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Articles

The Role of Organizational Slack and Human Capital in Managing Performance Shocks: An Analysis of US Nursing Homes and Hurricane Katrina

Austin McCrea [a]

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Public service organizations employ buffers to ward off disruptive performance shocks such as disasters, budget cuts, and uncertain events. Existing applications on buffering focus on how slack human resources are reallocated to high-risk areas during times of uncertainty to dampen the impact these events have on core organizational processes. Besides slack, the *quality* of human capital is also important. Skilled personnel have the technical acumen and expertise to help managers navigate through treacherous times and still deliver public services. Yet, existing work does not disentangle the distinct impact of these two buffers. Using a panel dataset of nursing homes in Louisiana and Mississippi, I explore how personnel slack and human capital helped mitigate the devastation that Hurricane Katrina had on a very fragile, dependent, and sensitive segment of the population. The findings suggest that human capital buffers the impact of Hurricane Katrina on health deficiencies and physical dependency. In contrast, slack capacity amplified the impact of Katrina on health deficiencies.

Theories of public management stress how organizations operate as open systems (O'Toole & Meier, 1999; but see Aldrich, 1979; Katz & Kahn, 1978 for theories in generic management). Operating in these open systems means that both opportunities and constraints influence how public services are delivered and impact those who care about, and benefit from, those services. To address the uncertainty of open systems, public managers regularly establish subunits and networks to help procure the environment's benefits or buffer its detriments (e.g., Lynn, 2005; Meier & O'Toole, 2003, 2008; Meyer & Rowan, 1977; Thompson, 1967). There are instances, however, when these strategies of managing the environment may not be enough. Within the subset of environmental disturbances are negative performance shocks such as disasters, major budget cuts, or other major disturbances which permeate the organization and disrupt the core delivery of public services. Under these circumstances, managers and personnel step in and perform essential roles to absorb the disturbance and limit its influence from contaminating the whole system (Meier et al., 2010; Ryu & Johansen, 2017).

This line of research focuses on internal management strategies which mitigate the negative implications of shocks. When environmental forces infringe upon the boundary work at the organization's perimeter, internal work units perform essential buffering roles (e.g., Yan & Louis, 1999). While many strategies can be utilized to buffer negative performance shocks, the most common inquiry gauges the relationship between slack and performance. Slack generally represents the extra human resources mobilized and allocated to the productive core of the organization in times of turbulence. Contrary to arguments for lean and trim bureaucratic agencies, slack does not harm performance but rather absorbs negative performance shocks (Cohen et al., 1972; O'Toole & Meier, 2010; Pfeffer & Salancik, 1978; Thompson, 1967). The ability to reallocate frontline workers during a disaster, emergency evacuation, or other forms of unexpected shock allows the main goals of the organization to be protected.

Slack grants managers more bodies that can be reallocated, but it is unclear if slack necessarily translates into effectiveness. In other words, access to human capital and skilled personnel may facilitate greater buffering effects rather than slack resources. Human capital generates knowledge spillover (Lucas, 1988; Rauch, 1993; Simon, 1998) and helps public agencies in technically complex tasks (Teodoro & Switzer, 2016). This logic should extend to environmental shocks since solutions are often technical, complex, and turbulent (e.g., Aldrich, 1979; Dess & Beard, 1984). Internal management needs to be coordinated in a way that correctly assesses the shock and ways in which to respond.

I test these two competing organizational buffers with a sample of Mississippi and Louisiana nursing homes from 2000-2008. The two types of buffers, slack and human capital, are based off the composition of nursing staff. Slack is

a Political Science, Texas Tech University, austin.mccrea@ttu.edu

measured as the total number of nursing hours per resident day and human capital is measured as the ratio of Registered Nurses (RN) to total nurses. Within the nursing home industry, RNs are often invaluable to the performance and maintenance of organizations given their greater degree of specialization, familiarity with regulatory and facility protocols, and relative scarcity. Using a natural experiment design that exploits the performance shock of Hurricane Katrina in 2005, I find that nursing homes in counties with 50,000 or more hurricane evacuations experienced more regulatory deficiencies and physical dependence amongst its residency with a low RN/Nurse ratio, or human capital. As human capital increases, the impact is dampened towards 0. In contrast, Hurricane Katrina increased health deficiencies at high levels of slack capacity, but exhibited a negligible impact for physical dependency.

Theories of Organizational Buffering

Classic work in organization theory explores how the environment interacts with management and the organization's core processes (Aldrich, 1979; Dess & Beard, 1984; Thompson, 1967). This interest can be traced back to Thompson (1967) who observed that organizations face a paradox. In order to be efficient, organizations must have internal stability and order, but their effectiveness is largely a result of their adaptability to the environment. Organizations resolve this paradox through buffering—the act of insulating core organizational processes from the environment while exposing other factors to the environment which can catalyze change. Since public organization are autoregressive systems, even the smallest shocks can remain in the administrative system and influence future performance (Meier & O'Toole, 2008; O'Toole & Meier, 1999). As such, the ability to buffer disturbances allows organizations to be resilient (see Boin & Van Eeten, 2013). Resilient organizations maintain a high level of performance despite operating in environments characterized with uncertainty, complexity, and disaster (K. Weick & Sutcliffe, 2001). While generally applied to contexts of high-reliability such as aircraft carriers or electric power grids, organizations in the public sector exhibit qualities of resilience (see Meier et al., 2010; Ryu & Christensen, 2019; Ryu & Johansen, 2017). The ability to be resilient is important for public service organizations since effectiveness and responsiveness are core public values and central to the services they dispense to the public. Social institutions, whether they are schools, emergency services, healthcare, or policing all perform vital functions in society that leave a gulf in their absence. The inability to deliver public services, even in antagonistic or uncertain environments, represent major bureaucratic failures and can have disastrous outcomes.

O'Toole and Meier (2003) suggest that the relationship between buffering and organizational performance can take three functional forms—a barricade, dampener, or filter. A barricade is a buffer which stops certain perturbations and shocks smaller than a given size from entering the organization. A filter is a buffer which allows certain elements, such as stakeholders or central issues to the organization's goals or missions, to be screened in while other unwanted elements are screened out. The final form, dampener, is a buffer which takes the impact of some external perturbation and reduces its effect by a given amount.

Existing empirical literature takes different approaches in conceptualizing buffering, with a key distinction made between buffering at the systems-level and buffering at the inputs-level. The most comprehensive measure at the systems-level is found in the work of Meier and O'Toole (2008) who examine correlations between historical (i.e., prior to the sampling frame) performance in time t and time t+1 for each organization. These correlations provide a sense of how autoregressive the organizational system is, or how quickly shocks dissipate within the system. As argued, "the buffering measure directly taps how an administrative system is or is not protected from having its production—in terms of results—shaped over time by reverberations from earlier events" (Meier & O'Toole, 2008, pp. 938–939). While this measure is explicitly agnostic about the *source* of buffering, other systems-level measures focus on the role of inter-organizational collaborations as a mechanism to ward off shocks. This stream of literature emphasizes how interdependent ties within networks can help insulate shocks from permeating into the productive core of the organization by exploiting the unique capabilities and competencies of different actors within the network (e.g. Berthod et al., 2017; Moynihan, 2009; Ryu & Johansen, 2017). This function allows actors to "lead" or "follow" depending on how their capabilities link to specific challenge posed by the environment. Despite the crucial role of collaborative networks, some environmental forces are too great for boundary work to handle and thus impact internal work units (Yan & Louis, 1999). Towards this end, particular attention has been given to the buffering activities often needed to address turbulence and complexity when it penetrates the inner workings of organizations.

Public organizations can pursue several different internal management or inputs-level strategies in buffering the environment, with most attention given to the role of slack (Bourgeois, 1981; O'Toole & Meier, 2010; Pfeffer & Salancik, 1978; Thompson, 1967). Slack is effectively the resources which can be transferred, mobilized, and allocated to the productive core of the organization in times of turbulence. These management activities are akin to what Miles and Snow (1978) call a "defender" strategy or what Mintzberg (1972) calls a "disturbance handler." Organizational slack can encompass many factors such as financial resources, extra inventory, human resources, and more general support from external actors. The benefits of slack, moreover, can be observed at the individual, subunit, and organizational level (Bourgeois, 1981). Regardless of how slack is operationalized as a concept, its general sentiment pushes back against the conventional wisdom of lean, trim, and efficient bureaucracies under New Public Management. The slack argument instead encourages public organizations to carry extra "bloat" to be more adaptive in the face of shocks, adversity, and changing environments (see Meier & O'Toole, 2009).

This manuscript draws specific attention to human resources as slack capacity due to the simple reality that

frontline personnel, management, and "people" more broadly, are the lifeblood of public service organizations. They translate policies into discretionary actions, handle day-to-day operations, and directly interface with the public and clientele served by the organization (see P. Kim et al., 2022; T. Kim, 2016). In this sense, human resources are indispensable—not only in times of stability, but turbulence as well. And indeed, most of the empirical literature within the last 10-15 years focuses on these dimensions of slack capacity. For example, Meier and O'Toole (2008) and O'Toole and Meier (2010) find that measures of capacity, both managerial and staffing, absorb the otherwise deleterious effects of unexpected budget cuts using data from Texas Schools. Having more frontline personnel at the organization's disposal allows for greater adaptability and responsiveness. Another study by Meier, O'Toole, and Hicklin (2010) makes a similar argument in analyzing the effects of displaced students from Hurricanes Katrina and Rita. That study finds that school districts with more managerial capacity reduces the impact of shocks. More recent work by Ryu and Christensen (2019) takes a slightly different approach to slack capacity by capturing the dynamics of administrative intensity. Administrative intensity is operationalized as the ratio of noncore (professional support, campus administration, and central administration) to core personnel (teachers and teachers' aides). This ratio is important because noncore personnel are not directly involved in producing services, meaning that they can help assist core personnel in performing essential function (e.g., Mintzberg, 1972).

The slack capacity argument, despite its different operationalizations, is essentially one of "more bodies." That is, having *more human resources* is key to buffering performance shocks. Otherwise, organizations must allocate scarce resources and limit their resiliency (Boin & Van Eeten, 2013; Wildavsky, 1988). The ability to spread human resources at a moment's notice preserves the integrity of core services and prevents goal displacement despite environmental challenges.

> H1: As slack capacity increases, the impact of performance shocks is dampened.

The slack capacity argument, however, is incomplete and does not necessarily account for the organization's human capital, or ability to effectively carry out certain tasks. A measure focusing on quantity, such as slack, is inherently limited in its ability to capture these nuances. Human capital refers to an individual or group's skill or knowledge which can be put to productive purposes (Nelson & Phelps, 1966). While traditionally applied to its relationship with technological development and growth (Benhabib & Spiegel, 1994; Nelson & Phelps, 1966; Scoppa, 2007; Wei & Hao, 2011), human capital also has implications for knowledge spillover and improved performance (Lucas, 1988; Rauch, 1993; Simon, 1998). While human capital usually focuses on general or core dimensions of performance, the logic on human capital should extend to buffering performance shocks. For example, Teodoro and Switzer (2016) find that human capital's impact on performance is greater in public agencies which implement technically complex tasks. Instead of focusing merely on a measure of quantity, the authors' exploit variation in educational attainment amongst the population and find that this links to better implementation for complex health compliance regulations. Since environmental shocks, and the organizational environment more broadly, are comprised of technical, complex, and turbulent elements (e.g., Aldrich, 1979; Dess & Beard, 1984); the impact of human capital, and access to technical acumen, may be necessary to screen out shocks. Moreover, several studies identify the importance of managerial and frontline stability as dimensions of human capital (e.g., Meier et al., 2010; O'Toole & Meier, 2003). As the argument goes, organizations which have more stability can develop greater expertise, experience, and human capital over time, remove the need for supervision, and free up both management and frontline workers' discretion as they adapt to crises.[1]

This argument on human capital is similar to "mindfulness" which argues that disaster management is more than just focusing on how resources are allocated (March, 1994). Rather, it takes higher-order skill and information processing to assess the disaster comprehensively and adaptively (K. E. Weick et al., 2008). A manager may have slack capacity, but rely on lesser skilled personnel who routinize responses to disaster rather than learn and adapt to them (e.g., Miller, 1993). As a result, organizations can be inertial and simplify responses based on previous practices. Without skilled personnel encouraging a critical assessment of the disaster and the recovery moving forward, rigidity will harm performance both in the short and long-run.

> H2: As human capital increases, the impact of performance shocks is dampened.

In summary, the literature on slack argues that organizations which have greater slack capacity under normal times of management can use their extra resources to insulate the productive core from negative performance shocks and times of uncertainty. The argument for human capital focuses more on the skill and technical proficiency needed to navigate performance shocks. At a basic level slack and human capital distinguish between *bodies* and *skill*, respectively. However, the relative merits of each buffer have evaded empirical exploration in previous studies.

1 It is important to note that this point on the link between stability and the development of human capital is an assumption made within models. Measures of stability tend to be limited in capturing variation between managers or frontline workers with respect to explicit dimensions of qualifications, skill, experience, etc.

The Nursing Home Context

Empirically testing the functional form of these two buffers requires an organizational context which directly delivers public services to clientele, exhibits variation in personnel ability, and an exogenous shock on performance with enough common support to accurately assess its impact. Below I illustrate the nursing home context and highlight its desirable features in exploring the relationship between buffering and performance.

Internal management is highly salient for nursing care (Bostick et al., 2006). Frontline staff are the lifeblood in "high touch, low tech" settings such as elderly, hospice, and hospital care. Due to the strong reliance on direct interactions with clientele, extant gerontological research echoes the human resource benefits of both slack and human capital. Consonant with the slack argument, facilities that staff more nurse hours improve health deficiencies and quality of care (Harrington et al., 2000; Schnelle et al., 2004). However, debates about nurse staffing are increasingly concerned with the notion of skill mix rather than raw measures of resources such as staffing hours (Bostick et al., 2006; Staggs et al., 2016). That is, the *quality* of nurses rather than just the *quantity* improves performance (H. Kim et al., 2009; Staggs et al., 2016). Skill mix is typically operationalized as "the composition of the nursing staff by licensure or educational status" (Van den Heede et al., 2007) and captures the ratio of registered nurses (RNs) to licensed vocational/practical nurses (LVNs/LPNs) and certified nursing assistants (CNAs).

Past research shows that these three forms of nursing staff differ in the scope of their responsibilities, training, and clinical practice. For example, CNAs carry out most of the basic daily direct care responsibilities, LPNs perform functions such as medication administration, treatments, and documentation of tasks, and RNs perform supervisory and delegatory roles (McCloskey et al., 2015; Yang et al., 2021). Despite overlap between the duties of RNs and LPNs, LPNs often lack the education and training necessary to make higher level decisions essential for supervision and delegation within a complex organizational context such as nursing home care. Some RNs even express discomfort and reluctance when delegating responsibilities to LPNs (Barber et al., 2000; Corazzini et al., 2015; Kenney, 2001). Due to the breadth of the RN skillset, they are often considered a protective factor against organizational dysfunction and help address clinical and environmental complexity by coordinating, socializing, and developing other staff (see Yang et al., 2021). Despite the value added when nursing homes staff more RNs, cost control is managed through salary reductions and RNs, on average, are more expensive to hire than the other types of nurses (Munroe, 1990). RN retention in nursing homes is also low due to better wages, lower workloads, and more favorable work environments in hospitals (Harrington & Swan, 2003; Keenan, 2003; Zinn, 1993).

The institutional context is also salient for the link between internal management and managing uncertainty. Nursing homes receive less disaster support from federal, state, and local response agencies than hospitals (Hyer et al., 2006; Levinson, 2006) and are not a priority in power restoration under federal law (Brown et al., 2007). Due to these circumstances, nursing homes are much more likely to be left to their own devices in dampening negative shocks. This reality is particularly troublesome since nursing homes tend to a highly vulnerable and frail group of citizens who need these resources more than the average citizen. Surprisingly, little work explores the link between frontline staff and disaster management, but it seems suggestive of buffering roles. In the hospital context, RNs are essential personnel in planning, coordinating, and implementing disaster response programs (Danna et al., 2010; Stanley, 2005). Based on the existing literature reviewed above, a similar role should be fulfilled by RNs in the nursing home context. Yet, inadequate staffing is regularly considered a shortcoming of nursing homes' disaster response despite their essential roles (Laditka et al., 2009; Levinson, 2006). Frontline personnel perform a variety of functions during disaster and the subsequent recovery. Nurses often volunteer extra hours and coordinate activities which provide physical care (Hyer et al., 2009) and emotional support to residents (Laditka et al., 2009). This work is largely descriptive but tells a positive story on the benefits of staffing—both for slack and human capital. How these two dimensions interact when managing disasters, however, is not clearly defined within the existing literature.

Data and Methods

Sample

This study is interested in exploring nursing home resilience in the face of one of the most devasting storms in recent memory, Hurricane Katrina. In the immediate aftermath of Hurricane Katrina, 70 nursing home residents died across 13 facilities (R. King, 2006). More broadly, the storm increased mortality rates and hospitalization rates, and decreased resident functionality (Dosa et al., 2010). For nursing homes that evacuated during the storm, resident morbidity, mortality, stress, cognitive decline, and restraint use increased (Brown et al., 2012; Claver et al., 2013; Dosa et al., 2010).

To test the effect of personnel buffering on Katrina's performance shock, I utilize several data sources. First, data from LTCFocus at Brown University School of Public Health contains repeated descriptive measures for US long term care facilities compiled from the Minimum Data Set (MDS), Medicare Denominator, the Residential History File (RHF), and the Online Survey Certification and Reporting (OSCAR) datasets. While nationally representative, I limit my analysis to facilities within Mississippi and Louisiana for the years 2000-2008 since Hurricane Katrina made landfall in both states and each experienced severe flood, wind, and infrastructure damage (FEMA Mitigation Assessment Team, 2006). In addition to the LTCFocus data, I use archival performance data from the Centers for Medicare and Medicaid Studies' (CMS) Nursing Home Compare. Additional data from the US Census Bureau is used to control for county size. Finally, the environmental shock is captured from data gathered from the Bureau of Labor Statistics. Table 1 re-

Table 1. Summary Statistics

	N	Mean	S.D.	Min	Max.
ADL Index	4,528	15.28	2.78	3	26.82
Deficiencies	4,025	8.72	6.75	0	62
Large Shock	4,620	0.01	0.12	0	1
RN/Total Nurse Ratio	4,561	0.16	0.16	0	1
Direct Care Hours per Resident Day	4,561	3.39	1.73	1.05	23.73
Population Size	4,642	125159	13624.10	1655	483663
Bed Size	4,620	108.00	53.44	4	551
Percent Medicaid	4,620	71.46	26.69	0	100
Percent Medicare	4,620	14.77	23.29	0	100
For-Profit	4,620	0.72	0.44	0	1

ports summary statistics on all the measures used in the analysis.

Performance

The measures of performance tap different dimensions relevant for resiliency in the face of shocks. The first of which is a very common and validated measure for nursing home performance—health deficiencies (Amirkhanyan et al., 2017, 2017; Mullan & Harrington, 2001; O'Neill et al., 2003). Health deficiencies have been widely used by health policy and nursing home scholars for 30 years and capture dimensions such as quality of care, resident behavior and facility practices, resident assessment, resident rights, physical environment, dietary services, pharmacy services, and administration and regulation. Nursing homes are inspected every 9-15 months which means that not all nursing homes are surveyed during each calendar year. To address this source of missingness in the sampling frame, I take the average number of deficiencies in nursing home *i* in time *t-1* and time *t+1* to calculate a score for time *t*.[2] Nursing homes can have between 0-180 deficiencies during a single inspection period. Higher values indicate worse performance. The sample indicates that the average nursing home has 8.72 deficiencies, with a standard deviation of 6.75 and range from 0 to 62.[3]

The second dimension of organizational performance is a facility averaged Activities of Daily Living (ADL) score for all residents admitted during the calendar year. LTCFocus identifies admissions using the Minimum Data Set, where individual scores are calculated from the Physical Functioning self-performance section which measures an individual's independence on 7 ADLs- bed mobility, transfer, locomotion on unit, dressing, eating, toilet use, and personal hygiene.[4] Each ADL is scored from 0-4, where 0 indicates total independence and 4 indicates total dependence. In other words, higher values reflect poorer performance. All values are then aggregated to the facility level. The measure has a mean value of 15.49 and a standard deviation of 2.65. The logic for this measure is that shocks are disruptive beyond that captured through standard performance measures. While not explicitly observed in the data, the physical and mental stress from evacuations or devastation within the community may cause residents to decline if not managed with the upmost focus on quality care. This concern is particularly relevant given the types of frail and elderly clientele these organizations provide services for. Previous studies have identified that hurricanes lead to immediate declines in ADL (Claver et al., 2013; Dosa et al., 2010), however it is unclear what strategies buffer this decline and if they are persistent.

Environmental Shock

The shock of Hurricane Katrina is modelled with a binary intervention variable for the 2005 time period. The intervention is constructed using data from a Bureau of Labor Statistics report on how Hurricane Katrina victims addressed the aftermath of the storm (Groen & Polivka, 2008). The report contains county-level estimates on the number of evacuees by county of origin. These data are reported as an ordinal scale partitioned into five categories. 1) 0-100 evacuees; 100-10,000 evacuees; 10,000-50,000 evacuees; 50,000-100,000 evacuees; 100,000-350,000 evacuees. I then construct the variable *shock* which reports all of the counties within the dataset having more than 50,000 evacuations as a result of the Hurricane.[5] This measure captures the overall impact of Hurricane Katrina since more evacua-

2 The statistical appendix contains specifications without the imputed values to similar substantive conclusions.

3 Given the inspection structure, not all facilities are inspected post-Katrina in 2005. 45 facilities are inspected 2005 pre-Katrina, 13 are inspected 2005 post-Katrina, and 17 are inspected post-2005. Since there are three years of post-shock data, hurricane-related disturbances can be picked up in the performance measurement.

4 LTCFocus reports that for cases where personal hygiene was missing, the dressing score was counted twice.

tions and displacements over the course of the year should correlate highly with the initial shock and its persistence within that geographical area. In 2005, 75 facilities experienced a large evacuation shock across 8 counties. This impact is non-negligible and accounts for nearly 15% of the observations during that year.

Slack and Human Capital

In order to measure slack and human capital as distinct dimensions of human resources, I rely on two common operationalizations of quantity and skill mix found within the nursing literature (see Butler et al., 2019; Choi & Staggs, 2014; Staggs et al., 2016; Unruh et al., 2009). First, I measure nursing staff quantity as the total direct care hours per resident day. The measure is constructed by taking the total number of hours worked by all nurses during a 24-hour period divided by the number of patients for that same 24-hour period (see Spetz et al., 2008). For example, assume that the entire nursing staff (RN+LPN+CNA) provided a total of 1,000 nursing hours to 500 patients within the nursing home. We would calculate direct care hours per resident day as 1000/500 or, 2 direct care hours per resident day.

The construction of this measure is consistent with the logic of slack capacity since organizations which possess *more* staff should be able to mobilize, reallocate, and absorb shocks (see Meier et al., 2010 for a similar measure) The measure has a mean of 3.39, a standard deviation of 1.73, and ranges from 1.05 to 23.73. Due to nonlinearities, I log transform the measure to reduce skewness.

Human capital is operationalized with a common metric for measuring nursing home personnel—skill mix. I focus on the skill mix of registered nurses (RN) hours per resident day divided by the total number of nursing hours per resident day. In contrast to the measure of slack, a measure of skill mix allows one to distinguish between frontline personnel who possess different credentials and qualifications. Due to the link between RNs and better performance (e.g., Staggs et al., 2016), this measure is a defensible construct of human capital since it centers the frontline workers who possess the greatest acumen in managing, delegating, and directing efforts towards performance shocks. Moreover, the skewness of this variable is theoretically important because nursing homes overwhelmingly struggle to staff RNs (Harrington & Swan, 2003; Keenan, 2003; Zinn, 1993). Given that human capital is a rarity within the organizational context, I expect that higher RN hours are particularly pronounced when a shock occurs. This measure has a mean of .16, a standard deviation of .16 and ranges from 0 to 1. Higher values indicate that staffing is largely driven by higher skilled RNs. This measure is also logarithmically transformed.

Control Variables

I control for the size of the county using data from the US Census Counties database. These data contain a county-level estimate on the total population for each county and year. Since the shock is measured as estimated number of evacuees, controlling for county size is important for accurate estimates on the shock variable. The LTCFocus dataset reports several key organizational characteristics which are controlled for in the analyses. First, I account for organizational size and capacity by including the logged number of beds. I also account for the presence of financially disadvantaged residents with the percentage of Medicaid residents. Facilities with a higher share of Medicaid residents are more resource poor due to lower reimbursement-to-cost ratios (Amirkhanyan, 2008; Amirkhanyan et al., 2008). I also account for the percentage of Medicare residents. Including measures on insurance in the model serves two main purposes. First, it helps alleviate concerns over facilities engaging in cream skimming—the act of selecting prospective residents based on their profitability. Second, it helps alleviate concerns over locational and reputational effects since the composition of insurance within a nursing home can proxy the larger client population and environment served by the nursing home. As such, changes in performance may be a function of facilities selecting desirable, profitable patients rather than the effectiveness of key organizational inputs. The final control variable is a dummy for whether the organizational is a for-profit facility or not.[6]

Model Specification

The analysis consists of two different estimation strategies. The first equation specifies a model which predicts the number of health deficiencies. Since this measure is a count outcome, a linear regression is not appropriate. Additionally, while the Poisson regression is commonly used to model counts, it makes a strong assumption that the mean and variance of the distribution are equal. When a Poisson regression is estimated on an overdispersed outcome

5 Alternative specifications presented in the statistical appendix estimate three different specifications. 1) Both small shocks (100-50,000 evacuees) and large shocks (50,000+); 2) a single ordinal scale; and 3) dummy variables for each category. None of these specifications offer better model fit and demonstrate that most of the performance shock occurs in counties which experienced a serious disruption. Additionally, the models presented in the main text lend themselves to the easiest empirical interpretation.

6 The LTCFocus dataset does not provide information other than if the facility is for-profit or not. Therefore, the reference category is comprised of both public and nonprofit facilities. As it relates to the question at hand, both public and nonprofit facilities enjoy better performance as compared to the for-profit facilities which typically admit more high-risk residents. Moreover, public and nonprofit facilities have greater incentives to invest back into the nursing home as opposed to financial incentives that go to the manager (Amirkhanyan et al., 2008). Additionally, Harrington et al. (2012) find that for-profit facilities have the lowest staffing level. Given the relationship between my key variables and for-profit ownership, there is little theoretical reason to suspect any issues with omitted variable bias as a result of not accounting for two sectoral dummy variables.

(i.e., variance of the dependent variable is larger than the mean), the results may be biased. A likelihood ratio test reveals that overdispersion is an issue with my dependent variable, so I estimate a negative binomial regression model which relaxes the assumption of equal mean and variance (G. King, 1998). The second specification uses pooled ordinary least squares to predict the ADL index. To account for serial correlation, both sets of equations include year fixed effects and standard errors clustered by facility. Given the inertia of organizations and interest in long-run resiliency, I also include a lagged dependent variable. Each equation also controls for the alternative measure of performance since outcomes are multidimensional and interrelated.

Findings

Deficiencies

Table 2 Model 1 reports a baseline negative binomial model that predicts the independent impact of human capital, slack, and performance shocks on deficiencies. Beginning with the RN/Nurse ratio, the model predicts that higher human capital predicts a 1.13 decrease in deficiencies, or a modest reduction of 13% from the average deficiency level. Similarly, higher total nursing hours predict a .26 decrease in deficiencies, a reduction of approximately 3% from the mean deficiency level. Albeit substantively small, this finding corroborates previous research documenting the benefits of slack. Finally, the equation shows that the unconditional shock from Hurricane Katrina predicts a modest .26 increase in deficiencies. This effect may seem unimpressive insofar as negative performance shocks are concerned, yet without testing the conditional effects of personnel on this shock it is unclear what the real magnitude is and if there are heterogenous impacts across facilities.

Next, I explore two conditional effects in models 2 and 3, corresponding to human capital and slack, respectively. The interaction term between the shock variable and logged RN/Nurse ratio is statistically insignificant and negative. This finding indicates that as the RN/Nurse ratio increases, the impact of the shock decreases. Since the term is insignificant, the confidence intervals overlap zero which provides support for a dampening effect of the organizational shock. While we cannot infer that a null effect is truly 0, the effect is nonetheless weaker than it is in nursing homes with little human capital. Given that this impact can be better represented graphically, the left plot in Figure 1 reflects the marginal effect of the shock across levels of the RN/Nurse ratio both as a continuous measure and a recent binning estimator recommended by Hainmuller, Mummolo, and Xu (2019). The binning estimator splits the RN/Nurse ratio into terciles since the lack of common support (i.e., few estimates at high levels of human capital) is a threat to inference. The conditional marginal effect estimates must rely on excessive interpolation or extrapolation in areas of the data with few observations. Since large reservoirs of human capital are rare in the context, conventional marginal effects may be misleading and exaggerate the extent to which human capital dampens performance shocks.

Both estimation strategies yield similar findings supportive of a dampener. As human capital increases, Hurricane Katrina exhibits a weaker impact. At low levels of human capital, performance shocks are associated with an increase of approximately 6 deficiencies. There is sizable uncertainty around this point estimate suggesting the effect is as low as 1 deficiency to as high as 12 deficiencies. Nonetheless, the point estimate alone corresponds to a standard deviation change in performance, a significant shock to the organizational system. A similar pattern is observed at moderate levels of human capital, where we observe an increase of 4 deficiencies. It is not until high levels of human capital that the effect is dampened towards 0.

Next, I explore the conditional impact of slack capacity in replace of human capital in model 2 on the right plot of Figure 1. Contrary to expectations, slack exacerbates the impact of Hurricane Katrina rather than dampen it. The point estimate of 8 corresponds to a 1.2 standard deviation increase in the number of deficiencies. When assessing the effectiveness of human capital and slack capacity as competing buffers, the models suggest that performance shocks on deficiencies are better managed under high human capital environments.

The control variables indicate that a larger population is associated with higher deficiencies, more beds are associated with higher deficiencies, more Medicare residents are associated with higher deficiencies, the for-profit sector is associated with higher deficiencies, and higher ADL (independence) is associated with lower deficiencies.

ADL Index

The other performance dimension explored in the analyses is the ADL index of resident dependence. Surprisingly, neither personnel measure is significantly associated with performance. Moreover, the direction of the coefficient is positive rather than negative. The effect of Hurricane Katrina, however, is positive and statistically significant. Facilities which experienced a shock saw a .43 increase, or 3% increase in resident dependence. In general, personnel and the other covariates do not explain much variation in dependence. The only control variables which exhibit any significant effects are the measure of logged population which exhibits a positive relationship and the deficiency measure which exhibits a negative relationship. The process of evacuation and the uncertainty of a disaster can have very real and personal consequences to the clientele independent of any shocks absorbed by performance. This equation demonstrates that the shock had negative effects on both formal process of care measures (deficiencies) as well as resident quality which is not explicitly captured in the performance appraisal system.

The conditional model introduces the interaction term between the RN/Nurse ratio and shock. Once again, I rely on both the continuous measure and binning estimator for graphical interpretations in figure 2. A similar dampener pattern is observed as in the deficiencies' equation. At low levels of human capital, Hurricane Katrina exhibits a positive impact of 1.23 higher dependence or a .46 standard deviation change in performance. At moderate and high lev-

Table 2. Buffering Performance Shocks I: Health Deficiencies

	1 Base Model	2 Human Capital	3 Slack Capacity
RN/Nurse Ratio (log)	-1.136***	-1.120***	-1.137***
	(0.188)	(0.188)	(0.188)
Shock × RN/Nurse Ratio		-1.206	
		(0.942)	
Total Nursing Hours (log)	-0.259***	-0.256***	-0.267***
	(0.0699)	(0.0698)	(0.0711)
Shock × Total Nursing Hours			0.193
			(0.203)
Shock	0.258**	0.403***	0.0291
	(0.105)	(0.146)	(0.235)
County Population (log)	0.0241*	0.0243*	0.0240*
	(0.0128)	(0.0129)	(0.0128)
Bed Size (log)	0.233***	0.231***	0.233***
	(0.0390)	(0.0390)	(0.0391)
Percent Medicaid	0.00183*	0.00176*	0.00185*
	(0.00107)	(0.00107)	(0.00108)
Percent Medicare	0.00260	0.00250	0.00265
	(0.00168)	(0.00167)	(0.00169)
For-Profit	0.0439	0.0457	0.0433
	(0.0373)	(0.0372)	(0.0373)
ADL Index	-0.00732	-0.00759	-0.00729
	(0.00517)	(0.00517)	(0.00517)
Lagged DV.	0.0309***	0.0308***	0.0309***
	(0.00224)	(0.00224)	(0.00224)
Constant	0.955***	0.964***	0.962***
	(0.257)	(0.257)	(0.256)
χ^2	796.24	806.58	806.29

DV= Number of Health Deficiencies; N=3,232; Negative Binomial Regression; Clustered Standard Errors in Parentheses; *** p<0.01, ** p<0.05, * p<0.1

els of human capital, this effect is indistinguishable from 0 and more effectively dampened. Model 6 then replaces human capital with slack capacity in the interaction term. Unlike human capital, where an interaction effect is present, there is virtually no difference across the range of data. Slack does not appear to matter in nursing homes' ability to limit the disturbances of Hurricane Katrina on dimensions of patient acuity.

In total, the empirical findings support the human capital hypothesis across two dimensions of organizational performance. Slack, on the other hand, is demonstrated to harm health deficiencies at high levels and bears no statistical relationship with the ADL index. The models fail to support the slack capacity hypothesis.

Discussion and Conclusion

Organizational buffering has received attention in recent public management scholarship but is limited to highly professionalized bureaucracies where identifying variation in human capital is challenging given the largely uniform distribution of credentials in frontline staff (e.g., Meier et al., 2010; Meier & O'Toole, 2008; Ryu & Johansen, 2017). This shortcoming is important since it is difficult to construct substantive measures beyond absolute personnel size (i.e., slack capacity). As a result, we know little about the relative merits of slack capacity compared to human capital in buffering performance shocks. This study contributes to the generalizability of organizational buffering by exploring US nursing homes, a context where frontline personnel exhibit significant variability in education, experience, and skill.

The ability to focus on variation in human capital is in line with O'Toole and Meier's (2014) call for greater contextual focus on how internal factors affect the relationship between management and performance. Distinguishing between these personnel strategies is an important theoretical implication for risk management, particularly in areas of public service delivery such as healthcare which rely on professionally heterogeneous frontline workers to manage disasters. The fact that human capital is demonstrated to be effective in such a vulnerable organizational context is

Table 3. Buffering Performance Shocks II: ADL Index

	4 Base Model	5 Human Capital	6 Slack Capacity
RN/Nurse Ratio (log)	0.474	0.499	0.474
	(0.424)	(0.425)	(0.424)
Shock × RN/Nurse Ratio		-2.157	
		(1.507)	
Total Nursing Hours (log)	0.162	0.170	0.163
	(0.165)	(0.165)	(0.166)
Shock × Total Nursing Hours			-0.0219
			(0.346)
Shock	0.432*	0.756**	0.458
	(0.227)	(0.346)	(0.475)
County Population (log)	0.0690*	0.0695*	0.0691*
	(0.0369)	(0.0369)	(0.0369)
Bed Size (log)	0.0449	0.0396	0.0448
	(0.104)	(0.104)	(0.104)
Percent Medicaid	0.00263	0.00251	0.00263
	(0.00244)	(0.00243)	(0.00244)
Percent Medicare	0.00231	0.00215	0.00231
	(0.00358)	(0.00358)	(0.00358)
For-Profit	0.0578	0.0624	0.0579
	(0.0772)	(0.0770)	(0.0771)
ADL Index	-0.0142***	-0.0143***	-0.0142***
	(0.00523)	(0.00524)	(0.00523)
Lagged DV.	0.681***	0.680***	0.681***
	(0.0202)	(0.0203)	(0.0202)
Constant	3.619***	3.643***	3.619***
	(0.712)	(0.711)	(0.712)
R^2	0.50	0.50	0.50

DV=Activities of Daily Living Index; N=3,480; Pooled OLS Regression; Clustered Standard Errors in Parentheses; *** p<0.01, ** p<0.05, * p<0.1

suggestive that it may be effective when imported to contexts where the clientele is more autonomous and less vulnerable to volatility. Adding human capital is obviously not free— labor markets may be limited and hiring quality personnel involves grappling with opportunity costs over budgets and expenditures. However, this analysis demonstrates that staffing a higher RN to nurse ratio matters for both the best of times and the worst of times. While balancing the advantages of human capital against its costs is beyond the scope of this paper, managers should certainly consider the frequency and likelihood of disaster in the areas where they operate to guide these decisions. For low-risk areas, higher staffing hours seems to be a reasonable solution. While slack may not be an important factor in dampening shocks, it can still be useful for managers who do not have to leverage their defensive repertoire against an unpredictable environment.

The findings contribute to our understanding into how shocks such as disasters impact performance beyond that which is regularly assessed through performance appraisal systems. Hurricanes, particularly those as devasting as Katrina, induce a great deal of physical and mental stress. The elderly population are especially at-risk as a vulnerable population not regularly studied in public administration. Disasters impact not only the current residents of the nursing home but also those that are admitted in its aftermath. Whether affected indirectly (e.g., worrying about loved ones) or directly (e.g., losing a home or receiving an injury) during the Hurricane; many factors contribute to the deterioration of the elderly and must be managed with the upmost care to not accelerate that process. If the study just focused on the performance appraisal system, this dimension of performance would not have been identified as an important consequence of Hurricane Katrina. If neglected, the study is just a replication of existing work on the link between buffering and performance and contributes little in the way of our theoretical understanding of public management in uncertain environments. A nursing home could hypothetically be compliant with the formal inspection process through CMS and manage "by the book" yet fail to provide personalized care and a comforting infrastructure to deal with patients admitted in the after-

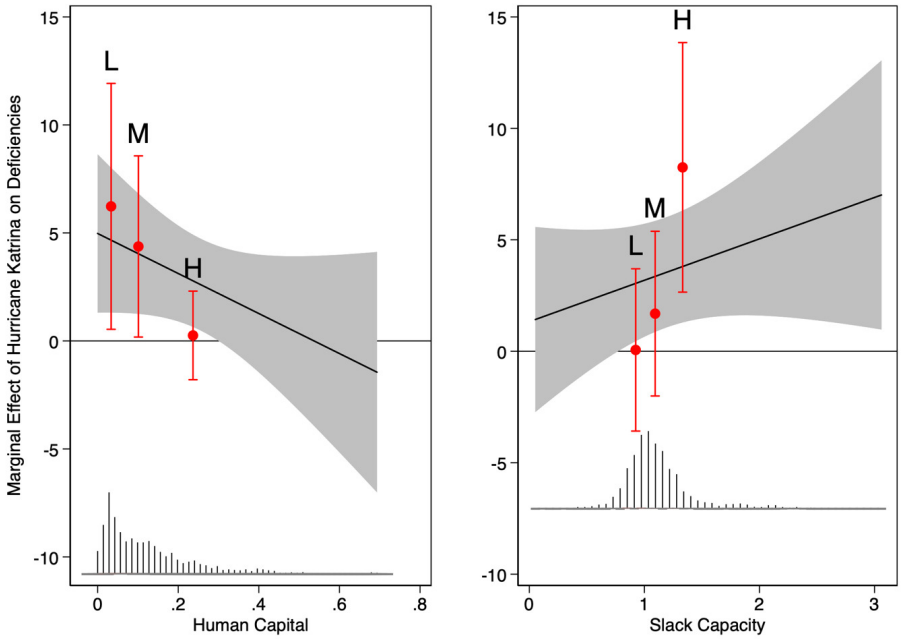

Figure 1. Hurricane Katrina's Impact on Health Deficiencies Moderated by Human Capital and Slack Capacity

Notes: Red dashed lines are estimated using Binning estimator, with low (L), Mid (M), and High (H) levels of the moderator (Hainmueller et al., 2019); Human Capital measured as ln(RN/Nurse Ratio); Slack Capacity measured as ln(Total Nurse Hours); Estimates from Table 2. Distribution of moderating variable along x-axis.

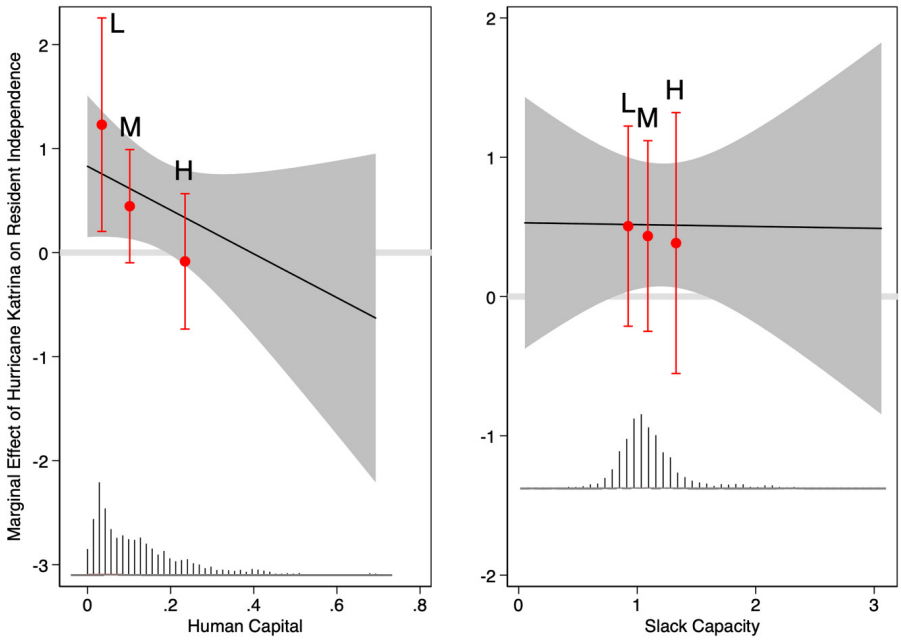

Figure 2. Hurricane Katrina's Impact on Patient Dependency Moderated by Human Capital and Slack Capacity

Notes: Red dashed lines are estimated using Binning estimator, with low (L), Mid (M), and High (H) levels of the moderator (Hainmueller et al., 2019); Human Capital measured as ln(RN/Nurse Ratio); Slack Capacity measured as ln(Total Nurse Hours); Estimates from Table 3; Distribution of moderating variable along x-axis.

math of the storm. Since the delivery of public services may involve some of the most vulnerable citizens in society, focusing on how organizational inputs manage the degree of vulnerability in their organizations alongside the externally imposed performance management regime is important for a more comprehensive understanding of buffering and resiliency in public programs.

This study is not without limitations. The first limitation is the annual data structure and an inability to measure disaster activities such as transportation for evacuation, food

delivery, administering medicine, and other basic services for survival during a catastrophic event such as Hurricane Katrina. Future work may consider that slack matters more in the immediate aftermath since the nature of the disaster requires immediate responsiveness. Satisfying larger goals, however, may require more human capital since a plan for recovery will need to be translated into action.

Second, prior research suggests considerable variation in disaster planning and training (Danna et al., 2010), yet nursing homes which evacuated and sheltered-in-place are indistinguishable in the sample. Since we know that previous research identifies performance differences between these facilities, it is an important limitation that future scholars should consider when assessing the impact of organizational buffering. While higher skilled nurses may be able to coordinate evacuations and responses using best professional practices, their efforts may be compromised if they operate within an organizational framework which has an insufficient evacuation plan on record. While the evidence reveals that human capital dampens the shock, efforts may be less effective in those organizations which do not have clear evacuation procedures vis-à-vis those which do. These shortcomings are of theoretical and practical importance and identify micro-foundational questions which may advance our understanding of buffering and negative performance shocks moving forward.

Third, Focusing on Hurricane Katrina as a performance shock serves as both a strength and limitation of the research design. On one hand, assessing the linkages between human capital, slack capacity, and performance shocks in the context of Hurricane Katrina should provide the most rigorous test for organizational buffering. Indeed, if human capital could buffer performance shocks from Katrina, then it may be the case that these same organizational inputs would be effective in buffering less severe storms. Nonetheless, since the analysis only examines buffering within the context of Katrina, it is unclear how generalizable these findings are to "average" hurricanes. It is possible that less severe performance shocks are more manageable and thus weaken the reliance on high human capital to buffer the shock. Perhaps it is the case that slack capacity can buffer less severe performance shocks since there is less stress, complexity, and technicality placed on core organizational functions and processes. While the results presented within this manuscript are promising for the study of buffering, future empirical work should explore the link between human capital and performance shocks within less severe shocks.

Finally, this study only emphasizes slack and human capital at one level of an organization, the frontlines. Based on existing work (e.g., Ryu & Christensen, 2019), these dimensions can also be observed at the managerial-level and may provide another level of protection in warding off shocks. If and how these dynamics is a question worth exploring in future studies and fits in with more careful considerations of levels of analysis within public administration.

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