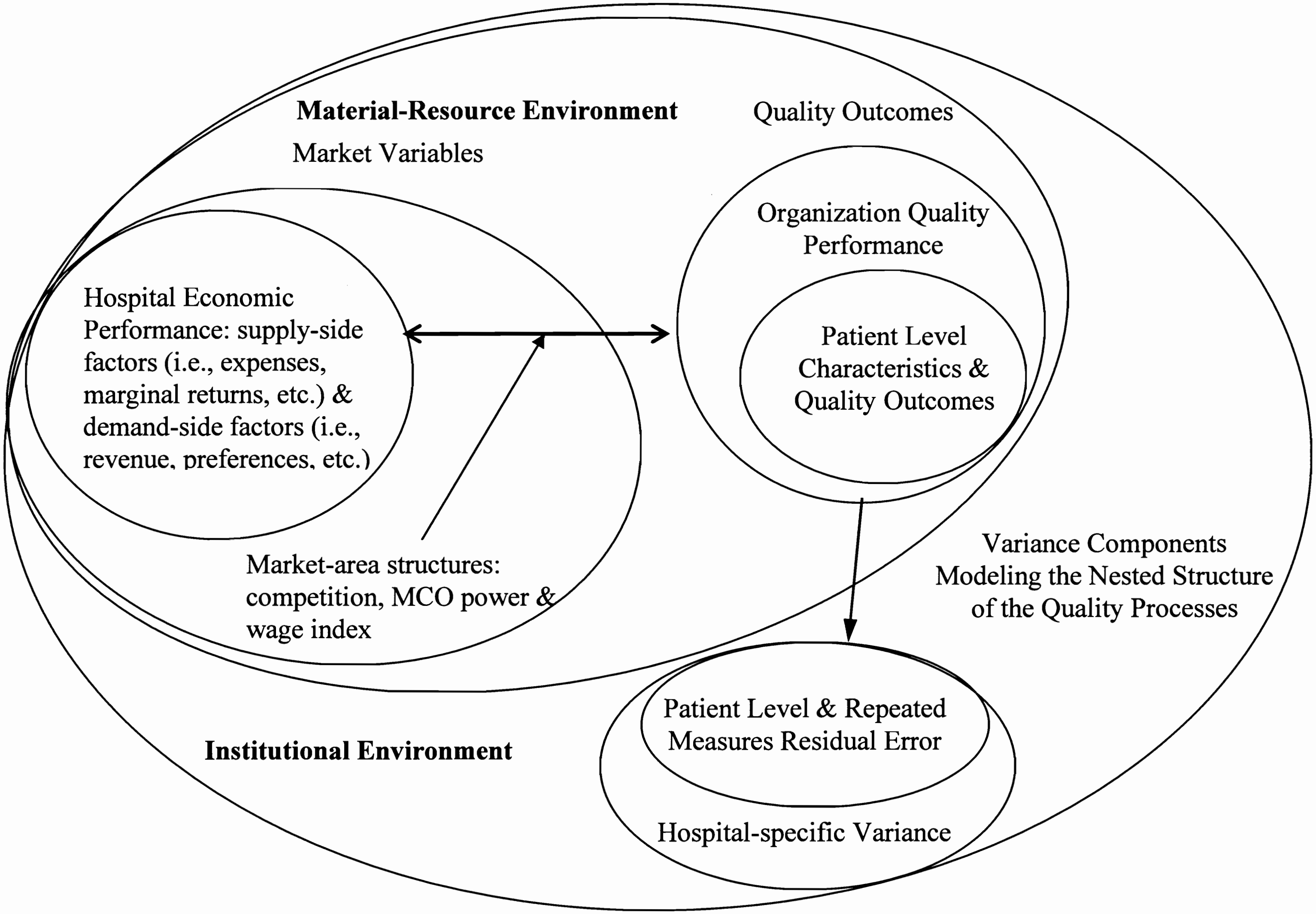

Figure 11. Modeling the Nested Data Structure of Hospital Quality Performance

relationship between the market enterprise model and the intended economic goals are as tightly coupled and technically efficient as propounded, a positive or efficient quality effect should be parsimoniously evident from the interaction of the market structure faced by and the financial performance achieved by hospitals.[8]

Assuming that significant systematic between-hospital variance on quality performance is detectable; hypotheses to test market effectiveness can be posed. Specifically the hypotheses posed by the conceptual framework is that increased evidence of market governance in the institutional environment should be associated with some or all of the following: 1) the competitive bar for quality performance rises over time; 2) quality cost more; and 3) hospital quality performance is differentiated by expected supply-and-demand-side dependent relationships.

The naturalistic perspective of institutional theory presumes no normative best-off position. The theory assumes only that a development trajectory of some type is likely to be associated with hospital-specific institutional performance. The nature of the development trajectory is best interpreted descriptively as a stylized fact associated with observed changes in the institutional environment, such as the implementation of market reform.

If the expected relationships between market dynamics and quality performance are not revealed, as the study hypothesizes, then institutional theory, it will be argued, is a

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[8] The material-resource environment is a theoretical construct developed in Chapter 3 to maintain the sufficiency assumptions of market dynamics (e.g., to separate economic factors from the institutional environment). The material-resource environment is treated as an orthogonal dimension to the institutional environment, and where organizations are considered to face and interact with both environmental factors.

better model with which to fit quality performance in healthcare. A better model in that it explains the absence of a tight linkage between supposed rational purposes and their unintended consequences. While decentralized market mechanisms may produce the expected efficiencies under certain environmental conditions, more complex organizing processes may be needed to achieve welfare objectives under hazardous environmental conditions. In healthcare the uncertainty surrounding health status is one such important hazard to consider when organizing the processes.

Study Methodology

The longitudinal research covers the years from 1998 through 2002. The unit of analysis is the acute care hospital. Data for the study was compiled from four sources: patient-level data from which the quality indicators (QI) were derived, patient-level data that capture environmental market-area factors, audited financial and production survey data, and a national pricing index database for the market-areas understudy. Data from AHA's national hospital survey population was also used for limited comparative purposes.

The longitudinal design applied takes hospital-specific performance trajectories to represent a nested data structure. Hierarchical linear models (HLM) are applied in the research as it is a general data-analytic strategy that is particularly advantageous for evaluating the effects of population-based interventions and for the exploration of longitudinal data (Reise et al., 2003). HLM analytic strategy can also "be regarded as representing the effects of unmeasured variables and the approximate nature of the linear model" (Snijders & Bosker, 2000), and is used to estimate an "unspecified" hospital-specific institutional effect.

The HLM statistical techniques involve multi-level analysis and are applied in two design stages. Stage one pursues validation of the measurement model for multiple patient-level QIs. In stage two, a linear growth-curve model is used to account for hospital quality performance. The model provides estimation for three sources of nested variability: temporal dynamics are modeled at the first level, hospital-specific characteristics are modeled at the second level, and market-area, or environmental factors are modeled at the third level.

Multi-level analysis is central to supporting the study's research propositions insofar as it allows estimation of between-group hospital variance on performance, and inference testing to answer Research Question 1. Critical to warranting support for the null hypotheses (falsification of market model propositions) are findings for significance systematic between-hospital variance performance trajectories (e.g., significant hospital-specific variance) over the years of study. Empirical support for the fact that hospitals do significantly differ in the quality of their outputs is important in it own right, given the sparse information available on hospital quality. The finding is also essential to justify the contrarian proposition that alternative, non-market institutional models should be considered as unmeasured effects to account for hospital performance.

It would not be enough to find that pricing and market structure variables are not related to quality outcomes as expected. Support for the study propositions will require findings that demonstrate organizations do significantly differ on quality performance, despite the findings that market factors fail to be determinate of the outcomes.

Overview of the Study Chapters

Chapter 2 reviews the literature on the measurement of hospital quality, and on efforts to relate market environment variables and economic performance variables to quality performance. Chapter 3 details the theoretical position used in the development of the research design and the predictive models tested. Attention is given to accounting for the treatment of the market enterprise model as one idealized mental model within a typology of mental models that carry weight in the institutional environment. The discussion compares and contrasts the market enterprise model, applied as ideology for market reform, with mainstream economic theory as a legitimating source for the organizing model. Chapter 4 presents the study's research design and describes the data sources, patient and hospital samples, variable measures and statistical analysis. Discussion attends to methodological concerns about both the validation of the measurement model developed to assess quality performance, and the fit between the analyses employed and the proposed conceptual framework. Chapter 5 presents the empirical results of the study: descriptive statistics, validation of the measurement model and parameter estimates for the fit of the predictive models. Chapter 6 presents a concluding summary of the empirical findings and interpretation of the hypotheses tested. The chapter then reviews weaknesses in the conceptual framework as employed in the research, and limitations to interpreting the findings. Indications for further research are offered, as are the policy implications of the results.

CHAPTER 2—LITERATURE REVIEW

From any perspective, a healthy and long life is preferable to conceivable alternatives. The utility of optimum health is apparent, and choices made to that end are easily viewed as adaptive, if not rational. Though medical care may not, in the long run, be the most significant determinant of health status (Evans and Stoddart, 1990; Sobel, 1991), healthcare systems certainly consume the bulk of economic resources and emotional investment devoted to the search for better health. While the pressures to contain cost and the adaptive market restructuring aimed at either creating or defending against financial controls have dominated the healthcare environment for decades, increasingly policy and research attention is being given to preferences for rationalizing the outcome of care (IOM, 2001; Ferlie & Shortell, 2001). Amidst the struggle over how "best" to constrain and to slice up the now mammoth healthcare economic pie, advocacy for measuring and improving on the outcomes of care is finding a place at the negotiating table. The value received for the dollar spent, not just how many dollars are spent on healthcare transactions, is an important economic and social question in need of rationalization.

Notwithstanding the potentially pervasive interest in the quality of healthcare outcomes, little is understood about how sensitive healthcare organizations or professionals are to external preferences for better outcomes. Increasing pressure to resolve quality problems is nevertheless as discernable as any of the transformations occurring in healthcare. While it may not necessarily be "[q]uality has taken center stage away from cost and access in the U.S. public debate about health care" (Chassin, 2002: p. 40), it is an issue receiving increasing priority. Assessment of quality performance is embryonic, but outcome research is believed to be having some impact on routine production functions even by cautious observers (McGlynn, 2003). Research consistently suggests we know better than we do. Does this quality reform movement carry the weight to push the market, however? Does health services research provide the details necessary to assist consumers and purchasers to get the demand-side leverage needed? Can organizations make a business case for implementing quality innovations?

Technically We Know Better Than We Do

A major reason for the new emphasis on healthcare quality is that health services research has empirically challenged optimistic cultural and market assumptions about the quality of care in the US. Findings have demonstrated wide variation in both process and outcomes of care throughout the United States (Wennberg, 1998). Research has also exposed a seemingly high incidence of gross medical errors (IOM, 2000; Dingwall & Fenn, 2000; and Moore, 1997). Other countries, spending less, have evidenced equal or better outcomes on sentinel health status events (Anderson, Reinhardt, et al., 2003; McGlynn & Brooks, 2001).

A good deal of recent research has focused on such applied areas as organizational quality performance and the publication of "report cards" to assess the providers. This literature is no doubt to some extent motivated by the market transitions in healthcare, and will be covered in subsequent sections. Research aimed at measuring the quality of care, naturally, has a longer history. Health services research into the processes and the outcomes of care, like evidence-based reform in physician education, has sought and argued for the need of comparable performance information in healthcare. As noted above, this research has been an import factor in bringing quality out of the professional closet and into the open for public debate. In a review by Robert Brook and his associates at RAND (2000), the modern quality field in medicine is framed within the last one-third of a century. Brook and associates contend the results have demonstrated that:

> "… quality can be measured, that quality varies enormously, that where you go for care affects its quality far more than who you are, that improving quality of care, while possible, is difficult and painful and, in general, has not been successfully accomplished" (2000: p. 281).

A very recent, large and exemplary study, the Community Quality Index study conducted at RAND and led by Elizabeth McGlynn, is revealing, revealing not only about the shortfalls in the quality of care received by Americans, but also as regards to the financial and organizational cost in realizing quality care information (McGlynn, et. al. 2003). Building on the longitudinal Community Tracking Study (CTS), the Community Quality Index study started with a random sample of adults in 12 metropolitan areas. Telephone surveys were followed with evaluation of the participants' medical records when written consent could be obtained. The study exposed gaping inadequacies in the process of care, by drilling down to patient experiences over time. The study found consumers could expect to get, on average, recommended care only 55% of the time.

Proportions of the shortfall between expected process standards and realized service were similar whether treatment fell into preventive care (55%), acute care (54%) or chronic care (56%). For particular medical conditions quality varied between 79% for senile cataract to 11% for alcohol dependence.

While the empirical results of the Community Quality Index study give strong support to the need for quality improvement in patient level care, it is important to note these results where generated by a consortium of large non-profit organizations and academic researchers funded and organized by public and philanthropic dollars. It was a public effort not requiring any market return on the investment. Though the communities studied are large metropolitan areas in which small and large and often national healthcare delivery and risk-bearing organizations compete, neither the provider organizations themselves nor other market actors in these communities would be able to generate, compare or market their own estimates of the quality shortfalls in the normal course of business.

As pointed out by Brook and associates in their review (2000), while researchers may have published the capacity to measure quality, the fundamental evidence is that performance variation is what can be counted on, not a competitive trend revealing that the bar of quality performance is being raised. Neither is there reported evidence of an industry trend that appears to be driving providers to organize or finance the information-gathering process that is essential to quality measurement, improvement or marketing (Berwick, James & Coye, 2003). What infrastructure exists for gathering and disseminating quality information appears to be built ad hoc by individual grant funded projects in the public domain.

Yet, consumers believe they are getting quality care though, 75% anyway, according to unpublished data from General Electric (Galvin & McGlynn, 2003). Does this mean consumers at a very abstract aggregate level could be working some invisible hand via selection and word of mouth reputation? Or, is it just psychologically easier to believe the best of the status quo when faced with uncertainty. While market theory anticipates a rational consumer selection process, others guess that demand-side selection is revealed more as a matter of faith, not a rational process based on empirical trial and error.

The distance between where we are in performance measurement and improvement, and where we know we can be, is the chasm referred to in IOM's report, "Crossing the Quality Chasm" (2001). There is a gap between the implementation of medical science and technology advancements and the lack of complementary implementation of organizational processes that could monitor and assure the ability to provide high-quality care. The chasm is the difference between the operational creativity and efficiency achieved internally by provider organizations and the technical products of healthcare that are simply exogenous material resource inputs provided by the market environment.

Given the inherent uncertainty and complexity underlying the biology of health status, and given the increasing technological complexities applied to intervene upon these biological processes, to say nothing of the financial complexities inherent in the health insurance market, it is not hard to imagine the venerable organizational forms of the solo practitioner or the stand-alone voluntary hospital were going to be substituted for by more complex social interdependencies and organizational forms (Shortell, et al., 2000; Scott et al., 2000). Healthcare has seen obvious changes in terms of its economic burden and the size, number and form of healthcare organizations. Are these new organizations, created as they were from the economic and market pressures of our time, able and willing to deliver the quality we believe is possible and promised?

The Role of Quality in the Marketplace

Problems with the quality of patient outcomes do not exist in a vacuum; they must be related to the antecedent system inputs. In economic terms, quality is a function of both the financial production inputs and the market environment of an organization. Market-oriented reforms appeal to expectations that the resulting pressures for more efficient pricing mechanisms will achieve an "optimum" balance, or trade-off, between costs and the quality of outcomes (Scott, et al., 2000; Rice, 1998; Newhouse, 2002; Enthoven & Singer, 1997). Market reform has prompted healthcare organizations to undertake substantial changes and strategic transformations. It is hard to tell, however, whether they have yet been induced to pursue strategies concerned with the technical demands of measuring and improving outcomes. That is, it is uncertain whether the promise of pricing mechanisms in our more market-driven healthcare landscape has in fact been realized, as rationally intended. As noted by Leatherman and associates (2003), the business case for market advantage following from better quality outcomes is uncertain in the minds of healthcare managers and purchasers. Quality is a noble ideal; but can outcome improvement pay the bills?

Profound business transitions are occurring in healthcare nonetheless. The major trends associated with the invigorated market approach include commercialization, concentration, integration, diversification, advertising, and privatization (Burns & Pauly, 2002; Bazzoli, et al., 2001; Robinson, 2001: Scott, et al., 2000). Research efforts to just classify the extent of ongoing hospital restructuring have required elaborate topologies (Bazzoli, et.al., 1999 and 2001). Can managers pursue quality strategies with comparable clarity to such strategic options as concentration and integration? Hospital restructuring has yet to be tied to quality strategies.

If quality could be marketed, it certainly would be; but this is a market that has been peddling wears of uncertain value for quite some time. The research findings relating either financial performance or market environment factors to quality outcomes are meager and often ambiguous. The literature that has to one extent or another attempted to assess how financial performance and/or market structure affect quality outcomes will be presented under four topics: 1) pricing of quality; 2) hospital nurse staffing as at a resource determinant of quality; 3) market environment effects as represented by hospital competition (hospital concentration) and price competition (purchaser leverage); and 4) the relatively sparse research reporting jointly on the effects of hospital financial performance and the market environment on quality outcomes.

Pricing Quality

The conventional market model predicts that when a firm reduces input resources to the production function, lower output will result, at least on average in a competitive market. If we consider quality a critical dimension to production output; then, *ceteris paribus*, hospitals that have lower expenses per unit of output should generally be sacrificing quality in the bargain. That is, better quality should cost more if market forces hold sway. Yet, even this simple proposition that healthcare quality is signaled in pricing is uncertain, as Newhouse (2002a, 2002b) has pointed out.

Newhouse, both in his book Pricing the Priceless: a Healthcare Conundrum (2000a) and in his article "Why Is There a Quality Chasm?" (2002b), points out several reasons medical care seems to obtain less value from the resources it consumes compared to other industries. The reasons he focused on were "consumers' ignorance, the rate of technological change, the widespread use of administered pricing, the difficulty of appraising a given provider's quality, and the role of the public sector with other objectives other than efficiency" (2002b: p. 13).

The uncertain relationship between the price of health services and the level of quality has been demonstrated in studies that have consistently found large geographic variations in medical practice and utilization. Such studies have found utilization patterns to be unrelated to differences in health outcomes. In a recent review, Fisher and Wennberg (2003: p. 70) concluded that population-based studies have shown that there are "dramatic variations in the quality of care provided… and the quality of care is unrelated to the level of spending." While research in this analytic framework has found systematic underuse of evidence-based practice guidelines occurs across regions, for a few medical conditions care was related to spending. These findings that do reveal quality of treatment is related to costs have discovered that the quality of care was, surprisingly, worse with more intensive use of resources (Fisher, et al., 2003). Though the quality of outcomes was not generally accounted for by the variation in resource utilization, Wennberg and associates have reported that overuse of services is related to a pattern of "supply-sensitive care." Supply-sensitive care is a term used to encompass the strong association between capacity and utilization, such has been found between hospital beds and hospital utilization, and between physician supply and rates of physician visits.

In contrast, other research approaches have related aggregate spending to better quality outcomes. A study by Picone and associates (2003) reported a positive link between the total cost of inpatient care and such outcomes as mortality, living arrangements, and function status. Their economic study modeled the outcomes as a function of treatment intensity (total expense per indexed admission) and length of stay (LOS). The authors did consider that hospital capacity was plausibly endogenous in their data and attempted to control for that effect with a proxy cost-of-capital index variable. They also modeled competition among hospitals with a Herfindahl index measure, and pricing competition by including an HMO penetration variable in their treatment intensity function. The measures of competition amongst hospitals and pricing competition with purchasers, used as controls in this study, have also been examined as main effects on quality, and will be discussed shortly. It is interesting to note here that while the main effect found between treatment intensity and quality outcomes would support standard market expectations, theoretical predictions for market environment characteristics were not found. For instance, the coefficient for the Herfindahl index was negative for intensity, implying higher resource intensity in areas with greater competition. That finding is inconsistent with market competition assumptions predicting that increased competition among hospitals will control costs, but the finding supports the supply-sensitive-care effect noted above.

Burstin and associates (1993) also found adverse patient outcomes were associated with hospitals' financial characteristics and with the patient payer mix. Rates of medical injury and substandard care were developed from a sample of 30,195 chart reviews at 51 acute care hospitals in New York in 1984. The study found that negligent medical injury was highest in hospitals with the lowest inpatient operating costs per hospital discharge. Hospitals in financial distress were also shown to have higher percentages of indigent populations. Negligent medical injuries were also more likely to occur at hospitals with less staff for patient care; a topic covered in the next section. Conclusions from the study point out the requirements for good risk adjustment in cost-benefit analysis, as much as any costs-of-quality relationship.

In a study aimed primarily at detecting the consequences of PPS cost controls at an academic medical center, Garber et al. (1984) estimated the costs associated with case-mix adjusted mortality rates for 12 diagnosis-related groups. They found no relationship between cost and outcome ratios for 9 of the 12 patient groups. For three patient groups, they found better outcomes to be associated with higher cost. Schultz et al. (1999) also found a positive relationship with mortality rates and operating expenses in AMI patients in California hospitals, as well as an inverse relationship between RN staffing levels and the availability of CABG/PTCA procedures. Positive findings relating hospital cost and adverse outcomes are always suspect, however. That is, it has been consistently argued that unobserved patient acuity factors for the very sick should be expected, regardless of the risk adjustment method used (e.g., Iezzoni, 1997). For these studies as well, the unobserved patient risk factors may be as likely to account for the poorer outcomes, as are the lower per patient expenses.

Staffing Factors as Determinant of Hospital Quality Outcomes

The relationship between hospital nurse staffing and the quality of care has been a significant area of research interest in health services research. Labor costs, being the largest variable expense in the hospital production function, have naturally come into play as managed care cost-containment has brought significant pressures to bear on hospital finances over the last two decades (Shen, 2003; McCue et al., 2003). Most hospitals reengineered operations in efforts to both increase efficiency and reduce costs. Their strategies have included reducing the number of registered nurses (per acuity-adjusted patient sizes) and increasing employment of less well-educated "nurse extender" personnel (Person et al., 2004, Bond & Raehl, 2000). Such changes in acuity-adjusted RN ratios, together with shortened patient LOS, have helped to reduce hospital costs and to steady the decline in hospital operating margins (see McCue et al., 2003). However, there has also been considerable backlash to such cost-containment measures, most often expressed as concern for patient safety. In response, California and other states have pursued legislation for minimum staffing requirements.

While researchers may contend that the literature supports the "prevailing notion that improving registered nurse staffing unconditionally improves quality of care" (Mark et al., 2004, p. 279; Mitchell & Lang, 2004), the evidence is clearly inconclusive and provides only a limited degree of support (see Aiken et al., 2002 and Lang et al., 2004 for reviews). A number of early studies did report reduced mortality with higher levels of nurse staffing (e.g., Hartz et al. 1989), but at least two studies found no relationship between nurse staffing and mortality (Al-Haider & Wan, 1991) or adverse events (Wan & Shukla, 1987). A recent review by Lang et al. (2004) concluded the literature only supports that richer nurse staffing is related to: "1) lower failure to rescue rates, at least among surgical patients; 2) lower inpatient mortality rates (although the evidence is mixed), and (3) shorter hospital stays, at least for medical patients" (2004, p. 335). Research into other quality measures including the adverse events of pneumonia, urinary tract infection (UTI) rates, and pressure ulcers indicates that associations between nurse staffing and patient outcomes are improbable.

Two very recent studies by Schnelle and associates (2004) and Mark and associates (2004) are interesting in that they found the relationship between nurse staffing and quality outcomes to be nonlinear. The latter study reported diminishing marginal returns in improving quality with staffing increases. For the measure of mortality rates, increasing a marginal unit of staffing in the lowest hospital-staffing category resulted in a significant decrease in mortality rates. The effect diminished at higher levels of staffing and disappeared altogether at the highest nurse staffing levels. The coefficients for nurse staffing ratios used to predict patient complication rates in this study not only lacked a significant positive association, but also revealed an unexpected pattern: relatively more complications at higher levels of nurse staffing. The other study to find nonlinear patterns of nurse staffing effects on quality examined nursing home outcomes (Schnelle et al., 2004). The results in this study showed that benefits from increased staffing were realized only by homes already staffed at the very highest level (Schnelle et al., 2004); for homes at lower staffing levels, i.e. most nursing homes, no marginal benefit was found for staffing increases.

Although returning acuity-adjusted nurse staffing ratios to the higher levels of past years has clear implications for labor cost, it is also plausible that some degree of staffing increase could be cost efficient. Sovie et al. (2000), for example, found improved skill mix did not increase patient care costs. The literature often alludes to potential savings from avoiding waste, but only one study has linked reductions in adverse events associated with higher nurse staffing to lower medical cost (Cho et al., 2003). Using multilevel analytic techniques, the study examined simultaneously the effects of nurse staffing and hospital characteristics on risk-adjusted patient outcomes.

Effects of the Market Environment on Patient Outcomes

Surprisingly, there is a good deal more comment made about the supposed effects of market environment factors on patient outcomes than actual empirical linkages on the relationship (the Journal of Health Politics, Policy and Law's 1999 issue on "The Mechanics of Backlash" highlights the point). The deficiency is surprising because the two most frequently discussed market environment constructs, managed care's financial pressure on hospitals and hospital competition, have respective measures (such as HMO penetration for the former and the Herfindahl index for the latter) that are often included in health economic research, and trendily included as control variables in the more general health services research literature.

The prevailing view on managed care is that its demonstrated effectiveness in controlling costs also puts the quality of care at risk (Feldman et al., 2000). Blendon et al. (1998) reported that 45% of Americans believe that managed care hurts the quality of care. Both an early review by Miller and Luft (1994) and a more recent review by Hellinger (1998), however, have reported that there is little evidence managed care differs from fee-for-service plans on outcome measures. Neither did Robinson (2000) find managed care performance was significantly different from alternatives when quality was assessed on treatment process criteria. What some studies have pointed out is that managed care may affect the health of vulnerable populations (see Miller and Luft, 1994; Hellinger, 1998).

Generally, questions about managed care's impact on healthcare quality concern selection hazards, where plans engage in strategies to enroll healthy members and discourage enrollment of costly patients (Frank et al., 2000). The effects on treatment outcomes are necessarily a more indirect consequence that follows from providers making treatment decisions under financial disincentives.

One published report attempted to capture the treatment effects of managed care inducing financial pressure on providing care, i.e., the impact on quality performance indicators. Shen (2003) constructed two measures of financial pressures from Medicare and from managed care to examine their effects on the quality of care in hospitals between 1985 and 1994. The two types of financial pressures were: "a PPS fiscal pressure variable that captures the average amount of income loss a hospital incurred as the result of Medicare price cut, and an HMO variable that captures changes in the overall HMO penetration at the county level" (p. 244). The study found that financial pressure has an adverse effect on hospital quality in the treatment of AMI patients. The clinical significance of the findings was not specified, and interpretation of the results is hard to assess. Construction of the study's dependent and predictive variables, and the analytic stages used to model the hypothesized relationship, illustrate how difficult the task is to relate economic trends to changes in treatment outcomes.

An exemplary and interesting study to examine the effects of hospital competition and HMO penetration on hospital outcomes was done be Kessler and McClellan (2000). Their study modeled the influence of both market factors (taking particular care in constructing an exogenous measure for hospital competition) on mortality and readmission rates for Medicare heart attack patients over the period of 1985 through 1994. The results present a number of economic models with contrasting and ambiguous findings.

The results using conventional measures to model hospital competition (i.e., the Hirshchman-Herfindahl Index) revealed no difference in patient outcomes across various levels of market competition. The authors argued, however, that traditional methods for modeling hospital competition are hampered by endogenous bias. To correct for this, they included in their design a rather elaborate and esoteric estimate for a patient level HHI measure that was used comparatively to demonstrate the weakness of conventional hospital competition models. The intricacies of the their model preclude a detailed discussion, but it included, for example, patient-level estimates of hospital competition based on a predicted admission probability for a given patient and hospital pair, not the actual hospital admission. Results from their unconventional model were asserted to provide a strong case for a positive trend of market influence in healthcare.

By contrasting results from the first years of their data with subsequent years, they found "greater" competitive market forces achieved more efficient outcomes, both fiscally and in terms of seemingly better quality. The initial study period covered from 1985 to 1989, and was compared to the more market-determined timeframe covering 1990 through 1994. The authors reported the early period findings were ambiguous, since they found hospital competition to be associated with higher payments and better quality. For the 1990 to 1994 period however, competition "was unambiguously welfare improving" (p. 601). In this latter period, highly competitive areas had lower average payments and were also lower on mortality and complication rates, when compared with less competitive market environments.

In regard to HMO penetration, Kessler and McClellan (2000) concluded that managed care might explain the results changing across the two timeframes. In markets with low HMO enrollment, high hospital competition increased expenditures but resulted in insignificantly better outcomes. In markets with high HMO penetration, hospital competition resulted in lower payments and fewer adverse outcomes for both mortality and complications. Since the study was conducted on a Medicare population, the reported effects must be considered as a generalization of supposed managed care consequences on private coverage.

Though Kessler and McClellan's conclusions support an optimistic view of market forces, their evidence suggesting a positive impact on quality performance is fragile. The conflicting results observed between their unconventional and more commonly applied models for hospital competition calls for further validation. Validation not found, for example, in Wong et al.'s (2005) reported examination of competing measures used to assess hospital competition. They found empirical studies are likely to be "insensitive to the choice of hospital competition measure employed" (p. 84). Additionally, the clinical significance of the relative differences in patient outcomes across the levels of hospital competition is hard to assess from the reported results, and thus weakens assessment of the social welfare achieved by more market competition.

Economic Performance and the Market Environment as Determinants of Patient Outcomes

Investigations that have tried to relate quality outcomes to a significant range of a hospital's production function variables, including cost functions and financial performance measures, are truly rare. In one study, "The Relationship Between Quality and Cost: Pure and Simple," Fleming (1991: p. 36) reports results that " the indicate relationship between the cost and quality of hospital performance is far from 'pure and simple'." The study modeled the cost function of Granneman et al. (1986) and found a convex linear relationship between a readmission index quality of care measure and cost. A nonlinear relationship was also found between hospital costs and surgical patient mortality rates. The regression analysis modeled marginal cost curves, with higher cost at the low and high ranges of quality. Further, the results indicated a quality range within the above-average levels where cost predictably moved lower. The characteristics of this optimal high quality with lower cost range varied depending on the quality measure examined.

Another study to depict a critical number of hospital financial performance measures and market environment characteristics in modeling quality outcomes was an investigation conducted by McCue et al. (2003). Though the primary aim of the study was to evaluate the effect of change in nurse staffing on changes in hospital financial performance during the early 1990s, a very extensive model was justified. An important real world consideration attended to was that hospitals were reducing costs in this period in order to raise their profits or operating margins above minimal levels. A plausible scenario would be to reduce labor expenses and potentially compromise the quality of patient care. Alternatively, hospitals could attempt to raise demand by improving on their reputation. So the study examined quality performance measures as they related both to nurse staffing levels and their effects on financial performance. Market environment factors of hospital competition and managed care penetration, along with other hospital characteristics were included in the modeling as controls. While results from the study showed that hospitals experienced higher operating costs with increases in RN staffing, no significant impact on profit margins was associated with staffing increases. The authors concluded that improved hospital profitability need not be achieved through cuts in RN staffing. Variation in mortality rates was found to have no effect on either hospital costs or profits. The findings thus maintain the view that uncertainty about quality outcomes minimizes its potency as a driver in economic dynamics.

Improvements and Extensions to be Pursued in the Proposed Analysis

The empirical literature reviewed in this section has well-known, if hard-to-overcome, limitations. This study aims to extend the analysis to test the hypothesized relationships between market mechanisms and hospital quality performance in three areas. First, rigorous analytic methods will be employed to validate the measurement model of the hospital quality performance indicators. The proposed research design detailed in Chapter 4 includes the use of multiple quality measures independently validated in the literature. Using a set of quality measures to capture organizational performance allows for testing a measurement model where the indicators may represent a single unobserved, or latent construct for organizational performance, or alternatively whether the measures represent casual effects arising for diverse and independent inputs that are only marginally tied to organization specific factors.

Prior research has tended to restrict hospital quality performance to a single or small set of outcome measures such as mortality, or to a limited patient population, e.g., Medicare heart attack patients. This research will investigate both patient level outcomes of mortality rates and a set of complication measures that arguably can represent the unobserved variable of quality performance at a level appropriate for the hospital organization. The inpatient mortality indicator will be assessed for each patient level category used in the APR-DRG risk adjustment methodology developed and refined by 3M. Such a rather inclusive patient category range to determine quality performance would accurately reflect a hospital-level effect, compared to the constrained patient subsets that have been reported in the literature.

Development of the proposed measurement model for quality performance will also investigate the set of quality indicators that have been developed in the healthcare cost and utilization project (HCUP QIs). Each quality measure used will demonstrate at the patient level a degree of face validity. That is, the selected measures will meet the test of being monotonically ascending across the levels of risk adjustment factors (Shukla & Fisher, 1999). The measurement model will further be vetted by applying multilevel analysis procedures to demonstrate the measures can detect a significant random component variance across the hospital cohort under investigation as assessed by empirical Bayes estimation of the inter-class correlation (Goldstein, 2002).

Second, the proposed research will assess a reasonably comprehensive set of market mechanism effects that have been considered to impact on hospital quality performance. Demand-side cost will be estimated from both a global perspective of total hospital revenue and as an extended model that decomposes revenue by payer types. Also, effects of change in the cost function input variables, including capital costs and non-labor operating expenses, as well as differentiated labor category inputs that can evaluate nurse and non-nurse staffing changes will be estimated. Additionally, financial performance variables such as operating margin will be evaluated; as well as market environment factors will be modeled as well in the research effort to assess market impact on hospital quality performance.

Third, the use of longitudinal analysis is intended to extend the empirical precision and sensitivity found in recent studies using panel data in both estimating effects on quality outcomes and financial performance achieved by hospitals that face varying market and institutional environmental characteristics. The proposed analytic methodology will use random and fixed effects models with panel data from acute hospitals in Virginia during the period of 1997 through 2001.

The results of the investigation are intended also to extent the generalization of prior research by ung data from patients and hospitals in Virginia. Prior studies have tended to rely on data from a few large states and Medicare data. Comparison of the Virginia data sources for both patient level outcomes and hospital financial performance have been regard to generally exhibit excellence validation and development characteristics (VHI, 1998).

The study is presented as a pioneering work that finds justification as much in the juxtaposition of wide-ranging theoretical propositions to adequately define the cost of quality relation, as in the regression coefficients that are offered to model the functional relationships. Some in health services research may find the theoretical framework to be of merit, some may find the methodological design provides merit, but it is only hoped with certainty that the considered effort to link quality outcomes to assumptions about the efficiency of market governance as a means to achieve social order in healthcare generates debate and further efforts at theoretical falsification of our working assumptions.

CHAPTER 3—THEORETICAL FRAMEWORK

Empirical Testing of Market Ideology

The theoretical aim of the research is to test normative propositions of market ideology, and to challenge organization theory arguments isomorphic with the taken-for-granted market optimism prevalent in orthodox economics and in our cultural generally. Specifically, the study intends to call into question the presumptions that the longstanding problem of uncertain quality has been technically solved by the two or more decades of "market reform" in healthcare, or that it will be solved by further policy designed to support positions framed by market ideology.

Working from an institutional theory viewpoint, the study examines market ideology applied as social reform (Fligstein, 1996) in the institutional environment of organizations, hospitals in this study. Institutional theory has a rich history of skepticism toward rationales that attribute simple rational optimizations or inevitable efficiency to organizational routines and outcomes. Institutional theory attends to observations that uncover either loose connections between expressed goals and actual behavior, or the decoupling of intended actions with their unintended consequences.

The exposé tradition of institutional theory derives from a methodological approach common in organization theory generally, that of descriptive ethnology

(Hodgson, 1998), or more simply, an empirical orientation to investigating phenomena of interest (Simon, 1997). From a philosophy of science interpretation, the methodological approach taken can be viewed either as an orientation toward historical development or as an evolutionary point of view. The key methodological position is that there are social and biological explanations that cannot be reduced to universal laws or formal explanations akin to equilibrating dynamics as found in the physical sciences. It is an approach that abstains from the formalism and reductionism of the physical sciences and neoclassic economics. Instead institutional theory attends to "lumpier" contextual explanations that are holistic, or in the term of the evolutionary biologist Ernst Mary (1997), "organicism."

Investigators interested in institutional phenomena often function more as historians and empirical observers of stylized facts in need of explanation, than as purveyors of quantifiable laws. Such an empirical orientation eschews reductionistic formalism that aims to achieve a general theory of social welfare as practiced in neoclassic economics. Rather, institutional theory encourages employment of longitudinal observations to support the hypothesized social structures and the dynamics of collective action (Scott, et al., 2000).

Institution theory has assumed many forms and undergone critical transitions. It can be considered unified only in (1) its descriptive methodological modes of analysis and (2) its position that social institutions represent an array of collective action mechanisms (e.g., conventions, moral rules, social norms, rule of law, and organizing organizations), which yield a problematic sort of social order. Hierarchical social forms, including individuals, households, organizations, organizational fields, and cultures are taken as ontological objects that constitute social order. The transmission or flow of information across these nested social boundaries is seen as a means to achieve social stability and change. The overarching institutional change processes is referred to as "structuration" (DiMaggio & Powell, 1983; Scott, et al., 2000).

As outlined in the previous chapters, the study relies on quantitative modeling of market competition and pricing mechanisms as explanatory of hospital quality performance "as if" in support of the normative position of *efficient* market performance (Freidman, 1953). The theoretical stance taken, however, is suspicious that the goals that "ought" to be achieved are, in fact, empirically supported. Healthcare's history has long revealed social and economic conundrums where private market presumptions would have assumed otherwise (Newhouse, 2003). The hypothesized predictions in this research presume that efforts made toward more market-oriented reform have not greatly changed the uncertain value achieved in healthcare.

As covered in Chapter 1, the once-tranquil vista of healthcare has undergone a remarkable transformation in the last few decades. Only the uncertainty as to what is actually the price to be paid for a given health status remains unchanged.

Change is certain. Its directions and implications are what command our attention. Healthcare production has revealed both economic and quality problems, and reporting on the problems has certainly contributed to the social pressures that have pushed for its reform. Even so, the directions taken in this sector also reflect a more ubiquitous cultural trend for increased reliance on market governance and diminishing legitimacy for more "mixed-economy" approaches (Kutner, 1997), which defines the funding of non-profit organizations and government agencies.

Essential to market predictions following from the Fundamental Theorems of Welfare Economics (i.e., Pareto optimality) are that impersonal "things," material resources are for sale, based on an individual's willingness to pay (and, of course, on collective action support for the property rights needed to sustain free-market capitalism). In the paradigm legitimizing decentralized market governance, the individual is the sovereign actor. Yet, the analytic formalism also requires that the behavior of individuals be homogenous and exchangeable (Arrow, 1986). Market logic presumes that an optimum economic state will prevail if each of us is rational and farsighted enough to avoid the hazards implied within a self-interested exchange relationship (e.g., *caveat emptor*), when engaging in voluntarily exchanges for mutual benefit. The competitive equilibrium theory that legitimizes market ideology obliges individuals to think alike, to be rational maximizers.

The formalistic theory that supports market ideology is stringent about the conditions needed to attain the ideal end-state of perfect market competition. Numerous hazards have been defined that can potentially thwart an exchange relationship. Nonetheless, *a priori* behavioral assumptions about motive and the faculty to compute rational expectations remain requisite to the neoclassic position.

Social governance based on market competition is a notion uniquely disdainful of collective action (e.g., the pooling of resources and the coordination implied) as a means to effective problem solving. The "methodological individualism" applied by market logic predicts a social welfare effect that is remarkably deterministic, arising from the "invisible hand" of simple system dynamics, fitted to a model of ideal conditions resulting in ideal economic consequences.

Critiques of market logic often call attention to the inadequacies of the behavioral foundations. Though such devices as rationality and exchangeability are indispensable assumptions to warrant the formalism of economic analysis, many social scientists and economists, including Winter (2004: p. 301), have noted that cognitive research suggests that the *a priori* behavioral proposition may not suffice as a foundation:

> "That full rationality theory is indispensable does not mean, however, that it is fundamental. On the contrary, it is the bounded rationality perspective that is fundamental; it provides the general theory within which the true place of full rationality can be accurately seen."

Another often-noted weakness of the "methodological individualism" of orthodox economic theory is that it abstracts the concept of organizations to a very simple idea in the theory of the firm. Markets simply start with the existence of firms. To achieve the best-off state in market dynamics, a firm need only be a point in the equilibrium results, or a supply-side black-box driven by market forces. "There are simply inputs and outputs, a production possibility set, and a motive—maximization of profits (possibly in some sophisticated form that takes account of uncertainty and the future)" (Arrow, 1999: p. vii). There is no complexity of structure or development in the market view of organizations, or to the processes of organizing as it involves collective action.

Oddly, the support for, and the actions taken towards, "market reform," whether framed by the polity or just the healthcare sector, is an exemplary instance of collective action development. Odd because the gist of the pro-market reliance on decentralized action is the belief that in a free-for-all competition for material wealth, the welfare of all individuals in the aggregate will rise, or at least none will fall, because markets are the best means to an economical end given scarce resources. Odd, also, in that it is collective action directed at warding off alternative action not pursuing the ideal of what Olson and Kahkonen (2000) good-naturedly refer to as "economic imperialism."

Critics, however, suspect markets to be capable of harboring opportunism[9] or other hazards, especially when a degree of outcome uncertainty may well hinder and overwhelm decentralized rational calculation. Alternative social choices reflect a degree of pessimism for the prospects of individuals having to fend for themselves when a problem demands some degree of social coordination or common security.

What has been emphasized in organization theory, as well as in the social sciences generally is that behavioral assumptions used to derive fundamental theorems of economics need not be taken for granted, but can be empirically tested. As a whole, empirical findings suggest that opposing theoretical constructs such as "bounded rationality"[10] and social learning would be better behavioral assumptions on which to ground social theory and policy (see Simon, 1997; Dosi, 2004; Mantzavinos, 2001; and Williamson, 2000b for reviews). This countervailing, interdisciplinary position maintains

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[9] Williamson (1997a: 97) has described opportunism as being "self-interest seeking with guile."

[10] Bounded rationality denotes, on the one hand, that goals are as likely to emerge from a search for a solution to an ill-structured problem, as to be an anticipated end-state of a rational system. On the other hand, goals, as well as social meaning, are defined situationally—that those in the situation "do not create this definition, even though their society can be said to do so; ordinarily, all they do is to assess correctly what the situation ought to be for them and act accordingly" (Goffman, 1974: p. 1-2).

that the "ontology" of social interaction cannot be reduced to "methodological individualism." Behavior is too complex for such simple constraints.

The research program rising from the Graduate School of Industrial Organization at Carnegie-Mellon, led by Herbert Simon and a host of notable faculty and students, is probably the strongest representation of this empirically disciplined approach to the social sciences.[11] In tune with the critique developed by Simon and associates (Simon, Mie & March, 2004), this empirical position argues:

> "Modern mainstream economic theory is largely based on an unrealistic picture of human decision making. Economic agents are portrayed as fully rational Bayesian maximizers of subjective utility. This view of economics is not based on empirical evidence, but rather on the simultaneous axiomization of utility and subjective probability" (Gigerenzer & Selten, 2001: p. 13).

Herbert Simon is a self-described scold of economic orthodoxy (Simon, 1997) who, though not *per se* an institutional theorist, has made major contributions to three themes in organization theory that are central to the framework of this study. The themes are interdependent, and cumulatively provide an internally consistent description of the social dynamics they aim to explain. The themes are also taken as a micro-organizational foundation that is congruent with the more macro dynamic notion of structuration in institutional theory, and will be used to justify a bit of optimism for the otherwise skeptical institutional theorist.

[11] The Carnegie-Mellon business school has been an important intellectual source for institutional economics (for the transactional cost strand see Williamson, 2000c; for evolutionary economics see Dosi, 2004); cognitive psychology (Henrich et al., 2001) and; of course, organization theory's strand of empirically grounded rational adaptation (Fligstein, 2001).

First of the three themes is an appeal for an empirically disciplined social science attentive to observations on "process matters." Solid empirical grounding should be sought for fundamental positions such as purported micro-behaviors, causal mechanisms, and aggregate dynamics.

As noted above, this empirical position, which pragmatically attends to consequences, is the methodological approach taken in institutional theory. Moreover, such a contextually relative position is more generally evidenced by organization theory's pluralistic approach to uncovering "stylized facts," where a researcher often chooses among theoretical positions based on contextual relevance, rather than adhering to any one general theory. Methodological positions that stand in contrast to the normative formalized position of mainstream economics

Simon's empirical approach emphasizes that process matters. Intertemporal process transformations should be explained as a convincing story as to why variable x has the value that is does in time t, before a formal mode is applied to assert inevitable consequences. Among such important process stories that the student of organization should explore are unintended consequences and the imperatives of bureaucracy (March and Simon, 1958).

The second central theme concerns Simon's "bounded rationality," a cognitive construct to deal with real world decision-making. Bounded rationality is a concept critical to appreciating the institutional cognitive elements used to frame the analytic path taken in this research. The cognitive construct intentionally stands in contrast to the hyper-rationality assumption of orthodox economics (Simon, 1997). Simon argues that the less-demanding cognitive condition of bounded rationality models what "actually goes on in people's heads." Yet, it is also a concept that complicates organizational analysis by simplifying cognitive structures to context-sensitive heuristics.

For Simon, bounded rationality "is consistent with our knowledge of actual human choice behavior, assumes that the decision maker must search for alternatives, has egregiously incomplete and inaccurate knowledge about the consequences of actions and chooses actions that are expected to be satisfactory (attain targets while satisfying constraints)" (1997: p. 17). Bounded rationality leads Simon to conceive of a descriptive theory of deliberation (or lack of it); "behavior ought to be robustly nested into corresponding empirical generalizations from e.g. cognitive psychology, experimental economics, organizational studies, sociology, etc." (Dosi, 2004: p. 137).

The third theme goes to the heart of the distinctions by which social theory turns one way or the other: the mechanisms of social control that shape human interaction and adaptation, or how social order is achieved. The means of achieving social order is a venerable philosophical discussion generally framed in a dialectic manner. Mantzavinos (2001: p. 161) accords the notion in an economic context as human interaction taking shape along two paths: "(a) a process of voluntary exchange between individuals or (b) the voluntary pooling of resources by individuals for a common use." These two kinds of human interaction have been termed respectively as "market" and "organization." Market interactions are characterized within a context of material resource scarcity as a spontaneous "bottom-up" adaptation realized though an "invisible hand" social process.

Organization in economics is simply treated as a means to construct autonomous actors out of collective action boundaries, whether represented by government bureaus, political parties, firms, or educational organizations (Coleman, 1990). In both the rational choice theory of economic orthodoxy and the rational approach tradition of Chester Barnard in organization theory (Scott, 1992), organization is conceived of as cooperative adaptation of a "conscious," purposeful, and contractual arrangement working through administration.

Conversely, theory that reflects and advances the Simon/Carnegie-Mellon program has given substance to deeper, messier, and more informal dynamics to organization as "top-down" collective action. Here collective action is not just a boundary to personify an alter ego of that stands for autonomous agency, but interaction that benefits from coordination and cooperative loyalties. Further, the dependent relations between actors are seen by Simon 1997) as gaining advantage over decentralized market exchanges in some situations. Support for a richer interpretation of formal and informal social institutions as collective-action structures proceeds from stylized facts and a multiplicity of motivational drivers.

In a review of Herbert Simon's legacy, Dosi (2004: p. 218) explains this "institutionalist" idea positions institutions as a "quasi-primitive concept of the theory rather than a derived one stemming from e.g. self-seeking rationality…" Simon (1990) ties collective-action dynamics to its microfoundations in terms of motivational and cognitive attributes, among which he features docility (disposed to be taught), identification, and loyalty. Collective-action dynamics arise from the fact that the human species is notable for its dependency on others for daily survival and for the ability to learn from others.

Simon proposed social learning as a key selection determinant in adaptive social processes. The social learning process is conceived as contributing to the fitness of the individual in two ways:

> First, it provides knowledge and skills that are useful in all of life's activities, in particular, in transactions with the environment. Second, goals, values, and attitudes transmitted through social learning, and exhibited in the speech or behavior of the learner, often secure supportive responses from others. For brevity, we will call the knowledge and skills of the first kind "skills," and those of the second kind "proper behaviors" (Simon, 1990: p. 1666).

Most of what we know is acquired from our social environments. Among the facts that we know or believe, there are few that we have figured out for ourselves (Simon, 1997).

The three themes of organization theory outlined above frame a highly socialized anthropological view of human interaction and adaptation. That view stands in contrast to the anthropological view of neoclassic economics. The contrast has usually been framed in terms of longstanding polemics pitting the decentralized, self-interested, and rational *homo economicus* against the more centralized and dependent *homo sociologicus*—overarching behavioral axioms offered to solve the critical issue of social order (Elster, 1989; Mantzavinos, 2001).

Though the behavioral assumptions and methodological approach taken in this study contrast with mainstream economics, care is given to qualifying a tack that avoids unseemly theoretical conflict with academic positions not grounded in the interdisciplinary approach of organization theory.[12] Yet, even when limited to an organization theory context, the social science issues are so fundamental and the "economic imperialism" of market ideology so ubiquitous, a competitive confrontation can not be avoided. The most notable benefit expected from respectfully challenging the theoretical position of market reform is that it might weaken the Panglossian spirit that lead us to believe we have found the treatment for what ails healthcare production, when empirical facts still point to an ill-conceived healthcare system.

The intended approach is to frame market logic not as wrong, but rather as incomplete, and limiting when trusted as an exclusive rationale for superior performance. Reason supporting market reform will be viewed here as one of a small set of idealized models of organizational governance that individuals and organizations can learn to embrace, each having comparable strengths and weakness in real-world problem solving. From an objective scientific standpoint, the criticism aims to point out the potential loss of adhering too closely to an Occam Razor-like simplifying strategy, when facing the degree of complexity and uncertainty encompassed by healthcare.

Critiques of the neoclassic economic thought have been longstanding and, more importantly, gaining in clarity (Arrow, 2000). Theoretical development on economic and social processes has pushed for a richer microanlysis of market institutions. While the literature critical of neoclassic economic reasoning has guided and encouraged this study,

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[12] Such a confrontational stance is best left either to economists who would argue for one of the various strands of the new institutional economic schools of thought, and who are liberally referenced herein, or to those who would argue for "market failure" in the context-domain of healthcare exchanges (see Rice, 1998).

a thorough review of what is problematic with the logic used to argue for market reform in healthcare is not necessary for this study. The reader here is simply referred to the cited writings of Kenneth Arrow and Herbert Simon, and to a monograph by the author that more elaborately contrasts the evolutionary metaphors (i.e., covering laws) used to premise collective action dynamics and the equilibrating dynamics of conventional economics (Fisher, 2005). The reader is also referred to Thomas Rice's (1997) internal critique of the orthodox position as it relates to healthcare.

The intent is to inform on an institutional paradigm that differs with commonly held economic principles and is pessimistic of the expected efficiencies thought to be achieved through healthcare market reform. The conceptual framework draws heavily on schools of thought that stand in dialectic opposition to neoclassic economic reasoning as to how social order is achieved. Particularly, the interdisciplinary field of "new" intuitional theory (NIT), which incorporates insights from various elements of the social and biological sciences, will be used to frame the study propositions. The economic strands of this field, collectively referred to as "new" institutional economics (NIE), clarify options available to an institutional perspective that can account for economic concerns without abstracting the dynamics of the institutional environment, and the role of organizing in constructing a boundedly rational model for problem-solving and decision-making.

Organizing Dependent Relations or Impersonal Markets Exchanges

Discussion of markets can range over a lot of ground. Confining discussion to the effects of market reform on organizational performance and the interests covered by organizational analysis brings certain socioeconomic features to the foreground. One relevant stylized fact is the socioeconomic trend towards more integrated and complex organizational forms and networks, and greater ownership consolidation—a phenomenon that has been of critical interest in organizational analysis (Meyer and Rowan, 1991). One can argue that economic explanations for the ubiquitous cultural form of organizations are provided by economies of scale and scope. Current public discussion has lost even nuanced reference to market excesses, however, and has assumed a more taken-for-granted response that presumes optimality from private market capitalism, what ever the organizational forms of ownership might be. Apart from vague references to global competition, the formalism of orthodox economics furnishes no direct quantifiable link between the increasing consolidation of revenue streams at points of corporate actors (or equity actors who control them) and scale/scope parameters (Ijiri & Simon, 1977). The trend now shapes institutional changes in healthcare (Bazzoli, et al. 2001; Burns and Pauly, 2002), albeit somewhat belatedly as compared to other industrial sectors.

Analysis of this trend towards larger and more complex organizational forms is a central focus of transaction cost economics (TCE). As a school of thought in both new institutional economics (NIE) and organization theory, TCE takes exception with economic orthodoxy by emphasizing that institutions *do* matter, economically (Williamson, 1998). TCE argues for comparative analysis on the feasibility of discrete governance structures of which markets constitute only one and includes hierarchies (the economic organizing of organizations), government bureaus and other institutional structures as alternatives.

TCE has its origins with the canonical problem of vertical integration (Williamson, 1981): corporate actors capturing resources from the market through the organization of economic activity.[13] To account for such economic activity, TCE also relies on the tradition of distinguishing two types of organizing adaptations: autonomous and cooperative. Markets, as they represent autonomous adaptation, cannot account for the increasingly evident problem of vertical integration. Cooperative interdependence, represented by the pooling of resources by organizations' vertical integration, is an adaptive response explained by economizing on transactional costs, albeit one of last resort given the added bureaucratic costs (Willaimson, 2000c). TCE's position rests on a bounded rationality notion that "all complex contracts are unavoidably incomplete," and that the "mitigation of contractual hazards through the *ex ante* choice of a better mode of governance" is feasible, at least in the long run (Williamson, 2000b: p. 14).

Of central importance to this study, is TCE's focus on intertemporal process transformations that require committed investments and social dependencies over time. By realizing that cost economies or design benefits accrue from "investments in relationship-specific assets that isolate the transactors from market alternatives" (Masten, 1999: p. 40) the dependent relations of *homo sociologicus* can be warranted economically. Four types of relationship-specific assets are categorized in TCE under the construct of asset specificity. TCE's economic reasoning is that markets are efficient when exchanges are simple, impersonal and their outcomes are reasonably certain.

[13] Organization in this sense connotes the centralization of economic activity, in contrast to the decentralization of exchanges in the marketplace.

However, when the identity of a trader matters because the process transformations take time and require continuous monitoring due to process complexity, dependent relations form around such intertemporal transactions. Organizing dependent relations are seen as a safeguard against opportunism and the transactional cost of opportunistic tendencies.

TCE's discovery and promotion of asset-specificity as requisite to understanding the economics of vertical integration as a governance structure apart from the orthodox notion of firms acting in accordance to market forces is insightful. Economic analysis of asset specificity as involving transaction costs has been informative (Carroll & Teece, 1999). For purposes here, however, the notion of dependent relations (as embraced by asset specificity) will be taken as a more primitive and fundamental behavioral construct, not just the causal result of opportunism achieved via guile of the self-interested. It will be simply assumed that the performance impact realized by dependent relations formed within cooperative organizing can be treated in a black-box fashion, but should and can be taken into account.

The TCE point is that economic organization can benefit from institutional explanatory factors and that all disciplinary niches require consideration of material-resource explanatory factors. Certainly, economic theory has been informative about what has come to be seen as the less-than-ideal state of economic performance in healthcare. Cross-fertilization could go both ways, however.

This health services research study aims to return the favor, informing on the complex and problematic nature of economic organization (Robinson, 2001). Economic organization is viewed to become problematic when dependent relations must be given an institutional context. For this study, it will be consider sufficient that organizational-specific relational dependencies will required a developmental context when the homogeneous behavioral assumptions of rational choice theory falls short of explaining welfare benefit, e.g., when competition for material-resources does not sufficiently explain organizational performance. Social scientists outside of mainstream economics have offered a more descriptive, developmental, and context-sensitive understanding of markets forces (Fligstein, 2000) that contrast with normative economic positions, and it is to that literature this study turns its attention.

Explaining Organizational Performance with New Institutional Theory

As a means to guide the reader towards the framework objectives of the remaining three sections, I would like to summarize the general points made so far in reference to what follows. The next section, Assessing Quality Performance within Healthcare's Nested Social Structure, addresses the methodological approach taken in this study. The methodology aims for an empirical account of the structuration process of collective action. The dynamics of structuration accounts for, and occurs across, nested boundaries of social interaction. Reasoning is given to how the phenomena of dependent relations can be mapped onto a simplifying theoretical model that is context-sensitive across the boundaries of social interaction. The reasoning follows from observing different sources of variability at different levels of social analysis.

Though the fundamental methodology holds for each of the study's research questions, the notion of nested sources of variability is readily observed in the development of the measurement model. The measurement issues typify the mapping of hospital performance as a nested data structure. By accounting for patients events grouped by diagnostic/treatment groups which are then grouped within hospitals, exchange events are observed to be nested within organizational performance as hospital-specific collective action. Further, by accounting for hospital performance over repeated measures, it will be argued the patterns that represent dependent relations within organizational-specific processes can be mapped empirically. The research questions reduce to whether market and economic variables (i.e., material-resource factors) can sufficiently account for this hospital-specific performance variability. And if not, what would account for the dependent relations represented by persistent patterns of hospital quality performance?

The following section of this conceptual framework, Embedding Market Institutions within the Pluralism of Organization Theory, aims to provide a convincing story as to why market institutions should be treated, like other institutions, as embedded within the wider institutional environment. The point of the conceptual exercise is to allow the static economic ideal of competitive equilibrium to be treated as a special case of human adaptation, but within a consistent institutional theory framework. While the theoretical positions can be viewed as antithetical on core debates, organization theory's pluralistic approach seeks for what is gained from the contrast in terms of "dialectical relief."

A typology of four idealized types for organizing organizations will be offered as a stylized fact in need of theoretical explanation. The market enterprise model is offered as one in a set of mental models defining the logics that can guide and constrain organizational routines and the reform of organizational fields.

Finally, the section, Institutional Constructs, covers the institutional perspective that provides a basis for pessimism about market reform ideals of efficient material-resource dynamics on hospital quality performance. Discussion moves to clarify what is relevant in the new orientation of NIT that allows for conceiving market ideology and market governance as a comparative option within a range of feasible alternatives. The approach taken is contrasted with institutional positions that conceive of market forces as being separate and beyond the explication of institutional premises—only an element in the technical environment.

Assessing Quality Performance within Healthcare's Nested Social Structure

Some organizational theoreticians may suspect some chicanery in applying institutional theory to assess market performance. For instance, a more conventional approach would simply treat orthodox economic reasoning in support of market ideology as a given, and propose only that provider strategies are a cloak for using market ideology's good name to gain advantage.[14] To decouple expressed administrative goals from core production technology effects is a well-known organizational phenomenon commonly referred to as *buffering* (Scott, 1992).

The theoretical aim here, however, is not simply to impugn the technical efficiency usually claimed for market reform, but to investigate the possibility that there

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[14] This is an implicit position that leaves the door for the option that the rules of the institutional game have yet to match the market model, and more market reform is in order if quality is to be priced efficiently (Enthoven, 2004).

are alternative institutional processes at work to realize superior performance, even if there is a decoupling between "market reform" and its expected efficiency effects. The absence of anticipated market institution effects is not sufficient to support the case for institutional effects. A key study premise is that positive institutional effects arise from the dependent relations of collective action and the permeability of social learning across socially constructed boundaries. The issue of positive institutional effects engages the first research question: Is there information to adequately distinguish organizational-specific performance in quality outcomes?

To understand why institutional dynamics might better account for positive findings in hospital-specific outcomes than decentralized material-resource explanations, attention must be turned to the telling persistence of outcome uncertainly in healthcare. Why, as David Eddy put it, do we still "not have excellent ways of evaluating how well we are doing" (1998: p. 7)? Eddy offered three stylized facts to explain what seemed to be an inconceivable delay in getting started with assessing the quality performance of healthcare organizations: (1) a general assumption of quality, (2) an implied insult to the medical profession, along with public ill-ease about measuring performance, and (3) the difficulty of making substandard performance visible except through a statistical lens (e.g., a scientific focus with a wide population view). The three factors associated with the slow progress in measuring and improving healthcare quality merits elucidation within a social learning context.

The factors identified by Eddy can be conceived as different means for making sense of quality routines in a negotiated order sort of sense (Wieck, 1995). The explanations deal with different cultural modes of learning that "push" values and solution routines onto participants in dependent relations. The first two modes of learning can be called authoritative legitimacy (Suchman, 1987), as they rely on normative expectations, social trust or conventional wisdom. Authoritative legitimacy solves quality leaning by fiat. A solution is attained by structuring the social boundaries in an evolutionary fashion, not as simple rational calculation.

Eddy's third explanation can be described as a problem to be overcome if a more effective mode of social learning is to prevail. This more effective mode of social learning can be treated as a pragmatic sort of legitimacy based on scientific methods that aim for empirical auditing of routine objectives (Suchman, 1987). Here, science is not treated as determined end-game, but as a collective process of approximating the goal of best social learning practice. The statistical lens approach, like social trust, is also burdened with social dependencies and a reliance on shared understanding aimed at a common or centralized use.

The presumption of quality is explained by the traditional trust given to medical authority, and by the profession's reliance on expectations that biomedical technology wielded by autonomous practitioners yields optimum solutions. Such expectations have been culturally defined over the medical profession's history of dominating the social order in healthcare (Zazzali, 2001; Starr, 1982). Cultural values define what are legitimate solutions (Zucker, 1986). In this case, learning social values constrain the options available to healthcare organizations and consumers and, thus, constrain the resulting outcomes.

Social trust and acceptance of social norms constitutes an energy efficient sort of learning (Mantzavinos, 2001). It is not necessary to view such socialized learning as social control or laziness on the part of the participants, but rather a matter that not all problems required a thorough search for solutions. The trust given (once upon a time) to the medical profession by patients and healthcare purchasers is not dissimilar from the trust given to market governance by consumers and economists in our culture generally. Generally, trust arises in classic economics from the benefits achieved though the division of labor, where it is efficient for some problems to reach a status of having been solved by others with whom we cooperate. Hence it is low-energy, if not low-cost, learning. Yet, new problems can be perceived to emerge, contributing to social unrest, and promoting more pragmatically legitimate processes.

Eddy's third explanation, which considers the application of a statistical lens to healthcare quality, can be thought to embrace such a pragmatic learning mode. Thus, science grounded in statistical methodology can also be thought to pragmatically and approximately compete in gaining the trust of the polity and the consumer.

The statistical lens approach, however, also can be tied to significant information costs and to implications for governance mechanisms aimed at a common use. The cost to develop, coordinate and share the information is certainly one reason for its sparse use. The difficulty of extracting information from the noise associated with the variability and uncertainty enveloping health status outcomes is well known (Donabedian, 1988).

Information difficulties arises in healthcare because any particular experience of pathology is infrequent from the patient's perspective, and entails complex calculations along a number of dimensions and variables going to etiology and treatment, as well as on patient and clinician characteristics. From the decentralized perspective of the individual patient, the autonomous physician or even the hospital-specific organization, implementing the statistical lens referred to by Eddy can be a daunting task. A daunting task because it demands a population-wide view to be achieve significant solutions, and because it requires an integrating solution aimed at information use that is common to all participants in the field. In the case of healthcare this is everybody. The statistical lens needs not only to observe the dependent relations that cut across nested social boundaries (patients in diagnostic groups, patients within physician practices, nurses and surgical teams within hospitals, etc.) that are determinant of outcomes, but the construction of the lens requires coordination of dependent relations across these same nested social boundaries.

The information costs cannot be treated as simply data points along some budgetary dimension, however. Rather, the statistical lens, as an intertemporal social learning process, needs to be constructed in a coordinated and integrated fashion. Achieving statistical lens outputs calls for understanding the social learning process that underlies the generation of the needed information. The clinicians, health service researchers, purchaser coalitions, government agencies, and non-profit accrediting organizations that stand in support of the evidenced-based medicine movement, the quality improvement movement, and movement toward more research into treatment outcomes, as discussed in the first two chapters, can be treated as yet another set of collective actors promoting institutional change. These actors seek institutional structuration arguably on a smaller scope than either the medical guild or the capitalists who seek governance in healthcare, but at a level of scope that needs no small amount of coordination and collective action if it is to be effective.

Thus, the statistical lens solution can also be framed as institutional reform, and a movement that is scientifically legitimated, and which also calls for a more centralized approach to the production and monitoring of health service delivery. The monitoring and information sought calls for organizations to allow their data stores to be integrated into a wider population frame, and to allow for the information derived by these more macro, external organizations to be shared with an even wider population.

Like the mapping of conventional economics into an enacted agenda of market reform, the diverse group of professionals who are arguing for enactment of a quality agenda must be considered as promoting reform for greater centralization and integration in healthcare (Shortell et al., 1996). Whatever might be conceived as motivating the members in the quality movement, there is clearly not the same scale of material rewards to be had as by those who amassed personal fortunes from building national for-profit hospital systems by acquiring community non-profits, or from converting the non-profit Blues into publicly traded MCOs. Such folks must be considered rational, and if they are not material maximizers, then it may be they are aiming to build dependent relations just because it's the next right thing in the problem-solving process. The point is to note that diverse institutional interests continue along an epic conflict or along an evolutionary trajectory to shape the institutions and routines that would set the rules in healthcare. Each of the various groups pursue solutions for rectifying perceived healthcare failures—

whether conceived of as government, market or professional failures. While market reform has gained territory in the organizational field, the current healthcare environment can also be regarded as a conflicted field of play (Scott et al., 2000). Thus, the research assumes there are various sources of institutional influence acting on hospital quality performance.

Further, the methodological assumptions of the research are holistic in assuming there can be no perfect or even optimal research designs to determine causation of hospital outcomes. Real world healthcare outcomes may be just too messy, complex, and uncertain, or, in a word, too *organic*, to be mapped into analytic equations aimed at empirical support for any given determined mathematical formalism.[15] The variable relationships that can be conceived as determining hospital outcomes are considered both numerous and challenging of accurate measurement, and thus not easily specified, even by the wide array of measures collected in this study design.

The research intends to test a set of market enterprise model variables in econometric, fixed-effect fashion to systematically evaluate their impact on quality performance, and to test whether the supposed market dynamics provide a significantly sufficient explanation of the production outputs. The methodological approach also importantly attends to variance component analysis that deals with the unspecified relational dependencies that can be considered to frame the nested social boundaries and

[15] Fixed-point mathematical theorems are the basis of the existence proofs for general competitive equilibrium theory. Most economists view general equilibrium dynamics, and the mathematical proofs on which they are based as the fullest culmination of neoclassical theory.

collective action of hospital-specific performance. The nested social boundaries are mapped contextually as multilevel analysis that models micro-unit observations that constitute and aggregate up to macro-unit performance.

A macro-unit variance component (e.g., between-group variance) is realized by accounting for the "degree of resemblance between micro-units belonging to the same macro-unit [and] can be expressed by the *intraclass correlation coefficient*" of a nested data structure (Snijders & Bosker, 2000: p. 16). The formal details of the intraclass correlation coefficient (ICC) statistic will be covered in Chapter 4. Suffice it to say in this chapter, the ICC statistic is treated as connecting the notion of dependent relations in collective action to an empirical estimation of the unspecified relational dependencies in group or collective action.

Development of such relational dependencies is the socially constructed process that institutional theory attempts to explain in its historical accounts and story telling. Whether it is the collective action that constitutes a specific organization, or which permeates the organizations that constitute an organizational field, institutional theory aims to understand the dependent relationships that form, replicate and evolve with social reform.

Intraorganizational patterns are comparatively taken to represent a latent and unmeasured underlying set of institutional processes that guide the developmental trajectories of organizations. Decomposition of the nested sources of variability is an attempt to represent "the effects of unmeasured variables and the approximate nature of the linear model" (Snijders and Bosker 2000: p.45). The methodology facilitates addressing the lumpy, non-economic factors that are treated as unmeasured, but are yet made comparable in this study design to the fixed-effects achieved by the more perfect measures of price, quantities and competition as a source of variance to be explained.

The institutional dependencies carried by the set of hospital-units observed are statistically estimated as ICC measures and reliability scores. The statistics are taken to map onto real world dependent relations, which are yet unmeasured institutional processes hidden within the black-box view of organizations as economic production functions. Dependent relationships are thought to be defined by such processes as the career commitment made by nurses to a hospital organization, the commitment of a hospital to the careers of its employees, a hospital's commitment to the monitoring of the care given to its patients' quality of life, its commitment to the delivery mechanisms of social status and monetary rewards, etc.

The research methodology gives considerable attention to the reliability of the measurement model and to the contextual analysis that can account for the distinct sources of variability in the nested data structure. Both concerns derive from psychometric and statistical theory traditions, which have attempted to account for the approximate nature of linear modeling.

The only clear evidence in health services research is that provider organizations do vary in their processes of care and that there is a great deal of room in the variance for improvement. It may be that organizations can effectively be abstracted as material-resource production functions, driven by competitive market forces when accounting for quality performance variance. In that case, organizations as institutions apart from the competitive equilibrating dynamics occurring in the marketplace do not matter. It is not a fact that can be assumed, however. Rather, accounting for quality performance variation is an important question that needs an empirical answer, as posed in Research Question 1: Is there information to adequately distinguish organizational-specific performance in quality outcomes?

Two hypotheses are proposed to evaluate the goodness of the measurement model developed:

H1a: A parsimonious set of independent inpatient quality indicators can be found from a larger set of potential indicators that evidence strong face validity for patient-level risk-adjustment, which also demonstrates significant systematic between-hospital variance.

H1b: The quality indicators developed from the yearly cross-sectional development phase will continue to evidence a significant hospital-specific variance component in a longitudinal design that examines variance in the growth trajectories of hospital quality performance.

Estimation of the various sources of variability is applied throughout the research design. The predictive models used to asses the adequacy of the market enterprise model in determining hospital quality performance will be based on the significance of the fixed-effects coefficients for the market variables and on the explained variance achieved for each of the sources of variability.

Embedding Market Institutions within the Pluralism of Organization Theory

Organization theory inclines to take theoretical and ideological pluralism as a key principle in explaining why an organization exists, what organizations are intended to accomplish, and how they are (or should be) designed. In this multi-disciplinary field, approaches have frequently been developed in opposition to one another, but no one paradigm has established dominance. Nor do most of the competing paradigms assert a best-off normative analysis. Applied researchers are frequently seen to pick and choose from the diverse theoretical frameworks according to the context appropriateness of core constructs based on the unit-level analysis and on the most descriptively relevant attributes of the particular organizational form, or the attributes of the organizational field, under discussion. This study draws on the observation that the theoretical pluralism embraced in the organizational literature both acknowledges the complexity of organizations and recognizes the need to simplify in the face of such complexity (Perrow, 1993; Astley and Van de Ven, 1983).

Starting from the notion of complexity and the divide-and-conquer heuristics that inhere in organization theory's pluralism, a position will be sought from which to juxtapose contradictory theoretical perspectives within a single testable model. In Astley and Van de Ven's (1983: p. 244) metatheoretical analysis of organization theory, they argue that the merit of such a reconciling effort lies in the ability to bring opposing viewpoints into "dialectical relief".

Astley and Van de Ven (1983) present the value of outlining a metatheoretical framework as a means to move beyond theoretical compartmentalization and ideological polemics, while attempting "to preserve the authenticity of distinctive viewpoints, thereby retaining the advantages associated with theoretical pluralism" (p. 245). The objective is to define alternative theoretical interpretations that coincide with the possible divergent directions that inferences within an empirical model can take, while avoiding inconsistencies in the conceptual framework. The research objective here is to construct an empirical model derived from a theoretical position that relies on the significance of unmeasured variance terms, and yet predicts support for the null hypotheses grounded in an alternative theoretical framework. Hypothesis testing can warrant a pessimistic, as well as a positive, theoretical interpretation if alternative positions have been adequately presented in terms of "dialectical relief."

A number of divergent perspectives were compared in Astley and Van de Ven's (1983: p. 245) metatheoretical analysis that examined six core debates within organization theory. The inquiry at hand limits the scope to but two of these core issues. The relevant central debates are:

> "Are organizations functionally rational, technically constrained systems, or are they socially constructed, subjectively meaningful embodiments of individual action…?
> Is organizational behavior principally concerned with individual or collective action?"

The two opposing viewpoints offered to frame the "dialectical relief" posed by these core organization theory debates are: 1) orthodox economic theory of the firm that treat organizations to function "as if" they are rational entities affected by technically-determined, market system dynamics, which are formalized as "economic laws" derived solely from behavioral assumptions of individual action; and 2) institutional theory, where organizations represent collective action nested within a system of socially constructed structures that must be subjectively interpreted in a context-sensitive or evolutionary manner. Core debates, such as cast by this market-institution conflict, cannot be viewed as being won or decided, but only as illuminating the methodological modes of analysis and theoretical paths taken.

Specifically, the "dialectical relief" aimed for in this study is to simplify the analysis by framing market reform as one in a set of archetypal organizing solutions (e.g., mental models) embedded within the institutional environment. The approach treats the vaunted effectiveness of market institutions as a special case that does not necessarily generalize beyond certain context-sensitive conditions or problem-solving domains. The analysis argues that implementation of market governance structures and organizational routines in certain context-sensitive domains that are not a good fit with its simplifying assumptions are as likely to have unintended consequences and as much welfare loss (i.e., inefficiencies) as any substitutable governance forms or organizational routines. Market institutions, like all social institutions, are tools that can cut either way, for good or ill.

While this study seeks to directly validate market logic as it describes the means to efficient ends, the research also aims to support such comparative analysis. Comparative in the sense that market governance can be feasibly substituted for by alternative governance structures (Williamson, 2000c, 1999).

Hospitals may distinguish themselves in quality performance even after it is demonstrated that their play in the competitive market game has no effect on their quality score. The position is that institutions matter, and that market institutions are always embedded within a wider institutional framework. Support for such a position not only is found by demonstrating weak linkages between market and pricing variables and the rationally expected goals, but also requires evidence that *effective* organizational performance is influenced by alternative institutional structures.

From the pluralistic organization theory standpoint, efficient outcomes merit empirical investigation. Organizational theorists need not, at the outset, assume efficient outcomes are a social fact achieved by the enactment of market reform by organizational actors embracing a shared mental model of economic and social theory.

Market Ideology as One in a Set of Ideal Mental Models to Guide Organizations

As socio-economic systems are complex, it has been a common tactic in theory development to apply "ideal types" to abstract descriptions of "situations, phenomena, or persons that indicate the general features on which a theorist will focus as crucial for purposes of explanation" (Hodgson, 1998, p. 174). Economic characterizations of perfect competition and monopoly, for example, can be viewed as idealized market types. However, the view of market ideology as a distinctive theoretical ideal amongst a number of idealized mental models practiced by organizational actors is rather new in organization theory.[16] Instead, diverse organization theory perspectives, such as the micro theories of strategic management (proactive behavior) and contingency theory (reactive

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[16] Industrial organization as an attempt to translate economic theory to strategic competitive management is both an exception and a validation of this point. As Perrow (1993: 219) has noted, "[t]he venerable but small field of industrial organization assumes profit maximization, but of the firm, and even this assumption is conditioned by great uncertainty and 'satisficing'."

behavior), as well as macro theories like population ecology (passive selection and retention), often draw from the broader assumptions and theorems of economics.

Organization theories have tended to view market mechanisms as parallel to core constructs in organization theory. The common approach has been to accept economic deductions, such as the *efficient market thesis,* as key theoretical propositions (Fama, 1964). Market competition outcomes were either taken for granted, or considered outside the scope of organizational analysis. This critique, that market efficiency is treated as a taken-for-granted social fact (Scott, 1992), holds for some institutional analysis as well, and is a topic covered in detail shortly.

Organization theorists have recently highlighted the relevance of including market ideology directly as an enacted and competing mental model within organizational analysis. Drawing from the literature and the pluralistic tradition in organization theory and the sociology of work, Bunderson, Lofstrom, and Van De Ven (2000) constructed a typology for organizing that consists of four ideal types. In addition to a *market enterprise model*, their organizing typology includes the bureaucratic system model, the professional group model and the community service model. Similarly, Elliot Friedson in his book *Professionalism: The Third Logic* (2003) contrasts three ideal work types and their complementary sources of control: free market, bureaucracy and professionalism.

Ostensibly derived from a general literature review, Bunderson, Lofstrom, and Van De Ven's typology of organizing models is cast in dialectic terms based on the analytic dimensions of *administrative* and *professional rationality*, and *internal* versus *external locus of control*. For these researchers, the market enterprise model represents the quadrant intersection of administrative rationality with an external locus of control.

Key to distinguishing the market enterprise model from the alternative modes that guide the design and objective functions of organizations is that the model views the organization as a business enterprise attentive to external material-resource incentives and wealth maximization. The external locus of control is a decentralized focus on demand in the form of one-dollar-one-vote. While the development of demand for a particular consumer may be an involved process, the business approach pursues an aggregate bottom-line score. Though an implicit assumption of the mental model is that the customers creating demand in the marketplace are capable of judging competing products or services, the externally based bottom-line objective is attainable quite independent of any one ideal of how consumers *should* vote with their pocket-book. Even give a scenario that consumers are not predictable, homogeneous decision-makers (relative to their economic status) the objective function of business can yet proceed in a trial-and-error fashion.

The other three archetypal models have more predetermined constraints on the objective functions that can be used to guide success or satisficing results. Choices of action for these alternative models are predetermined in a historic or developmental sense and in a more centralized collective sense. Bureaucratic systems must have authority bestowed on the objective function, and are generally guided by standardized rules, for instance. The members of professional groups have a common history and education that enable collegial control over the objective functions of the organization.

Observing that organizations are heterogeneous in how they can proceed to organize, even if only on a few dimensions of typology, significantly complicates organizational research. Such a framework that encompasses diverse and competing models to represent the real world choices made by agents to achieve a negotiated order in complex organizations reflects the relatively applied, empirical and eclectic tendencies of researchers trained in organization theory (Perrow, 1993; Scott, et al., 2000).

Bunderson and associates' typology was, in fact, empirically tested with a survey instrument to evaluate the organizing models that were applied within organizations. Data from their repeated measures design was reported to support the convergent and discriminant validity of the proposed conceptual categories, as well as their temporal stability and generalizability across occupational groups. Their findings revealed that the degree of intraorganizational ideological pluralism related to fundamental disagreements about how to proceed in the development of the organization. A statement from one manager in a vertically integrated healthcare organization was revealing:

> "'It is hard to make good decisions when one person says health improvement and others say profit, market share…my shoes are tied with these competing objectives. Select a goal – any goal – and I can mange this place well. Now we have a hung jury'" (p. 368).

Taken as a stylized fact, ideological pluralism and the associated conflicts among organizational actors deserve explanation in terms of organizational development and performance.

Taking an applied theoretical approach that eschews unified formalism, in order to account for diverse and potentially contradictory models enacted within and between organizations, casts such theorizing in terms of a naturalist perspective (Scott, 1992: 24), or what has already been referenced as "organicism" (Mayr, 1997). Institutional theory is in tune with such a naturalist perspective, though it has attended more to the ills than the good that can be observed in institutional dynamics and organizational behavior. The next step is to define the core constructs of institutional theory, and what is new in institutional theory that would avoid the pessimism of the exposé tradition of institutional theory and would allow all institutions to be double-edged, at least until proven otherwise.

Institutional Constructs

Core Constructs

Institutional theory is an interdisciplinary framework that has a long history and has taken many transitional forms (see reviews by Scott (1995) for an organization emphasis, Hodgson (1998) for an economic perspective, and Williamson (2000c) for a more mixed interdisciplinary approach). As one strand in organization theory, institutional theory—whether in its old, neo, or new forms, and whether developed within psychological, sociological, political, economic, or business school traditions—has focused on collective action as embodied by social institutions, and on organizations as institutions. Institutional theory asserts that institutions matter as explanatory agents because individual action is permeated with shared meaning and by conceiving of our environments as socially constructed. A good description of what constitutes an institution is:

> "[I]nstitutions consist of cognitive, normative, and regulatory structures and activities that provide stability and meaning to social behavior. Institutions are transported by various carriers—cultures, structures, and

> routines—and they operate at multiple levels of jurisdiction." (Scott, 1995: p. 33).

The notion of nested levels of social action is an important piece of the conceptual framework. The organization is considered to manifest institutional structures and processes internally. Organizations, in turn, are embedded within an organizational field with particular cultures, structures, rules, values and routines. Organizational fields are similarly affected by the wider societal frame or culture. Institutional theory recognizes various boundaries by which to frame human interaction, but it also recognizes that social boundaries are inherently permeable. Not unlike patterns found in biology, the permeability observed across the nested structures of social interaction evolve as a system of dependent relations, such as organs and cells. Organizations are not only influenced by the wider environment, but are also constituted the wider environment. An actor (framed by whatever level of analysis) not only acts, but also enacts the social definition of the actor itself (Meyer, 1994).

To assert that market institutions are institutions is trivial. Market institutions affect how we define and structure social activity and values. Similarly, it is trivial to assert market exchanges are grounded by wider institutional elements such as the law, property rights, and role formation. The relevant theoretical issue is whether it is justified to view the governance structured by market institutions as apart from, and superior to, alternative institutional governance structures and dynamic forces that affect organizational behavior. As noted earlier, it is not uncommon, even within the institutional literature of health services research, to hold markets out as if they were unique social constructions able to produce rationally intended technical efficiencies with deterministic inevitability. This is a position that will be reconsidered in the section titled What's New in Institutional Theory?

Markets, while usually treated as an aggregate of material exchanges, are always embedded as economic institutions within the institutional environment of a given organizational field. If an organizational field is constituted in part by market structures, these structures can variously interact in a competitive or a complementary fashion with alternative governance structures, routines, conventions and ideologies, and are substitutable with alternative institutions within an evolutionary scope.

In short, market institutions, like all institutions, consist of cognitive, normative, and regulatory structures and activities that give meaning to social behavior, that define distinctive social relations, and that foster social stability. Though sustained and replicated monetarily by capitalists, market institutions exist as they do because laws, professional standards, education, and convention legitimize their enactment. Conversely, supply-and-demand-side actors are not the exclusive arbitrators of the impersonal material-resource environment—even if market proponents wish that were so.

Institutional theory conceives of culture and the social environment as essentially problematic. Rational choice theories of economic organization, in diametric contrast, tend to abstract social actors so as to "sweep the big problems under the rug of 'culture' without dealing with the debris lying under this idea" (Meyer, 1994). Of course, acknowledging the theoretical contrast complicates the study's objective to position the constructs and variables of the market enterprise model within an institutional framework.

Hence, discussion will be devoted to framing conventional economic theory of market dynamics into the collective action market ideology form, e.g., explaining the profound change realized in healthcare market reform.

Three core propositions of institutional theory are offered here as essential to modeling the effects of market reform as a governance structure in healthcare and, in particular, as a governance mechanism substitutable in whole or in part by alternative social structures. The three propositions are: 1) organizations are embedded within patterns that are built up in wider environments in that organizations are not built purely on internal, technical or functional logic; 2) environmental patterns comprises not only narrow legal and economic components, but also broad cultural patterns that guide and constrain actors; and 3) the environmental patterns that create and change organizations can be described as rationalized in the sense that shared meaning is indispensable to organizing activity, especially schemes that define means-to-ends relationships (Scott and Meyer, 1994: p.2-3).

Each of the three core propositions gives rise to analytic constructs. The first proposition leads to understanding how organizational behavior is best framed within an open and natural system perspective recognizing nested or multi-level systems. For instance, cells constitute individuals, and individuals constitute social units or collectivities including organizations, nation-states, and so forth.

The second core proposition leads to awareness of a causal duality in the overarching dynamics of *structuration*. Structuration occurs across the boundaries of members and their group environment: environmental patterns constrain and define organization responses "to a structural context at the same time that the organization's behavior reinforces or modifies this context" (Scott et al., 2000: p.26).

The third proposition acknowledges the requisite development of rationalizations or shared mental models (SMM) to instill legitimacy and social force upon actions. Knowledge, learning, and decision-making are endogenous to the social ordering system in that the environment of individuals and of organizations is socially constructed. Further, through knowledge and culture (e.g., cognitive elements formed by the communicative and cooperative process and denoted as shared meaning) the past is intimately connected to the present in an evolutionary process. Analysis that collapses this temporal development dimension is at risk of misidentifying important factors of organizational variation.

Organizations are penetrated by normative, regulative and cognitive elements of the institutional environment. The overall institutional consequences have been interpreted to suggest that organizations are: "(a) somewhat ritualized; (b) internally decoupled; (c) isomorphic with environmental patterns and rules in their identities, structures, and activities; and (d) showing broadly isomorphic patterns of change over time…" (Meyer, 1994: p. 34). Institutional analysis is thus more pessimistic than the rational perspectives in organization theory, such as strategic contingency or industrial economics, about the inherent utility of organizations to achieve optimizing goals.

Power, authority, stability and comprehension are the most obvious consequences affected by the institutional environment. All are double-edged social tools that can cut for good and ill. While all organizations can be conceived of as beneficial or as achieving effective outcomes, such assessments have to be framed in comparative terms, addressing an organization's alignment, or fit with both its task and its institutional environments (Williamson, 2003).

Although institutions have cognitive, normative, and regulative components, theorists often stress just one of those institutional pillars as central to their explanations (Scott, 1995). The analysis here—examining market reform as an institutional process—concentrates on the cognitive component. In particular, NIE's development of the notion of shared mental models (SMM) as a means for dealing with uncertainty is the theoretical focus (Denzau and North, 2000; Mantzavinos, 2001).

The emphasis on one analytic element over the others is conceded as a heuristic convenience. The component systems are, in fact, interdependent and mutually reinforcing as socializing effects on actors. The social framework is "overdetermined in the sense that social sanctions plus pressure for conformity, plus intrinsic direct reward, plus values, are all likely to act together to give a particular meaning system its directive force" (D'Andrade, 1984: p. 98).

Though they will not be developed in this study's framework with the same degree of elaboration as the cognitive system, appreciation for the normative and regulatory systems in healthcare is nonetheless implicit in the study's core propositions. Normative system influences "consist of the formal and informal constraints constructed to order interpersonal relationships" (North 1990: p. 3). The structures of the normative system can emerge from evolutionary social processes as rare "punctuated change" design opportunities. Design opportunities most obviously occur with the introduction of "formal rules," an important interface between the normative and regulatory systems. For example, such punctuated change occurred in healthcare when national for-profits were permitted to acquire community non-profit hospitals, and the Big Blues were permitted to convert to publicly traded for-profits.

Of particular importance to NIE theory are formal rules such as constitutions, laws, and property rights. Though fairly stable over time (estimated by Williamson (2000a) as on the order of 10 to 10^2 years), the creation of formal rules are opportunities for "first-order economizing"—getting the rules of the game right.

Regulative systems as institutional arrangements can be depicted as constituting governance structures, in that governance mechanisms *follow* from the rules (Scott et al., 2000: p.24). NIE views the conditions necessary for spontaneous and efficient market dynamics as limited to comparatively simple commodity exchange environments (spot markets). As has already been hinted at, market dynamics can be treated as a self-regulating special case of more complex economic transaction environments. When attention is turned to more complex transactional environments, NIE issues center on the "farsighted" development and enforcement of contracts (Williamson, 1995), on the evolution of property rights (North 1990), and on economic organizing via organizations as collective action institutions (Williamson, 1981).

Whereas the evolution of property rights frames a regulatory system that defines the rules of the game (with costly court-order enforcement), and engages economic interest in positive political theory for structuring governance, Williamson's transactional cost economics concerns itself with the institutional dynamics of governance. TCE pursues analysis of the play of the game at the *ex post* stage of the contract and the formation of organizations as the vertical integration of production (2000a: p. 599). TCE views the various forms of governance in economic organization, such as firms, bureaus, and nonprofits, as each being feasible adaptations, depending on such transactions attributes as complexity, uncertainty and asset specificity. TCE, like all the branches of NIE, applies a long-run perspective for both setting the rules and playing the game, at least in comparison to the impersonal market focus on resource allocation results of short-term exchanges.

It is along the temporal dimensions that market institutions can be thought to most easily distinguish themselves from other institutional governance and SMM forms. As was discussed earlier when accounting for the evolution of the organization as a ubiquitous social form, and the economic accounting for vertical integration, the collective action and structuration engender by an organization constitutes a rather durable system of dependent relations. By contrast, markets institutions can be viewed as a least energy form for maintaining the social structures because the decentralized focus waste little energy to build or maintain the dependent relations over time. Markets readily form around the most basic and universal elements of shared meaning: consumable materials.[17] When dependency is short-lived in that it carries little ramification into the future, as is the case for simple consumable commodities, material-resources are a

[17] Wealth is more than a consumable resource, of course, as it symbolizes much more than the ability to acquire consumable materials. It is a conduit for acquiring social power, status, and control over the labors of others; as well as acquiring the leisure time with which to construct *more* intimate dependent relations.

convenient and sufficient medium across which to share the meaning of a social relationship.

Thus, as market institutions are transported away from the marketplace of consumable commodities (spot markets) and into more complex products and services with uncertain outcomes, they require additional institutional support. When problems-solving and task requirements become more complex and uncertain they are necessarily accompanied by complementary legal, professional, and organizational institutions to support the dependent relations required, even if the mental model rational attends to only the time frame of material exchange and consumption. The temporal frame of human relations are at the heart of distinguishing between autonomous adaptations thought to occur in impersonal market exchanges and cooperative adaptations more contextually reliant of institutional-specific arrangements that persist.

Long-run evaluation is relevant to the cognitive, as well as regulatory and normative, components of the institution environment. The new institutional framework, while challenging the feasibility of fully rational autonomous actors, extends the notion of human rationality to learning. Learning how to trust cooperative adaptations is a fundamental example (Zazzoli, 2001). That we do trust, or at least learn to tolerate cooperative adaptations daily, supports a notion that institutional arrangements can be somewhat adaptive, in the rational adaptation tradition of Herbert Simon.

There are hazards to interdependence, but there are also benefits to be realized from collective action. TCE research has been attentive to framing the economic benefits of cooperative adaptation, and alternatively, the transactional cost hazards of market governance, when the attributes of the transaction entail some degree of complexity, uncertainty and asset specificity (Williamson, 2000c).

Except for the last notion that institutions may represent adaptive benefits, the positions of institutional theory so far presented are fairly consistent propositions common to the many forms the theory as taken over the years. Discussion now turns to more recent advances that represent what is new in NIT's conceptual framework, and the implications that market reform in healthcare may not be as adaptive as conventional wisdom would suggest.

Cognitive Elements in the New Institutional Theory

NIT in organization theory and NIE in economics have expanded the scope of previous institutional concepts, particularly as to the cognitive components of the institutional environment. Development of cognitive elements is particularly relevant to how the institutional and material-resource environments faced by organizations are conceived to interactive, as each environment holds resources for problem-solving.

Emphasis in this research is given to the cognitive elements making up institutions because behavioral assumptions about the rationality and self-interest of decision-making are at the heart of the questions being considered. Orthodox economics and market ideology proceeds from optimism about how substantial our ability is to make optimizing decisions, to deduce or calculate, and to extend into the future a pricing and substitution model for optimizing any particular exchange decision (Arrow, 1997; Winter, 2004). Institutional theory, and organization theory in general, attend to a more bounded, interdependent and endogenous sort of rationality. Actual decision-making processes are treated as problematic and in need of empirical inquiry, and are not simply taken to be revealed outcomes that optimizes self-interest.

Organization theory has attended to the stylized fact that complex environments, complicated tasks and uncertain outcomes necessitate organization, both in the form of voluntary pooling of resources and in division of labor coordination. Moreover, these same complicating attributes frequently confound decision-making. Herbert Simon employs the notion of "bounded rationality" to represent realistic cognitive processes in complex situations, and deduces that "a great deal can be learned about rational decision making ... by taking account of the fact that the environments to which it must adapt possess properties that permit further simplification of its choice mechanisms" (1956: p. 129).

Institutions, as an environmental property, simplify and facilitate satisficing decisions. Whether the decisions are effective is at best a comparative issue. Institutions as socially constructed rules, routines, conventions, mores, and norms explain two sorts of problem-solving processes. First, social construction of shared meaning explains how cooperative solutions arise to address social problems and to overcome social conflict. This is the standard line given in most social and political theories to explain how the state and other enforcement agencies arise from the Hobbesian dilemma of social order.[18] The second process speaks to the burden of problem solving: the cognitive structures needed to deal with numerous, recurrent and complex social problems.

[18] The apparent willingness to sacrifice free-will derives from the alternative: living a life that is "solitary, poor, nasty, brutish and short" (Hobbes, 1651).

Empirical observation of the human mind does not suggest it to be a perfect organ for computing difficult solutions, especially in real-time situations, such as the interaction with other human minds (Winter, 2004).[19] Cognitive capacity is adaptive to heuristic solutions, however (Gigerenzer and Selten, 2001). One obvious solution is to rely on readily available problem solving routines that have been shared by others, with which you can identify, and which, by convention, will not be challenged. The cognitive system of institutions is framed by the sharing of meaning and information—social learning.

The cognitive system of institutional theory captures a level of social analysis more abstract and fundamental than either the rules of the game or the play of the game. Williamson (2000a: p. 596) envisions this as the top level of social embeddedness, "where the norms, customs, mores, traditions, etc. are located." Culture is information in the sense that it consists of:

> "...ideas, values, beliefs, behavioral strategies, perceptual models, and organizational structures that reside in individual brains, which can be learned by other individuals through imitation, observation (plus inference), interaction, discussion, and/or teaching. Culture is not institutions, technology, or social structure but is inextricably related to the evolution and functioning of each" (Henrich et al., 2001: p. 345).

Where other organization theories tend to take the environment as a constant impinging on organizations, institutional theory proceeds with the notion "that resource

[19] The normative economic position is dependent on strong assumptions of rationality that aid formal translation. Economists and other proponents of market reform to not often acknowledge how fragile the theoretical arguments are under scrutiny (Arrow 1986 & 2001). Henrich et al. (2001: p. 344) contrasts bounded rationality assumptions with traditional economic assumptions in the following manner: "bounded rationality departs from the traditional assumptions of omniscient, 'Laplacean Demons' with unlimited information, time and processing ability, and instead assumes that individuals possess fast, frugal algorithms which allow individuals to solve a variety of difficult problems under ecologically realistic circumstances without incurring substantial information-gathering or processing costs."

dependence is socially constructed… [and] focus more on how firms have constructed or enacted their worlds" (Fligstein, 2001: p. 9). The sociological tradition of institutional theory has most frequently framed the cognitive component of the institutional environment as the ubiquitous process of rationalizing, the communication of schemes and routines that represent means-to-end chains. Rationalization, as it is a shared collective act does not function, however, "as a coherent rational super actor (e.g., a tightly integrated state or a highly coordinated invisible hand)… [rather] as an evolving set of rationalized patterns, models, or cultural schemes" (Meyer, 1994: p. 33). The epitome of the rationalizing process results in the "rationalized myth," where rationales become taken-for-granted social facts.

Shared mental models: Institutional cognitive elements in the marketplace of ideas.

Other branches of NIT have developed the SMM as a cognitive construct complementary to rationalizing. A recent convergence focusing on institutional change—contributed to by North's economic historical approach (Denzau & North, 2000), evolutionary economics (Mantzavinos, 2001; Potts, 2002), cognitive anthropology (D'Andrade, 1995), and cognitive psychology (Kahenman & Tversky, 2000)—has envisioned the SMM construct as a link between micro and macro social order mechanisms. Acts of communication are conceived of as leading to shared cognitive rules, which give rise to correspondent "default hierarchies" and in the end to SMMs (Mantzavinos, 2001: p. 77).

Individual behavior is not modeled here as indiscriminate perceptual acquisition to be calculated on, but rather as the result of cognition selectively filtering and categorizing information through the use of mental models. SMMs shape perception and influence how we store and retrieve information. Actors seek familiar patterns in complex and uncertain contexts and frame their experience into expected relationships. The actor's comprehension and responses are structured to mitigate "cognitive dissonance," to be appropriate and congruent with available expectations (Festinger, 1957). Meaning is not computed; meaning is shared, even negotiated (Weik, 1995). Cognitive processes cohere: provide internal cohesion for the individual and join the individual with the social collectivities within which he/she groups or networks.

The SMM construct provides a linkage between the stabilizing role of institutions and the action role of individuals attempting to problem-solve and having to making decisions. Institutions affectively provide for an unburdening (Entlastung) of individuals by achieving cohesion or agreement. When members classify the same set of problems as old ones, then each is allowed to follow the same routines as a path of least energy. As Gehlen (1961: p. 72) puts it:

> "If the institutions provide us with a schema in certain respects and if they shape our thoughts and feeling along with our behaviors and typify them, we can take advantage of these energy reserves in order to show within our particular set of circumstances the uniqueness which is bountiful, innovative, and fertile. He, who does not want to be a personality in his own circumstances but in all circumstances, can only fail" (quoted and translated by Mantzavinos, 2001: p. 88).

SMM is a cognitive social construct that merges with a vast amount of micro-analytic organization theory based within the natural and open systems tradition. The behavioral approach is, for instance, not only congruent with Simon's (1957) focus on decision making, but is also in tune with Perrow's notion of third-order controls as premise control and "unobtrusive control," with Weik's (1995) notion of sensemaking, and with Schein's (1990) notion of organizational culture.

Since this study limits application of the SMM notion to the empirically supported four ideal types of organizing proposed by Bunderson and associates (2000), an extensive review of this literature is not essential to presenting the stance taken. Those familiar with this micro-analytic organizational analysis will better understand why, though, the approach is pessimistic of the efficient market thesis, while other intuitional theorists pursuing healthcare research have been more accommodating.

The connection of SMMs with the above cited body of literature is most obvious when ideology is treated as an important organizing principle for society and organizations. For example, Weik (1995) rendered the nested boundaries of social interactions as modulations in "vocabularies." Starting with "Ideology: Vocabularies of Society," Weik (1995: p 111-131) transitioned through the different vocabulary level by describing: third-order controls of organization, paradigms of work, theories of action of coping, tradition of predecessors, stories of sequence and experience. Similarly, Trice and Beyer (1993: p. 33) connected ideology to decision making as a "shared, relatively coherent interrelated set of emotionally charged beliefs, values, and norms that bind some people together and help them to make sense of their worlds."

A SMM represents external knowledge as conventional wisdom. Yet, it is only through actors' internalizing such means-end chains that the cognitive structures can be considered to motivate a social force representing institutional change. SMMs, as ideology, then are a necessary cognitive component in forming and guiding social movements and social reform.

The individual capacity to interpret and share mental models is best viewed as a genetic destiny or a common heritage, as much as a voluntary choice. A view corroborated by neuroscience evidence that brain structures are responsible for language and the communication of emotional content; as well as the reliance of brain functions on selective attention and habituation.

Individual participation must, nonetheless, be seen to reciprocate in the social learning process by providing a cumulative strength or legitimacy to the institutional instance that provided the cognitive component. The individual returns the favor by instrumental application of an SMM in each idiosyncratic context, which thus establishes new connections. The aggregate effect of forming new connections in a problem domain establishes a developmental trajectory of social change—the growth of knowledge (Loasby, 2002). Social learning is then a feedback process that reaches across the boundaries of the hierarchically constructed social system. In the case of academic disciplines, for example, no one scholar owns the advancement of a theory or a paradigm shift. Science and art is most often a cumulative, if non-linear, trajectory, which is dependent on the consensus and dissonance that has come before.[20]

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[20] Kuhn's (1968) descriptions of scientific development as a trajectory marked by path dependent accumulation punctuated by revolutions resulting in paradigm shifts closely models the arguments used here to describe the process of institutional transformations in terms of cognitive elements.

Such institutional dynamics are often reference as a marketplace of ideas metaphor. The dynamics of such a cognitive space should not be confused with spot market mechanics, however. The accumulation of knowledge as social conflict is better conceived in evolutionary terms as causal duality occurring between a member and species and between a species and its ecology. Dynamics better framed as "punctuated change" across nested boundaries, than as equilibrating dynamics.

SMMs connect then to institutional change and agency. The new cognitive construct helps to improve on a longstanding weakness of institutional theory, explaining institutional dynamics. A topic covered more extensively in the section on Institutional Dynamics, For Good and Ill.

What is to be noted here is that a SMM is a social construction attached to problem-solving efforts. Further, the solution attributes of a SMM are remapped as they cross the social junctures, similar to how genetic information is transformed into anatomical structures and physiological processes, and anatomy and physiology are integration into behavioral performance across the joints of the biological system. Thus, the significance and function of an SMM is not equivalent at each social level, but rather must be considered within the context domain.

Because they require a degree of political consensus, SMMs emerge and change over a long timeframe, and the transformational timeframe progressively increases at higher hierarchical social levels (Williamson, 2000b). Cognitive elements of the individual are more mutable and adaptive than the organization, the organization more adaptive than the organizational field, and the field more adaptive than the culture.

Though the SMM construct is congruent with the earlier conception of rationalization as a cognitive institutional element, the concept is more tightly linked to the micro-level social learning process. Emphasis is shifted from a static process to a dynamic institutional process (Mantzavinos, 2001). Shifting focus to dynamic, if slow developing, institutional process is an essential point in the conceptual framework presented here; and highlights what is new in NIT.

Internal and external legitimacy of shared mental models

For institutional theory, the rationalizing processes that would persuade and then instruct normative action with cultural force is problematic and in need of explanation. Namely, scientific theorizing is itself grist for the mill of social governance, being a form and source of rationalizing aimed at establishing authority and legitimacy.

The conflict inherent in the rationalizing process was more casually referenced above as competition in the marketplace of ideas. The conflict is pursued not only with capital investment, but with social skill resources. The importance of social skill resources is that cultural knowledge defines the division of labor into spheres of social authority, control, and coordination (Fligstein, 1996). The struggle is a long-run process of destructuring and restructuring within an organizational field (Scott et al., 2000), or within an academic community (Kuhn, 1977). Long-run institutional dynamics are best viewed as political-cultural transformations in which market institutions are just a subset of the social structures that are driving and are being driven by political action and social reform (Fligstein, 1996).

For NIT, social conflict and reform are central to the slow developing process of structuration. For instance, NIT theorists have described organizational fields governed by markets as achieving structuration via monetary politics (Fligstein, 1996, 2001), or as rhetorical persuasion when a challenging social movement pursues to capture market share resources from incumbents (Hensmans, 2003), or as the outcome of politico-cultural processes (Biggart & Beamish, 2003).

A distinction then can be drawn then between the external normative position of neoclassic economics and the internalization of the market enterprise model by organizational actors. While orthodox economics can academically be viewed as having an external position (e.g., that of technical inevitability given ideal conditions), the theoretical solutions must be considered as having an internal point of view as well (Hart, 1994). The influence of economists, as a profession, on such topics as the politics of shirking and associated policy decisions to pursue outsourcing, especially by the government, is an example of this internal point of view. Like scientific rules or legal rules generally, economic rules possess, in addition to an external regularity aspect, a normative meaning for the actors themselves, an internal aspect. As Hart (1994: 90) observed:

"What the external point of view, which limits itself to the observable regularities of behavior, cannot reproduce is the way in which the rules function as rules in the lives of those who normally are the majority of society. These are the officials, lawyers, or private persons who use them…as guides to the conduct of social life. For them the violation of a rule is not merely a basis for the prediction that a hostile reaction will follow but a reason for hostility."

The transformation of scientific theory or professional standards as an external point of view to an internal enactment of daily routines is an important analytic advance that has been pursued by the sociological and the social psychological branches of institutional theory (Biggart & Beamish, 2003; March & Simon, 1993; Weiks, 1995).

Positing SMMs as structures absorbed and idiosyncratically maintained by individuals, which in the aggregate represent ideologies, allows one to define problem solving as a social learning process. Learning represents a causal duality in this paradigm, reaching across the member-environment (bottom-up) and structure-action (top-down) boundaries. An individual, organizational or national/cultural effort has results that can be compared to another's efforts and results or to previous efforts and results.

The diffusion of a particular SMM in an organizational field can be observed in a story telling process, and its effects can be empirically tested. For this research, acknowledging the internalization of theory or knowledge as a boundedly rational pragmatic process confers a comparative potential for any SMM to be superior. The task of science is to measure and explain the attributes of superiority within a verifiable and falsifiable context.

Here scientific method is not only an objective, external point of view, but also acts to legitimize pragmatic results of internalized enactments. Under such a framework, it might be insightful to challenge the theoretical assumptions or to question whether the actors have got the model right, but not a perquisite to research. It would be sufficient to assess whether the implementation has a clear directional consequence and to measure whether it solves a definable problem. Negative scientific findings not only weaken a theory, but also give force to a deconstructing social process. Positive findings for an SMM, such as the intended goals for any particular stakeholder group match with the outcomes, can be conceived as legitimizing in a pragmatic sense (Suchman, 1987).

This institutional rationale is often overlooked; institutions emerge, in part, because they demonstrate a pragmatic legitimacy, addressing a problem domain and contributing to solutions (Mantzavinos, 2001). Language and conventions, like driving on the right side of the road, are examples of routinized collective action with pragmatic benefit.

As Suchman (1987) clarified, although legitimacy is a generalization achieved at a collective level, the legitimizing process on which institutional structures depend can have perceived benefits for the constituent audiences. When stakeholders perceive a linkage between the problem-solutions realized by collective action and shared normative values or conventional standards then a pragmatic sort of legitimacy can be achieved. Suchman termed this evaluation of effectiveness by consensus as pragmatic legitimacy.

In the "new" institutionalism, especially the NIE strands, SMMs have the potential for a pragmatic sort of good, assuming: 1) the model is held as a consensus within the context of its application, and 2) it is a good fit with the task environment. SMMs are then boundedly rational heuristics that are situational, rather than universal optimization strategies; and can be comparatively effective as strategies to exploit regularity (Gigerenzer & Selten, 2001), or to attend to syndromes in the environment

(Williamson, 2000a). "Old" institutionalism considered fairly functional ends for institutional means, but generally examined control and governance regimes as a means to maintain social stability for extant elites, the state, and powerful others. The "new" institutionalism perceives a multiplicity of ends to the socialization process, which breeds social movement transformations as well as social stability (Fligstien, 1996, 1999).

There are no optimistic assurances of scientific or institutional outcomes, however. The stylized fact is that "action often works obliquely to stated goals" (Meyer, 1994: p. 16). The technical competence attributed to individuals and organizations by political and economic theory are quite often conspicuous by their absence.

Institutional Dynamics, For Good and Ill

To a significant degree, institutional theory has attended to how organizational fields emerge from new technologies or political events to become institutionalized, and how the social environment, once formed, has a powerful normative effect on subsequent interactions. Once constructed and in place, institutional environments foster concerns for legitimacy and compel isomorphic adaptations so that organizations become more like one another. Much of the literature has focused on what DiMaggio and Powell (1983) identified as three institutional processes to achieve organizational isomorphism: coercion, mimicry, and the enforcement of norms.

Since institutional theory has traditionally explained isomorphic dynamics and the satisficing role of rationalization and routines in organizational behavior, the dynamics of social learning has been more implied than explicit. For neo-institutional theory, collective action, as represented by the institutional environment, became simply an "iron cage" (DiMaggio & Powell, 1983: p. 147).

In an apparent attempt not to appear unduly negative and to mitigate the theory's limited account of change dynamics, the organizational branch of institutional theory established a dualistic notion for environmental determinants, positing both a technical environment as well as an institutional environment. The technical environment was associated with quick, market-like response factors and attributed with positive influences as they substantively affected efficiency in organizational performance.

Yet, from its inception, even proponents of this dualistic notion were skeptical about the direction taken. A frequent comment of theoreticians in the 1990s was the need for institutional theory to advance a concept for institutional change unbiased by institutional preferences (Scott, 1995; Powell, 1991). Powell (1991) critiqued the apparent shortcomings of the field and gave suggestions for a research agenda to overcome the limitations and to expand the scope of institutional analysis as:

> "… the program is in need of improvement: (1) Current work in the field makes too much of the differences between so-called market-driven sectors and institutionalized sectors…(2) Although the observation that organizational practices and structures are loosely coupled with outcomes and policies is a key insight, it has led to…an inappropriate view that institutionalized organizations are relatively passive, inefficient manipulators of symbols rather than substance…And (3) we need an enhanced understanding of both the sources of heterogeneity in intuitional environments and the processes that generate institutional change" (p. 183).

Put simply, institutional theory, like the US culture in the 1980s generally, identified market institutions as the preferable means to take on global competition and other perceived social ills of the time. As institutional research expanded its focus to observe on transformations of once stable fields to conditions of "profound change," social system change was seen to exhibit institutional conflict forces as well as isomorphic trends (Scott et al., 2000).

Profound change is rapid change reflecting contradictory forces that is given substance, according Scott and associates (2000), as emerging from a subtle process of destructuring and restructuring within the organizational field. Scott and his associate (2000) characterize profound change with an extensive list of institutional dynamics: multi-level change occurring across individual actors, organizations, populations of organizations, discontinuous "second order" change, new rules and governance mechanism, new logics, new actors, new meanings, new relations among actors, modified population boundaries, and modified field boundaries.

The focal instance of profound changed studied by Scott and his associates (2000: p. 217) was, in fact, the current era in healthcare—the research focus of this study. Scott and associates characterized the new era in healthcare as one of "managerial control and market mechanisms."

Observation of institutional change has reinvigorated "old" concepts of political adaptation, or positive political analysis (Fligstein, 2002) by considering the interaction and conflict between shared cognitive structures. That is to say political adaptation takes place as the formation of coalitions across field boundaries. Now, not only are states and professions viewed as political coalitions with ideological legitimacy, but collective actors unambiguously focused on economic power, such a private corporations, industrial cartels and trade associations, are also viewed as having sway in struggles that deconstruct and reconstruct the institutional environment (Fligstein, 2002).

The new cognitive constructs of NIT have advanced Powell's (1991) research agenda. As is presented in this study, NIT casts market logic and market reform within the conceptual notion of an SMM, an ideology to legitimize a particular form of organizational governance and social stability. Diffusion of a SMM within the context of profound institutional change can be seen as a treatment effect in need of empirical testing. Just how tightly coupled is a SMM in guiding an organization's culture and routines towards the task objectives pursued. The institutional transformation that has occurred in healthcare can be viewed as social reform that may or may not be adaptive in achieving the intended purposes of the market enterprise model (Fligstein, 2001).

Beyond the good of market institutions and the ill of feasible alternatives

The study's conceptual framework can be clarified by contrasting the position taken with an example that demonstrates the still widely held dualistic view that market intuitions are efficient and "more" institutionalized alternatives are ineffectual. The example is a recent publication by Jeffery Alexander and Thomas D'Aunno (2003), "Alternative Perspectives on Institutional and Market Relationships in the US Health Care Sector." Reviewing diverse perspectives on the relationship between institutional and market forces in healthcare, Alexander and D'Aunno (2003) capture the widely accepted ideological characterization of market institutions and market alternatives:

> "[I]nstitutional forces stand in marked contrast to the forces of the market that reward organizations for efficiency and effectiveness. Traditional, institutional forces that have dominated health care for the past 50 years

> include professional dominance and autonomy, public regulation of health care organizations, voluntary and philanthropic support of service organizations, and—perhaps most important—strongly held societal beliefs in health care as a right rather than a commodity. The central question …is: How do the emergent technical and market forces in health care, as represented by managed care, cost containment, and corporate ideology, interact with and react to these traditional, institutional structures and beliefs?" p. 44

The theoretical paper offers various answers to the question posed and points out the inadequacies of both institutional theory and market economics in explaining the unsettled healthcare environment. The passage quoted, however, reveals two important points that frame the ideological issue of market reform posed in this study.

The first ideological issue raised is that market solutions are applied through real-world enactments such as the formation of managed care organizations and the promotion of corporate ideology, as the actual *moves* in the social movement towards "market reform." By formalistic economic methods that treat the firm as a black-box responding to the determinism of market forces, "market reform" is arguably a misnomer for the institutional changes in healthcare over the last few decades (Bazzoli & Luft, 1998; Arrow, 2001). The alternative to accepting the observed environmental and organizational consequences as authentic market reform, however, is to assert that market reform is, as yet, a vague or even unattainable ideal (Newhouse, 2002). It is reasonable to agree with Alexander and D'Aunno's observation that we are witnessing more market-like activity in healthcare, even if the enacted solutions do not life up to an external, ideal reference. The "revealed preferences" for organizational forms and routines that have emerged should be an approximation of the rational response to the "call" for more market efficiency and accountability. Certainly, economists are fond of relying on the expression that their rather strong estimates of rational behavior and subsequent deductions of market efficiency are just that, a good approximation of reality.

Segmenting organizational life into efficient market forces and less-than-efficient institutional forces is a natural consequence of embracing the logics of the market enterprise model. So while economic analysis tends to abstract and ignore organizational variation, organization theorists are comfortable asserting on the basis of taken-for-granted economic reasoning that:

> "[P]owerful market forces now compel health care organizations to respond to pressures for efficiency, and effectiveness. Although the medical profession has traditionally controlled these domains, health care organizations are increasingly designing structures and processes to provide control and administrative oversight to enhance both the market and technical capabilities of their organizations" (Alexander & D'Aunno, 2003: p. 52).

As discussed in the literature review, however, organizational forms that have credibly problem solved on cost, quality and administrative integration often display strong non-market institutional characteristics (i.e., Kaiser-Permanente HMO and the Veterans Administration). In contrast, the market's ostensible preference is for the PPO organizational form (Hurley et al., 2004), which seldom is held up as an examples of efficient and effective problem-solving.

Nonetheless, the transformations observed in healthcare have a history clearly grounded in the business practices of the wider cultural environment and in normative supply-and-demand theory, and have been stimulated by the arguments for change put forward by economists (e.g., Enthoven, 1988).

Although it can be reasoned that cost problems exposed the need and stimulated the search for new solutions, the particular reform measures enacted in US healthcare portray the actors' internalization and identification with market ideology (Scott et al., 2000; Simon, 1990). It is important to consider the possibility of disparity between the social policy goals (in both their academic and political expression) and the actual performance of those organizations that the policy legitimizes. Indeed, that possibility is central to the exposé tradition of the institutional school in organization theory: "things are not as they seem" (Perrow, 1993: 159).

The second ideological point in Alexander and D'Aunno's quote is that as a form of social governance, market forces contrast with alternative institutional options in being a normative, not a descriptive assessment. The authors assert that market governance via material rewards *causes* organizations to be efficient and effective, whereas other institutional structures in the organizational environment are derogated to the more nebulous attribute of "legitimacy." For Alexander and D'Aunno (2003) legitimacy signals an organization's worthiness to receive societal resources. Legitimacy as a social learning process is most often characterized[21] as the cloaked means for achieving a loose coupling between goals and consequences in organizations.

Market logic reasons that organizations affected by market-oriented forces are more tightly coupled with their intended goals. It is "as if" organizations in the private

[21] Suchman (1987) has provided the most definitive assessment of legitimacy in institution theory. He delineated between types of legitimacy that involved reactionary and isomorphic processes such as authority and normative sanctions, and a more useful kind of legitimacy, pragmatic legitimacy.

sector that are competing for pecuniary rewards are immune to deceptive and less-than-optimal practices. It is common in multi-disciplinary settings to grant the normative position of orthodox economics as a given. But doing so may well reflect more of an ideological bias than sound economic or organization theory (Denzau & North, 2000). Such undiscerning bias towards the fitness of markets over other feasible governance structures both ignores the critiques of the normative economic position (Rice, 1998), and arguably misreads the exposé tradition in institutional theory as well. From an organizational perspective, suspending the normative position in favor of a comparative empirical stance is tenable (Simon, 1987).[22]

What is clear from the five market-institution interaction possibilities reviewed by Alexander and D'Aunno (2003) is that market ideals and rationales are substitutable for alternative institutional norms as the logic to be applied in support of organizational governance in healthcare. Furthermore, none of the authors' scenarios envisions decentralized market governance without some collective action infrastructure, an "appropriate" institutional environment to facilitate market opportunities and efficiencies. Although Alexander and D'Aunno (2003) do generally conclude that any feasible best-off remedy in healthcare is a combination of market forces and alternative institutional forms, it is nevertheless unclear what they think is *gained* by maintaining non-market institutions

[22] Cross-national comparisons are readily available for such quasi-experimental research. Evidence found so far would indicate the US market reform approach is economically inferior to more centralized and institutional health systems (Anderson, et al., 2003).

in the mix. Their emphasis is only that efficiency is lost in the presence of institutional factors.

The analysis by Alexander and D'Aunno is on target when pointing out that there are various ways to conceive of market-institution interactions. What their assessment misses is any explicit recognition that markets have two faces: the economic theory ideal of a spontaneous mechanism arising from voluntary exchanges between individuals, and the social embeddedness of the market as collective action with specific institutional values, interests, and power—e.g., market institutions (Granovetter, 1985; Fligstein, 1996). It is one thing for economists to consider the exercise of aggregating exchanges under ideal constraints in a formalistic model that are the mechanisms of an allocating machine. It is a very different matter for organization theorists to compare alternative governance regimes and organizational forms, and to ascribe only "good" to market institutions and only "ill" to alternative institutional structures and processes.

Alexander and D'Aunno were insightful in explaining the difference between the neo-institutional school's limited theory of action, and the new institutional concepts of cognitive power struggles that frame epoch change at the field level (a rebirth of really old institutional notions). Their analysis of these "old institutionalism" factors led them to conclude that reform trends in healthcare can be characterized as: "organizational actors who expressed their agency primarily did so to promote market-based approaches that would weaken the role of institutional constraints" (2003: p 56).

In uncertain task environments like healthcare, it may be that there are trade-offs for all known governance structure rationales. It may be simply an empirical question whether significant gains in healthcare can be achieved by non-market institutions. International comparisons have demonstrated, for example, that national budgets are smaller, and the national health status is generally better in countries that rely more heavily on non-market governance (Anderson et al., 2003).

A material-resource environment as an objective construct, not a normative position

While exception was taken with the old dualistic notion of a beneficial technical environment needing to stand in contrast to the detrimental affects of the institutional environment, there is theoretical benefit in acknowledging an impersonal dimension of "things," as material resources. All institutions operate, of course, in economic jurisdictions, or more simply at a level where the institutional environment interacts with a material-resource environment.

Scott and associates (2000) have made an important theoretical contribution to NIT by distinguishing a socially constructed institutional environment from the impersonal, material-resource environment; but without attributing to the material-resource environment any preconceived norms as to which institutional governance option best allocates scarce resources.

The material-resource environment has been conceptualize by Scott and associates (2000: p. 18) as comprising four sets of factors: (1) demand-side factors, (2) supply-side factors, (3) technologies employed by field participants, and (4) the structure of the industry as it affects the flow of resources. Demand-side factors take resource consumption into account as consumer utility and the assessment of quality. Orthodox economic theory tends to abstract both technologies and demand-side characteristics as givens by assuming adequate information (i.e., simply measured by "revealed preferences") and capital support for entrepreneurial effort (see Gaynor & Vogt, 1998).

The material-resource environment, while a necessary factor in organizational analysis, is not sufficient by itself to account for organizational performance. Simply mapping all dynamics onto the material-resource environment is problematic, because excluding relationships in the institutional environment courts misspecification of critical process elements. For example, the social learning process benefits from relational dependencies and causes dependencies to form, and is determinate of collective action outputs. Further, social learning effects can be misspecified when simply treated as the cost of information searches. Time and labor are not simply exchangeable for money, at least not when time frames a process of how labor can (or should) be divided and coordinated, or when time captures the development of shared knowledge.

Scott's clarified formulation for the allocation of material-resources stands in contrast to the tendency to attach the value of technical efficiency solely to market institutions. The product of positive economic analysis has clearly shown the benefit of structuring transactions in terms of supply-side and demand-side incentives. Yet, positive economic analysis need not always be framed by fiat as positive support for the superiority of market institutions over feasible institutional alternatives. Economic analysis can be interpreted within a less systematic general theory, and can be framed more as a taxonomy of stylized facts (Simon, 1997). Economists pursuing NIE propositions, whether under the framework of TCE or evolutionary economics, have shown this approach to be productive (Carroll & Teece, 1999, Dosi, 2004).

The distinction made by Scott et al. (2000) between institutional and material-resource environments (as a description of their historic interaction) is an excellent example of such an unbiased theoretical approach, and one undertaken as a major study of the healthcare organizational field.

Institutional change as a selection process with causal duality

Up to this point, I have alluded to NIT's new concern for institutional change more than giving definition to the dynamics involved. The institutional dynamics follow from the cognitive elements that have been ascribed to in this "new" institutional approach. Rationales, specifically SMMs as guiding means-to-end solutions, provide for pragmatic legitimacy or an adaptive sort of potential emerging from the institutional environment. The diffusion of SMMs support understanding a top-down sort of learning that works to define what should be perceived as problems with ready solutions, and what are problems yet to be solved.

Institutional change as conceived by NIT is a natural extension of the Simon/Carnegie-Mellon program in organization theory as discuss in the introduction of this chapter. While the adaptive focus taken by Simon is more commonly associated with micro-analytic approaches in organization theory, it has been applied to the more macro interests of institutional and economic theory, as well. Simon (1957, 1991, 1997), and his adherents in the NIE branches of TCE (Williamson, 2000c) and evolutionary economics (Earl & Potts, 2004), have vigorously argued for institutional effects in establishing what are feasible institutional adaptations to economic hazards and what are the mechanisms to developing knowledge.

Understanding that a "causal duality" reaches across individual member and collective action boundaries is essential to appreciating the dynamics ascribed to by the various strands of NIT. Causal duality gives a collective context to agency by acknowledging the role of social skills in social reform, and the role of social reform in institutional change (Fligstein, 1999). Causal duality has a rich intellectual history that has given substance and support for the structuralist notion of the "duality" of structure and action (Giddens, 1979). The construct has also been advanced in natural systems approaches that contrast organization order feedback mechanisms to the equilibrating mechanisms of simple system dynamics (Khalil, 1998 & 2000).

In order to give some hardening to the abstract construct of casual duality and how it relates to social learning feedback mechanisms and organizational effectiveness, discussion is developed on selection dynamics, since it is common ground for both economic and NIT reasoning. An evolutional economics viewpoint will be covered since it most clearly frames the temporal processes as developmental and evolutionary issues.

When market economists communicate with each other they rely on the formalistic shorthand of what is generally termed the general competitive equilibrium theory. When it comes to applying social skills to persuade non-economists (e.g., those of us who observe organizations instead of firms and generally resign ourselves to less than optimal choices), however, economists tend to stand on a more authoritative notion that the equilibria modeled by their theory are simply convenient instruments for prediction, which work well as first approximations. In these more general social discussions, persuasion often draws on the concept of selection as an evolutionary process, or even a tautological goal of welfare progress. In that case, the supply-and-demand treatment of organizations (the firm-as-a-production-function) emphasizes a determined equilibrating end state due to an evolutionary process occurring in the real world. The evolutionary process arises from the selection of autonomous, yet rather homogeneous, optimizing winners who survive and replicate by calculating on environmental inputs and demand for outputs. The less-than-fully rational unfit losers exit the market.

To support market superiority, market economist assert organizational fitness is governed by a selection mechanism practiced by buyers via either *ex post* judgment or from rather instantaneous and infallible *ex ante* reasoning. Entrepreneurs, venture capitalist, owners, and managers need only be strategic enough to choose or know their place in the market and to rationally follow its pricing signals, and resource optimality is at hand for all of us.

Because the incentives that control behavior act on the rational actor within such a short time scale, the time it takes to "clear a market," the actual selection (e.g., decision-making) process remains somewhat ambiguous. Description of the selection process is not deemed overly relevant, however, since it is viewed as sufficient to simply observe the consequences as "revealed preferences" Orthodox economists get to a selection process, then, without putting too fine a point on the development of these selection preferences (Rabin, 1998; Hodgeson, 2001; and Bowles, 1998). Whatever temporal evolutionary processes may be buried within or abstracted from market systems, they are conceived as being "so effective that no study of them is necessary; ex-ante and ex-post selection are close to being observationally equivalent, and ex-ante selection is easier (and more elegant—one should not overlook the aesthetics of rationality) to model" (Loasby, 2002: p. 1228).

Alchian (1950), for example, provided arguably the best, and certainly the most thoughtful and often-cited version of an evolutionary process in market systems. Economists arguing that their optimizing formalization is a good approximation of social reality frequently reference his model. As Loasby (2002) points out, however, Alchian's market selection operated on nonrational behavior; and the responses to change it produced were, on average, in the appropriate direction, but not framed as optimal or best-off.

Evolutionary economics has since come to argue that the selection process is better framed by alternatives to pricing mechanism optimization. Evolutionary economic theory has tended to view knowledge, along with institutions and organization as aids to learning, to be a more productive construct for modeling the economic process (Loasby, 2002; for reviews see Mantzavinos, 2001; Potts, 2003; Dosi, 2004; Earl & Potts, 2004; Winters, 2004).

The point is that market theory need not preclude the possibility that individuals and organizations in the economic system follow an evolutionary path. There is no problem when market equilibrating dynamics and social evolutionary processes are complementary. These two systems would be complementary when pricing signals provide sufficient knowledge to calculate a probabilistic end-state with confidence. Following Occam's razor or the law of least energy, solution routines would tend to apply the general model of equilibrium dynamics rather than the bulkier and lumpier social evolution explanations.

Yet, we should anticipate problems to arise in context situations where the evolutionary social dynamics are not complementary to competitive equilibrating dynamics. We might anticipate problems, for instance, when conditions in the ecology does not favor the self-interested to rationally and rather instantaneously calculated expected utility with any certainty. Context-sensitive conditions of complexity and uncertainty of future events may instead favor pooling our knowledge and material resources to socially construct security via monitoring and common use preparation (i.e., education and the military). Yet, what the supply-and-demand model does not allow is any such best-off performance for an evolutionary path that does not follow market rules. The market model supposes that markets, as an inevitable path to efficient production, cannot be trumped by any socially constructed alternative.

Prominent neoclassic theoreticians such as Arrow (1999) and Alfred Marshall have advised against limiting analytic focus to coordination achieved by competitive objectives and access to information. Marshall advised, for example, that "[o]rganization aids knowledge; it has many forms, e.g. that of a single business, that of various businesses in the same trade, that of various trades relatively to each other and of the State providing security for all and help to many" (Marshall, 1920: p. 138-139; cited in Loasby 2001: p. 1234). Knowledge and its growth are suggestive then of social learning feedbacks, which help to define collective action as productive of pragmatic benefits.

Cultural information, as elements that form institutional structures, work top-down to define what should be perceived as problems with ready solutions and what problems are yet to be solved. Habits, conventions, norms and mores, as well as SMMs, are not just randomly constructed, but form as evolutionary adaptations to problems faced in the environment. So institutions framed as social learning have a positive side. They can motivate and guide organizations substantively as well as politically and symbolically.

Summary of the NIT Framework Used to Test the Market Enterprise Model

NIT, and its economic strands of NIE, has essentially proceeded without an overarching theory to stand in contrast with mainstream economic theory (Hodgson, 1998). NIT has advanced by "uncovering and explicating the microanalytic features… and by piling block upon block until the cumulative value added cannot be denied" (Williamson, 2000: p. 596).

The attractiveness of neoclassic economics' core model, as it supports market ideology, appears irresistible in contrast. Applied economic theory lately has been as likely as not to "become a purer version of itself—almost a lobby for the idea that the real economy should strive to emulate the model" (Kutner, 1997: p. 6). A notion that reflects economist John Eatwell's oft cited if somewhat facetious remark, "If the world is not like the model, so much the worse for the world."

Summarizing the NIT position is a tentative effort at best. Borrowing from Williamson's (2000a) modeling of NIE's focus on the institutional framework, a summarizing sketch is provided in Figure 2. On the left side a hierarchical progression is

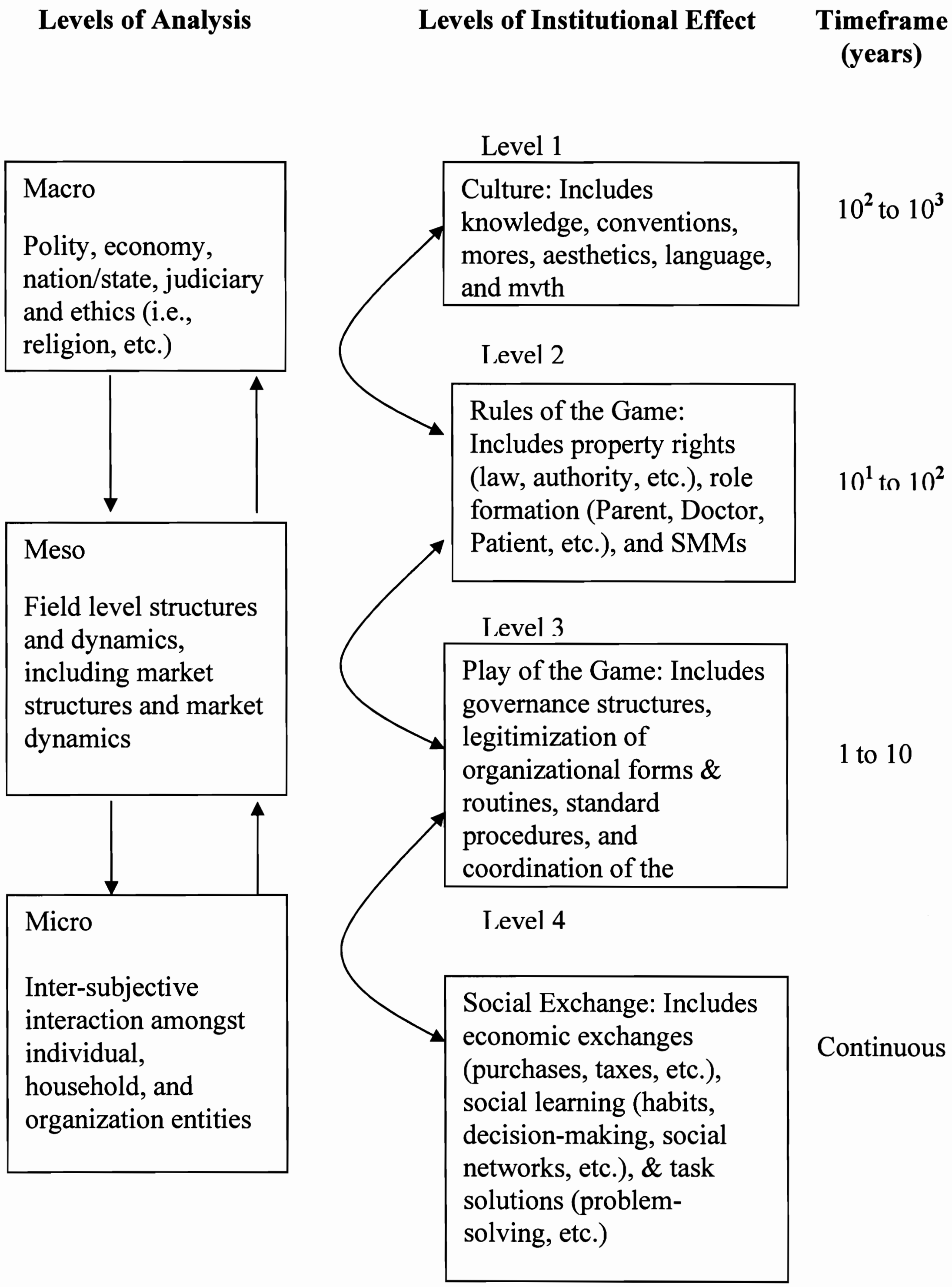

Figure 22. Levels of Institutional Dynamics

used to model the levels of analysis attended to by the various schools of organization theory. In the center, four levels of institutional effects are modeled in descending levels of abstraction. The highest level of abstraction engages social learning as represented by culture, where conventions, mores, aesthetics, language, and myth interact with lower levels. The second level frames the rules of the social game, and includes property rights, enforcement, governance structures, and SMMs. The third level captures the play of the game as represented by governance dynamics, legitimization processes, standardized knowledge, and the division of labor. It is at this third level that NIT, especially the NIE strand of TCE, focuses on aligning governance structures to the problem attributes observed in given context domain.

The lowest analytic level represents units of social exchange between individual actors. It is only at this lowest, reductionist level that the market enterprise model logics are intended to apply—conditioned on perfect market competition strategies, rules, and market-capitalism culture.

For orthodox economics the reductionist focus observes on the flow of material resources and estimates equilibria that could result from such simple system structures. The market enterprise model is grounded then in an external locus of control, dependent only on the material-resource environment. For the microanalysis of organization theory, the lowest level applies to the particular processes used to deal with the task environment, and represents an organization's technical core (Scott, 1992).

If social theory or ideology takes dependent relations in human interaction seriously, then the lines suggesting feedback across the boundaries of collective action represent social learning processes in need of context-sensitive explanations. Economic exchanges represented at the lowest organizing level then are always embedded within an institutional environment and interact with cognitive, regulatory and normative institutional components. In many context-sensitive domains, calculating on optimum material-resource outcomes cannot be isolate from the social learning processes that defines what is to be valued as utility, and what are the problems in need of a solution.

The right-hand column provides a rough estimate of the timescale for observing transformational trends or evolutionary development in the institutional environment. An important distinction applies here at the temporal framing of means-ends chains. Market forces can be, and usually are, treated as continuous and rather instantaneous system dynamics. Market ideology's intended effect of achieved efficiency is thought to be captured at the field level within just a few quarters or possibly a few years—markets are responsive and "markets should clear" rather quickly. In contrast, the transmission of the cognitive institutional elements into governance structures and routines is institutional change that occurs over years and decades. This leads to the issues framed by second research question of this study, and the first set of predictive market models.

Research question 2: Is there evidence of any trend in hospital quality performance, and do factors central to the market enterprise model and market reform account for hospital-specific performance trajectories?

While the equilibrating dynamics of market competition can be conceived as being relatively instantaneous, implementation of market reform in an organizational field must be seen as more evolutionary and developmental. Trending patterns associated the profound institutional change in this new era of "managerial control and market mechanisms" should be evident, however, during the time period studied in this research since market reform had been pursued for a decade or more prior to the study. If pricing mechanisms and market competition have raised the competitive bar then a significant trending effect should be observed. Two hypotheses consider the trending of quality performance in this new era of market reform.

H2a: Hospital quality performance will show a significant linear trend over the study time.

H2b: Hospitals facing higher market competition will demonstrate a stronger trend of increasing quality performance, when other relevant market pricing and demand-side factors are accounted for.

The nested levels of the institutional environment represented in Figure 2 also frames the issues raised by Research Question 3, and the next of set hypotheses used to asses the efficient market thesis in terms of healthcare quality outcomes. Working from the rather trivial premise that market institutions, as all institutions, are embedded with the institutional environment, and the more substantive observation that healthcare is a conflicted institutional field, the framework is pessimistic that the material-resource environment is a sufficient domain by which to account for the relational dependencies determinate of organizational performance. That is, are equilibrating pricing mechanisms in the material-resource environment, which are assumed to be governed by market-forces, determinant of quality outcomes? Two hypotheses that address both sides of the supply-and-demand model for pricing effects on quality performance are investigated:

H3a: When controlling for market competition factors, demand-side pricing mechanism are determinant of hospital quality performance; such that, the presumed higher utility value associated with better supply-side quality is associated with higher demand-side cost as measured by hospital revenues.

H3b: Pricing mechanisms when viewed as a supply-side production function can explain higher quality performance as costing more; such that the production function expense categories of labor, nonlabor and capital costs, along with retained earnings are significantly related (as individual effects or jointly) to adverse patient outcomes in an inverse manner.

Institutional theory's empirical approach to uncovering and explaining stylized facts of structuration across the nested boundaries of social interaction allows for context-sensitive analysis of historic developments. Thus, it is not inconsistent to observe that in some problem domains market institutions can have a selection advantage over other institutional forms. NIE has argued that the special case of market efficient institutions is likely to be defined by simple self-regulating economic transactions that are not overly complex or do not entail high uncertainty about the consequences of an impersonal exchange. When markets feature self-regulating feedback learning about material-resource allocations, they can be viewed as a kind of least energy or low transactional cost institutional form, and the supposed selection process is a good institutional fit.

Yet, neither would it be inconsistent to observe that in cultural or field environments social movements develop to foster the construction of isomorphic institutional constraints, even market institution constraints, that are less than optimal for the context. That is, the social construction of market institutions is dependent on culture and social movement formation, and they do not necessarily assure outcome optimality, especially in conditions with complex transactions (i.e., education, law, health, etc.). Complex environments with uncertain outcomes are contexts where market institutions, like others institutions could be legitimized by collective action as social skills to "spin," market, or persuade—even though only loosely coupled to the technical attributes of the problem domain. Such is the selection process in the marketplace of ideas.

Research question 4: Are expected maximizing demand-side responses, taken as preferences for better quality outcomes, rationally related to hospital economic performance?

H4: Lagged quality performance, as a proxy for demand-side market signals, will be predictive of improved hospital economic performance as demonstrated by better operating margins.

Market logic asserts that competitive selection pressures emanating from demand-side preferences raise the performance bar for supply-side performance. Demand-side preferences here act as incentives for changes in supply-side production functions with the objective to maximize on material-resource flows to a firm. Better quality outcomes then should be predictive of improvement in market fitness as measured by hospital operating margins.

Again, the predictive models of research questions 3 and 4 are framed in support of the market enterprise model, but predictions are made in support of the null hypothesis. Why should one suppose that hospitals that are guided by the market enterprise model will not be the best performers in healthcare's marketplace of ideas? Simply, the reason is the task environment is too complex, and future events too uncertain, for the simple rules and play of the game of market maximization on material resources. This is but a restatement of Arrow's 1963 healthcare thesis that: "The logic and limitations of ideal competitive behavior under uncertainty force us to recognize the incomplete description of reality supplied by the impersonal price system" (p. 967). Pessimism of the anticipated goal attainment of the market enterprise model, based on such problems as its incompleteness, thus puts the study squarely within the exposé tradition of institutional theory.

Hypothesis Summary and Research Model

A summary of the hypotheses is presented in Table 1. For each hypothesis, the table provides the equation used to model the hypothesized relationships, as a means for easy reference to the research design elements that will be presented in Chapter 4. Development of the outcome measures and explanatory variables will be discussed in Chapter 4. The analytic approach applied to assess both the explanatory pricing and market relationships assumed to be associated with quality performance, and the estimation of the unspecified relational dependencies carried by hospital-specific institutions that remain unaccounted for in the market enterprise model, is also covered in the Methodology chapter.

Table 11. Research Questions, Hypotheses and Equations

Research Question 1: Is there adequate information to distinguish between healthcare organizations when the quality of their outcomes is the performance under study? That is, after accounting for patient-level determinants, is there sufficient variance in hospital quality performance to give a "true" and reliable account of how much, and why, hospitals differ?

H1a: A parsimonious set of independent inpatient quality indicators can be found from a larger set of potential indicators that evidence strong face validity for patient-level risk-adjustment, which also demonstrates significant systematic between-hospital variance.

$$\mathrm{Prob}(Y_{ij}=1|\beta_j)=\varphi_{ij} \qquad (4.1)$$

$$\mathrm{Log}[\varphi_{ij}/1-\varphi_{ij}]=\eta_{ij}$$

$$\eta_{ij}=\gamma_{00}+\sum_q \gamma_{q0}(X_{qij}-X_{q..})+\sigma u_{0j}$$

$$\mathrm{var}\left[u_{0j}\right]=\tau_0^2 \quad \text{where } u_{0j}\sim N(0,\tau_0{}^2) \qquad (4.2)$$

H1b: The quality performance measures selected in the yearly cross-sectional development of the quality performance measures will continue to evidence a significant hospital-specific effect in longitudinal research that examines variation in the growth trajectories of quality performance.

$$Y_{tjk}=\beta_{000}+\beta_{100}Time(t-t_0)_{tjk}+(u_{0jk}+u_{1jk}Time(t-t_0)+e_{tjk}) \quad (4.6)$$

where variance components are estimated by

Level 1 $\quad \mathrm{var}(e_{tjk})=\sigma_e{}^2 \quad$ where $e_{tjk}\sim N(0,\sigma_e{}^2)$

Level 2 $\quad \mathrm{var}\begin{bmatrix}u_{0j}\\ u_{1j}\end{bmatrix}=\begin{bmatrix}\tau_0^2\tau_{01}\\ \tau_{01}\tau_1^2\end{bmatrix}=\mathbf{T} \quad$ where $\mathbf{T}\sim \mathrm{N}(0,\tau^2)$

Level 3 $\quad \mathrm{var}(r_{00k})=\omega_0^2 \quad$ where $r_{00k}\sim \mathrm{N}(0,\omega^2)$]

And, where (u_{0jk}) is the random-effect parameter tested for significance

Research question 2: Is there evidence of any trend in hospital quality performance, and do factors central to the market enterprise model and market reform account for hospital-specific performance trajectories?

H2a: Hospital quality performance will show a significant linear trend over the study time.

$$Y_{tjk}=\beta_{000}+\beta_{100}Time(t-t_0)_{tjk}+(u_{0jk}+u_{1jk}Time(t-t_0)+e_{tjk}) \quad (4.7)$$

Table 1 Research Questions, Hypotheses and Equations (continued)

H2b: Hospitals facing higher market competition will demonstrate a stronger trend of increasing quality performance, when other relevant market pricing and demand-side factors are accounted-for.

$$Y_{tj} = \beta_{00} + \beta_{10}Time(t-t_0)_{tj} + \beta_{20}\text{MCOpower}_{tj} + \beta_{30}\text{WageNdx}_{tj} + \beta_{01}HHI_j + \beta_{11}HHI_j + \beta_{02}\text{ForProfit} + (U_{0j} + U_{1j}Time(t-t_0) + e_{tjk}) \quad (4.8)$$

Research question 3: Are equilibrating pricing mechanisms in the material-resource environment determinant of quality outcomes?
H3a: When controlling for market competition factors, demand-side pricing mechanism are determinant of hospital quality performance; such that, the presumed higher utility value associated with better supply-side quality is associated with higher demand-side cost as measured by hospital revenues.

$$Y_{tj} = \beta_{00} + \beta_{10}Time(t-t_0)_{tj} + \beta_{20}\text{RevAdjDay}_{\text{tj}} + \beta_{01}\text{MCOpower}_j + \beta_{02}\text{HighComp}_j + \beta_{03}\text{MedComp}_j + \beta_{21}(\text{WageNdx}_j * \text{RevAdjDay}_{\text{tj}}) + (u_{0j} + u_{1j}Time(t-t_0) + e_{tj}) \quad (4.9)$$

H3b: Pricing mechanisms when viewed as a supply-side production function can explain higher quality performance as costing more; such that the production function expense categories of labor, nonlabor and capital costs, along with retained earnings are significantly related (as individual effects or jointly) to adverse patient outcomes in an inverse manner.

$$Y_{tj} = \beta_{00} + \beta_{10}\text{Time}(t-t_0)_{tj} + \beta_{20}\text{LaborAdj}_{\text{tj}} + \beta_{30}\text{NonLabAdj}_{\text{tj}} + \beta_{40}\text{CapAdj}_{\text{tj}} + \beta_{50}\text{Opincom}_{\text{tj}} + \beta_{21}(\text{WageNdx}_j * \text{LaborAdj}_{\text{tj}}) + \beta_{01}\text{MCOpower}_j + \beta_{02}\text{HHI}_j + (u_{0j} + u_{1j}\text{Time}(t-t_0) + e_{tj}) \quad (4.10)$$

Research question 4: Are expected maximizing demand-side responses, taken as preferences for better quality outcomes, rationally related to hospital economic performance?
H4: Lagged quality performance, as a proxy for demand-side market signals, will be predictive of improved hospital economic performance as demonstrated by better operating margins.

$$\text{OpMargin}_{tj} = \beta_{00} + \beta_{10}\text{Time}(t-t_0)_{tj} + \beta_{20}\text{Errors}_{t-1j} + \beta_{30}\text{Mortality}_{t-1j} + \beta_{40}\text{OpMargin}_{t-1j} + (u_{0jk} + u_{1jk}Time(t-t_0) + e_{tj}) \quad (4.11)$$

CHAPTER 4–METHODOLOGY

Overview

The details of the research design are provided in this chapter and include: identifying the data sources, the measurement variables, and the analytic methods applied to examine the hypothesized hospital performance relationships proposed in Chapter 3. Figure 1 and Table 1 provide summary references of the research elements developed so far, and outline the methodological issues that are covered in this chapter. Figure 1 in Chapter 1 provides a graphic summary of the relationships under study, and Table 1 in Chapter 3 summarizes the research hypotheses and the equations used to model them.

Research Design

This longitudinal research observed the performance of acute hospitals in Virginia for the years from 1998 to 2002. As is often the case in social research, the observations represent a hierarchical or nested data structure. Hierarchical linear models (HLM) are applied at each stage of the research design as the techniques overcome the limitations of traditional approaches in the analysis of nested data structures (Searle et al., 1992; Bryk & Raudenbush, 1992). HLM is a general data-analytic strategy that is particularly advantageous for evaluating the effects of population-based interventions and for the exploration of longitudinal data (Reise & Duan, 2003).

Specifically, the study uses a one-way ANCOVA with random effects design to develop risk-adjusted measurement models for four patient-safety indicators (Bryk & Raudenbush, 1992). The risk-adjusted measurement model results are used to developed yearly latent measures for two hospital quality performance indicators, a Mortality QI and an Errors QI. A linear growth-curve design is then used to test the predicted relationships between the repeated measures data for hospital quality performance and the economic and market factors of theoretical interest.

It is possible to construe the research design as a quasi-experimental design invoking market reform as a natural experiment with hospital organizations variously self-selecting on the treatment effect, and matched on competitive environmental factors (Campbell & Cook, 1967). However, such a methodological treatment effect, or fixed-effect approach is not stressed.

Rather, the HLM designs implemented in the study permit a model-based approach to be taken. Model fitting is given emphasize in the study, and the focus is on first accounting for the nested sources of variability and then assessing explanatory affects that can account for the variability in the nested data structure (Snijders & Bosker, 2000). Hypothesis testing aims to reveal explained variability as sequential models are specified—an inferential approach particularly applicable for observational research (Campbell & Cook, 1967). As Snijders and Bosker (2000: p.45) explained, the HLM analytic strategy "can be regarded as representing the effects of unmeasured variables and the approximate nature of the linear model."

The linear growth-curve design for repeated measures allows for examination of the causal dynamics argued for in the market enterprise model. Organizations following market logics, or driven to a greater degree by market forces are thought to simultaneously optimize their competitive economic position and social welfare, via efficient resource allocation. In comparison, organizations following alternative institutional logics, or driven by alternative institutional forces are thought to be less efficient, contributing less than optimal social welfare outcomes.

Repeated observations also permits assessment of proposed causal links through the use of lagged or baseline measures as temporal antecedents to subsequent organizational performance. The growth-curve design approach adopted when assessing hypothesis [H4], and its premise that the assumed demand-side (i.e., patient) preference for better quality is an antecedent determinant of supply-side (hospital) economic performance. The repeated measures design additionally helps to control for short-lived spurious effects to which a cross-sectional design is subject.

Unit of Analysis and Sample

The primary unit of analysis is the short-term, general, nonfederal hospital in Virginia. The sample comprised 77 acute hospitals that had at least 1,200 discharges in the study years from 1998 to 2001. The total number of discharges in the Virginia sample over the four years was 3,160,781. Two hospitals closed during the study period and were not included in the sample. The data was drawn primarily from two Virginia data sources. An additional price-wage index variable and comparative data were extracted from national database sources.

Data Sources

Multiple data sources were needed to model the scope of the study analysis, which ranged across nested contextual levels. The contextual levels include: 1) patient-level assessment of quality outcomes and other patient measures aggregated to the hospital-level; 2) hospital-level economic and operational performance variables; and 3) market-level determinants sampled by geographic areas. The study design was facilitated by the Commonwealth of Virginia's regulatory rules requiring acute hospitals to submit both patient discharge data and organizational performance information subject to validation.

Virginia acute hospitals are mandated to submit two sets of data: inpatient discharge data, which is provided on a quarterly basis and a financial and operational performance survey, which is submitted annually along with an audited financial statement. These two principal data sources are maintained by the public/private partnership formed between the nonprofit Virginia Health Information (VHI) organization and the state.

VHI is responsible for collecting and maintaining inpatient discharge data submissions, and performs validation checks on the quarterly patient records. The resulting "clean" data is combined into an annual research database. In addition to the standard UB-92 claim form patient record items, VHI adds the All Patient Refined DRG (APR-DRG) risk adjustment identifiers by applying 3M's patient grouper to the inpatient data. VHI's inpatient datasets for the years from 1998 to 2001 were used to develop the measures of hospital QIs. Other patient characteristics, such as payer identification, are also included in the administrative data, and are, in aggregate, used to frame hospital economic characteristics.

VHI also collects financial and operation performance data in an annual survey. The data is principally used to publish an annual industry report aimed to comparatively assess the efficiency and productivity of hospital and nursing home facilities. Audited financial statements are required in the survey process, which VHI uses in its review and validation of the survey data. The financial data is based on a hospital's fiscal year. For those hospitals with a fiscal year based on a timeframe other than the calendar year, their financial data was proportionally transformed to a calendar year basis. To achieve this transformation and to apply lagged variables, the reporting years from 1997 thru 2002 of the annual industry report database were used in the study.

Environmental variables used to model market competition factors faced by hospital organizations were also derived from the VHI patient datasets. Inpatient data was used to frame the market-area groupings based on matching achieved between Virginia Health Planning Region codes and CMS's MSA codes. The resulting seven market-areas were used to estimate hospital market share for inpatient days, and to derive demand-side purchasing leverage based on funding concentrations for the large MCOs in the market-areas. A hospital wage index published by CMS was also extracted for market-area analysis.

The AHA national hospital database was used for comparison with the Virginia sample. The comparative data provides reference as to whether the sample results have elements that can generalize to other populations.

Measurement of Variables

The variables selected or derived in this study are classified by five types: patient-level variables, hospital quality performance variables, hospital economic performance variables, hospital structure variables, and market-level variables. A temporal variable, with a range from 0 to 3 to represent the four outcome years, is also applied to assess the longitudinal growth curve of hospital performance. Variables included in the analysis are summarized in Table 2.

Development of Hospital Performance Measures from Patient Outcomes

The prevailing uncertainty of healthcare outcomes has constrained research on the comparative value of healthcare, and highlights the burden faced by consumers, purchasers and policy makers in making optimal choices about hospital services. A measurement model for quality performance must overcome two confounding factors: the measures must effectively risk-adjust for patient-level characteristics that are known to overwhelm provider effects if unaccounted for; and the resulting risk-adjusted outcome measures must demonstrate significant organizational-specific variance so as to adequately distinguish between provider effects. The former goes to a burden of the measure's face validity, and the details of this methodological issue is undertaken in the Patient Risk Adjustment section. The latter is a matter of a measure's statistical validity (Campbell & Cook, 1967), and is discussed in the Hospital Performance as Outcome Variance section.

Substantial care was given to the development of the quality outcome measures that met the burden of these requirements. The analytic details employed in the validation

Table 22. Variables, Definitions, and Sources

Variable	Definition	Data Source
Patient Level		
AHRQ PSIs (3)	Adverse patient events	Inpatient output of AHRQ software modules
Mortality	Inpatient mortality events	Administrative patient data
Hospital Quality Performance		
Mortality QI	Factor scoring index of the odds for global hospital mortality and the PSI events for failure to rescue	Administrative patient data
Errors QI	Factor scoring index of the odds for the PSI events of accidental puncture or laceration and infection due to medical care	Administrative patient data
Hospital Economic Performance		
RevAdjDay	Inpatient revenue per case-mix adjusted day	VHI Hospital Survey
OutPtProp	Proportion of outpatient revenue to total patient revenue	VHI Hospital Survey
GovPart	Participation in government funding as a percentage of inpatient revenues	VHI Hospital Survey
ComPart	Participation in commercial funding as a percentage of inpatient revenues	VHI Hospital Survey
OtherPart	Participation in other patient funding sources as a percentage of inpatient revenues	VHI Hospital Survey
CharityPart	Participation in charity care	VHI Hospital Survey
NonPtRevProp	Non-patient revenues as a proportion of total revenues	VHI Hospital Survey
TOEadj	Total operating expense per case-mix adjusted admission	VHI Hospital Survey
LaborAdj	Labor expenses per adjusted admission	VHI Hospital Survey
NonLabAdj	Non-labor expenses per adjusted admission	VHI Hospital Survey
CapAdj	Capital costs per adjusted admission	VHI Hospital Survey
OpIncome	Operating income per patient day (total revenues in excess of total operating expenses)	VHI Hospital Survey
OpMargin	Earnings before interest, taxes & depreciation as a % of total revenues	VHI Hospital Survey

Table 2 Variables, Definitions, and Sources (continued)

Variable	Definition	Data Source
Hospital Structure		
ForProfit	Dummy variable set to 1 for for-profit organizations & 0 for non-profits	VHI Hospital Survey
System	Dichotomous variable indicating integrated system affiliation	VHI Hospital Survey
System (5 categories)	Dummy variables indicating affiliation with a specific hospital system	VHI Hospital Survey
Case-mix	Average case-mix across all years	Administrative patient data
TransM	Patients transferred out of the mortality population (%)	Administrative patient data
TransE	Patients transferred out of the error event populations (%)	Administrative patient data
NB_Prop	Proportion of newborn discharges to total discharges	Administrative patient data
SBocc	Staffed bed occupancy	VHI Hospital Survey
AdjLOS	Case-mix adjusted LOS	Administrative patient data
Market Environment Attributes		
Comp	Hirshchman-Herfindahl Index competition measure for market share of inpatient days	Administrative patient data
MCOpower	Measure of purchasing leverage achieved by managed care funding concentrations	Administrative patient data
WageNdx	CMS wage index for the market-area as a proxy for the geographic price index	CMS wage index file

process used to select the particular subset of observed hospital outcomes included in this study was reported in a preliminary study (Fisher, 2003), and the results are summarized in Chapter 5.

The preliminary research evaluated a large number of inpatient quality indicators and patient safety measures (referred to simply as QIs), and the strength of their patient-level risk adjustment (Fisher & Shukla, 2002; Fisher, 2001). Two research objectives were pursued in the preliminary selection criteria of hospital quality performance measures. First, construct validity of the risk-adjustment methodology was sought. Second, a discriminating criterion was sought where a sufficiently significant amount of the variance in the quality measure was attributable to hospital-specific effects, after accounting for patient-level measurement error.

The latter issue of discriminating sensitivity follows from the fact that hospital performance rankings are based on nested patient outcomes aggregated up to the hospital-level. The degree of relational dependency or resemblance between patients as micro-units Discriminating power is then dependent on having significant amount of between-hospital variation as a "true" measure of hospital heterogeneity. This hospital-specific rank ordering of performance outcomes should have strong dependencies on the effects of unmeasured variables representing organizational or hospital-specific patterns.

The QIs evaluated in the preliminary study included 16 of AHRQ's Patient Safety Indicators (PSI), 25 of AHRQ's Inpatient Quality Indicators (IQI), and a global in-hospital mortality indicator (Shukla & Fisher, 1998). Results from the study suggest only four likely candidates for inclusion in the measurement model of this study (Fisher, 2003).

In the mid 1990s, AHRQ researchers developed a set of administrative inpatient data quality indicators as part of the Healthcare Cost & Utilization Project (HCUP) (Johantgen, Elixhauser, et al., 1998). Continued interest, such as IOM's call to develop medical error reporting systems (Kohn, Corrigan, et al., 1999), prompted AHRQ to further efforts in "realizing the potential value of administrative data based measures" (Zhan & Miller, 2003) to assist efforts in organizational improvement, public reporting and payment decisions. AHRQ contracted with the Evidence-Based Practice Center at the University of California San Francisco and Stanford University to further expand, test, and refine inpatient quality measures as well as to improve the evidence behind their use with extensive literature reviews and broad clinical consensus panels. The products of this effort were two software modules to calculate the adverse incidence rates for AHRQ's PSIs and IQIs given standard discharge data (Romano, et al., 2003).

The 25 AHRQ IQIs included 13 mortality conditions, 7 measures of procedure volume, and 5 screens for procedures indicative of poor practice. AHRQ's IQI measures as a whole had very low incidence rates and generally produced a leftward skewed distribution, often with a mode of zero for the hospital sample of this study. None of the AHRQ IQIs met the criteria for risk-adjustment validation or statistical validity, primarily due to the distribution characteristics of the population estimates.

Four of the 29 PSIs were found acceptable for both risk-adjustment construct validity and statistical validity in the preliminary research (Fisher, 2003). Three of these PSIs are included in the analysis of this study:[23] failure to rescue (Needleman et al. 2002; Siber, et al., 1995; Siber, et al., 1997; Aiken, et al., 2002), infection due to medical care (Iezzoni et al., 1999; Miller et al., 2001), and accidental puncture or laceration (Johantgen et al., 1998; Miller et al., 2001; Iezzoni et al., 1999).

Similar to the IQIs, most of the 25 PSI found to be unacceptable measures of quality performance for the hospital sample in this study where rejected because of low

[23] The fourth PSI meeting the measurement evaluation criteria was decubitus ulcer.

very low incidence rates. Six PSIs did not evidence statistical validity in demonstrating significant systematic between-hospital variance.

A global mortality QI (also evaluated with the same measurement model criteria), which was initially developed by Shulkla and Fisher (1999), was also selected for inclusion in the study. This global mortality indicator assessed 98% of inpatient deaths. The risk adjustment methods and associated selection criteria for the QIs are covered in the next section.

Patient risk adjustment methodology used to measure hospital quality performance

The three data elements from 3M's APR-DRG clinical classification grouper (version 15), along with gender and age, were the variables used in the risk-adjustment methodology. The APR-DRG risk-adjustment system provides a matrix between its principal patient classification scheme based on the primary admission diagnosis and an acuity index of comorbidity derived from secondary diagnoses and procedural information (Averill et. al, 1998). Two comorbidity indices are produced as ordinal measures that range from minor, moderate, major, and extreme subclasses. One comorbidity subclass is a risk-of-mortality index intended to predict an increasing trend in mortality rates and the second severity index was derived for prediction of resource utilization rates (i.e., LOS and charges). The risk-of-mortality index was used to adjust the global inpatient mortality rate measure and the severity index was applied in adjustment of the three PSI indicators.

The methodology applied to select hospital-level QIs in this study was advanced by Shukla and Fisher (1999) in research that assessed the construct validity and statistical stability of 3M's APR-DRG mortality risk-adjustment system. In accord with Iezzioni's (1997) recommendations for evaluating the performance of risk-adjustment methods, three steps were followed in the validation process. First, construct validity of the risk-adjustment methodology was assessed by associative strength between the ordinal comorbidity scale and actual mortality rates of the sampled population (i.e., the association should reveal a strong monotonic ascending trend). Testing was conducted for each primary APR-DRG patient diagnostic category to assess the construct validity of the risk-adjustment attained by the comorbidity scale for that patient population. The criteria used to affirm the construct validity for each patient category was an association of 0.667 or greater as measured by Kendall's tau. This degree of association establishes that the comorbidity index is monotonically ascending, with the cutoff criteria representing only one reversal and no ties across the ordinal categories (detailed reasoning on the monotonic property as supporting the face validity of the APR-DRG risk-adjustment system is provided in Shukla and Fisher, 1999).

A second analytic step addressed the statistical validity of the measures that attends to the stability of the measure, and simply is a question of the sample size for each sub-grouping. The sample size for the primary diagnostic category by comorbidity subclass cell had to be 30 or greater.

Finally, predictive validity for the risk-adjustment methodology was assessed as in the final step of the measurement development process. Predictive goodness attends to the percentage of the patient outcomes accounted for by risk-adjustment. The literature has generally suggested that a good criterion for the risk-adjustment methodology is to account for at least 12% of the variance at the patient level (Ash & Shwartz, 1994; Iezzoni, 1999). Statistical criteria for the discriminatory power at the provider or hospital level have rarely been offered and are in need of refinement (Hofer, et al., 1999). The criterion for the HLM analytic method used in this study was an average patient-level reliability estimate of greater than 0.5 (a topic to be discussed in more detail in the Analytic Methods section below).

It is of note that the results obtained by Shukla and Fisher (1999) indicated that the APR diagnostic groups that met these three criteria are also very likely to meet criteria for discriminating power. The discriminating power or sensitivity of an adjustment method will be covered in more detail in the section on Analytic Development of Organization Specific Quality Performance below.

Given the essential difference between the national development of the AHRQ PSIs and the more study-specific development of the global inpatient mortality QI, more stringent criteria were applied in the global mortality QI adjustment methodology. First, for the mortality indicator, all cases of an APR-DRG were excluded if the diagnostic group did not meet the requirements in steps 1 and 2 covered above, as compared to defaulting the risk-adjustment rate to the APR-DRG patient diagnostic category, as was the case of the three PSIs. Further, the following additional requirements were set for inclusion of an APR-DRG into the at risk population: each APR-DRG by risk-of-mortality subclass cell had to have at least 5 death events, and the expected rate at the APR-DRG level could not be less than 1 in 5,000 cases. These latter requirements excluded only three APR-DRGs from the study that related to vaginal delivery of normal newborns—a result considered to have clinical, as well as statistical, validity.

No cases derived from the AHQR PSI selection methodology were excluded from analysis. Instead, cases in APR-DRGs not meeting the requirements for steps 1[24] and 2 were assigned an expected rate at the APR-DRG level, thus eliminating the comorbidity severity index as an adjustment factor. The hospital rates used in the study are then consistent with the numerator and denominator definitions of the AHRQ methodology, and are comparable to the validation results for the PSIs published by the Evidence-Based Practice Center (Romano, et al., 2003) and other studies using AHRQ's quality indicator methodology.

Hospital performance variance as outcome

Using the appropriate APR-DRG risk-adjusted expected values for patient comorbidity categories described above, along with the patient variables of gender and age, a risk-adjusted model of each hospital's performance on the four QIs for each of the four years was obtained using hieratical linear modeling (HLM) techniques. The analytic technique allows for the joint modeling of both the patient-level variance of an outcome (i.e., a within variance component), and a between-hospital variance component that provides for estimation of organizational specific effects conditional on the patient characteristics. While similar to OLS regression (which ignores group membership

[24] Applying the construct validity criteria of the severity index validation in two stages. As a measureof resource utilization the subclass had to demonstrate monotonicity on a combined standardized score for LOS and charges initially and subsequently across each of the PSI rates as well. Only three out of the 354 APR-DRGs did not demonstrate the requisite monotonic property for the resource utilization measure.

dependency) or ANOCOVA, the HLM approach produces 1) more stable estimates when sample sizes per group are unbalanced, and 2) readily estimates group or organizational effects even when the number of organizations is large (Bryk & Raudenbush, 1992, Hox, 2002). A detailed explanation of the benefits achieved in this analytic approach is provided in the discussion section on analytic methods given below.

Using the log-odds outcome of each hospital's residual deviation from the population mean estimate, exploratory factor analysis was undertaken to assess whether the four QIs captured one or more unobserved latent constructs of hospital quality, or whether the indicators are best treated as independent and unrelated hospital performance proxies. Principle axis factor analysis applied to the four QIs revealed two latent hospital quality performance factors. Each factor was composed of distinct and easily interpreted underlying or latent variables. Factor loadings for each of the QIs over the annual observations delimited common variance for: 1) a factor associating adverse patient safety events due to a system's inability to avert errors of commission (Errors), captured by the accidental puncture or laceration and the infection due to medical care QIs; and 2) a factor involving the two QIs associated with an organization's inability to avoid the terminal event of inpatient mortality (Mortality), the global mortality and the failure to rescue QIs.

Applying the factor analytic results, the two latent quality variables were included in the measurement model as weighted average indices. The weights were based on the yearly standardized factor scores of the log-odds outcome measures.

Operations and Financial Variables of Hospital Economic Performance

The hospital operations and financial data provided in the VHI annual survey were used to measure hospital-level economic performance. The market enterprise model argues that the management objectives to maximize material-resource factors are sufficient to determine an optimal economic state, conditioned on demand-side preferences for better quality. The measurement of material-resource variables at the hospital level is relatively straight forward, since it must be more or less self-evident (e.g., rational to both supply-side and demand-side actors involved in the monetary transaction). Foremost in modeling the optimality, thought to be achieved by pricing mechanisms, is to attend to changes in the unit price of inputs and outputs. A decomposition of both demand-side costs (as hospital revenue) and supply-side expenses per severity-adjusted patient day is undertaken to model changes in unit pricing (Grannerman, et al., 1986).

The productivity and efficiency measures of staffed bed occupancy rates and case-mix adjusted LOS are also analyzed as managerial process effects in the competitive pricing process. Characteristics of hospital structure are also examined as contextual factors to be controlled for at the hospital-level.

Pricing hospital outputs

The VHI financial survey collects revenue stream data points for outpatient and inpatient services, along with associated contractual allowance discounts, by five payer categories: Medicare, Medicaid, Other Government, Commercial, and Other. Information is also provided for the amount of charity care, payments made to or received from the

State's Indigent Care fund, and other non-patient revenue. The data is used to develop seven revenue variables: revenue per case-mix adjusted patient day (RevAdjDay), proportion of outpatient revenue to total patient revenue (OutPtProp), participation in government funding (GovPart), participation in commercial funding (ComPart), participation in other patient funding (OtherPart), participation in charity care (CharityPart) and non-patient revenues as a proportion of total revenues (NonPtRevProp).

Hospital expenses as a production function

Total operating expense per case-mix adjusted admission (TOEadj) will be used as a bundled operating cost variable in production function models that estimate general trends of unit pricing. In other models, total operating expenses is decomposed into labor expenses per adjusted admission (LaborAdj), non-labor expenses per adjusted admission (NonLabAdj), and capital costs per adjusted admission (CapAdj). Operating income per adjusted admission (OpIncomeAdj), as defined by total revenues in excess of total operating expenses, is also included as a retained earning element in models that use the hospital production function as a predictor of patient outcomes. The repeated measures of OpIncomeAdj is also used to derive a between-subject, hospital-level dummy variable to group hospitals in poor financial condition (PoorIncome), defined as hospitals that have an annual average of $10 or less of operating income per adjusted patient day.

Operating margin as a measure of economic performance

Market dynamics that relate demand-side selection effects to hospital economic performance will be modeled as a relationship between lagged quality outcomes and hospital operating margin, conditioned on the prior year's operating margin as a base-level control. Though the hospital industry is rather distinctive in the degree to which non-profit and for-profit organizations compete, the adoption of market reform is considered to have had an equivalent institutional effect on management actors (Sloan, et al., 2001). Managerial incentives to maximize on material resources (either framed as available strategic decision options or as compensation levels) can be seen to make higher profitability preferable to low profitability. Certainly expending more for patient services than generated from treatment revenues puts the very survival of the organization into question, at least in the current era where hospital acquisitions are more common than public or philanthropic lifelines.

In an economic model of hospital performance it is necessary to specify the operating margin of patient revenues in excess of operating costs (Grannerman, et al., 1986). Standard financial practice defines operating margin (OpMargin) as earnings before interest, taxes and depreciation (EBITD) as a percentage of total revenues.

Hospital structure

A number of hospital characteristics, institutional in nature, have been considered to shape and constrain economic performance, as they tend to be more intransient. Certain hospital characteristics are linked to this new era of market reform having transformed the once dominant form of the stand-alone, non-profit facility dependent on voluntary community support (Kutner, 1999). Theoretical significance is given to hospital ownership (Sloan, et. al, 2001), which is specified by a dummy variable depending on whether the hospital is a non-profit or a for-profit organization (ForProfit). Whether a hospital has been incorporated into a larger business management system is also tracked.

There are five integrated hospital systems that compete in Virginia, and two hospitals owned by national chains without other affiliates in Virginia. For some model specifications, a dummy variable will be used to denote system affiliation (System). Expanded models will specify five dummy variables to group affiliated hospitals with three or more hospitals in Virginia as Sys1, Sys2, Sys3, Sys4, or Sys5, with the intercept used to denote hospitals without system affiliation in Virginia.

Other time invariant contextual variables (between-subject variables in repeated measures design vernacular) used to account for hospital structure include: the annual average of the natural log of the average daily census (ADCnl) as a proxy for hospital size, and the annual average APR-DRG severity case-mix (CasmixAvg). While hospital teaching status is considered a significant organizational and institutional factor, the small sample size for membership in the Council of Teaching Hospitals (n=3) precluded its inclusion.

The significance of the average proportion of newborn discharges to total discharges will also be tested as a potentially important contextual variable. Normal delivery can be an important product line that accounts for a significant number of admissions and affects financial performance. Since, it is a distinctively healthy population not treated by all hospitals, and is not a population included within any of the patient outcomes measures, normal delivery is taken as an important contextual variable. A cumulative quartile ranking variable (NB_Quartile), based on annual newborn discharges as a proportion of the total discharges, is used as a hospital characteristic in some of the models tested.

Finally, annual averages for staffed bed occupancy (SBocc) and adjusted length of stay (AdjLOS) are also applied as between-subject variables in some model specifications. These productivity and efficiency measures can either be viewed as endogenous to supply-side rationality as adjustments intended to affect an organization's production function (thus assumed within market dynamics), or as institutional developments within an organization.

Market-Level Factors

Healthcare is a local and rather personal market, and thus market sampling is defined by seven geographical categories in Virginia. Six of these market-area categories are defined by health planning MSA designations, and a seventh category is used to represent rural hospitals throughout the state that have no competitors within 25 miles.

This market-area grouping of hospitals is the only model component defined at level-three, and is treated as a variance component representing a latent construct for unmeasured small area variations attributable to the clustered sampling of the data. Accounting for potential heterogeneity between the seven market-areas is principally treated as a "nuisance" issue, and is discussed in detailed in the Predictive Models Tested section. As is conventional in econometric research, market influences, such as represented by the Comp, MCOpower and WageNx variables, are consistently treated as hospital environment or contextual variables, and measured in a disaggregate fashion at the hospital-level, never at the market-area level.

The explanatory fixed-effects of market-area forces can variously be modeled either at level-1 as time varying, or as between-subject hospital variables taken as time invariant averages at level-2. Time varying variables used to model the dynamics at this market-area sampling level include a Hirshchman-Herfindahl Index competitive measure for market share of inpatient days (Competition), a demand-side measure of purchasing leverage achieved by managed care funding concentrations (MCOpower), and a regional wage price index (WageNdx).

Since the market-area sample size is small (N=7), the Hirshchman-Herfindahl Index measure is expected to rather "lumpy" and not likely to evidence a normal distribution. Categorical grouping of the competition variable along an ordinal scale depicting low, medium and high competitive hospital environments is expected to be the best means to operationalize the measure. Furthermore, if this measure of hospital market share for patient days demonstrates only small changes across years, a time invariant categorical measure of hospital market competition will also be considered. A time invariant representation of competitive measure can be given as two between-subject dummy variables that indicate whether a hospital faces high competition (HighComp) or medium competition (MedComp).

Analytic Methods

In order to specify both the relationships assumed by the market enterprise model and the suspected influence of alternative institutional factors unaccounted for by the model, the study applies a hierarchical linear model (HLM) analytic approach. The advantage of HLM modeling is that it allows for the estimation of multiple variance components in predictive models for observations that are suspected to reveal multilevel relationships due to the nested structure of the data. Social research regularly involves problems that investigate the relationship between wider societal influences and individual action (the action of individual organizations in this case). Individual behavior and outcomes can be viewed as nested within causal influences associated with group membership. For example, numerous educational studies have demonstrated the utility of multilevel research that accounts for data structures where pupils are nested within classrooms, and where classrooms can be nested within schools (Bryk and Raudenbush, 1992). The central statistical model in multilevel analysis is "one of successive sampling from each level of a hierarchical population" (Hox, 2002: p. 1).

By combining maximum likelihood (ML) algorithms to estimate fixed-effects and the residual variance of the dependent variable with empirical Bayes estimation for variance components of the structural equations that model higher level influences, HLM provides for inferences to made about the significance of unobserved group level effects. For this study, the variance of the repeated measure outcomes is estimated as the residual error term at level-1 and between hospital and between market-area variance is modeled at level-2 two and level-3, respectively.

The advantages of the HLM analysis in comparison to more conventional multivariate and univariate repeated measures methods have been thoroughly reviewed (Ware, 1985; Bryk and Raudenbush, 1992; Davis, 2002). Critical for this study is that the methodology provides: (1) growth curves for each hospital dependent on regression coefficients at the occasion level, at the hospital-level, and at the market-area level; (2) estimation based on information available from observations can be achieved, even though unbalanced group sizes or missing data for an occasion may be present; and (3) modeling of complex covariance structures between the repeated measures, which allows for relaxing assumptions of simple compound symmetry maintained in standard panel designs (Baltagi, 1995). HLM techniques are particularly suited for panel research that would assess organizational performance dynamics believed to be influenced by theoretical mechanisms in the wider social environment.

The study design uses repeated measures to account for the growth curve of the Virginia hospital system at level-1. The repeated observations are individual hospital outcomes that can either be explained by other time-varying covariates (sampled as either hospital or market covariates) or as time-invariant, between-subject hospital variables at level-2.

Organization performance is, in turn, clustered within a larger societal and economic frame that defines inter-organization competition and the flow of resources driven by market-forces at the market-area level in this study. While the variance component for market-area heterogeneity will be used to assess the appropriate covariance structure for the predictive models, no explanatory variables are estimated at the market-level in this study. In part, this is because the market-area variables can all be modeled as time varying covariates (within-subject variables) and, in part, because the number of market-area units is small (n=7). The essential reason for not modeling market effects hierarchically, however, is that it is not theoretically required, given the reductionist orientation and decentralized focus of the market enterprise model. However, the statistical validity of the conventional econometric fixed-effect approach will be evaluated through estimation of the market-area variance component, a topic addressed in the next section.

Taking repeated observations enables assessment of variation due to random measurement error (e.g., noise) caused by transient and unmeasured constructs. Repeated measures at level-1, further strengthens the power to detect persistent population patterns in comparison to cross-sectional observational designs.

The dependency of patterns on group membership (the hospital organizational effect in this case) is viewed as a nuisance effect in econometric, fixed-effect, panel designs. Such designs often attempt to control this "nuisance" by simple estimation of each firm's fixed point intercept, and then assuming that the variance is homogeneous across all organizations. Zhoa (2004: p. 76), for instance, related financial and staffing decisions to hospital quality performance by controlling for "omitted variable bias" of hospital process characteristics in this manner. The risk, of course, is that the statistical assumptions are wrong, and that between-hospital variance is significant. Failure to test and adjust the model assumptions can lead to misspecification of the model and inaccurate inferences.

Most of the tested hypotheses assume short-run dynamics or a concurrent mechanism of action, where the hospital's annual economic performance is conceived as a system of inputs that cause the annual quality rate outcomes, or outputs. Errors in this assumption are believed to average out over the repeated measures. In this case, a supply-side production function focus is given to the relationships of interest, with available demand-side market factors included as controls.

However, one predictive model does rely on longitudinal observations to test dynamic propositions about demand-side and supply-side responses that can be conceived to have a longer developmental cycle. Specifically, model testing of [H4] employs lagged measures of quality performance to assess the latent construct effect of demand-side rationality on hospital profitability, the supply-side maximizing objective.

Analytic Development of Quality Performance Measures

The attention given to the development of an adequate measurement model for hospital quality performance tackles the concerns of Research Question 1: is there sufficiently significant hospital-specific variance in quality performance to allow for adequate assessment of the hypothesized explanatory effects. That is, after accounting for patient-level determinants, is there a true signal of heterogeneous organizational outcomes—treatment source variability accounted for by hospital-specific dependencies and separate from measurement error and random measurement fluctuations. Only if the measures for quality performance can be validated as a hospital source of variability can predictive models effectively test whether pricing mechanisms and market dynamics, and/or any other relevant organizational or institutional effect, matters to patients.

As the outcome variables considered in the study are dichotomous inpatient events, a generalized linear model with a Bernoulli binomial distribution (i.e., possible outcomes are 0 and 1 and each patient is an individual trial) was used to estimate risk-adjusted hospital outcome rates. As mentioned above, the development of the measurement model for organization specific quality performance also relied on HLM methodology in this initial analytic step to estimate hospital QIs. Risk-adjustment of the patient level data is necessary to remove bias from hospital quality performance indicators due to patient characteristics and is accomplished in this study by adjusting for APR-DRG comorbidity categories, age and gender. The two-level logistic model is of the form:

$$\mathrm{Prob}(\mathrm{Y}_{\mathrm{ij}}=1|\beta_{\mathrm{j}})=\varphi_{\mathrm{ij}} \qquad (4.11)$$

$$\mathrm{Log}[\varphi_{\mathrm{ij}}/1-\varphi_{\mathrm{ij}}]=\eta_{ij}$$

$$\eta_{ij}=\gamma_{00}+\sum_{q}\gamma_{q0}(X_{qij}-X_{q..})+\sigma u_{0j}$$

where:

φ_{ij} is the probability of an adverse outcome for the i$^{\mathrm{th}}$ patient in the j$^{\mathrm{th}}$ hospital;

γ_{00} is the expected value for the population;

X is a q dimensional vector of covariates that measure the APR-DRG relative weight, age, and gender of the i$^{\mathrm{th}}$ patient in the j$^{\mathrm{th}}$ hospital;

γ_{q0} are the coefficient parameters of the covariates;

σ is a scale parameter set to 1; and

u_{0j} is a hospital's risk factor given by the residual deviation from the expected value, the intercept for hospital j.

The two terms on the left side of the predictive function are the fixed-effects explained by the model, and the right-side term u_{0j} is a random effect in the model. The variance component for the random effect of this logistic model is:

$$\mathrm{var}\left[u_{0j}\right]=\tau_0^2 \quad \text{where } u_{0j}\sim N(0,\tau_0{}^2) \qquad (4.22)$$

The analytic procedure applied is distinctive from standard least square procedures (Bryk and Raudenbush, 1992) in its estimation of the between-group variance for the random component u_{0j}. Some explanation and justification for the technical approach taken to estimate $\mathrm{var}\left[u_{0j}\right] = \tau_0^2$ is in order.

Development of the measurement model with the HLM approach provides the covariance matrix information needed to evaluate the measurement issues raised in Research Question 1, and to statistically test hypothesis [H1a]. Hypothesis [H1a] examines whether the selected inpatient QIs have sufficient hospital-specific variance, such that tested relationships are given a fair chance to account for a "true" substantive signal of quality performance, not just stochastic noise. Selection of the outcome indicators follows not only from the strength of the patient-level risk-adjusted fixed-effects, but also from the significance of the hospital-specific variance component $\tau_0{}^2$.

Estimation of the fixed-effects for the coefficient of adjustment terms, $\sum_q \gamma_{q0}(X_{qij} - X_{q..})$, allows for inferences to be drawn about the adequacy of the risk-adjustment methodology. Estimation of the random between-subject effects allows for inference to be made about the significance of the hospital-specific effects.

It is common in risk-adjustment practice to estimate a predicted population outcome (or expected value) conditioned on a coefficient of adjustment derived only from patient characteristics. The empirical Bayes residuals estimated under the HLM method jointly use the patient-level characteristics and an adjustment for reliability at the organizational level, which takes into account the stability of the estimate given the hospital sample size. An advantage to the conjoint HLM approach is that it permits more accurate estimation of the hospital effect by using all available information in an unbalanced sample size design. As with this study, such unbalanced designs are common in research investigating provider performance in healthcare.

Both theoretical and empirical evidence has demonstrated that the empirical Bayes approach utilized in HLM techniques provides more accurate estimation of the group effect than obtained via fixed-effect methods (Efron and Morris, 1975; Morris, 1983). The estimation method controls for capitalization on chance by groups with relatively smaller sample sizes, which is particularly important given the low frequency of adverse hospital events. Empirical Bayes achieves more accurate assessment by estimating a "shrunk" estimation that accounts for reliability. Inspection of the measure of reliability used as a shrinkage factor is also an important consideration in the adequacy of the adjustment model and will be presented in Chapter 5. HLM output of the hospital residuals, or hospital-specific effects, compares to traditional least-square estimates in the following manner:

$$u_{0j}^{*} = \lambda_j \hat{u}_{0j} \qquad (4.33)$$

where

u_{0j}^{*} is, for each hospital J, the empirical Bayes posterior mean, or each hospital's residual estimate as a deviation from the population average;

$\hat{u}_{0j}$ is the OLS estimator for each hospital J; and

λ_j is the empirical Bayes estimate of reliability for each hospital J, which tends to approach 1 as the sample size increases.[25]

Given the nested data structure of risk-adjustment methodology, validation of QI measures requires empirical support at both the patient and provider level. It is necessary but not sufficient to demonstrate that a significant proportion of patient outcome variance is accounted for by the adjustment coefficients (Ash and Swartz, 1994). The adjusted QI must also demonstrate a significant degree of between-group variation such that provider effects or group-specific effects can be distinguish and potential explained (Hofer, 1999)—that group membership shows a sufficiently high degree of relational dependency. Estimation of both a within and a between group variance allows for jointly testing the significance of the between-hospital performances, as well as the variance account for by the coefficient of adjustment.

Fisher (2003) has previously reported on the risk-adjustment validation details for the complete set of inpatient QIs that were evaluated for selection in this study. Summary results of the explained variance achieved by the risk-adjustment methodology and the hospital-level variance components for each of the four individual IQIs selected will be presented in Chapter 5. The analytic focus for this study's measurement model, however, is on the development of the two latent quality variables derived from the four selected quality outcome measures. Validation of the two quality indicators derived from the

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[25] Taking the variance components as $\mathrm{var}(Y_{ij}) = \mathrm{var}(u_{0j}) + \mathrm{var}(e_{ij}) = \tau_0^2 + \sigma^2$, reliability increases with the sample size at level-2 by: $\lambda = \tau_0^{\ 2} / (\tau_0^{\ 2} + \sigma_e^2 / n_j)$; where the sample size for each hospital j is n_j.

exploratory factor analysis will concentrate on assessment as to whether the QIs have sufficient strength to account for organizational specific effects, as is hypothesized in [H1a].

Explanatory Model Specification

The general form of the most complex models that potentially could be used for testing the study hypotheses can be given as:

$$Y_{tjk} = \beta_{000} + \beta_{100} Time(t-t_0)_{tjk} + \beta_{p00} X_{ptjk} + \beta_{pq0} Z_{qjk} + (u_{0jk} + u_{1jk} Time(t-t_0) + r_{00k} + e_{tjk}) \quad (4.44)$$

where

Y_{tjk} is a dependent outcome for hospital j (with j=1,…,77), in market-area k (with k=1,…,7) at time point or occasion *t* (with t=0,1,2,3);

β_{000} is the estimated intercept, representing the mean initial status or the expected value in Virginia at the beginning of the study, 1998, conditioned on the other variables included in the model;

$Time(t-t_0)$ is a linear growth fitting curve function, with the initial year (1998) set to 0;

β_{100} is the fixed-effect coefficient for the linear growth-curve, the mean growth rate;

X is a *p* dimensional vector of time varying level-1 covariates, which can variously be associated with hospital-level or market-area dynamic processes;

β_{p00} are the coefficient parameters of the time varying, or within-subject covariates;

Z_{jk} is a q dimensional vector of time invariant between-subject covariates characterizing fixed institutional effects;

β_{pq0} are the coefficient parameters of the between-subject hospital covariates, which interact with leve-1 effects;[26]

u_{0jk} is the estimated random effect for hospital-specific performance, and is given as a hospital's residual deviation from the mean initial status (e.g., a j dimensional vector of hospital posterior means);

$u_{1jk}Time(t-t_0)$ is the estimated linear random effect of hospital-specific growth rates, allowing for the slope of $Time(t-t_0)$ to vary for each hospital j;

r_{00k} is the estimated random effect attributed to each market-area at level-3, and is given as a market's residual deviation from the mean initial status value (e.g., a k dimensional vector of market-area posterior means). The market-area variance component is included only if significant heterogeneity is found between the seven market-areas; and.

e_{tjk} is the residual error term at level-1.

The first four elements in the predictive function are the fixed-effects explained by the model, and the right-side bracketed elements are the random effects specified by the model. The covariance structure given to the random effects are:

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[26] For clarity, HLM designs are commonly represented as structural equations built separately at each level, and then combined (see Snijders and Bosker, 2000; and Bryk and Raudenbush, 1992). This especially aids in understanding cross-level interactions, and associated issues of heteroscedasticity. For brevity, only the combined form is given here. Since the cross-level effects modeled in this study primarily deal with the relatively easy to conceive level-2 covariate effect on the random intercept, this is considered sufficient.

$$\text{Level 1} \qquad \text{var}(e_{tjk}) = \sigma_e^{\ 2} \qquad \text{where } e_{tjk} \sim N(0, \sigma_e^{\ 2}) \tag{4.55}$$

$$\text{Level 2} \qquad \text{var}\begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} = \begin{bmatrix} \tau_0^2 \tau_{01} \\ \tau_{01} \tau_1^2 \end{bmatrix} = \mathbf{T} \qquad \text{where } \mathbf{T} \sim \text{N}(0, \tau^2)$$

$$\text{Level 3} \qquad \text{var}(r_{00k}) = \omega_0^2 \qquad \text{where } r_{00\text{k}} \sim \text{N}(0, \omega^2)$$

The total variance of the dependent variable is estimated as the sum of all the variance components.

Each predictive model will be sequentially assessed. Evaluation first attends to what is an appropriate base model, or "empty" model form, which includes only intercept and time function terms, estimated as both fixed- and random-effects. The empty model forms used in this first step will provide results for two analytic objectives. A primary objective in assessing an empty model form is to make inferences that test the hypotheses proposed by [H1b] and [H2a].

Another objective is to use the results to determine what the most appropriate form for the covariance structure. By obtaining comparative information from models that increasingly relax assumptions on the covariance structure, judgments can be made about the statistical validity of the inferences made. Evaluation of level-1 and -3 sources of variability are treated as potential "nuisance" issues. The goal is to determine if a parsimonious two-level design is statistically justified, as it provides for a clearer interpretation of the results.

After providing results from the empty model evaluation, analysis proceeds to sequentially evaluate explanatory fixed-effect variables: market-area variables, economic performance variables and, hospital control variables that are consider as essential process factors with wide ranging effects (i.e., case-mix and size). Finally, any of the "other" hospital variables that are found to be informative (e.g., improve the model fit) are reported. This last stage in the model building process is offered as *ad hoc* analysis for guiding future research—as stylized facts not anticipated by the market enterprise model. The significance and change in the random effects will also be reported at each stage in terms of explained variance.

Assessing the Appropriate Model for the Covariance Structure

Since the HLM approach provides estimates of the covariance structure of nested data, analysis allows not only for inference about hypothesized effects, but also for addressing troublesome homogeneity of variance issues. The covariance structure in this study can be assessed across the three levels, each of which needs to be accounted for, but for different reasons.

As discussed in the last section, the degree of heterogeneity at the hospital-level is of theoretical importance, and initially subjected to empirical testing to answer [H1b]. Analysis tests whether the quality indicators, developed in the measurement model phase, evidence a significant hospital-specific effect when subjected to a repeated measures design that estimates the random-effect as deviations from a mean growth curve. The significance of this between-hospital variance component continues to be critical in all subsequent tests of the proposed hypothesis as variance to be explained.

Though subsequent hypothesis testing focuses on the significance of the explanatory relationship and the degree to which the hospital variance component can be explained, statistical analysis also addresses concerns for the adequacy of the covariance structure modeled for the repeated measures at level-1 and the market-area sampling frame at level-3. The statistical concerns for an adequate model of the covariance structure relate to whether the standard errors used for inferences are estimated with the appropriate statistical assumptions. Attention will first be directed to the homogeneity of variance issues that have been central to methodological advancements achieved in repeated measures designs via variance component analysis (Davis, 2002).

Although the HLM approach can model and test complex covariance structures for the level-1 variance of repeated measures, recommendations for designs with four or less repeated measures has generally been to keep the covariance structure relatively simple (Bryk and Raudenbaush, 1992; Hox, 2002; Snijders and Bosker, 2000). For short times series, a linear growth-curve design, as represented in equations (4.44) and (4.5), is practical in longitudinal research. The linear growth-curve design models a random intercept (u_{0jk}) (i.e., initial status between-hospital variance in this study) and a random linear growth term ($u_{1jk}Time(t-t_0)$) as trajectory parameters. The design assumes independent errors with constant variance. The caveat to taking such a practical approach with relatively sparse repeated measures is requisite testing of the homogeneity assumption for level-1 errors. The test used is based on estimation of the standardized measure of dispersion for between-subject units (Bartlett & Kendall, 1946; Bryk & Raudenbush, 1992). If test results point to a rejection of the homogeneity of variance assumption, more complex covariance structure models will be pursued. More complex model fitting for the covariance structure comes at a cost, however (Davis, 2002).

The statistical issue regarding the market-area variance component at level-3 also addresses potential problems for assumed homogeneity, but is conceptually a bit thornier. It is the elusive nature of the market enterprise model that, despite economic performance being conditioned on market structure, the effect of market-forces is solely conditioned on decentralized assumptions about the interaction of agents competing within the market. As the market-area covariates can be effectively represented as either within-subject repeated measures, or as between-subject hospital fixed-effects (the central unit of analysis in this study), no level-3 fixed-effect estimates are needed for testing the theory based hypotheses. Such “disaggregated” analytic treatment of repeated measures (framed by a nested sampling factor higher than the dependent variable) is common in economic panel studies (Dempster, et al. 1981).

Such treatment ignores the statistical problem that can occur with unspecified dependencies associated with sample clustering, however. It is not credible to make the standard statistical assumption of homoscedasticity: that residual variance is constant and does not depend on any number of unspecified factors that can differentiate the market-areas sampled (Snijders and Bosker, 200).

The statistical issue of the market-area variance is handled in this study as a “nuisance” effect. It is clearly best treated as such in this study, because the small market-area sample size (n=7) provides insufficient power for inference about fixed-effects, even if theoretically relevant. Initial analysis will compare models with, and without a level-3 variance component. Knowing the relative impact of the market-area variance component on the random-effect for hospital-specific performance estimates will help determine if it is necessary to estimate the level-3 variance component parameter in the sequential model building process. If the level-3 "nuisance" effect is small, as anticipated given the sample size, this allows for analysis to proceed with a simpler two-level model. The general two-level model reduces to:

$$Y_{tj} = \beta_{00} + \beta_{10}Time(t - t_0)_{tj} + \beta_{p0}X_{ptj} + \beta_{pq}Z_{qj} + (u_{0j} + u_{1j}Time(t - t_0) + e_{tj})$$

(4.66)

The empty form of the linear growth-curve model of (4.6) is used as a comparative workhorse in the evaluation of both the hypothesized and nuisance effects. The empty model estimates the hospital-specific and temporal effects without any explanatory terms, and is simply:

$$Y_{tj} = \beta_{00} + \beta_{10}Time(t - t_0)_{tj} + (u_{0j} + u_{1j}Time(t - t_0) + e_{tj}) \quad (4.77)$$

The level-2 empty form is compared against more complex empty model forms of equations (4.4) and (4.5) as a means to assess the potential "nuisance" effects and determine the appropriate model for the covariance structure. Estimation provided by more complex model forms for the covariance matrix parameters of σ^2 and ω_0^2 at level-1 and level-3, respectively, will be compared to results obtained in equation (4.7). Comparative assessment of the variance components estimated provides the information necessary to choose the most appropriate covariance structure. The objective in testing for these "nuisance" effects is to allow for choosing the simplest model that provides unbiased inferences.

Joint evaluation of the two hospital-specific random-effects ($u_{0j} + u_{1j}Time(t-t_0)$) in equation (4.7) is also used to judge hypothesis [H1b] that attends to the adequacy of the measurement model. Estimation of the fixed-effect for the time function ($\beta_{10}Time(t-t_0)_{tj}$) provides the mean growth rate and is used to accept or reject the trending effect hypothesis [H2a].

Predictive Models Tested

The predictive models employed to examine the hypothesized insufficiency of the market enterprise model to explain hospital quality performance is dependent both on the results achieved from the preliminary measurement model development, and on the rejection of the null hypotheses for [H1a] and [H1b]. Given that the measurement models for the Errors and Mortality performance indicators are adequate, each latent dependent variable will be separately evaluated in the following predictive models.

Research question 2: Is there evidence of any trend in hospital quality performance, and do factors central to the market enterprise model and market reform account for hospital-specific performance trajectories?

While quality improvement can be attributed to many causes, the theoretical implication addressed in Research Question 2 is that the profound changes wrought by market reform and increased reliance on governance via market mechanisms can be viewed as a natural experiment. The market model would suggest that more efficient outcomes would accompany the governance and ideological changes in health services delivery. The associated promise of efficiency will be evident as raising the competitive bar on quality.

First, the trend in hospital performance is examined. Hypothesis [H2a] tests whether quality is improving, as the current era of market reform had already begun and continued through the years of study. The predictive model uses the empty model form given in equation (4.7).

Hypothesis [H2a] assesses the estimates for β_{10}. If the 95% CI range for the randomly varying Time coefficient is negative, the null hypothesis can be rejected, as adverse quality events would evidence a decreasing trend. This initial model (4.7) will be used as the empty model for which subsequent explained variance comparisons can be made. The adequacy of the linear growth-curve design assumptions regarding the covariance structure of the repeated measures will be assessed: 1) by testing for homogeneity of level-1 variance and 2) though comparative tests with simple compound symmetry, first-order autoregressive, and fully heterogeneous models. The correlation between hospital performance deviations at initial status and hospital quality growth-curve slopes, as estimated by τ_{01}, can also be evaluated by the empty model.

Comparison of the empty model (4.7) to one that includes a market-area random effect will also be reported. The model comparison allows for assessing the significance of any the "nuisance" effect attributable to market-area sample clusters. If ω_0^2 is significant for the empty model, the parameter will be estimated in subsequent predictive models to control for bias.

The second model assesses hypothesis [H2b], and examines the relationship between market-structure and competition on the quality performance growth-curve, controlling for ownership as a critical market incentive. The predictive model considers the following relationships:

$$Y_{tj} = \beta_{00} + \beta_{10}Time(t-t_0)_{tj} + \beta_{20}\text{MCOpower}_{tj} + \beta_{30}\text{WageNdx}_{tj} + \beta_{01}HHI_j + \beta_{11}HHI_j + \beta_{02}\text{ForProfit} + (U_{0j} + U_{1j}Time(t-t_0) + e_{tjk})$$

(4.88)

Significant explanatory effects estimated by equation (4.88) are expected to be related to reductions in the hospital-specific variance component that captures variation in the performance trajectories, jointly assessed by the random initial status intercept term and the random slope for the Time function, e.g., the growth rates. Alternatively, a significant reduction in the residual variance of the repeated measures (level-1) would be considered as somewhat anomalous, as it would require interpretation of the market factors accounting for measurement error. Interpretation of how market factors impact hospital performance is naturally estimated as aggregate mean fixed-effects, per conventional econometric assumptions.

Estimates of $\beta_{01}HHI_j$ and $\beta_{11}HHI_j$ give the relational effects of competition on, the initial performance status, and the growth rate of quality performance, respectively. Negative coefficients would support the position that initial hospital quality and/or its improvement is associated with higher market competition, when hospital governance, relative market pricing, and MCO market power are controlled for.

Hospital governance is viewed as a critical hospital characteristic, in that for-profit organizations are usually taken as the superior decentralized form in market efficient explanations, and as the organizational form that has increasingly been implemented in this era of market reform. A negative coefficient would bolster the premise that healthcare improves when supply-side competitors are free to maximize their material self-interest; by evidencing for-profit hospitals have a higher incentive to reduce adverse inpatient events, when other market factors are controlled for. Market relative prices and the demand-side factor of MCO market power are material-resource environmental factors that need to be taken into account.

Positive findings for [H2b] would support the contention that the anticipated positive trend in quality performance needs to be addressed from a macro governance perspective as welfare benefit achieved from freeing incentives through market reform, as well as through lower level processes, such as intellectual and professional development—conceived here as motivated by economic self-interest.

Research Question 3: Are equilibrating pricing mechanisms in the material-resource environment determinant of quality outcomes?

The hypotheses to be tested under the material-resource focus of Research Question 3 do not assume any significant growth rate effect, but will continue to fit the growth curve as a control variable for temporal variation. While the study period represents over 3 million inpatient discharge transactions, and while market forces are usually assumed to produce a fairly optimal stable point in a reasonably short equilibrating timeframe, the four observation points in this panel may be insufficient to detect the institutional trends associated with market reform and increased market governance. Thus, additional model fitting of the data that test more static theoretical constructs is also undertaken.

This rather static material-resource focus is not dependent on any cumulative social welfare benefit achieved by market reform, and simply tests whether a dependent relation exists between pricing and the assumed value that can be given to quality outcomes. Both sides of the economic equation for equilibrating maximization—demand-side utility and supply-side profits—will be looked at.

Testing the effectiveness of demand-side pricing reasons that "we get what we pay for." That is, there should be value for the dollar, at least relative to the strength of existing market factors. The value of the dollar is treated as substitutable in an efficient market and as a sufficient measure of "things," in that market dynamics are framed by an *external locus of control* conferred on the material-resource environment. Hypothesis [H3a] examines whether demand-side pricing mechanisms are determinant of hospital quality performance, where demand-side costs are measured by hospital revenues (RevAdjDay). The basic model for testing [H3a] is:

$$Y_{tj} = \beta_{00} + \beta_{10}Time(t-t_0)_{tj} + \beta_{20}\text{RevAdjDay}_{\text{tj}} + \beta_{01}\text{MCOpower}_j + \beta_{02}\text{MedComp}_j + \beta_{02}\text{HighComp}_j + \beta_{21}(\text{WageNdx}_j * \text{RevAdjDay}_{\text{tj}}) + (u_{0j} + u_{1j}Time(t-t_0) + e_{tj})$$

(4.99)

Market-area covariates are included as controls in equation (4.99), but as between-subject variables in this case. Market competition is treated categorically here, and determined by whether a hospital faces high (HighComp) or medium (MedComp) competitive intensity, with hospitals in low competitive market-areas (primarily rural) defaulted to the intercept. The wage index variable is used as a cross-level interaction term to control for the relative market pricing influence on hospital revenues. This is achieved by treating RevAdjDay as a non-random variable in the level-2 structural equation (Bryk & Raudenbush, 1992).

Interpretation will focus on the predictive strength of β_{20}, the fixed-effect estimated for the adjusted inpatient revenue per day (RevAdjDay). The tested market assumption is that a significant negative relationship will exist between the average patient revenue and adverse inpatient events—that quality costs more. The between-subject market covariates of MCO power and hospital competition (HighComp and MedComp) are used as market-structure controls, and the market-area wage index is used to adjust hospital revenues relative to market-area pricing.

As discussed earlier, additional analysis will sequentially evaluate the impact of adding relevant between-subject variables, as institutional and economic controls, to the base model given by (4.99). First, the production characteristics that account for the relevant hospital transfers, size, and case-mix will be added as essential process control variables. These are well known factors affecting the firm's black-box outputs, and thus not necessarily a hazard to assumed market efficiency in the long run. Yet, these essential organization factors, in the actual "play of the game," may well be empirically interesting, and lead to either a better understanding of the economic hazards faced, which further market reform may yet correct, or to a better understanding of how market enterprise logic can only hazard a "loose coupling" with health delivery task environment outcomes.

The flip side of using demand-side patient revenues to account for quality performance is to apply the supply-side production function as predictive of outputs, which is the test posed by [H3b]. Flipping the economic equation is pretty much a matter of decomposing revenues into fundamental production expense categories (labor, nonlabor and capital costs), with one important caveat. The caveat to a simple decomposition is that revenues do not necessarily equal expenses at the hospital-specific level.[27] The critical difference is in retained earnings, which can take the form of gains or losses. Whether retained organizational earnings has an optimistic and optimizing equilibrium point in "free markets," or not, is a fundamental debate between mainstream and institutional schools of economics. The model used to test [H3b] is:

$$Y_{tj} = \beta_{00} + \beta_{10}\mathrm{Time}(t-t_0)_{tj} + \beta_{20}\mathrm{LaborAdj_{tj}} + \beta_{30}\mathrm{NonLabAdj_{tj}} + \beta_{40}\mathrm{CapAdj_{tj}} + \beta_{50}\mathrm{Opincom_{tj}} + \beta_{21}(\mathrm{WageNdx}_j * \mathrm{LaborAdj_{tj}}) + \beta_{01}\mathrm{MCOpower}_j + \beta_{02}\mathrm{HHI}_j + (u_{0j} + u_{1j}\mathrm{Time}(t-t_0) + e_{tj})$$
(4.1010)

Estimates for β_{20}, β_{30}, and β_{40}, which provide the effects for adjusted labor, non-labor, and capital expenses, respectively, can be tested jointly and individually. Like revenues, the joint effect and at least one of the expense components is expected to

[27] When econometric market averaging is applied, revenues do tend to approximate expenses given an average profit margin.

significantly relate to adverse patient outcomes in an inverse manner, again giving evidence to better outcomes cost more.

Interpreting the estimated effect for operating income, β_{50}, is considered to be little more complex. In the base model (4.1010), operating income is considered as an approximated effect and control. Adding a dummy variable, PoorIncome, as a spline function (Snijders and Bosker, 2000) to separate the effect of hospitals in poor financial condition and more successful market organizations, is believed to give a better estimate for the suspected non-linear effect of operating income on quality performance (Fleming, 1991). The cross-level interactive coefficient for PoorIncome (defined as averaging $10 or less per patient day in operating income over the four years) is expected to be positively associated with adverse patient events. The subsequent fixed-effect for OpIncome is then expected to have an even stronger negative association with poor outcomes, as it would evidence an entrepreneurial cost for quality.

Finally, *ad hoc* analysis will evaluate all relevant organizational factors that might better define the relationship between quality performance and the material-resources of organizations. This *ad hoc* analysis will examine revenue sensitive factors listed as hospital economic performance variables in Table 1 (i.e., OutPtProp, GovPart, ComPart, CharityPart, NonPtRevProp, etc.), and structure and process factors listed as Hospital Structure variables in Table 1 (i.e., system affiliation, ALOS, staffed-bed occupancy, etc.). Results of this *ad hoc* analysis will be presented in the form of a "best fit" model that continues to estimate pricing and market factors accounted for in equations (4.99) and (4.1010). The findings are intended and reported as potential stylized facts that may warrant further research.

Research question 4: Are expected optimizing demand-side responses, taken as preferences for better quality outcomes, rationally related to hospital economic performance?

The final predictive model will test the market logic that firms will be selectively rewarded by demand-side choices for outcome efficiencies achieved. That is, hypothesis [H4] premises better quality outcomes will be predictive of subsequent improvement in a hospital's market fitness as measured by gains in operating margins. This prediction is evaluated with lagged quality performance measures as determinant of hospital operating margins the subsequent year, when the previous year's operating margin is controlled for. The base model for [H4] is:

$$\begin{aligned}\text{OpMargin}_{tj} = \beta_{00} + \beta_{10}\text{Time}(t-t_0)_{tj} + \beta_{20}\text{Errors}_{t-1j} + \beta_{30}\text{Mort}_{t-1j} + \beta_{40}\text{OpMargin}_{t-1j} + \\ (u_{0jk} + u_{1jk}Time(t-t_0) + e_{tj})\end{aligned} \tag{4.1111}$$

where: t-1j represents the lagged value of the prior year's hospital measure.

Estimates of the quality outcome coefficients, β_{20} and β_{30}, can be tested jointly and individually. Market dynamics would predict an inverse relationship between improved material-resource hospital fitness and adverse patient events in the prior year. This expected welfare relationship between consumer utility and producer maximization is central to any notion of market selection rationality and market efficiency.

Summary

This chapter presented on the research design and included discussion on data sources, variable measurement, and analytic approaches employed in the study. HLM techniques are used to model the repeated measures design to determine the relevance of the market enterprise model in accounting for the relationships that exists between financial performance, market-structure and hospital quality performance.

Two databases, an annual inpatient discharge dataset and an annual financial and operational performance survey, are used to construct repeated measures for the data analyzed. The inpatient data is used to develop and test a measurement model for hospital quality performance as an initial design step. Results developed to measure hospital quality performance are merged with the financial and operational data and cover the years from 1998 to 2002.

The two latent variable quality indicators, Mortality and Errors, were selected as measures for hospital quality performance. The two QIs were derived from 3 PSIs developed by AHRQ and a global hospital mortality rate developed by the author. Factor analytic techniques were used to develop the latent variable quality performance measures.

Analysis is aided by HLM techniques that allow for estimation of the variation components of the hierarchical data structure. The linear growth-curve design treated the repeated observations as nested within-subject variables that can be explained by between-subject hospital variables. HLM analytic techniques, additionally, allow for estimating and testing the significance of market-area sampling effects, which can credibly violate the usual statistical assumption of homoscedasticity when estimates of market fixed-effects are treated as subject variables at the organizational level (e.g., the primary unit of analysis).

The study takes a model-based approach by applying the analytic flexibility of the HLM techniques for testing the theoretical hypotheses. The approach taken allows for the assessment of, and appropriate model fitting corrections for issues of heterogeneity, which can be anticipated in any longitudinal study of nested data structures.

Chapter 5 presents the results of this model-based analytic approach. Chapter 6 discusses the study findings along with their implications, limitations, and applicability to future research.

CHAPTER 5—RESULTS

The empirical results of the study are presented in this chapter. The first section presents descriptive statistics. This initial section includes comparison between the Virginia sample characteristics and a national hospital population, as well as providing descriptive results of the organizational variables of interest. Next, results obtained from the HLM methodological approach utilized in the research design are reported. Results for the quality measurement model are given and then the results from the linear growth-curve design applied to assess the relationships between economic performance and market structure with quality performance are reported.

Virginia Sample Hospitals with AHA National Survey Comparisons

Comparisons between the AHA national survey and the Virginia hospital sample are given in Table 3. The national sample, like the study sample, included hospitals with at least 1,200 annual admissions that were short term, general, nonfederal hospitals. Structural characteristics for the proportion of hospitals operating within a system and the proportion of for-profit hospitals are presented only for year 2000, as the change across years was small.[28] The national data showed a slight and insignificant trend in the

[28] Two Virginia hospitals converted to for-profit status in 1999, and were treated as time-invariant for the study. System membership did not change across the study years

Table 33. Comparison of the Virginia Study Sample and the AHA National Survey

		Virginia Study Sample			AHA National Survey			
Year	Variable	Mean	Std. Error	Std. Deviation	Mean	Std. Error	Std. Deviation	t or Chi-square value
1998	Admissions	8956	954.82	8379	8540	151.14	8125	0.43
	Patient Days	43744	5167.91	45348	43279	874.32	47002	0.09
	Federal Gov. Participation (%)	64	1.29	11	64	0.27	14	-0.08
1999	Admissions	9137	977.07	8574	8816	156	8520	0.33
	Patient Days	44665	5271.62	46258	44265	889.67	48591	0.08
	Federal Gov. Participation (%)	64	1.29	11	65	0.35	19	-0.21
2000	Admissions	9289	990.08	8688	8977	158.39	8726	0.31
	Patient Days	45377	5373.34	47151	44470	895.19	49317	0.17
	Federal Gov. Participation (%)	64	1.24	11	68	0.39	21	-3.44 **
	For-Profit	24%			17%			1.495
	System	49%			50%			0.108
2001	Admissions	9481	1012.24	8882	9254	164.33	8989	0.22
	Patient Days	46227	5481.37	48099	45364	911.98	49884	0.16
	Federal Gov. Participation (%)	64	1.26	11	67	0.24	13	-2.63 *

$^{**}p < .000$, $^{*}p < .05$

growth of for-profit ownership, moving from 16.4% of the sample in 1998 to 16.8% in 2001, and had a high of 17% in year 2000

The percentage of patient days accounted for by Medicare and Medicaid patients showed no difference between the two populations for the first two years, but did differ on the last two years. Federal government participation in the national sample did evidence a significant increase in the last two years, however, from 65% in 1999 to 68% and 67% in 2000 and 2001, respectively. On inspection of the AHA data, the shift appeared to primarily result from an increase in the number of hospitals reporting near or above 100% of their patient days as Medicare or Medicaid patient days, suggesting possible measurement error bias. Differences on hospitals matched across the two datasets were observed, which speaks to measurement instrument bias. For two of the four years, matching hospital data on federal government participation was significantly higher for the AHA observations.

Hospital size characteristics, as measured by admissions and patient days, were similar between the two populations, each showing a slight increasing trend. The Virginia hospital sample was taken to be representative of the nation sample.

Descriptive Analysis

The longitudinal data is taken to represent a nested data structure, and the hierarchical framework is used to assess the degree to which the market efficient thesis applies to hospital quality performance. Descriptive statistics are first presented on the annual observations for the time-varying measures modeled at level-1. Next, descriptive statistics for hospital characteristics treated as time-invariant, or between-subject variables are presented. Though the three market factor variables are sampled across geographic areas, the market-area variables are treated either as "disaggregate" between-subject hospital characteristics, or as time-varying level-1 variables. Statistics at the market-area sampling level are presented for reference.

The longitudinal design of repeated annual observations strengthens assessment of the hypothesized relationships by providing for evaluation of trends as well as associations between the variables of interest. The panel research also benefits by controlling for transient spurious factors of association that occur with a single annual observation.

The yearly log-odds residual output from the risk-adjustment models provide the hospital-specific quality performance measures. The multilevel logistic regression analysis estimates this level-2 variance with an empirical Baysian approach that adjusts the performance ranking by reliability factor that accounts for the patient sample size at level-1.

Since the estimates for the annual hospital-specific effect are standardized as log-odd residuals from the expected mean, variance across years is preserved by calculating an observed to expected ratio from each year's risk-adjusted hospital rate and the expected four-year Virginia population risk-adjusted rate. Similar to the odds estimates, the ratio value is standardized to the state-adjusted expected population rate, and thus has an expected value of 1.0 based on the actual patient population for the four years. Values higher than 1.0 reflect a greater than expected number of hospital adverse events, and lower values indicate better than expected performance. The two latent QI variables, Mortality and Errors, are a weighted index averages based on factor components scores from the factor analysis results, as previously discussed.

The latent Errors variable did not represent a normal distribution, with the samples taken in 1998 and 2001 having Kolmogorov-Smirnov statistics of 1.8 and 1.38 ($p < .05$), respectively. A natural log transformation produced approximately univariate normal distributions ($p > .10$ for all years). Histograms of the complete four year sample for the Errors QI measure and the log transformed measure are provided in Figure 3. The

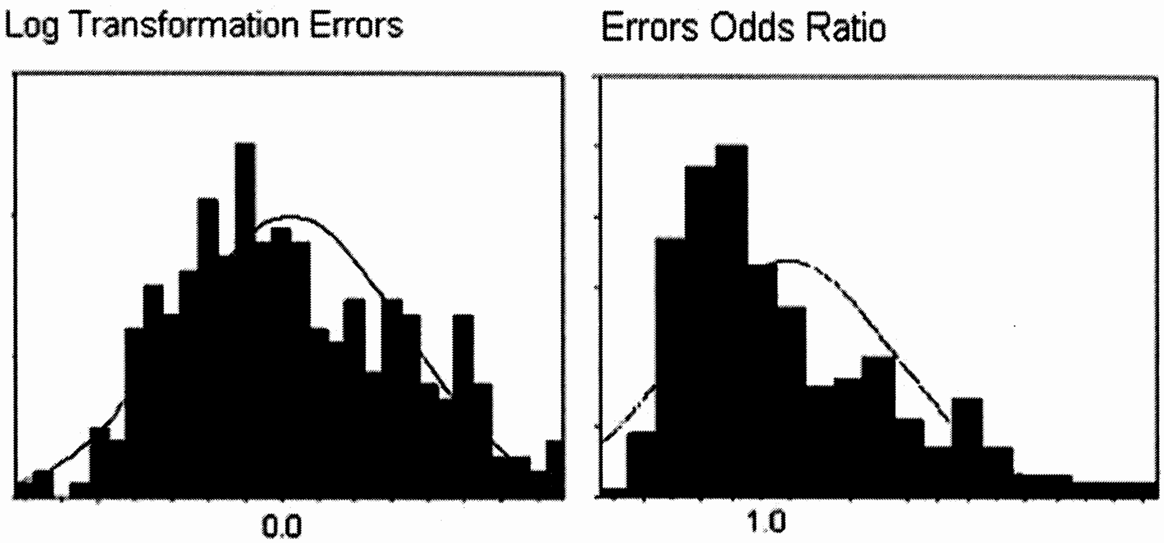

Figure 33. Histograms for the Errors QI and the Log Transformation of Errors

Kolmogorov-Smirnov statistic for the complete sample improved from .125 to .069 (n=308) with the transformation. The log transformation preserves the centering of the expected state population value, transforming the expected odds ratio value of 1.0 to a log-odds value of zero (as was the case for the yearly log-odds risk-adjusted residual output).

Trend and variable distribution information for hospital quality outcomes and related APR-DRG risk-adjustment factors are presented in Table 4. The latent Mortality measure shows a good deal of between year variability, bouncing up and down from a average low of around 1.00 in year 2000, to a high of 1.05 in 1999. The global inpatient mortality component of this latent variable is similarly variable with both the hospital averages and the total state rates bouncing up and down (though not in perfect unison).

Table 44. Hospital Quality Performance and Risk-Adjusted Patient Factors (n=77)

Variable	Label	1998	1999	2000	2001	All Years
Risk-Adjusted Odds Hospital Mortality QI	Mortality QI	1.01 (0.21)	1.05 (0.22)	1.00 (0.30)	1.04 (0.22)	1.03 (0.23)
Patients Transferred Out of the Mortality Population (%)	TransM	4.01 (2.46)	4.08 (2.67)	4.54 (3.62)	4.25 (2.88)	4.22 (2.97)
APR-DRG Risk-of-Mortality Relative Weight		1.12 (0.32)	1.16 (0.36)	1.13 (0.32)	1.15 (0.35)	1.14 (0.34)
Hospital In-patient Mortality (%)		2.82 (0.96)	2.89 (1.07)	2.85 (1.16)	2.86 (1.13)	2.86 (1.08)
State Mortality Rate (%)		2.54	2.55	2.50	2.57	2.54
State In-hospital Mortality Pop.		764460	775980	793046	808446	3141932
Hospital Failure to Rescue (%)		14.77 (4.71)	15.01 (4.61)	14.15 (5.10)	14.37 (4.12)	14.58 (4.64)
State Failure to Rescue Rate (%)		15.57	15.11	14.06	14.57	14.80
State Failure to Rescue Population		18422	19678	20993	22614	81707
Risk-Adjusted Odds Hospital Error QI	Errors	1.13 (0.49)	1.09 (0.40)	1.11 (0.45)	1.12 (0.47)	1.11 (0.45)
Risk-Adjusted Log-Odds Hospital Error QI	Errors QI	0.04 (0.42)	0.02 (0.34)	0.03 (0.39)	0.03 (0.39)	0.03 (0.38)
Patients Transferred Out of the Errors Population (%)	TransE	4.18 (2.56)	4.21 (2.75)	4.47 (2.86)	4.44 (2.99)	4.33 (2.78)
Hospital Infection Due to Medical Care (%)		0.15 (0.13)	0.16 (0.12)	0.18 (0.14)	0.17 (0.14)	0.16 (0.13)
State Infection Due to Medical Care (%)		0.20 601679	0.19 611379	0.22 622786	0.21 632005	0.21 2467849
Hospital Accidental Puncture or Laceration (%)		0.24 (0.18)	0.24 (0.17)	0.25 (0.18)	0.27 (0.19)	0.25 (0.18)
State Accidental Puncture or Laceration (%)		0.31 586564	0.32 596013	0.33 605800	0.37 616094	0.33 2404471
APR-DRG Severity Index	Case-mix	1.06 (0.20)	1.07 (0.21)	1.08 (0.21)	1.09 (0.21)	1.08 (0.21)

Note: Standard deviation in parentheses below the mean

As with all the QIs, the at-risk population for in-patient mortality grew at a steady pace over the four years.

The hospital mean log-odds and the unadjusted state rate for the Failure to Rescue component also bounced around a bit, but there does appear to be a somewhat decreasing trend over the four years. The highest state rate for Failure to Rescue events occurs in 1998 (15.51%), with the lowest rate (13.96%) occurring in year 2000.

Both relevant control factors for adverse mortality events were slightly increasing over the study time. The APR-DRG risk-of-mortality relative weight, the patient acuity factor used in mortality risk-adjustment, had a low of 1.12 in 1998 and a high of 1.16 in 1999. The case proportion of patients transferred out to other hospitals also had a slight increasing trend from a low of 4.01 percent in the initial year. Though transferred patients were excluded from the population in analysis, the measure is still viewed as an important control variable in hospital performance.

The Errors odds ratio QI had a four year average of 1.09 and the log transformed four year average was at 0.031. Neither the odds nor the log-odds risk-adjusted measures revealed a clear trend. The lowest hospital average was observed in 1999 (odds at 1.09). That the first year had the highest average rate (odds of 1.13) is suggestive of a slightly decreasing trend. The Infection Due to Medical Care component of this quality factor showed a slight increasing, unadjusted trend for the yearly hospital averages, from a low of 0.15% in 1998 to a high of 0.18% in year 2000. The unadjusted state rate also revealed a slight increasing trend from a 1999 low of 0.19% to a high of 0.22% in year 2000. The Accidental Puncture or Laceration PSI also had a general increasing, unadjusted pattern from 0.24% in 1998 to 0.27% in year 2001. The unadjusted state rate pattern was similar, ranging from 0.31% in 1998 to 0.37% in 2001.

The severity index relative weight was used both as a patient-level risk-adjustment factor in the development of the Errors QI and as the aggregate hospital case-mix control variable. It had a slight if steady increasing trend, from 1.06 in the initial year to 1.09 in the fourth year, 2001. The percentage of patients in the Errors QI population transferred out ranged from a low of 4.18% in 1998 to a high of 4.47% in year 2000.

Table 5 provides descriptive statistics of hospital economic performance variables over the years studied. Both revenue and expense variables are given in the standard form of dollars per case-mix adjusted day, and show an increasing trend over the four years. Outpatient revenue as a proportion of total hospital revenue (OutPtProp) and bad debt as a percentage of total revenue (BadDebt%) also show an increasing trend effect. Funding participation by payer types is very consisted across the four years.

Table 5 also reveals a decreasing trend for the average operating income per adjusted day (OpIncomeAdj) and for the mean hospital operating margin (OpMargin). Further analysis of the measures showed that about 20 percent of the hospitals operate in the red each year.

Table 6 presents the descriptive statistics for hospital characteristics that were considered to be relevant process variables that could directly or indirectly effect hospital quality performance. The averages for the two hospital operating efficiency measures staffed bed occupancy (SBocc) and the adjusted length of stay (ALOS) demonstrate mixed trends. After improving a couple of points in the second year, staffed bed occupancy rates drop a bit in the last two years. In contrast, the average hospital length of stay shows a steady decline from 4.68 to 4.54 days over the four years.

Table 55. Hospital Economic Performance (n=77 per year)

Variable	Label	1998	1999	2000	2001	All Years
Revenue per Case-mix Adjusted Day	RevAdjDay	1200 (210)	1228 (213)	1276 (221)	1339 (229)	1261 (223)
Proportion of Outpatient Revenue to Total Patient Revenue	OutPtProp	40.67 (9.65)	41.88 (9.81)	43.41 (10.1)	44.70 (10.1)	42.68 (10.0)
Participation in Medicare & Medicaid as a Percentage of Inpatient Revenue	GovPart	64.28 (11.3)	64.24 (11.3)	63.70 (10.9)	64.07 (11.08)	64.07 (11.09)
Participation in Commercial Funding as a Percentage of Inpatient Revenue	ComPart	27.13 (11.6)	27.78 (11.5)	28.14 (11.3)	27.87 (11.4)	27.73 (11.4)
Participation in Other Patient Funding as a Percentage of Inpatient Revenue	OtherPart	8.59 (5.64)	7.98 (4.37)	8.16 (4.68)	8.06 (4.61)	8.20 (4.83)
Participation in charity care	CharityPart	3.34 (1.75)	3.09 (1.64)	3.11 (1.87)	3.52 (2.46)	3.27 (2.00)
Non-patient Revenues as a Proportion of Total Revenues	NonPtRevProp	4.44 (3.71)	4.53 (3.71)	4.06 (3.52)	2.67 (3.40)	3.92 (3.65)
Total Operating Expense per Case-mix Adjusted Day	TOEadj	1006 (169)	1031 (181)	1066 (187)	1110 (192)	1053 (186)
Labor Expense per Case-mix Adjusted Day	LaborAdj	520 (105)	531 (112)	554 (115)	581 (118)	547 (115)
Non-labor Expense per Case-mix Adjusted Day	NonLabAdj	373 (73.7)	386 (80.1)	396 (86.4)	415 (95.6)	393 (95.6)
Capital Costs per Case-mix Adjusted Day	CapCostAdj	99 (42.3)	100 (42.9)	104 (45.9)	101 (42.0)	101 (42.3)
Bad debt as a Percentage of Total Revenue	BadDebt%	5.95 (2.27)	6.54 (3.17)	6.92 (2.74)	7.35 (2.98)	6.69 (2.85)
Operating Income per Adjusted Day (total revenue in excess of TOE)	OpIncomeAdj	98 (139)	88 (135)	81 (119)	73 (141)	85 (133)
Operating Margin (not adjusted for depreciation)	OpMargin	8.50 (8.20)	8.21 (6.83)	8.25 (6.17)	8.10 (6.58)	8.27 (7.00)

Note: Standard deviation in parentheses below the mean

Table 66. Dynamic Hospital and Market Characteristics (n=77 per year)

Variable	Label	1997	1998	1999	2000	All Years
Dynamic Hospital Characteristics						
Staffed Bed Occupancy (%)	SBocc	63.93 (18.2)	66.08 (18.0)	65.83 (18.4)	64.98 (20.0)	65.15 (18.60)
Length of Stay per Adjusted Admission	ALOS	4.68 (0.84)	4.64 (0.67)	4.59 (0.64)	4.54 (0.66)	4.61 (0.71)
RN staffing level per 1,000 adjusted patient days	RNadjDay	3.31 (0.88)	3.24 (0.85)	3.18 (0.75)	3.12 (0.76)	3.21 (0.811)
Clinical staff per 1,000 adjusted patient days	ClinicFTE	5.03 (1.48)	4.94 (1.28)	4.78 (1.16)	4.70 (1.18)	4.86 (1.28)
Natural Log of Patient Days	Size	10.25 (0.93)	10.27 (0.94)	10.27 (0.97)	10.28 (0.98)	10.27 (0.95)
Quartile Rank for Newborn Discharges (values 0-3)	NB_Quartile	1.28 (1.14)	1.35 (1.18)	1.35 (1.20)	1.23 (1.12)	1.30 (1.16)
Market Dynamic Variables						
Demand-side Purchasing Leverage of the largest MCO (% of Revenue)	MCOpower	13.16 (1.02)	14.25 (2.09)	15.31 (1.62)	15.08 (1.59)	14.45 (1.83)
CMS Wage Index for the Geographical Area	WageNdx	0.93 (0.07)	0.94 (0.07)	0.95 (0.06)	0.95 (0.06)	0.94 (0.07)

Note: Standard deviation in parentheses below the mean

Both the staffing level measures (RNadjDAy and ClinicFTE) show FTEs per 1,000 adjusted patient days to be decreasing over time. The clinical staff variable includes aides, staff physicians, physician assistants and registered licensed nurses.

The time-varying Size variable, measured as the natural log of hospital patient days, demonstrates growth in the average hospital size as well as increased variability over the study years. Since only 23 hospitals had no or only a few newborn deliveries, the measure for participation in the new born product line was taken as quartile ranks, with the lower quartile representing zero newborn discharges.

Longitudinal analysis allows for these time-varying characteristics to alternatively be treated as time-invariant aggregates by averaging over the repeated measures. When treated as aggregate means the measures become between- subject variables or level-2 hospital controls. A few of the time-varying hospital characteristics were handled as between-subject variables in some models, and are discussed below.

Table 6 also provides the time varying "disaggregated" market-area variables framed at the hospital-level, as environmental characteristics faced by each hospital. Only the largest heath plan, Blue Cross Blue Shield, demonstrated any significant purchasing power in Virginia. The share of hospital revenue for this health plan represents two franchise organizes, one in northern Virginia and one covering the rest of the state. The revenue share of the Blue Cross Blue Shield plan increased its market share from 13% to 15% over the study years. The second largest MCO never achieved more than 4% in a given year, and was not present in all market areas, so only the revenue share of the largest plan was used as a proxy for MCO purchasing power (MCOpower).

CMS's hospital wage index variable was included as a resource control variable for cost of living differentials between the seven market areas. The wage index demonstrated a small increasing trend in the hospital averages.

There are just seven Virginia market areas defined in the study. Six of these market-area designations were geographic areas where a cross-match existed between the CMS designated metropolitan statistical area and a corresponding Virginia Commonwealth health planning area (HPA). The seventh market-area constituted hospitals that did not produce a cross-match and were deemed as rural in both the CMS and VHI databases. Effectively the latter market area designation resulted in distinguishing rural hospitals that were not within twenty-one miles of any other Virginia hospital.

The descriptive statistics for the time invariant between-subject variables are presented in Table 7. As noted above, the proportion of for-profit hospitals and hospitals owned by a vertical hospital system did not significantly differ from the national AHA sample. The sole for-profit hospital system (System1) had the largest number of hospitals (n=10), and represented a majority of the for-profit hospitals (n=13). The other four multi-hospital systems operating in Virginia had between four and six hospitals each. About a third of the hospitals in Virginia are considered to be financially vulnerable since, on an average annual basis, they operate close to or below the break even point (averaging $10 or less of operating income per adjusted patient day).

Four year averages for size and case-mix were also employed as between-subject hospital attributes and included as essential controls in some explanatory models. The aggregate variables for the log of the average daily census (ADC) and the average case-mix (Case-MixAvg) provide contextual attributes that give clear interpretation of time invariant hospital effects.

Between-subject market attribute variables are also present in Table 7. Hospital-level measures for MCO purchasing power and the wage index were taken as yearly averages, as they demonstrated little variation across years. Though aggregating the repeated measures effectively reduces the sample size from 308 observations to 77, utilization of the aggregate values did improve the univariate distribution of the variables and did not substantively effect model estimation. The across-level expected values for

Table 77. Hospital and Market-Area Attributes (n=77)

Variable	Label			Statistics	
Hospital Attributes		Count	Percentage	Mean	Standard Dev.
For-profit Hospitals	For-profit	13	16.9%		
System Membership	System	28	36.4%		
First System (For-Profit)	System 1	10	13.0%		
Second System	System 2	6	7.8%		
Third System	System 3	5	6.5%		
Fourth System	System 4	4	5.2%		
Fifth System	System 5	5	6.5%		
Hospitals in Poor Financial Condition	PoorIncome	25	32.5%		
Hospital Characteristics Aggregated Over 4 Years					
Case-mix Average	Case-Mix			1.076	0.208
Average Daily Census (natural log)	ADC			4.412	0.957
Market Characteristics at the Hospital Level					
Demand-side Purchasing Leverage of the Largest MCO	MCOpower			14.451	1.415
Wage Index Average	WageNdx			0.941	0.056
HHI (ordinal scale of -1, 0 ,1)	Comp			-0.039	0.107
High Market Level Competition	HighComp	32	41.6%		
Medium Market Level Competition	MedComp	10	13.0%		

each measure were essentially the same (to the fourth decimal point for each), and the distributional characteristics of the aggregate values at the hospital-level naturally improved.

As the time varying Herfindahl Index variable was not univariate normal over the seven geographic areas and changed little over the study time, categorical between-subject hospital variables were derived from the competition index. A categorical grouping of the competition variable along an ordinal scale depicting low, medium and high competitive hospital environments (Competition) is used in some models.

Two hospital-level dummy variables were also utilized as control variables for hospital competition. The dummy variables depicted whether a hospital faced high competition (HighComp) or medium competition (MedComp). The top three most competitive markets (the Richmond metropolitan area, the eastern Tidewater area and the Northern Virginia area) were categorized as having high competition (ranging from 1168 to 1748 on the Herfindahl Index). This high market competition group consisted of 32 hospitals. The two market areas categorized as medium competition markets were the Radford and Roanoke areas (with average HHI values of 2889 and 3207, respectively) and consisted of ten hospitals. The remaining market had just two hospitals and they, along with the remaining 35 rural hospitals, were assigned to the default reference group.

Descriptive statistics for market-area economic and patient variables are presented in Table 8. As discussed in Chapter 4, all explanatory model measures are defined at a hospital-level unit of analysis, whether time varying or between-subject variables. While the market factor variables are sampled by market-area groups, only the unspecified variance component of these seven market groups is accounted for in the predictive models. Market-area aggregate statistics are provided in Table 8, however, as matter of reference.

Since market efficiency dynamics are conceived to affect organizational performance by decentralized rational judgments attentive to pricing and competition factors, variance attributable to unspecified market-area sampling effects has been given little attention in the rather idealized assumptions of the efficient market thesis. That is, it is generally assumed the fixed-effect estimates for the competition and pricing faced by

Table 88. Aggregate Market Variables (n=7)

Variable	Mean	Std. Dev.	Min.	Max.
Market Variables				
Hirshchman-Herfindahl Index	3803	3041	1168	8978
Market Wage Index	0.952	0.069	0.884	1.059
MCO Power	14.286	1.559	11.672	16.850
Patient Variables				
Mortality Performance	0.996	0.114	0.815	1.132
Error Performance (log odds)	0.122	0.233	-0.188	0.463
Patient Admissions	101747	60231	14896	178763
Case-mix	1.142	0.141	0.959	1.354

each organizational actor can effectively account for market variations. The small sample size at the market-level (n=7) in this study would additionally support the case that geographical variation should be minimal, after accounting for inter-organizational pricing and market share competition.

Nonetheless, exploratory models will be initially applied to examine whether it is statistically necessary to model at the geographically clustered sample level. That is, the significance of including a third level variance component will be tested as a "nuisance" effect. If the significance of this variance component is not effectively eliminated by inclusion of the market variables, then all subsequent models will report on the market-area variance component in subsequent model testing.

Table 9 provides the correlation matrix for all the repeated measure variables used to test the theoretical hypotheses. The bivariate relationships are given reference purpose.

Table 99. Correlation Matrix

	Mortality QI	Errors QI	RevAdjDay	LaborAdj	NonLabAdj	CapAdj	OpIncome	OpMargin	HHI	MCOpower	WageNdx	Case-Mix	Size
Mortality QI	1												
Errors QI	0.03	1											
RevAdjDay	-0.15	0.04	1										
LaborAdj	-0.11	-0.08	0.67	1									
NonLabAdj	-0.04	0.10	0.74	0.46	1								
CapAdj	0.03	-0.09	0.35	0.22	0.27	1							
OpIncomeAdj	-0.12	0.12	0.46	0.06	0.06	-0.02	1						
OpMargin	-0.06	0.07	0.26	-0.16	-0.18	-0.10	0.79	1					
HHI	0.06	-0.50	-0.20	0.07	-0.17	0.00	-0.14	-0.05	1				
MCOpwer	0.26	0.02	-0.19	-0.27	-0.10	-0.16	-0.13	-0.03	0.06	1			
WageNdx	-0.26	0.16	0.46	0.41	0.36	0.16	0.15	-0.04	-0.29	-0.30	1		
Case-Mix	-0.03	0.64	-0.08	-0.27	0.17	-0.10	-0.02	-0.07	-0.46	0.17	0.14	1	
Size	-0.09	0.61	0.14	-0.06	0.25	-0.03	0.17	0.02	-0.46	0.04	0.31	0.70	1

Model Analysis

Evidence for the Measurement Model of Hospital-Specific Outcomes

Research Question 1: Is there information to adequately distinguish organizational-specific performance in quality outcomes?

Four year hospital averages are given in Table 10 for the quality indicator rates, the explained variance, the reliability scores, and the hospital-specific variance components as estimated from the patient-level risk-adjustment results. The table summarizes the findings from the preliminary measurement development model study (Fisher, 2003). Across all years, each of the selected QIs demonstrated significant between-hospital variance (Wald test $p < .01$, and the χ^2 test proposed by Bryk and Raudenbus, 1992, at $p < .000$). The lower incidence rate for the two QIs associated with treatment error is considered to be the primary reason for the relatively lower explained variance of the risk-adjusted methodology.

Table 1010. Summary of the Preliminary Selection Results for the Four IQIs

Quality Outcome Indicator	Four Year Average Rate	Average Explained Variance (R^2)	Average Reliability (λ_0)	Average Hospital-level Variance (τ_0^2)	Average S. E. for τ_0^2
Mortality Rate (%)	2.54 (0.034)	0.34 (0.013)	0.90 (0.024)	0.09 (0.025)	0.02 (0.006)
Failure to Rescue Rate (%)	14.80 (0.651)	0.30 (0.015)	0.50 (0.124)	0.08 (0.054)	0.02 (0.007)
Infection Due to Medical Care (%)	0.21 (0.013)	0.12 (0.019)	0.67 (0.055)	0.33 (0.108)	0.09 (0.028)
Accidental Puncture or Laceration (%)	0.33 (0.026)	0.11 (0.002)	0.73 (0.016)	0.31 (0.024)	0.07 (0.008)

Note: Standard deviations listed parenthetically

The relatively high explained variance for the two mortality QIs is generally attributable to the higher incidence rates for these two QIs. Both the more stringent risk-adjustment criteria for the global mortality QI (which excluded some APR-DRG patient categories as discussed in Chapter 4) and implementation of APR-DRG's mortality comorbidity index relative weights likely contributed to the high explained variance in the mortality rate as well. The relatively small average sample size per hospital (mean of $n_j \approx 273$) lowered the reliability for the failure-to-rescue QI. As each of the PSIs evidenced face validity for patient-level risk-adjustment, and also demonstrates a significant between-group, hospital-specific variance component, the premise of hypothesis [H1a] is accepted.

Development of Two Latent Quality Performance Variables from Factor Analysis

Initial and extracted communalities among the16 measures tended to be relatively strong and well balanced. The initial commonalties, which ranged from .845 to .472, are shown in rank order in Table 11. Risk of Mortality tended to have the highest measures of shared variance and Failure-to-Rescue had the lowest.

Results from the unrotated principal axis extraction procedure, using standard scores, resulted in four factors with eigen values greater than one. Two primary factors accounted for 29% and 27% of the variance for a cumulative percentage of 56%, while the two remaining factor extractions accounted for only 7% and 6% of the variance. Results for the two primary factors are presented in Table 12. The two factors had a clear interpretive pattern, where: 1) the first factor gave a dimension to adverse patient safety

Table 1111. Commonalities among the 16 Annual QI Measures

Quality Outcomes for Each Year	Initial	Extraction
Risk of Mortality 1999	0.845	0.866
Accidental Puncture or Laceration 1999	0.821	0.890
Risk of Mortality 1998	0.843	0.862
Risk of Mortality 2000	0.791	0.756
Infection Due to Medical Care 1999	0.784	0.827
Accidental Puncture or Laceration 1998	0.776	0.777
Risk of Mortality 2001	0.764	0.736
Infection Due to Medical Care 2000	0.736	0.798
Accidental Puncture or Laceration 2000	0.703	0.648
Failure-to-Rescue 1999	0.664	0.774
Accidental Puncture or Laceration 2001	0.631	0.651
Infection Due to Medical Care 2001	0.628	0.590
Failure-to-Rescue 1998	0.602	0.395
Accidental Puncture or Laceration 1998	0.552	0.547
Failure-to-Rescue 2000	0.523	0.576
Failure-to-Rescue 2001	0.472	0.370

Table 1212. Factor Analytic Results for Two Latent Quality Performance Variables

Quality Indicator	Factor 1 (Errors)	Factor 2 (Mortality)	Component Weights for Errors	Component Weights for Mortality
Accidental Puncture or Laceration 1998	0.716	-0.271	0.593	
Accidental Puncture or Laceration 1999	0.798	-0.271	0.672	
Accidental Puncture or Laceration 2000	0.707	-0.296	0.630	
Accidental Puncture or Laceration 2001	0.670	-0.335	0.606	
Infection Due to Medical Care 1998	0.522	-0.466	0.540	
Infection Due to Medical Care 1999	0.601	-0.553	0.643	
Infection Due to Medical Care 2000	0.624	-0.405	0.571	
Infection Due to Medical Care 2001	0.551	-0.355	0.498	
Risk of Mortality 1998	0.468	0.723		0.748
Risk of Mortality 1999	0.481	0.793		0.856
Risk of Mortality 2000	0.461	0.701		0.700
Risk of Mortality 2001	0.366	0.701		0.645
Failure-to-Rescue 1998	0.520	0.350		0.406
Failure-to-Rescue 1999	0.224	0.643		0.482
Failure-to-Rescue 2000	0.267	0.417		0.318
Failure-to-Rescue 2001	0.254	0.516		0.412

events due to a system's inability to avert errors of commission (Errors), captured by the accidental puncture or laceration and the infection due to medical care QIs; and 2) the second factor associated with an organization's inability to avoid the terminal event of inpatient mortality (Mortality), captured by the global mortality and the failure-to-rescue QIs.

Given the principal axis results, principal component analysis was then conducted for each latent dimension to determine a yearly weighted average index score. The extracted communalities for each component of the two latent variables are also given in Table 12, and were used to calculate weighted log-odds for each annual quality performance score.

Predictive Model Testing

Results from the linear growth-curve models use to test the four hypotheses for research questions two and three will be presented separately for each of the latent quality indicators, beginning with the findings on the Mortality QI. Presentation of the results will progress from simple to more intricate model forms in the assessment of the study hypotheses proposed. Results for the model used to test Hypothesis [H4a], which evaluates the effect of hospital quality performance on the subsequent years' operating margins, is presented in the final section.

Mortality QI performance models

H1b: The quality indicators developed from the yearly cross-sectional development phase will continue to evidence a significant hospital-specific variance component in a longitudinal design that examines variance in the growth trajectories of hospital quality performance.

Table 13 presents the results from two "empty" HLM models for the Mortality QI performance data. Model (0) can be depicted as a null model as it contains only level-2 random- and fixed-effects for the intercept term, and accounts only for the error term and the between-group hospital variance. Model (1) includes estimation of the random and fixed-effects for the Time variable, and thus accounts for relational dependencies over time for each hospital-specific unit. Model (1) is the basic two-level linear growth-curve model used in this study.

The random-effects estimated in the two empty models are used to evaluate hypothesis [H1b] in testing the adequacy of the measurement model. Results of the empty growth-curve model additionally evaluates whether there is a significant trend effect in quality performance, as posed in hypothesis [H2a]. Concerns about the relative importance of the "nuisance" effects discussed in Chapter 4 will be addressed with subsequent model comparisons being made against the two-level growth-curve results of model (1). The empty models are also used as reference for the explained variance solutions in subsequent predictive models. The variance of the individual hospital deviations from the estimated population mean intercept term is given by τ_0^2. The mean intercept as a fixed point predictor is given by β_{00}. For model (0), the 1.026 coefficient for the intercept is simply the Mortality QI average across all hospitals and occasions. The null model estimates the repeated measures variance as 0.0142, and represents

Table 1313. Mortality QI Empty Model Results

Mortality QI Parameters	M0: empty random intercept				M1: empty growth-curve (referenced at initial status)			
Fixed Effect	Coefficient	*se*	t ratio	p value	Coefficient	se	*t ratio*	p value
Mean intercept, β_{00}	1.026	0.023	44.0	0.000	1.0198	0.024	41.8	.000
Mean growth rate, β_{10}					0.004	0.006	0.648	0.52
Random Effect	Variance	*df*	χ^2		Variance	*df*	χ^2	
Hospital-specific, $var(u_{0j})=\tau_0^2$	0.0379	76	899	0.000	0.0364	76	370	.000
Growth rate, $var(u_{1j})=\tau_1^2$					0.0003	76	86	0.206
Intercept-slope covariance, τ_{01}					0.0003			
Level-1 error, e_{tj}	0.0142				0.0136			
Deviance	-247.27				-248.41			
Reliability								
Hospital intercept	0.914				0.792			
Growth rate					0.103			
Test of homogeneity of level-1 variance	$\chi^2 =$ 0.1751		$p > .500$		$\chi2 =$ 0.065		$p > .500$	

measurement error and chance variation. The hospital-specific variance was relatively large at 0.0379. The χ^2 statistic for the hospital-specific variance term is significant at 899 (df = 76, p<.000), and would support rejection of the null hypothesis for [H1b]. The null model does not account for temporal variance, nor does it effectively adjust for the collinearity that likely exists between the annual hospital observations.

The linear growth-curve design represented by model (1), which includes an estimated effect for time, does account for temporal variation and the collinearity of the dependent observations. The model design assumes compound symmetry in the residual variance, but estimates both fixed-effects and hospital-specific variance components to account for the collinearity between the repeated measures. Collinearity in this model is taken as hospital-specific dependencies, and is jointly captured by estimation of a random hospital-specific intercept term and a random slope effect for time (e.g., variations in each hospital's linear growth rate in this study). The fixed-effects for these terms provide estimation of a mean growth trajectory, and the random-effects give estimation to individual variation in hospital growth trajectories. Attention will first focus on the random-effect results in model (1), as the degree of variation in the hospital-specific growth trajectories relate to [H1b].

The estimated variance for the growth rate is relatively small, τ_1^2 = .0003, and statistically insignificant (χ^2 = 86, df = 76, p = .206). Hospitals do not much differ on their performance trends, and the mean growth rate, estimated by β_{10}, is flat (the significance of which is discuss in detail below). The intercept term in model (1) now references the initial performance status in 1998, with a variance of τ_0^2 = 0.00364, and a mean intercept of β_{00} = 1.026. The hospital-specific random-effect for the initial status term (e.g., the relative hospital rankings on Mortality QI performance) is significant (χ^2 = 370, df = 76, p <.000), even after accounting for the variation in hospital growth rates. The findings from model (0) and (1) both support the [H1b] premise that the latent Mortality measure has significant hospital-specific variation. The random-effect results can best be characterized as revealing significant heterogeneity in the relative rankings in the initial observation that tends to persist over the repeated observations.[29] The correlation between initial status performance and each hospital's growth rate is .23; suggesting better performers tended to improve slightly, and poor performers were losing ground, on average.

Interpretation as to what the hospital-specific random-effect represents in this longitudinal design can be discerned from the ICC static, which provides information on the magnitude of the effect. The ICC statistic, ρ_I, estimates the correlation due to nested sampling or group dependent measurement.[30] Hence, the hospital-specific random-effects address the collinearity issue of panel designs. HLM analysis directly estimates the

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[29] Both models are needed to support the persistence and strength of the random-effect. Because the intercept reference point in a growth-curve design is arbitrary, shifting the intercept to a different time point can change the significance of the intercept variance component. The small estimated variance for the growth rate, taken along with the insignificance of the mean growth rate, does indicate the performance standings estimated at the initial status are, on average, relatively persistent.

[30] The ρ_I statistic is the proportion of the total variation attributable to a given variance component in data structures that are nested.

between-subject dependencies and accounts for the effect with ρ_I. The values for ρ_I are quite high in each model, .727 and .718 for model (0) and model (1), respectively.

Other than for studies concerned with judging the reliability or measurement error of a dependent measure, as is the case here, collinearity between the repeated measures is usually simply assumed; and often is *assumed* to be controlled for by estimation of some baseline effect in predictive equations. For balanced designs, ρ_I is perfectly correlated with the average reliability, which estimates the degree to which the level-2 hospital-specific effect (estimated quality performance in this case) is, in fact, a good measure of the "true" group mean (Bryk and Raudenbush, 1992). The reliability for the intercept term is .914 in model (0) and .792 in model (1). It is reasonable to conclude that the relative hospital rankings on the latent Mortality QI are an effective and reliable measure of quality performance. The findings of statistical significance for the hospital-specific intercept variance component, along with the evidence of its magnitude, thus support accepting the premise of [H1b]; the Mortality QI measure adequately discriminates on hospital quality performance.

Hypothesis testing for the potential "nuisance" effects of the variance components at level-1 and level-3.

Results for the tests of homogeneity of level-1 variance are also given in Table 13. The test addresses the assumption of compound symmetry. Is the assumption, in fact, satisfied, after accounting for level-1 collinearity through estimation of the hospital-specific growth trajectories? The test of homogeneity of level-1 variance for both empty models indicates the covariance structure used to model the repeated measures is adequate, and thus more complex model designs are not needed to treat for the potential "nuisance" effect. The assumption of homogeneity need not be rejected as the estimate of the χ^2 statistic is 0.175 in the null model and 0.065 for the linear growth-curve model (for both, df = 76, p >.500).

In comparison, a general linear repeated measures model specifying only the mean hospital fixed-effect did not meet the test homogeneity[31] of residual variance (χ^2 = 236, df = 9, p<.000). The small effect or model improvement associated with the growth rate random-effect term in model (1) indicates this residual variance heterogeneity observed in the OLS fixed-effect results is effectively reduced when the nested structure of the data is accounted for by the random hospital-specific intercept term. Thus, the findings support the advantages of variance component analysis, over more conventional fixed-effect analysis, in addressing the heterogeneity of residual variance issue, as noted in Chapter 4 (Davis, 2002).

However, the test statistic for residual variance homogeneity is not very informative about how well the linear growth-curve design, with its compound symmetry assumption, compares with alterative model restrictions on the covariance structure of the repeated measures. Table 14 provides the model-fit results for the two empty models along with comparative improvement statistics for models with alternate assumptions and

[31] More specifically in the context of repeated measure design, the fixed-effect model did not meet the test of *sphericity*.

Table 1414. Mortality QI Comparison for Differing Covariance Structure Assumptions

Model Restrictions on the Covariance Structure	Deviance	# of parameters estimated	df	$\chi 2$	p value
Null Model (with compound symmetry)	-247	3			
Linear Growth-Curve (with compound symmetry)	-248	6	3	1.137	0.768
First-order Autoregressive	-249	4	2	0.943	0.624
Heterogeneous HLM (random intercept for each occasion)	-258	9	3	9.683	0.002
MANOVA (fully multivariate)	-272	11	5	23.443	0.000

Note: Comparisons are against the Linear Growth-Curve model, except were the Linear Growth-Curve is compared to the Null Model

restrictions on the structure of the covariance matrix, including: first-order autoregressive model, heterogeneous HLM model (which estimates the random-effect for each year's intercept), and the fully multivariate MANOVA model.

The model-fit for the first-order autoregressive model assumptions does not significantly differ from the linear growth-curve design. As is expected, the later two designs, which impose few or no restrictions on the covariance structure, achieve significant model-fitting improvement. The superior performances impose limitations on hypothesis testing and the ease of interpretation, however, when judged against the linear growth-curve design. The findings are best treated as benchmarks against which the subsequent explanatory growth-curve models can be compared. Visual inspection of the less restricted covariance matrices shows that year 2000 is distinctive, and had a relatively larger variance and smaller correlations than the other annual Mortality QI measures, which were very similar.

The empty model for the three-level design, which provides an additional market-area variance component estimate, is presented in Table 15. When compared to the two-level linear growth-curve model, it provides information about the "nuisance" effect of ignoring unspecified dependencies that can creditably exist from sampling across hierarchical populations. As discussed in Chapter 4, the level-3 "nuisance" effect can potentially result in biased statistical inference.

Table 1515. Mortality QI Market-Area Variance Component

Parameter	M1: Empty Growth-Curve (two-levels)				M2: + Level-3 Variance Component			
Fixed Effect	Coefficient	*se*	t ratio	p value	Coefficient	*se*	t ratio	p value
Mean initial status, β_{00}	1.02	0.024	41.8	0.000	1.009	0.036	28.1	0.000
Mean growth rate, β_{10}	0.004	0.006	0.65	0.518	0.004	0.006	0.65	0.518
Random Effect	Variance	*df*	$\chi 2$		Variance	*df*	$\chi 2$	
Initial status, $var(u_{0j})=\tau_0^2$	0.0364	76	370	0.000	0.0330	70	263	0.000
Growth rate, $var(u_{1j})=\tau_1^2$	0.0003	76	86	0.206	0.0003	76	86	0.206
Market intercepts $var(r_{00k})=\varpi_0^2$					0.0039	6	14	0.028
Level-1 error, e_{tj}	0.0136				0.0136			
Deviance	-248				-250			

The estimated market-area variance component ω_0^2 was 0.0039. As a "nuisance" factor, the heterogeneity in quality performance between the seven market-areas is not significant. Given the small sample size, the appropriate statistic for inference is the Wald, where $t = .91$, and p = .199. This is also confirmed by observing the insignificantly small model improvement that results for the additional parameter estimate (χ^2.= 1.6, *d.f.* = 1, p = .205). Though the findings indicate the parameter can be safely dropped from the model estimation, it is worth noting the level-3, market-area variance estimate is 8% of the total. Research sampling from a larger number of market-areas may very likely find the effect an important factor to consider.

Research question 2: Is there evidence of any trend in hospital quality performance, and do factors central to the market enterprise model and market reform explain the growth curve trajectory of hospital quality performance?

The descriptive trend analysis of hospital quality performance did not provide a clear impression of improvement over the study time for either of the latent quality variables. The fixed effect for the mean growth rate of Mortality QI performance in model (1), presented again in Table 16, provides a statistical estimate to assess hypothesis [H2a]. The yearly variation for the Mortality QI is not well modeled by a linear trend, as the coefficient for the mean growth rate is insignificant ($\beta_{01} = .004$, $t = 0.65$, $p > .500$). The 95% CI for the mean growth rate ranges within a flat trajectory, from a slope of -0.008 to 0.0164. Thus, the null hypothesis for [H2a] cannot be rejected. Hospital performance on the Mortality QI was not improving during the study time, which was otherwise distinguished as a period of profound institutional change driven by market reform.

Hypothesis [H2b] was proposed to test whether hospitals facing higher market competition would demonstrate a stronger trend of increasing quality performance, when other relevant market pricing and demand-side factors are accounted-for. The lack of a significant mean growth rate however, shifts the attention from a dynamic to a more static perspective when examining market competition factors as explanatory of quality

Table 1616. Mortality QI Market Factors Model

Parameters	M1: Empty Growth-Curve				M3: Market-Area Factors			
Fixed Effect	Coefficient	*se*	t ratio	p value	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	1.026	0.023	44.0	0.000	1.026	0.024	43.000	0.000
Mean growth rate, β_{10}	0.004	0.006	0.6	0.518	-0.001	0.008	-0.148	0.883
MCO power, β_{20}					0.012	0.007	1.704	0.088
Wage Index, β_{30}					-0.485	0.274	-1.772	0.077
Comp, β_{01}					-0.001	0.025	-0.038	0.972
Comp, β_{11}					-0.005	0.007	-0.751	0.455
For-Profit, β_{02}					0.001	0.060	0.014	0.989
Random Effect	Variance	*df*	χ^2		*Variance*	*df*	χ^2	
Initial status	0.0364	76	370	0.000	0.0334	74	835.000	0.000
Growth rate	0.0003	76	86	0.206	0.0005	75	89.000	0.114
Level-1 error, e_{tj}	0.0136				0.0136			
Deviance	-248				-255			
Test of homogeneity of level-1 variance	$\chi 2 = 0.06531$ p >.500				$\chi 2 = 0.06121$ p >.500			

performance. The results for equation (4.8) in Chapter 4 are presented in Table 16 as model (3).

Neither market competition nor hospital ownership improves understanding of hospital quality performance. Increasing market share for the dominant Virginia MCO has a slight positive association with higher Mortality QI rates (β_{20} = .012, t = 1.7, p = 0.088), and is a market-area effect in need of explanation, and possibly corrective action if greater efficiencies are the objective. The market-area wage index is associated with better quality performance (β_{30} = -0.485, t = -1.77, p = 0.077), and in this model can be taken as a proxy for higher-rent, cosmopolitan locales. Including the market-area explanatory variables does not significantly improve the model-fit for Mortality QI performance (χ^2= 6.81, *d.f.* = 5, p = .235). The explained variance accounted for by the market-area variables was R^2 = .06.

Therefore, the null hypothesis of [H2b] cannot be rejected. The findings on market factor effects, whether taken separately or as a whole, do not support the premise that any performance benefit was achieved through market competition or market structure.

Research question 3: Are equilibrating pricing mechanisms determinant of quality outcomes?

The demand-side variable of patient revenue is added to the model to assess the market efficiency assumption that better quality will cost more, when controlling for other relevant market factors. Results for the demand-side pricing mechanism model (equation 4.9) are presented in Table 17, and are used to evaluate hypothesis [H3a]. Hospital revenue per risk-adjusted patient day is not a determinant of inpatient mortality outcomes, and the null hypothesis on the effect of demand-side pricing cannot be rejected. Including revenue pricing in the model and framing the market-area factors as between-subject variables resulted in a significant positive finding between MCO market leverage and Mortality QI outcomes (β_{20} = .05 t = 2.95, p < .01). The evidence suggests a 1% increase in the MCO market share results in approximately an odds rate increase of 0.05 for inpatient mortality outcomes. Improvement in the model-fit of model (4) compared to the empty model (1) was marginally significant (χ^2= 11.6, *d.f.* = 5, p = .041). The proportional variance explained by hospital revenue and the market factors was

Table 1717. Mortality QI Demand-Side Pricing Model

Parameters	M4: Demand-side Pricing of Mortality QI Performance				
Fixed Effect	*Coefficient*	se	t ratio	*p value*	*95% CI*
Mean initial status, β_{00}	1.026	0.033	31.03	0.000	.096 to 1.09
Mean growth rate, β_{10}	0.006	0.007	0.85	0.975	-.007 to 0.02
RevAdjDay, β_{20}	-0.00005	0.0001	-0.57	0.568	-.0002 to 0.0001
MCO Power, β_{30}	0.050	0.017	2.95	0.005	0.017 to 0.083
HighComp, β_{02}	-0.014	0.047	-0.31	0.760	-.11 to 0.08
MedComp, β_{03}	0.046	0.070	0.66	0.512	-.09 to 0.18
Wage Index, β_{21}	-0.0001	0.001	-0.72	0.943	-.002 to 0.002
Random Effect	*Variance*	*df*	χ^2		
Initial status, τ_0^2	0.0324	73	808	0.000	
Growth rate, τ_1^2	0.0003	76	86	0.207	
Level-1 error, e_{tj}	0.0136				
Deviance	-260				

$R^2 = .11$, most of which came from reducing the random intercept variance component. The conditional ICC estimate for the hospital-specific variation in growth trajectories remains relatively high, however, $\rho_I = .70$.

Additional organizational characteristics that are generally conceived in health services research as important process factors to be considered in determining hospital outcomes are included as controls in model (5) and presented in Table 18, along with model (4). The process variables included in the model are hospital size, as measured by the nature log of the average daily census (ADCnl), case-mix, and the proportion of the relevant patient outcome populations transferred from the hospital (TransM).

The findings from model (5) demonstrated only that the yearly case-mix variable is significantly related to the Mortality QI in an inverse fashion ($\beta_{30} = -.249$, $t = -1.99$, $p < .05$). Hospitals that experience higher at-risk cases deliver fewer adverse mortality

Table 1818. Mortality QI Demand-Side Pricing & Hospital Process Controls

Parameters	M4: Demand-side Pricing				M5: + Hospital Process Controls			
Fixed Effect	*Coefficient*	se	t ratio	*p value*	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	1.026	0.033	31.03	0.000	0.992	0.038	26.00	0.000
Mean growth rate, β_{10}	0.006	0.007	0.85	0.975	0.002	0.033	0.06	0.957
RevAdjDay, β_{20}	-0.00005	0.0001	-0.57	0.568	-0.00009	0.0001	-1.07	0.288
MCO Power, β_{01}	0.050	0.017	2.95	0.005	0.054	0.017	3.11	0.003
HighComp, β_{02}	-0.014	0.047	-0.31	0.760	0.024	0.055	0.43	0.667
MedComp, β_{03}	0.046	0.070	0.66	0.512	0.071	0.072	0.99	0.328
Wage Index, β_{21}	-0.0001	0.001	-0.72	0.943	-0.0004	0.001	-0.34	0.732
Case-mix, β_{30}					-0.2494	0.125	-1.99	0.047
TranM, β_{40}					-0.0050	0.005	-0.94	0.347
ADCnl, β_{04}					0.0018	0.033	0.06	0.957
Random Effect	*Variance*	*df*	χ^2		*Variance*	*df*	χ^2	
Initial status, τ_0^2	0.0324	73	808	0.000	0.0311	72	334	0.000
Growth rate, τ_1^2	0.0003	76	86	0.207	0.0003	76	86	0.208
Level-1 error, e_{tj}	0.0136				0.0133			
Deviance	-260				-265			

events. Although the dependent outcome was risk-adjusted at the patient-level, the results demonstrate the aggregate hospital case-mix variable needs to be taken as a contextual shift of meaning, and not treated as equivalent or substitutable for patient-level risk-adjustment. In this case, the results are interpreted to reflect that higher case-mix equates to more experience with severe cases. This organizational experience fosters development of a task environment culture that has learned by doing—learned from the deaths of their at-risk population. The results are congruent with the body of research that has association higher volume with better patient outcomes.

The organizational learning associated with better mortality outcomes does not appear to be connected to any significant search costs. Leaning to defer inpatient mortality events might be thought of as "priceless" in the sense that, even after controlling for case-mix experience and the other essential hospital characteristics, there is no basis for asserting knowledge is related to market pricing mechanisms. Other than strengthening the MCO Power direct effect relationship with Mortality outcomes, the hospital process control variables did not provide any additional clarification as to how patient revenues and the other market factors might relate to Mortality QI outcomes.

As discussed in Chapter 4, the supply-side production function can be treated as the flip-side of demand-side pricing mechanisms, and deals with the evaluation of [H3b]. Analysis of the supply-side production function is considered another opportunity to gain insight into how the efficiency to be achieved by market reform might yet relate to the utility achieved by quality outcomes. Model (6) in Table 19 presents the findings estimated by equation (4.10).

The decomposition of revenues into the production function set of expenses and operating income for each hospital does not explain the relative material-resource value for the utility of Mortality QI outcomes. Again, MCO power and case-mix were shown to be differentially related to quality performance.

Non-labor expenses and capital expenses were positively associated with mortality outcomes, but the effects were insignificant. Though labor expense per adjusted patient day and operating income both have an estimated negative fixed-effect for mortality events, the coefficients were not significant (β_{20} = -.0001, t = -.52, p =.603 and β_{50} = -.00009, t = -1.01, p = .315, respectively).

Table 1919. Mortality QI Supply-Side Pricing Model

Parameters	M6: Supply-Side Pricing				M7: + Poor Financial Condition			
Fixed Effect	*Coefficient*	se	t ratio	*p value*	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	1.01	0.024	41.47	0.000	1.02	0.025	40.24	0.000
Mean growth rate, β_{10}	0.0092	0.008	1.19	0.237	0.0089	0.008	1.15	0.255
LaborAdj, β_{20}	-0.0001	0.0002	-0.52	0.603	-0.0001	0.0002	-0.60	0.546
NonLabAdj, β_{30}	0.00003	0.0002	0.11	0.910	0.00002	0.0002	0.08	0.941
CapAdj, β_{40}	0.00009	0.0004	0.21	0.836	0.00011	0.0004	0.26	0.798
OpIncome, β_{50}	-0.00009	0.0001	-1.01	0.315	-0.00017	0.0001	-1.38	0.168
Case-mix, β_{60}	-0.259	0.1159	-2.23	0.026	-0.260	0.1154	-2.26	0.025
TranM, β_{70}	-0.0096	0.0053	-1.83	0.068	-0.0099	0.0053	-1.88	0.060
MCO power, β_{01}	0.0598	0.0170	3.33	0.002	0.0581	0.0179	3.24	0.002
Comp, β_{02}	-0.0144	0.0470	-0.31	0.760	0.0021	0.0273	0.08	0.940
Wage Index, β_{21}	-0.0001	0.001	-0.72	0.943	0.0014	0.002	0.56	0.575
PoorIncome, β_{51}					0.0002	0. 0002	0.95	0.345
Random Effect	*Variance*	*df*	χ^2		*Variance*	*df*	χ^2	
Initial status	0.0311	74	314	0.000	0.0304	74	310	0.000
Growth rate	0.0004	76	89	0.151	0.0005	76	90	0.129
Level-1 error, e_{tj}	0.0144				0.0144			
Deviance	-239				-240			

To account for suspected non-linear effects with operating income, a between-subject dummy variable, PoorIncome, was tested as a piecewise function, and the results are presented in model (7). Though the results did show that hospitals consistently in poor financial condition averaged higher mortality events, the effect was not significant. (β_{51}=.0002, t = .947, p =.345). The effect for operating income in financially stable hospitals remained insignificant (β_{50}=-0.00017, t = -1.38, p = .169), though the strength of subsequent relationship did improve. Thus, neither of the supply-side pricing models in Table 18 supports rejection of the null hypothesis for [H3b], that quality outputs are efficiently priced to cost more.

Ad hoc analysis conducted to find a "best fit" model for hospital performance on the Mortality QI measure is presented in Table 20. The demand-side pricing model (equation 4.9) was used as the base model for the *ad hoc* analysis since the deviance score demonstrated a better fit with Mortality QI variance than did the supply-side model Mortality QI quality performance. The set of specific system affiliation variables were sufficient to improve the model fit of the demand-side pricing model to an optimal level. Each of the five system group variables had a negative effect on Mortality outcomes, and four of the five Virginia hospital systems performed significantly better than average.

Table 2020. Mortality QI *Ad ho*c Best-Fit Analysis

Parameters	M6: Ad hoc Analysis of Demand-side Pricing			
Fixed Effect	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	1.010	0.031	36.00	0.000
Mean growth rate, β_{10}	0.010	0.007	1.33	0.187
AdjInPtRev, β_{20}	-0.0001	0.000	-1.19	0.235
Case-mix, β_{30}	-0.144	0.102	-1.41	0.159
MCO power, β_{01}	0.056	0.018	3.08	0.003
Comp, β_{02}	0.093	0.029	3.24	0.002
Wage Index, β_{21}	-0.0009	0.001	-0.89	0.375
Sys1, β_{03}	-0.213	0.063	-3.36	0.002
Sys2, β_{04}	-0.275	0.088	-3.12	0.003
Sys3, β_{05}	-0.293	0.092	-3.20	0.002
Sys4, β_{06}	-0.301	0.104	-2.90	0.005
Sys5, β_{07}	-0.006	0.081	-0.070	0.945
Random Effect	*Variance*	*df*	χ^2	
Initial status	0.0231	69	266	0.000
Growth rate	0.0004	76	85	0.232
Level-1 error, e_{tj}	0.0135			
Deviance	-285			

Interpretation of these "lumpy" results[32] is more difficult than market optimizing conclusions, like "you get what you pay for." The findings beg for more detailed case study analysis to assess why some systems are better than others, and why non-affiliated hospitals compared so poorly to their system counterparts. An easy, if abstract, conclusion to draw is that organizational culture and/or institutional routines appear to matter, independent of material-resource competition factors.

To summarize the findings on Mortality QI performance: none of the hypotheses optimistic of the consequences of profound market-reform evidenced empirical support. The null hypothesis has carried the day. The study provides no evidence of market efficiency (i.e., welfare benefit or consumer surplus) as measured by market mechanisms either setting or raising the bar on patient mortality outcomes.

Errors QI performance models

H1b: The quality indicators developed from the yearly cross-sectional development phase will continue to evidence a significant hospital-specific variance component in a longitudinal design that examines variance in the growth trajectories of hospital quality performance.

The two "empty" models for the Errors QI measure are presented in Table 21. Model (0) again depicts a null HLM model that contains only a randomly varying level-2 intercept term. Model (1) is the empty linear growth-curve model, which provides

[32] "Systemness" by itself did not bestow any benefit in this data. This follows not only from the fact that one of the Virginia hospital systems had mediocre performance, but also from the fact that the two hospitals owned by national systems without affiliation with any other Virginia hospital consistently had very poor mortality outcomes.

Table 2121. Errors QI Empty Model Results

Parameters	M0: null model				M1: linear growth-curve model			
Fixed Effect	Coefficient	se	*t ratio*	p value	Coefficient	se	*t ratio*	p value
Mean intercept, β_{00}	0.031	0.039	0.80	0.427	0.032	0.044	0.73	0.470
Mean growth rate, β_{10}					0.0002	0.011	-0.02	0.988
Random Effect	Variance	df	χ^2		Variance	df	χ^2	
Hospital-specific, τ_0^2	0.1095	76	961	0.000	0.1244	76	504	0.000
Growth rate, τ_1^2					0.0037	76	122	0.001
Intercept-slope covariance, τ_{01}					-0.0072			
Level-1 error, e_{tj}	0.0381				0.0320			
Deviance	62.40				56.61			
Reliability								
Hospital intercept	0.92				0.848			
Growth rate					0.367			
Test of homogeneity of level-1 variance			$\chi2 = 0.889$	p >.500		$\chi2 = 0.308$	p >.500	

estimation of both random- and fixed-effects for both initial status and time as a function. The estimated mean intercept for the null model (0) gives the four year hospital average as 0.031 log-odds, and, unlike the Mortality QI variable, evidences no significant variation across the yearly averages (t = 0.80, p = .427). The hospital-specific variance component is τ_0^2 = 0.1095, evidencing there is a significant amount of performance heterogeneity (χ^2 = 961, df = 76, p <.000). The resulting ICC estimate is also high at .742. Thus, the null model results demonstrate the measure has significant systematic between-hospital variance, and supports rejection of null hypothesis for [H1b].

Random-effects for the linear growth-curve model confirm there is significant hospital-specific variation in the growth trajectories. The variance component for the random slope of the hospital-specific growth rates in model (1) is, unlike the Mortality QI, significant for the Errors QI observations, where τ_1^2 = .0037 (χ^2 = 122, df = 76, p = .001). The variance of the relative hospital performance rankings at initial status was significant as well, where τ_0^2 = 0.124 (χ^2 = 504, df = 76, p <.000). The negative covariance between initial status and growth rate indicates there is a trend to regress towards the population mean.

It is often the case in variance component analysis that inclusion of an explanatory variable, such as Time, can increase rather than decrease the between-group variance component. This is the case for the empty models in Table 21, were τ_0^2 increase from 0.1095 in model (0) to 0.1244 in model (1). This is the reason that the proportional reduction of prediction error approach is applied to assess explained variance in HLM models (Snijders and Bosker, 2000), as was discussed in Chapter 4.

Even though the random-effect for the growth rate term is significant for the Errors QI, the relative performance ranking at initial status is largely determinant of hospital-specific growth trajectories. The ICC and reliability statistics for the variation in hospital rankings at initial status are ρ_I = .777 and $\hat{\lambda}$ = .848, repectively. Variation in hospital-specific growth rates had a smaller effect in establishing hospital heterogeneity, with ρ_I = .023 and $\hat{\lambda}$ = .367. The findings provide evidence to support accepting the premise of [H1b]; the Errors QI measure adequately discriminates on hospital quality performance.

Hypothesis testing for the potential "nuisance" effects of the variance components at level-1 and level-3 for the Errors QI measure were similar to the comparative results reported for the Mortality QI. Thus, the analysis will not be repeated.

Research question 2: Is there evidence of any trend in hospital quality performance, and do factors central to the market enterprise model and market reform explain the growth curve trajectory of hospital quality performance?

As was the case with the Mortality QI measures, neither the descriptive analysis nor the linear growth-curve results in model (1) demonstrate any significant trending effect. The mean slope for the Time function is essentially flat and insignificant (β_{01} = -0.00018, $t = 0.02$, $p > .500$). The 95% CI for the mean growth rate ranges between a -.023 and .022. Hospital performance on the Errors QI measure was not improving during the study time, and thus, the null hypothesis for [H2a] cannot be rejected.

Model analysis turns to examining the effect of market factor explanatory variables on the hospital-specific growth trajectories, as posed by hypothesis [H2b]. Table 22 presents the Error QI results for equation (4.8).

Neither market share for the dominant MCO, nor hospital ownership, nor market wage index variations significantly affected the Errors QI outcomes. Hospital competition was positively related to higher adverse outcomes on the initial performance status (β_{01} =.213, $t = 5.65$, $p <.000$). Competition did not have a significant effect on hospital-specific growth rates, however (β_{11} = .008, $t = .638$, $p = .525$). Thus, the adverse relationship between competition and initial performance did not improve over the study

Table 2222. Errors QI Market Factors Model

Parameters	M1: Empty Growth-Curve				M3: Market Factors			
Fixed Effect	Coefficient	*se*	t ratio	p value	*Coefficient*	se	T ratio	*p value*
Mean initial status, β_{00}	0.032	0.044	0.7	0.470	0.050	0.036	1.385	0.170
Mean growth rate, β_{10}	0.000	0.011	0.0	0.988	-0.004	0.014	-0.283	0.778
MCO power, β_{20}					0.006	0.011	0.565	0.572
Wage Index, β_{30}					-0.057	0.428	-0.134	0.894
Comp, β_{01}					0.213	0.038	5.661	0.000
Comp, β_{11}					0.008	0.012	0.638	0.525
For-Profit, β_{02}					-0.109	0.089	-1.227	0.224
Random Effect	Variance	*df*	χ^2		*Variance*	*df*	χ^2	
Initial status, τ_0^2	0.1244	76	504	0.000	0.0743	74	793	0.000
Growth rate, τ_1^2	0.0037	76	122	0.001	0.0037	75	121	0.001
Level-1 error, e_{tj}	0.0320				0.0319			
Deviance	57				26			
Test of homogeneity of level-1 variance		$\chi2$ =0.889		p >.500	$\chi2$ = 0.3091		p >.500	

period. The findings do not support the premise of hypothesis [H2b], which proposed that incentives realized by higher market competition would raise the bar for quality performance, when market-area price indices and MCO purchasing leverage are held constant. However, the findings are congruent with the organization field's less than effective history of competitive strategies, conventionally described as the medical arms-race competition and the utilization of all available supply-side production capacity.

Adding the market explanatory variables as fixed-effects in model (3) did result in a significant model improvement (χ^2= 30, *d.f.* = 5, p < .000), if not in expected direction of the efficient market thesis. The explained variance accounted for by the market variables was R^2 = .28.

Research question 3: Are equilibrating pricing mechanisms determinant of quality outcomes?

Results from the Errors QI demand-side pricing model (equation 4.9) are presented in Table 23. Hospital revenue per adjusted patient day was unrelated to Errors QI performance (β_{20} = .00000, t = .981, p = .479). The null hypothesis for [H3a] cannot be rejected.

Table 2323. Errors QI Demand-Side Pricing Model

Parameters	M4: Demand-side Pricing				
Fixed Effect	*Coefficient*	se	t ratio	*p value*	95% CI
Mean initial status, β_{00}	-0.166	0.056	-2.96	0.005	-.277 to -.056
Mean growth rate, β_{10}	0.000	0.013	0.00	1.000	-.026 to 0.026
AdjlnPtRev, β_{20}	-0.0000	0.0001	-0.02	0.981	-.0002 to .0003
MCO power, β_{01}	0.015	0.026	0.57	0.570	-.037 to .067
HighComp, β_{02}	0.409	0.071	5.72	0.000	.269 to .549
MedComp, β_{03}	0.194	0.108	1.802	0.075	-.0171 to .406
Wage Index, β_{21}	0.0004	0.002	0.23	0.816	-.003 to 0.004
Random Effect	*Variance*	*df*	χ^2		
Initial status, var(u_{0j})=τ_0^2	0.0922	73	394	0.000	
Growth rate, var(u_{1j})=τ_1^2	0.0037	76	86	0.001	
Level-1 error, e_{tj}	0.0320				
Deviance	28				

Higher market competition continued to demonstrate a strong positive relationship with adverse Errors events when framed as two between-subject categorical variables. Hospitals facing high market-share competition for inpatient days performed significantly worse than hospitals in low competitive market-areas, as represented by the intercept of model (5) (β_{02} = .409, t = 5.72, p = .000). Contrast analysis demonstrated the high competition market-area hospitals also performed significantly worse than medium competition market-area hospitals ($\chi^2 = 17$, d.f. = 1, $p < .000$). Medium competition market-area hospitals averaged higher log-odds for Errors events than hospitals facing low competition, but the difference was not significant at a .05 alpha level ($\beta_{03} = .194$, t = 1.8, p = .075).

The estimation of the relationship between hospital revenue and quality performance in model (4) did not improve on the model-fit realized by market factors alone, as estimated in model (3). In fact, the deviance score increased from 26.5 to 28.3 with the addition of the pricing parameter. The conditional ICC depicting the yet unspecified variance in hospital-specific growth trajectories remained high, $\rho_I = .675$, after demand-side pricing and market-area factors were taken into account.

As shown in Table 24, including the organizational characteristics of the proportion of the patient population transferred out, size, and case-mix into the model was informative in explaining Errors QI performance. The change in the model-fit deviance statistic was quite significant ($\chi^2 = 58.8$, d.f. = 3, $p < .000$). While case-mix was inversely related to Mortality QI outcomes, hospital case-mix was positively related to the Errors QI outcomes ($\beta_{30} = .934$, t = 5.9, $p < .000$). Hospital size, as measure by the log of the average daily census, was also positively related to worse outcomes ($\beta_{30} = .934$, t = 5.9, $p < .000$).

The general conclusion to be reached from the findings in model (5) is that larger hospitals attracting the tougher cases experience more errors of commission. It might seem reasonable to surmise that such facilities experience the higher hazard because they

Table 2424. Error QI Demand-Side Pricing & Hospital Process Controls

Parameters	M4: Demand-side Pricing				M5: + Hospital Process Controls			
Fixed Effect	*Coefficient*	se	t ratio	*p value*	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	-0.166	0.056	-2.96	0.005	-0.029	0.048	-0.60	0.552
Mean growth rate, β_{10}	0.000	0.013	0.00	1.000	-0.014	0.012	-1.13	0.261
AdjInPtRev, β_{20}	0.00000	0.0001	-0.02	0.981	0.00008	0.0001	0.68	0.498
MCO power, β_{01}	0.015	0.026	0.57	0.570	-0.010	0.020	-0.50	0.622
HighComp, β_{02}	0.409	0.071	5.72	0.000	0.159	0.063	2.52	0.014
MedComp, β_{03}	0.194	0.108	1.802	0.075	0.078	0.083	0.94	0.351
Wage Index, β_{21}	0.0004	0.002	0.23	0.816	0.0007	0.001	0.50	0.620
Case-mix, β_{30}					0.934	0.158	5.90	0.000
TransE, β_{40}					0.015	0.011	1.32	0.190
ADCnl, β_{04}					0.100	0.045	2.24	0.028
Random Effect	*Variance*	*df*	χ^2		*Variance*	*df*	χ^2	
Initial status, τ_0^2	0.0922	73	394	0.000	0.0620	72	295	0.000
Growth rate, τ_1^2	0.0037	76	86	0.001	0.0025	76	108	0.010
Level-1 error, e_{tj}	0.0320				0.0313			
Deviance	28				-31			

are more ready, willing and able to pursue "relentless" treatment than smaller hospitals with less challenging cases. More to the point of this research, the findings call for further investigation into the routines and processes being pursued within the firm's black-box. What can be concluded with greater certainty is that knowing the effects of these essential hospital characteristics does not clarify what market efficiency and consumer pricing have to do with hospital errors committed on patients.

Table 25 presents the results from the supply-side pricing equation (4.10) for the Errors QI outcomes. Model (6) does show a significant positive effect for labor costs per adjusted day. That is, higher labor benefits per patient day are associated with more errors of commission ($\beta_{20} = .0005$, $t = 2.17$, $p < .05$). The production function components for non-labor and capital expenses were estimated to have insignificant negative effects on the Errors QI events. The simple linear estimation for operating income in model (6) is also insignificantly related to the quality outcomes.

The findings indicate that, *ceteris paribus*, increasing labor expenses by $100 per adjusted patient day will increase the log-odds of Errors QI events by .05. One should not read too much detail into this negative relationship between labor cost and quality, though. The production function components are general monetary abstractions conventionally chosen as to weigh competitive pricing efficiency and the firm's rationality to manage short-run variable costs (i.e. labor expenses) and long-run fixed costs (capital expenses). While economists and operations research professionals analyze these material-resource factors as substitutable input drivers acting on the firm's black-

Table 2525. Errors QI Supply-Side Pricing Model

Parameters	M6: Supply-side Pricing				M7: + Poor Financial Condition			
Fixed Effect	*Coefficient*	se	t ratio	*p value*	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	0.045	0.034	1.33	0.187	0.086	0.040	2.16	0.034
Mean growth rate, β_{10}	-0.015	0.012	-1.31	0.196	-0.016	0.012	-1.39	0.169
LaborAdj, β_{20}	0.0005	0.0002	2.17	0.031	0.0005	0.0002	2.48	0.014
NonLabAdj, β_{30}	-0.0004	0.0003	-1.40	0.162	-0.0004	0.0003	-1.27	0.207
CapAdj, β_{40}	-0.0004	0.0005	-0.72	0.470	-0.0003	0.0004	-0.66	0.508
OpIncome, β_{50}	0.0001	0.0001	0.68	0.500	-0.00002	0.0001	-0.13	0.894
Case-mix, β_{60}	0.993	0.151	6.57	0.000	1.064	0.140	7.58	0.000
TranE, β_{70}	0.012	0.011	1.02	0.309	0.010	0.0112	0.93	0.354
MCO power, β_{01}	0.003	0.020	0.13	0.899	0.001	0.0208	0.04	0.969
Comp, β_{02}	0.086	0.030	2.85	0.006	0.091	0.034	2.72	0.009
Wage Index, β_{21}	0.003	0.003	1.19	0.235	0.003	0.003	1.06	0.291
ADCnl, β_{03}	0.093	0.043	2.158	0.034	0.068	0.042	1.60	0.113
PoorIncome, β_{04}					-0.119	0.053	-2.26	0.027
Random Effect	*Variance*	*df*	χ^2		*Variance*	*df*	χ^2	
Initial status, τ_0^2	0.0584	73	284	0.000	0.0597	72	288	0.000
Growth rate, τ_1^2	0.0026	76	109	0.008	0.0025	76	108	0.009
Level-1 error, e_{tj}	0.0310				0.0311			
Deviance	-38				-43			

box outputs, labor cost should not be mistaken as a proxy for the more fundamental and micro-analytic process routines of staffing decisions and skill-mix effects on hospital outcomes. This somewhat confusing issue will be elaborated on when the results of the *ad hoc* best-fit model are presented below.

The only conclusion that can be drawn for the inverse relationship between labor cost per adjusted patient and hospital quality performance is that, whatever motivates management to give more of the economic pie to employee benefits, the consequence appears not to be in the best interest of patients. In that the results provide any detail information about how the labor expense pie is being distributed within the organization, it hard to say what the material interests might be.

The estimated effect for hospitals that consistently demonstrated poor financial performance, attained by adding the dummy variable PoorIncome into model (7), was significant (β_{51} = -.119, t = -2.26, p < .05). The worse financially performing hospitals, as a group, had fewer Errors QI events than their more successful cash flow peers. The finding is unexpected, since the poor financial categorical variable was included primarily as a piecewise function to control for suspected non-linear effects in the continuous operating income variable. While inclusion of the piecewise function variable mitigates the positive relationship between operating income and the adverse event QI, the degree of profitability remains irrelevant to quality outputs (β_{50} = -0.00002, t = -.13, p >.500).[33] As intended, inclusion of the piecewise function did improve the model fit for the supply-side pricing model (χ^2 = 4.56, d.f. = 1, p < .05).

As was true for the Mortality QI, the findings for the Errors QI indicates the null hypothesis for [H3b] cannot be rejected, the finding to not support the efficient relationship that quality outputs cost more. The predicted relationship was not found whether framed by demand-side cost as revenue or by supply-side production function expenses. What waits to be explained is why there appears to be a labor cost and retained earnings premium for *poor* quality outputs. Market efficiency and institutional change

[33] Inclusion of more pieces of the piecewise function (i.e., the top third income performers) does not improve the model fit, nor result in significant coefficients.

towards market reform are woefully lacking as sufficient explanations for hospital quality performance.

Ad hoc analysis of the Errors QI measure suggest a more process oriented approach, independent of economic concerns, may guide future research in explaining hospital quality performance. The "best-fit" model for the Errors QI measure included two additional explanatory variables: the time varying measure of clinical FTEs per 1,000 adjusted patient days and the between-subject dummy variable for hospital in the top quartile for newborn deliveries. The results are presented in Table 26.

Table 2626. Errors QI *Ad hoc* Best-Fit Model

Parameters	M8: *Ad Hoc* Supply-side Pricing			
Fixed Effect	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	0.070	0.043	1.60	0.113
Mean growth rate, β_{10}	-0.023	0.012	-1.88	0.064
LaborAdj, β_{20}	0.0006	0.0002	2.38	0.018
NonLabAdj, β_{30}	-0.0003	0.0003	-1.04	0.298
CapAdj, β_{40}	-0.0003	0.0005	-0.72	0.472
OpIncome, β_{50}	-0.00004	0.0001	-0.32	0.751
Case-mix, β_{60}	1.033	0.147	7.01	0.000
ClinicFTE, β_{70}	-0.037	0.0159	-2.31	0.022
MCO power, β_{01}	0.009	0.0187	0.48	0.633
Comp, β_{02}	0.068	0.0297	2.30	0.024
Wage Index, β_{21}	0.002	0.003	0.96	0.337
ADCnl, β_{03}	0.070	0.042	1.66	0.102
PoorIncome, β_{40}	-0.096	0.056	-1.70	0.095
NBtopQrtl, β_{41}	0.095	0.060	1.58	0.119
Random Effect	*Variance*	*df*	χ^2	
Initial status, τ_0^2	0.0545	71	275	0.000
Growth rate, τ_1^2	0.0029	76	114	0.003
Level-1 error, e_{tj}	0.0303			
Deviance	-50.5		□	

Since the supply-side pricing model (equation 4.10) had the better fit of the two pricing models, it was used as the base model in the *ad hoc* analysis. Including ClinicFTE and NBtopQrtl as new variables in the model resulted in a significant model improvement (χ^2=8, *d.f.* = 2, p = .018). Hospitals in the top quartile for newborn discharges had, on average, more Errors events, but not significantly so (β_{50} = .093, t = 1.57, p = .121). Poor operating income continued to relate to better quality outputs (β_{40} = -.095, t = -1.70, p < .10).

Clinical FTEs were significant and inversely related to the Errors QI events (t = -2.31, p < .05). One additional clinical FTE[34] is estimated to reduce the Errors log-odds rate by .037. Though the number of clinical FTEs and labor expenses are significantly correlated (r^2 = .34), the differential paths each measure of labor intensity exerts on Errors QI outcomes is obviously complex. The conundrum is in need of richer contextual analysis, as it is not easily explained by abstract notions self-interested maximization and welfare optimization.

Dynamics of demand-side quality preferences on supply-side competitive advantage

The last market enterprise model relationship examined deals with the expected material-resource advantage achieved by hospitals that provide exchanges with higher quality or utility for the consumer (e.g., consumer-surplus in economic vernacular). Table 27 presents the findings from equation (4.11), which are used to examine the effect

[34] RN staffing was also inversely related to the Errors QI, but not significantly.

Table 2727. Demand-Side Utility and Subsequent Supply-Side Profits

Parameter	M9: Empty Linear Growth-Curve				M10: Effect of Quality Performance on Subsequent Earning Rate				Model11: + Market-area Controls			
Fixed Effect	*Coefficient*	se	t ratio	*p value*	*Coefficient*	se	t ratio	*p value*	*Coefficient*	se	t ratio	*p value*
Mean initial status, β_{00}	8.429	0.735	11.46	0.000	8.448	0.396	21.34	0.000	8.762	0.438	20.01	0.000
Mean growth rate, β_{10}	-0.334	0.376	-0.89	0.378	-0.201	0.279	-0.72	0.473	-0.411	0.303	-1.36	0.179
PriorOpMargin, β_{20}					0.670	0.057	11.78	0.000	0.677	0.057	11.81	0.000
Mortality, β_{30}					0.188	1.286	0.15	0.884	-0.515	0.869	-0.59	0.796
Erorrs, β_{40}					-0.567	0.782	-0.73	0.468	-0.275	0.874	-0.31	0.553
Competiton, β_{50}									-0.063	0.385	-0.16	0.871
MCOpower, β_{60}									0.311	0.185	1.68	0.094
Random Effect	*Variance*	*df*	χ^2		*Variance*	*df*	χ^2		*Variance*	*df*	χ^2	
Initial status, τ_0^2	33.395	76	389	0.000								
Growth rate, τ_1^2	8.516	76	355	0.000	2.908	76	251	0.000	2.781	76	246	0.000
PriorOpMargin, τ_2^2					0.068	76	112	0.005	0.071	76	113	0.004
Level-1 error, e_{tj}	11.780				14.414				14.326			
Deviance	1940				1823				1820			
Reliability												
Initial status intercept	0.802											
Growth rate	0.783				0.584				0.577			
PriorOpMargin					0.229				0.235			

hospital quality performance has on the subsequent year's operating margin, and to test hypothesis [H4]

Model (9) in Table 27 gives the empty growth-curve results for the four annual operating margin observations between 1999 and 2002. The estimated average operating margin in 1999 was the high point in the study, at 8.42%. Most of the trajectory variance was, however, attributable to between-hospital dispersion, not across year variations. The ICC statistic (conditioned on a linear function of time) for the hospital-specific variance component was $\rho_I =$ 0.62. The mean growth-rate was decreasing over the study time, but not significantly (β_{10} =-0.334, t = -0.89, p = 0.378). No association was found between quality outcomes and subsequent retained earnings in model (10), neither for the Errors QI (t = -.43, p > .500) or the Mortality QI (t = .29, p > .500). The finding suggests that those managers who have been encouraged by market-reform to seek more bottom-line

objectives need not be concerned with making quality performance a priority.

Adding market-area competition factors as controls into model (11) does not clarify the dynamics between demand-side utility (preference for better treatment outcomes) and supply-side material-resource competitive advantage. It is of interest to note that hospitals facing greater bargaining leverage from the dominate MCO did, on average, achieve higher retained earnings (β_{60} = .329, t = 1.72, p < .10).

Summary

The empirical findings did not support any of the market enterprise model predictions about the utility of pricing mechanism or market competition in explaining the production of quality performance as represented by the two latent QI measures. Neither was evidence found to support an effective relationship between demand-side preferences for quality and the material-resource advantages achieved by supply-side producers. Yet, interesting stylized facts about institutional performance were uncovered, which are in need of further explanation.

An important, if methodological, stylized fact demonstrated by the findings is that there are measures of quality performance on which hospitals systematically distinguish themselves. The degree of outcome uncertainty in healthcare is in some degree a problem moving towards more effective solutions. The findings suggest an improvement in the sense that it is very hard to improve on a hospital outcome if you can not systematically measure a true difference between hospital outcomes.

The empirical findings in need of richer contextual analysis, not sufficiently captured by the efficient market thesis, include some of the following. Since greater hospital competition and more MCO purchasing leverage adversely relate to quality outcomes, are there alternative interorganizational processes or organizational forms to be discovered that foster raising the quality bar? If higher concentrations of clinical labor foster better quality, then we need to follow the money very closely to find out just why higher aggregate labor expenses are associated with worse quality outcomes. Richer contextual analysis, in a nested data structure sense, needs to uncover the significance of case-mix as a hospital attribute relating to risk-adjusted patient outcomes.

CHAPTER 6—DISCUSSION

This study examined the extent to which the efficient market thesis is coupled to actual hospital quality outcomes. The relevance of the inquiry goes to the fact that market reform, as a social movement, has produced profound institutional change in healthcare. From a pragmatic policy point of view and from a scientific perspective it would be interesting to know the consequences of enacting the market enterprise model as an organizing solution to perceived healthcare problems.

Specifically, the study aimed to better understand if the consequences entailed improving on the longstanding problem of uncertain outcomes in health service transactions. Are the consequences as efficient as intended when valuing quality performance in our era of market reform? Or, is the efficient market thesis just another institutional example of a legitimizing cultural process decoupled from the pragmatic consequences intended?

That this is scant evidence about the relationship between market pricing and competition and hospital quality performance is taken as further justification for the research. The lack of empirical support was, in fact, taken as cultural evidence that the assumed efficiency of market governance and market mechanisms in healthcare should be treated more as a taken-for-granted social fact, than as a scientific inevitability.

Using a linear growth-curve design and the material-resource environment as a sufficient domain to measure organizational production processes, the study demonstrates a degree of pessimism is in order when considering market reform as the design solution to solving the persistent problem of hospital quality performance. HLM analysis demonstrated a significant degree of hospital-specific variation for two latent quality performance indicators, derived from a selected set of risk-adjusted adverse inpatient events. Economic supply-and-demand model explanations for this variation in quality performance were evaluated. This chapter summarizes the tested results, puts forward implications of the findings, details the study limitations, and offers suggestions for future research.

Summary and Interpretation of the Analysis

Descriptive analysis shows the inpatient quality outcomes did not noticeably improve for the aggregate of consumers over the four year study period. Aggregate costs for treatment continue to rise, however, despite a decreasing trend in the average severity-adjusted length of stay. While the adjusted revenue per patient day and the proportion of hospital revenue realized from outpatient services have been increasing, hospital economic performance, as measured by adjusted operating income per day and hospital operating margins, has been decreasing, on average.

Other than informing on a general absence of improvement in hospital quality outcomes, the descriptive analysis of aggregate fixed-point trends did not clarify whether the quality problem, the "quality chasm" in healthcare, is solvable, or what market pricing and competition have to do with designing a feasible solution. Seven hypotheses were proposed and tested for each of the two latent quality variables. Two of these hypotheses assessed the adequacy of the measurement model; and five hypotheses assessed the efficient market thesis with respect to hospital quality outputs.

Table 28 summarizes the measurement model results. The annual cross-sectional analysis for each of the four selected inpatient quality indicators demonstrated appropriate levels of explained variance for the patient-level, risk-adjustment coefficients *and* demonstrated significant systematic between-hospital variance. The results for [H1a] support the premise that the four selected patient quality indicators adequately account for the nested patient/hospital data structure of inpatient outcomes. That the majority of AHRQ's PSI indicators (21 of 25) did not demonstrate this degree of statistical validity in the preliminary selection process supports the contention the hypothesis was falsifiable. There is little assurance a suspected quality indicator is in fact a valid quality performance measure for a give hospital sample without the requisite statistical validation.

Table 2828. Summary of Measurement Model Results

Hypothesis	Significant Hospital-Specific Variance Component	Average Reliability(λ_0)	Variance Explained by Risk-Adjustment
H1a:Cross-sectional Measurement Model			
Inpatient Mortality	yes	0.9	34%
Failure to Rescue	yes	0.5	30%
Infection Due to Medical Care	yes	0.67	12%
Accidental Puncture or Laceration	yes	0.73	11%
H1b: Longitudinal Measurement Model		Reliability	ICC
Mortality QI	yes	0.91	0.73
Errors QI	yes	0.92	0.78

Longitudinal validation of the measurement model, sought in [H1b], was also empirically supported. The two latent factors, derived from combining the cross-sectional risk-adjusted performance rates as repeated measures for Mortality and Errors QIs, reveal that significant relational dependencies exist for organization-specific performance over time. The measurement model findings demonstrate the between-group variance component, as a hospital-specific source of variability, is sufficiently large, and in need of explanation.

The collinearity or relational dependencies observed in the repeated measures for the two latent QIs, and interpreted as hospital growth-curve trajectories, revealed significant between-subject variation, or systematic between-hospital variation in this study. For the Mortality QI this hospital-level variation was rather exclusively defined by the relative performance rankings at the initial status. That is, the performance rankings that separated hospitals in 1998 tended to persist over the study, as there was neither a significant change in the mean growth-rate, or a significant degree of systematic variation in hospital-specific growth rates. For the Errors QI measure, hospitals again distinguished themselves by their initial status performance rankings, and, to a lesser degree, demonstrated significant hospital-specific variation in their growth-rate trajectories. As with the Mortality QI, the Errors QI demonstrated no significant mean growth-rate trend, and was the relevant fixed-effect finding for the first set of predictive model hypotheses. The growth trajectory patterns for the two latent QI measures are shown in Figure 4, which graphically depicts 25 growth-curves randomly drawn from the hospital sample.

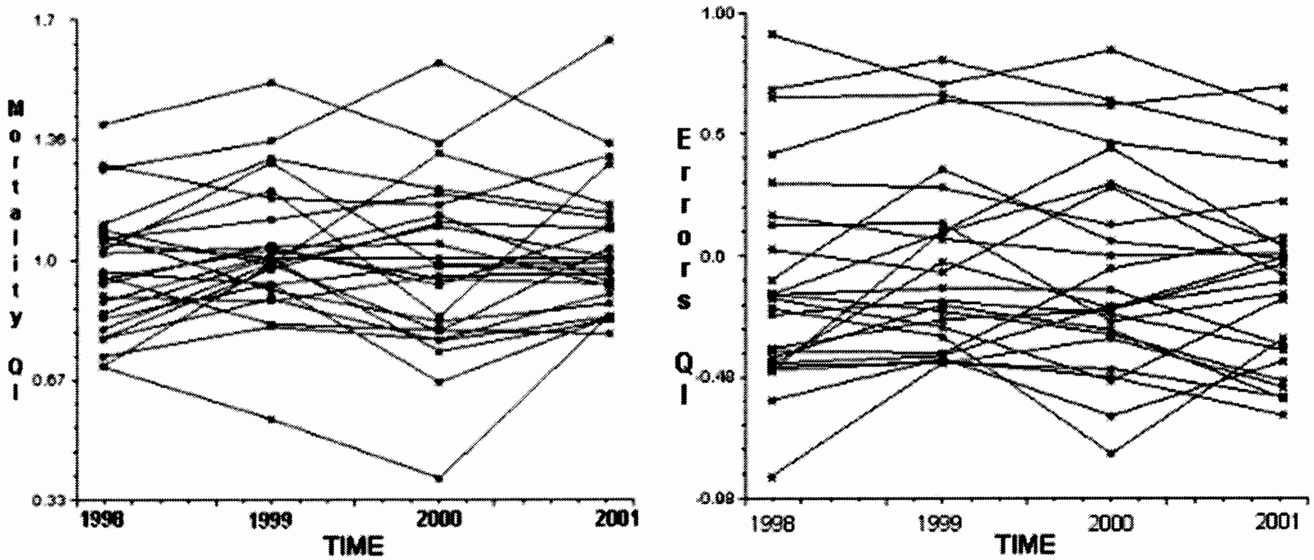

Figure 44. Hospital-Specific Growth Trajectories for the Mortality and Errors QIs

The measurement model results are taken to represent the general case that health services research has made steady progress in the measure and reporting of quality data in the research literature and, to some extent, in public publications for comparative use by consumers. Researchers and policy analysts are optimistic that change will follow from this progress in measurement (Clancy, 2006). The construct and discriminant validity of the quality indicators used in the study reflect advancements that have been made in AHRQ's HCUP Quality Indicators program (Zhan & Miller, 2003) and the continuing development of APR-DRG risk-adjustment methodology. While the improvement in healthcare quality can be conceived of as a developmental social learning process pursued by health service research professionals, the information reported in this study can also be considered as a material resource available in the market.

Because of the public mandate for the VHI mission, the data used to develop the performance measures are available to all participants in these economic transactions. The data sets are either known, or in the possession of Virginia firms involved in the purchase or delivery of healthcare services. The statistical methodology is also public information, and the tools reasonably inexpensive. If one assumes the actors are fully rational and farsighted, the search cost for similar hospital performance information need not be seen as a barrier to optimistically anticipating efficient market mechanisms.

Table 29 summarizes the results for the predictive hypotheses used to test the market enterprise model. As the quality indicators measure the odds or log odds of adverse inpatient events, better performance is inversely related to the measures. The excepted positive relationship between market dynamics and quality performance was

Table 2929. Summary of Market Enterprise Model Results

Predictive Models	Expected Sign	Mortality QI Results Coefficient	Significance	Errors QI Results Coefficient	Significance
H2a: Trend of Quality Performance	-	+	p > .5	-	p > .5
H2b: Trend Conditioned on Market Factors	-	+	p > .5	-	p > .5
Competition	-	-	p > .5	+	p < .000
MCO Purchasing Power	-	+	p < .01	+	p > .5
For-Profit	-	+	p > .5	-	p = .224
H3a: Demand-Side Pricing as Revenue	-	-	p > .5	-	p > .5
H3b: Supply-Side Production Function Pricing	-	-	p > .5	+	p > .5
Labor	-	-	p > .5	+	p < .05
Non-labor	-	+	p > .5	-	p = .207
Capital	-	+	p > .5	-	p > .5
Operating Income	-	-	p = .321	+	p > .5
H4: Effect of Quality Performance on Subsequent Profit Margins	-	+	p > .5	-	p > .5

predicted as a negative sign for the adverse events coefficients. As reported in Chapter 5, there is no empirical support for the Panglossian view that all is as it should be, now that we have evolved into this era of healthcare market reform.

The results for [H2a] and [H2b] indicate that quality did not improve over the study period, even after accounting for market-area competition and critical market-area material-resource factors. The trending predictions were thought to be the broadest and most lenient tests for market reform. Market logic rather exclusively focuses on ideal dynamics that abstract other domain complexities in order to assert a good first approximation of economic consequences. The conceptual framework of this study anticipated a more conflicted institutional reality and less clear empirical consequences. Change enacted in this era of market reform certainly supports the argument that market forces have gained ground relative to the professional and governmental eras of the past.

It was also suspected that proponents of quality improvement and evidence-based medicine reform, as well as technological advances in general, would have been factors contributing to observing the hypothesized progress. Stagnant quality performance not only impugns markets as failing to raise the competitive bar, but is a stylized fact that impeaches the organizational field more generally.

Quality performance remained stagnant when market-area competition was taken into account. Further, higher competition was found to be significantly associated with worse Errors QI outcomes, not an incentive for better outcomes as presumed. Hospital competition does not lead to market differentiation based on the value or utility of money to price quality results. Given past research on hospital competition, and assuming value and utility are somewhat uncertain to all participates, it appears more competition just motivates a medical-arms-race for more revenues or more market share (Devers, et al., 2003).

Finding that the market-share for the largest MCO organization was significantly related to worse Mortality QI outcomes is a subtler comment on market reform. MCO purchasing power is essentially treated as a control variable for demand-side modeling of material-resource constraints on market mechanisms. It is not revealing of hospital competition or pricing mechanisms *per se*. There is an interesting and common process story behind the untoward effect the organization evidences, however. The largest MCO organization in Virginia, as in many states, is now a publicly traded corporation that evolved from the Blue Cross Blue Shield non-profit plans that dominated the insurance market when the medical profession was the ruling regime and the trusted authority of public good in healthcare.

Ideally, formal theoretical support for making everything for sale in private markets is based on large number effects for competitive solutions. In practice, economists and market supports tend to qualify the ideals of perfect competition with arguments for the economic and pricing advantages of market oligopolies in lieu of any non-market governance structure. As noted earlier, the arguments tend to ignore the vertical integration problem of organizations as coordinated, not autonomous, substitutes for market governance.

Exactly when, and under what conditions, is the consolidation of resources within an organization too big or too little for optimum welfare? Economic research has not made this clear, and organization research suggest it is historically dependent, not economically dependent (Simon, 1997). Moreover, if big, integrated and centralized resources are optimal, what are the arguments for private, not common ownership of the resources, especially when all citizens are stakeholders in the outcome of production? It would be interesting to research whether this dominate commercial payer had the same deleterious effect as a non-profit institution in eras gone by.

While ideological economic arguments tend to frame policy issues and problems solutions simply as market or non-market choices, the reality is institutions, including organizations, are guided by wider array of feasible alternatives. As discussed in Chapter 3, organization theory promotes attending to a range of organizing models and ideals, of which the market enterprise model is only one in a larger set of feasible alternatives.

Regardless of the answers that might address the optimal organizational form and size, the enactment of market reform in healthcare has been principally expressed by national corporations consuming local non-profits, and non-profits transforming themselves into for-profits (Luke & Walston, 2003). Both are exemplified in the recent history of the largest MCO in Virginia.

The two sides of the pricing hypothesis did not suggest quality was well priced in the sense of costing more. For the demand-side equation of [H3a], we do not necessarily get what we pay for. Hospitals with higher revenues per case-mix adjusted day did not provide significantly better quality of care as measured by the inpatient adverse events considered in this study.

Decomposing revenues into production function choices made by the hospitals did not improve understanding as to what determines a quality producer. The supply-side results found in testing [H3b] suggest hospital firms attentive to market objectives are either not seeking, or have not found, a production function expense strategy to achieve market differentiation by pricing quality outputs. Hospitals do not efficiently signal quality by their pricing. This is not to say hospitals do not pursue the marketing of quality, however, which in healthcare remains a completely separate issue.

The finding that labor expenses were positively related to worse Errors QI outcomes raises a thorny issue for market ideology. If management decisions to give more of the economic pie to labor expenses are not related to core outcome issues, which are in the best interest of the patient, are there, then, alternative motivating factors or objectives that make rational sense?

Labor cost as an aggregate expense category provides no information about how the economic pie is being distributed within the organization as staffing decisions. However, the subsequent *ad hoc* model for the Errors QI, which fished over the complete set of available hospital variables, did suggest there is some enlightening information to be found at the level of staffing details. The *ad hoc* results revealed that a higher clinical staff ratio to patient days was associated with lower adverse patient events, while labor expense continued to be positively and significantly related to adverse events in the "best-fit" model. A richer context is needed to understand the differential effects that form around these two measures of labor intensity. Where are the higher labor expenses going, if not proportionally to higher costs for employing front-line workers? Though the two measures are correlated at $r^2 = .34$, they apparently work obliquely to each other in how they relate to quality performance.

The discordant results are in keeping with previous research that has found that the connections between staffing decisions, economic performance and quality outputs are uncertain (Zhoa, 2004), nonlinear (Mark et al., 2004), and diverge from commonsense expectations when positioned together (McCue et al., 2003). Though the findings do point to the fact that there are winners and losers in the competitive struggle for material resources, the relationships are not readily explained by simplifying abstractions that tie self-interested maximization to inevitable welfare optimization.

Similarly, the better quality realized on the Errors QI measure by hospitals consistently in poor financial condition calls for richer process details than can be explained by the bottom-line orientation of the market enterprise model. The joint findings that poor financial condition can benefit quality performance and that larger hospital size and a more severe case-mix are detrimental, speculatively, suggests greater hazard is associated with hospitals that are more ready, willing and able to pursue "relentless" treatment than its peers. Such a conclusion is, however, somewhat at odds with the common finding that volume and experience are associated positively with better outcomes (Dudley & Mangione, 2001).

The benefit of experience was supported in the Mortality QI findings, which showed hospital-level case-mix to be positively associated with better quality performance. The differing case-mix relationship found between the two latent variables highlights the fact that hospital quality performance does need to be viewed from a multi-dimensional and a multi-level perspective.

The process factors used as essential control variables were, generally, more informative (e.g., explained a larger amount of the hospital-specific variance component), than the market competition or pricing variables. Likewise, the *ad hoc* analysis was informative about factors that should be considered as important micro-analytic process determinants in explaining hospital-specific performance variance. Though the process and operation variables were not directly used to test market enterprise model predictions, the findings suggest that limiting analysis to market competition and pricing mechanism dynamics is insufficient to account for the hospital-specific variation found in quality performance growth-curve trajectories.

The results for hypothesis [H4] demonstrated no association between higher quality performances leading to better hospital economic outcomes in subsequent years.

The efficient market premise is that the information made clear under the statistical lens of this study is generally available to participants in healthcare transactions, including the consuming patient and health plan purchaser. Further, the assumption is that the information is acted on to rationally maximize the consumer's utility. This is considered the least tenable of the efficient market thesis presumptions, yet it is nonetheless essential to market logic and the market enterprise model.

Health economic research has extensively focused on "information asymmetry" and "moral hazard" as adversely effecting assumed market efficiencies. The concepts are propositions that explain market-failure, though. They are not arguments for market reform. Arrow (1963) relied heavily on these concepts to explain the value of non-market institutions in healthcare. The question from an institutional perspective is: why is there not more market-failure analysis published in health economics today, or economic arguments made in support of non-market policy? Why is economic analysis, and the assumed sufficiency of attending to material interest, so isomorphic across organizational fields?

Can economic explanations of common interest gain equal footing with material interest in the United States? It does appear, according to Engel & Schweizer (2000), that academic cultures outside of the United States have moved beyond dichotomous philosophical inclinations and reliance on normative theory, and towards a more pragmatic and balance economic approach—especially in healthcare.

Limitations of the Study

There are a number of limitations to this research. The limitations of the study are presented as concerns or problems related to: the use of administrative data, risk-adjustment and case-mix, and sample size.

Administrative Data

One concern is the data was not produced directly for research, but rather to satisfy routine administrative requirements. Administrative datasets are prone to various sources of reporting errors. The annual survey data, though accompanied with audited financial statements, were produced under varying conditions. For instance, most of the hospital systems produce reports for all their hospitals from compiled reports at their central office, which often lacked verification details for specific hospitals. The VHI annual survey data is viewed to be of high quality, however, given the inherent limitations of survey data collection, and in comparison to similar national survey instruments.

That patient discharge administrative data is error prone and approximate in nature has been long recognized (Iezzoni, 1994; Elixhauser et al., 1998; Scott, Youlden, & Coory, 2004; Weingart, Iezzoni, & Davis, 2000). The quality indicators developed by AHRQ's HCUP program were specifically constructed as administrative database tools and extensive precautions were taken to avoid misidentification errors. Nonetheless, the approximate nature of the indicators has been acknowledged (McDonald, et al., 2002). For example, the order of the diagnostic codes and whether they were subsequent to admission have been shown to be problematic, and effect both the identification of adverse events and their risk-adjustments.

The methodology used to develop the measurement model mitigates some of the measurement error associated with reliance on administrative data for the performance measures. Both the use of HLM analysis to estimate systematic between-hospital variation and the use of multiple measures have been reported by Scott, Youlden, & Coory (2004) to improve the statistical validity of quality performance indicators. Employing a repeated measures design to evaluate the reliability of the quality measures is also thought to strengthen validation of the measurement model.

Case-mix

The particular APR-DRG risk-adjustment methodology used in development of the three HCUP PSIs as performance outcomes needs validation from a wider number of researchers. Though the developers at the University of California San Francisco-Stanford Evidence-Based Practice Center anticipated the APR-DRG system as an appropriate risk-adjustment methodology, the approach taken has only been reported on by the research group with whom the author is associated. The risk-adjustment methodology applied in the study has undergone extensive development, refinement and validation (Shukla and Fisher, 1999; Fisher, 2001 & 2003). It is, however, a methodology that calls for further cross-validation.

Sample Size

The study's sample selection is considered a limitation in two ways. First, the sample size may lack sufficient statistical power to detect causal determinants with a small effect size. The four annual observations on the 77 Virginia hospitals provide 308 observations, and would be an acceptable sample for many types of designs. Estimation of nested levels in HLM designs complicates power analysis generally, and the need to account for collinearity in a repeated measures design further complicates the topic (Hox, 2002). The sample of observations is considered adequate, primarily due to the relatively high ICC statistics observed in the evaluation of the measurement models.

The second research constraint imposed by the selected sample is the generalizability of the results. As the sample is restricted to Virginia observations, the research implications may not apply to other locations. However, comparative analysis with the national AHA data revealed there was substantial similarity on basic hospital characteristics and adds weight to the likelihood that the sample is representative of a wider population.

A sever limitation of the study sample is the sample size of the geographic market-areas. The seven market-areas provide an insufficient range to fully assess the graded impact of the local markets as a source of variability. Because of the small sample, the measure of market competition used in the study is not as refined as applied in other economic studies (Wong et al.'s, 2005) Validation of the study results requires additional research with a larger number of market-area sampling clusters; which would provide a more precise estimate for the small-area variation component.

The conceptual framework taken in this study has pragmatically framed the economic concerns for market governance in terms of applied market reform and ideology consequences within an organization theory perspective. Market dynamics, as an economic construct, has a rich history and covers a lot of conceptual ground. The predictive equations used to model market dynamics must be taken as but a limited set within the possible range of models that can capture the effect of applied market governance. The research design invites cross-validation by other means to assess the efficient market thesis in the case of pricing quality healthcare outcomes. Specifically, validation of the study results calls for alternative analysis in the economic tradition of market-failure analysis.

Implications of the Findings

Implications for Organizational Theory

Effort was made to extend institutional theory by melding it with complementary collective action notions in the micro-analytic traditions of the Simon/Carnegie-Mellon program concerned with boundedly rational decision-making. The aim of the framework was to counter the neo-institutional proclivity to default to the abstract formalism of market mechanism to account for positive institutional/organizational outcomes. The approach drew heavily on new institutional economic theory, and its pragmatic relativism in considering institutional alternatives as feasible governance structures that can be judged and compared by their consequences (Knight, 2000). The approach attends closely to the cognitive elements of institutional dynamics and the relationship between collective action solutions and knowledge, information and social learning (Williamson, 2000c; Dosi, 2004; Mantzavinos, 2001).

The theoretical foundation essentially reversed the dualistic institutional view (frequently presented within a health services context) that market intuitions are efficient and that "more" institutionalized governance structures are ineffectual (Alexander & D'Aunno, 1990 & 2003). The research was guided by pessimism for the normative economic position and the cultural support given to conventional economic models within the context of healthcare. The conceptual framework, further, argued for a degree of institutional optimism by empirically looking at boundedly rational collective action adaptations in comparative terms. Where the comparative terms define a fit with what are perceived as problems to be solved, and what are taken as problems already solved. The degree of fit must not only account for material-resource environmental factors, but for an institutional environment as well. Specifically, comparative optimism led to assessing whether hospital organizations, as representing institutionally-specific collective action, distinguished themselves on solving the problem of quality performance, independent of economic constraints.

Pessimism for market enterprise model solutions to hospital quality performance was hypothesized because it does not fit well with the problem domain or task environment characteristics. The production of hospital outputs was observed to be a task environment characterized by uncertain outcomes, a high degree of technical and coordination complexity, and a need to account for intertemporal process transformations of significant duration. All are organizing attributes around which long-run dependent relations tend to form. The decentralized and impersonal focus of the market enterprise model was taken as a less-than-optimal fit to the problem domain. The principal drawback to the market governance solution was seen as its reliance on relatively short-run exchanges that dependent rather exclusively on material-resource environmental factors.

Pessimism for the efficient market thesis, which grounds the legitimacy sought by the market enterprise model as a SMM for organizing organizations, was empirically supported by the study results in three ways. First, no trend of quality performance improvement was demonstrated during this new era of market reform, even when market competition and other market-area material-resource variables were taken into account. Second, material-resource variables did not account for quality performance being efficiently priced, nor did production function variables explain the utility of better quality outcomes as represented by hospital performance trajectories And, finally, no relationship was found between demand-side utility for better quality outcomes and supply-side competitive economic advantage.

On the positive side, hospital organizations did distinguish themselves, even after material-resources factors were taken into account. The evidence at this point informs us that what distinguishes one hospital's performance from the rest are yet "unspecified" relational dependencies that cohere the boundaries of the organization as systematic routines.

The results also revealed the relational dependences were present at the beginning of the study and persisted over the study time. This can be deduced from the shape of the growth-curve trajectories for both the Mortality and Errors QI, which was primarily determined by the degree and significance of the ICC statistic for the initial status. This nebulous statistic attribution of unmeasured group cohesion is taken to represent a latent characteristic of dependent relations that await a richer contextual description than can be specified by simple material interest. Whether there are institutional patterns that can account for the good and bad performing hospitals is to be seen. But there is room for some optimism.

Theoretically there is reason for optimism that benefit can arise not only from decentralized material-resource environment solutions and market institutions, but also from the structuration occurring in the institutional environment of organizations and organizational fields. Maybe the performance heterogeneity that can warrant such comparative benefit conclusions mainly occurs in organizational fields undergoing profound institutional change and conflict. Or, it may be that institutional conflict can be detected, to some degree, in most organizational fields. Certainly, institutional theory can benefit from improving on its comparative analysis and from a better understanding of organizational heterogeneity that can evolve from a selection process occurring in the institutional environment. The marketplace of ideas may be a good place to start.

The study framework and empirical results are thus presented to follow the research agenda set by Powell (1991) to overcome the limitations and expand the scope of institutional analysis. Specifically, the objectives are: 1) to make less "of the differences between so-called market-driven sectors and institutionalized sectors;" 2) to improve on the "inappropriate view that institutionalized organizations are relatively passive, inefficient manipulators of symbols rather than substance;" and 3) to "enhance understanding of both the sources of heterogeneity in intuitional environments and the processes that generate institutional change" (Powell, 1991: p. 183). Two research design elements are consider to have particularly advanced these objectives. The first involved the treatment of cognitive elements as empirically grounded behavioral foundations for institutional action (Bunderson, Lofstrom, and Van De Ven, 2000). The second element entailed the use of HLM statistical techniques, as they allow for the analysis of nested data structures, and provide for an empirical mapping of the nested boundaries of social interaction.

Implications for Methodology

Applied social research frequently encounters nested data structures as individual events or variables describing individuals, which are then grouped (or framed by the sampling design) into larger units. Each higher level unit, consisting of a number of individuals, also constitutes action and has variables describing these higher order units. Similarly, social theory often requires explanation to processes that link individual events to larger social units. HLM analysis can be viewed to complement such theoretical explanation, as it is a general data-analytic strategy that directly estimates group cohesion as a between-group variance component. HLM designs can additionally estimate the effect explanatory variables have on this between-group source of variability.

Institutional theory conceptually attends to the hierarchical structure observed in social order: individuals nested within organizations, organizations nested within organizational fields, and organizational fields nested within cultures. The glue that holds the hierarchical order together is taken as a stylized fact in need of explanation. Thus, structuration is the primitive cohesive process and the observed dependent relations the story to be told. Institutional theory has tended to focus on how good is the glue, or how persistent the social structure. Analysis has also attended to a lumpier form of cohesion in terms of social reform, political conflict and intuitional heterogeneity.

The study has worked from the position that there is a complementary fit between the methodological underpinning of institutional theory and the statistical methods of HLM designs. By combining variance component analysis and Bayes estimation with fixed-effect regression analysis, the cohesion of group membership can be estimated and explained. Important for this study and the theoretical extensions argued, the between-group variance component allows for the estimation of collective action cohesion, and its relative importance as a causal effect at different nested levels. Further, accounting for cohesion can be hypothesized as fixed variable effects. Generally, HLM designs can add additional quantitative dimensions to the process story telling methodology of institutional theory.

Managerial Implications

From a managerial perspective, the findings can give new affirmation to how difficult the task is to achieve even a few critical organizational objectives in the organizational field of healthcare. For a vast majority of market sectors, there is no doubt a reasonable linkage exist between competition and pricing and industry standard measures for quality outputs. However, following standard routines that problem-solve on material-resource environment factors is not as likely to suffice in healthcare. The dimensions in need of monitoring and the complexity of the processes in health service delivery greatly complicate the administrative tasks and the relationships on which they depend. The training that would prepare hospital administrators and healthcare managers should not be isomorphic to what is thought as adequate for other industrial sectors.

The findings provide insight in two areas of hospital operations. First, it is difficult to change what cannot be measured. The methodology and results of the study reflect a slowly evolving progress in the evaluation of quality performance (Clancey, 2006). The learning curve for the measurement of quality outputs is changing the landscape, as "pay for performance" is the new big thing, and has had some implementation (Rosenthal, et al., 2005).

Yet, for those concerned with short-run market signals, the findings do not suggest any reason to rush into expensive re-engineering strategies. Hospital quality performance has changed only at the margins[35] since IOM's 1999 report, *To Err is Human*, roused public attention about the harm done in hospitals and caused all hospitals to react in some fashion (Leape and Berwick, 2005). Even in this era of market reform, healthcare markets may not show an effective rapid response to demand-side interest. When it comes to quality performance issues, it is reasonable to assume strategies of buffering and information gamesmanship should suffice in achieving bottom-line objectives for a number of quarters yet.

For those already committed to long-term goals at getting it right, in terms of professional standards and as a matter of public good, there is reason to take heart. If the organization has already started construction of the requisite clinical information infrastructure and has committed to the development of continuous quality improvement

[35] Leape and Berwick (2005), in their retrospective review of what has changed since the IOM report, cite only the following improvements: fewer deaths from accidental injection of concentrated potassium chloride, fewer complications from warfarin, and a reduction in serious infections. None of the solutions required significant changes in the production system.

strategies, and the dependent relations implied (Weiner et al, 2005), then the prospects of external acknowledgement and some funding is brighter. Still, your organization is not likely to have the best cash flow and you might not die as rich as some of you peers, but you may die happier in knowing.[36]

The second insight attends to comprehending how SMMs can affect organizational performance. As Bunderson, Lofstrom, and Van De Ven (2000) pointed out in their research on a vertically integrated healthcare organization, ideological pluralism within an organization leads to fundamental disagreements about how to proceed. A reasonable hypothesis is that research into to the organizational culture of hospitals with superior and inferior quality performance would reveal it is the degree of ideological cohesion and teamwork that distinguishes the good from the bad, not the particular SMM espoused. If benefit is derived from the institutional process of social learning, it comes from gaining surplus time and energy from agreement on what can be perceived as problems with ready solutions and what are the problems yet to be solved. SMMs need not be objectively treated as good or bad, but as a set of feasible possibilities. Getting organizational actors to coordinate their effort towards what can be shared as a feasible goal, with measurable goal attainments along the way, may improve as well as constrain performance.

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[36] For this in this category, economic solace may not be that important. Your organization is not likely to have the best cash flow and you are not as likely die as rich as some of you peers.

Policy Implications

To the extent that policy represents a high or wide level of nested social interaction, the findings are pessimistic that the institutional path taken in support of market reform in healthcare will solve on the problem of uncertain outcomes in health service delivery. The findings could add weight to debates about whether feasible policy alternatives exist. Such institution dialogue is diminished, however, by the fact that previous institutional eras and governance regimes did not measure, nor necessarily deliver better quality performance. Stimulating more research into the relationship between market dynamics and quality production would be a positive ramification in this wide policy sphere. The role of science in this institutional sphere is to give a reasonably objective assessment of the actual consequences to the policy pursued.

The destructuring implications of research are most obvious when comparative performance analysis is extended to cross-cultural studies. Studies that comparatively test our market-oriented approach against less well funded healthcare systems that rely on centralized collective action policies could provide strong validation for the study's thesis.

A preliminary example of cross-national research supporting the contention more centralized policy might foster quality outcome solutions is found in a recent report on health IT adoption. Health IT is frequently considered an infrastructure component essential for improving quality outcomes. The report disclosed the United States lags as many a dozen years behind other industrialized countries in health IT adoption (Anderson, et al., 2006). The reason cited by industry analysts for the United States lagging behind is that there is no business case, no return on the investment for IT in the United States. Yet, in an investigative piece stemming from the above article, Baker (2006: p. 1) reported that David Brailer, the outgoing health IT czar, "has long said the U.S. government will not, like other developed countries, buy IT… [that] instead the government's role is to create a business case for technology so that health care payers and providers will choose to purchase it."

Of course, while much is made about the legitimacy of market models in policy design, the reality is healthcare is a conflict field, though market changes have gained a lot of territory. Professionals in the field, including economists, consistently reference non-market institutions as needing to participate in effective healthcare reform. Non-profit trade and research organizations, as well as government bureaus, have importantly directed policy towards service delivery accountability. Since the organizational field practices it in many forms, emphasizing the benefits of policy directed at funding and coordinating public good is not irrational, but an adaptive institutional reality.

Given the institutional environment as it is now and the evolutionary nature of institutional change, adaptive policy aimed at reducing uncertainty in healthcare outcomes will likely emphasize the expected value of quality in the demand-and-supply-side model. For example, pay-for-performance policies can legitimate funding of more comparative research into the contextual processes that account for heterogeneous hospital performance.

Suggestions for Future Studies

In addition to the research agenda noted above, the study results invite richer contextual analysis into the underlying organizational processes that produce performance variations. Investigation into the process details are required to understand what distinguishes high and low hospital quality performance, and necessitates qualitative case studies and survey interviews. What are the process stories of superior performers, and how to these organizations fund their uniqueness? Naturally, the solution goals would entail operations research on a continuous basis, hopefully supported by national benchmarks.

Further research is also needed in the validation and possibly improvement of the risk-adjustment methodology used in the measurement model development. Specifically, the approach of using relative weights at the lowest subclass level could benefit for a larger sample size than the three million plus inpatient discharge records used in this study. A larger sample size would similarly allow for analysis of possible interaction effects between age categories and the APR-DRG comorbidity subclasses.

An alternative method for the development of the latent quality measures is also worthy of further research. The study design developed the measurement model in two phases. Annual risk-adjusted performance results for hospital-specific log-odds rates were derived for each adverse inpatient event indicator. Exploratory factor analysis was then used to reduce the four outcome indicators to the two latent QI variables. HLM multivariate designs do permit an integrated latent variable design approach (Hox, 2002).

Conclusions

The study found the economic utility of inpatient outcomes to be of uncertain value. Though cogently framed on theoretical grounds, the negative findings of the research are can as easily be regard as a stylized, if scantly documented, fact, than a scientific discovery (Newhouse, 2002a). As negative findings are generally discounted academically, the value of the results will mainly be derived from those who perceive the research as adding to the sparse information available about how pricing and market competition relate to hospital quality performance.

The pessimistic perspective and conclusions drawn can be taken as engendering distrust for our cultural norms and conventions. Such seemingly poor proper social behavior is something of a hazard for researchers who chose institutional theory for a conceptual foundation. Though the study framed market ideology and the market enterprise model pessimistically, the theoretical value of the study lies in its attempt to extend institutional theory towards embracing a view that organizations, as institutional carriers, need not be constrained to stories of only ineffectual consequence.

Melding the macro-environmental perspective of institutional theory with the micro-behavioral foundations of boundedly rational and sensemaking traditions would appear to be a natural evolution for organization theory. This combined micro-to-macro organization theory perspective is taken to be a more natural and systematic approach than the dualistic notion of institutional and market idealized types of organizing.

Fleigstien (2001) offered some insight as to why organization theories to not naturally or easily meld in academic practice. Fleigstien explained that the pluralistic positions in organization theory arose from scholars arguing against each other, where the theories were initially perceived as approaches developed in opposition. It may be time for organization theorists inclined to view social learning and causal duality across the nested levels of social interaction as useful social science premises to team up. The objective of such disciplinary coordination is to better appreciate that organizations are social constructions that can cut both ways, and that it takes objective science to measure the consequences of the good and the ill. There is certainly a need to understand that a balance is always achieved between decentralized participation and centralized constraints, but material interest may not be sufficient to describe the results.

Linking the theoretical notion of collective action to the methodological designs provide by HLM analysis is offered as an optimistic note in the research. HLM analysis, as a general data-analytic strategy, provides for rich contextual analysis of the individual organization in comparative relation to its peer. For researchers concerned with process story telling, and for employees concerned with monitoring, benchmarking, and improving on daily routines these tools for modeling nested data structures and their sources of variability can be of immense value. The tools were invaluable to the justification of this research.

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Vita

Ronald L. Fisher was born on November 15, 1950, in Cedar City, Utah. In 1975 he received his Bachelors degree from the University of Illinois, Champaign-Urbana, and in 1978 his Master degree in Psychology from the University of Nevada, Las Vegas. He worked as a clinical psychologist for the State of Nevada from 1978 to 1995. As a Senior Clinical Psychologiest at the Jean Hana Clark Rehabilitation Center in Las Vegas, Nevada he was involved in the physical rehabilitation treatment and behavioral medicine interventions of injured patients. As a clinical psychologist, he pioneered biofeedback and relaxation training treatment protocols to assist in pain and stress management. He also developed and was the Coordinator of the Chronic Pain Management Program. In August 1996, he enrolled in the Department of Health Administration's doctoral program at Virginia Commonwealth University, and completed the requirements for the Ph.D. degree in July, 2006. While studying for his doctoral degree, he held positions in management and project management at the Department of Medicaid Services for the Commonwealth of Virginia, and with Computer Science Corporation as Deputy Project Director for the Comprehensive Error Rate Testing contract with the Centers for Medicare and Medicaid Services.