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Soft budget constraints and ownership: Empirical evidence from US hospitals

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ABSTRACT

Consistent with the property rights theory of ownership incorporating soft budget constraints (SBCs), we find that controlling for SBCs, for-profit hospitals drop safety-net services more often and exhibit higher mortality rates, suggesting aggressive cost control that damages non-contractible quality.

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1. Introduction

An organization enjoys a soft budget constraint (SBC) if it can continue to operate despite poor performance because some external sponsor “bails it out” (Kornai, 1986). SBCs are not necessarily “bad” or socially inefficient (Kornai et al., 2003). Although a hospital with a SBC may under-invest in cost control and quality improvement, it is also less likely to compromise non-contractible quality through excessive cost reduction.

In this paper we present empirical evidence consistent with two predictions of the SBC property rights theory of ownership of Hart et al. (1997; hereafter HSV), as re-interpreted by Eggleston (2008) to incorporate SBCs: controlling for softness of budget constraint, for-profit private (F) hospitals will (1) engage in more aggressive cost control efforts, as manifest by dropping safety-net services; and (2) have lower quality on some non-contractible dimensions, as measured by higher risk-adjusted mortality rates for elderly heart attack (AMI) patients.

2. Theoretical predictions

We focus on the effect of ownership on cost control and quality, controlling for the softness of budget constraints.¹ We test two propositions that are straightforward implications of HSV and Eggleston (2008) that can be derived by comparing ownership forms while holding constant the measure of SBC (σ in Eggleston, 2008, reinterpreting the strong incentives of F providers in HSV as stemming from harder budget constraints [$\lambda(\sigma) \approx 1$]). As Sloan (2000) has emphasized, the HSV framework can easily be applied to compare F to private not-for-profits (N) as well as government firms (G).

Proposition 1. *Controlling for softness of budget constraint, F invests more in cost control (e) and the same in quality improvement (i) as other ownership forms. F therefore is more likely to drop unprofitable services.*

¹ For any given ownership form, a softer budget constraint implies (1) less cost control (a lower hazard of dropping safety net services), and (2) ambiguous impact on overall quality, with higher quality if the effect of SBCs on reducing quality-shaving cost control outweighs the effect of lower incentive for quality innovations. Shen and Eggleston (2009) find evidence in support of these hypotheses.

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Table 1
Effect of ownership and soft budget constraint on hazard ratio of service exit (1990–2005).

Hazard ratio (bootstrap standard errors)	Inpatient substance abuse	Outpatient substance abuse	HIV/AIDS services	Emergency department
Hospital ownership				
Not-for-profit hospital (reference group)	1.00	1.00	1.00	1.00
For-profit hospital	1.09 (0.21)	1.37* (0.22)	1.37* (0.20)	2.07** (0.49)
Government hospital	1.31 (0.24)	0.98 (0.17)	1.18 (0.15)	0.81 (0.18)
Hospital market ownership mix				
% of for-profit beds among competing hospitals within 15-mile radius	0.91 (0.24)	1.76* (0.41)	1.06 (0.21)	2.03* (0.64)
% of government beds among competing hospitals within 15-mile radius	0.99 (0.24)	0.90 (0.25)	0.98 (0.18)	1.25 (0.38)
Soft budget constraints categories				
SBC <20th percentile (reference group)	1.00	1.00	1.00	1.00
SBC 20–40th percentile	0.73 (0.14)	0.88 (0.16)	0.87 (0.14)	0.72 (0.17)
SBC 40–60th percentile	0.67* (0.13)	0.73+ (0.14)	0.87 (0.14)	0.52* (0.15)
SBC 60–80th percentile	0.57* (0.13)	0.62* (0.13)	0.73+ (0.12)	0.42* (0.16)
SBC >80th percentile	0.39** (0.10)	0.44** (0.10)	0.58* (0.14)	0.39** (0.13)
Observations	5863	9327	11,639	43,981

Note: Additional control variables include hospital system membership and urban location indicators, hospital volume (total inpatient discharges and outpatient visits, log transformed), hospital market characteristics (Herfindahl index, wage index, county population, per capita income, all log transformed). Year dummies and census region dummies are also included.

Hospital sample includes all general, acute, short-stay hospitals that are in continuous operation between 1990 and 2000.

Standard errors based on 1000 Bootstrap samples.

* Significant at 5%.

** Significant at 1%.

+ Significant at 10%.

Proof. See HSV *proposition 1* and Eggleston (2008) *proposition 4*. □

Proposition 2. Controlling for softness of budget constraint, non-contractible quality is lower in F compared to other ownership forms, because higher cost control damages quality ($-b(e)$). This suggests that when controlling for SBC, F will be associated with higher mortality rates.

Proof. See HSV *proposition 5* and Shen and Eggleston *Proposition 2*. □

3. Data and empirical methods

Data are from the American Hospital Association (AHA) annual surveys and hospital cost reports from the Centers for Medicare and Medicaid Services (CMS) between 1990 and 2005, supplemented by data from the Area Resource File, County Business Patterns, and county property tax data from the Census of Government Finance. We use data on hospital closures through 2000 from the National Bureau of Economic Research to construct an index of softness of budget constraint by first estimating a probit model of the probability of closure (see Appendix Table 1) and then taking its inverse, categorized by quintiles (the lowest SBC quintile represents the hardest budget constraint). Our sample includes all general, acute, short-stay hospitals that operate continuously between 1990 and 2005, excluding ones that converted ownership or were acquired.

To test *Proposition 1*, we estimate the effect of ownership and SBCs on safety net service survival (inpatient substance abuse treatment, outpatient substance abuse treatment, HIV/AIDS treatment, and emergency departments) using discrete-time proportional hazard models (Prentice and Gloeckler, 1987). To test *Proposition 2*, we exclude hospitals with fewer than 20 AMI admissions in a year and estimate the effect of ownership and SBCs on 30-day, 90-day, and 1-year AMI mortality rates using generalized least square models. All standard errors are estimated with bootstrapping methods to account

for the fact that the SBC index was a generated variable in the first stage.

Table 2
Effect of ownership and soft budget constraint on AMI mortality rates (1994–2004).

Hazard ratio (bootstrap standard errors)	30-day mortality	90-day mortality	1-year mortality
Hospital ownership			
Not-for-profit hospital (reference group)	–	–	–
For-profit hospital	0.012** (0.003)	0.011** (0.003)	0.009** (0.003)
Government hospital	0.007** (0.003)	0.010** (0.003)	0.013** (0.004)
Hospital market ownership mix			
% of for-profit beds among competing hospitals within 15-mile radius	–0.002 (0.003)	–0.004 (0.003)	–0.005 (0.003)
% of government beds among competing hospitals within 15-mile radius	–0.005 (0.003)	–0.007* (0.003)	–0.008* (0.004)
Soft budget constraint categories			
SBC <20th percentile (ref group)	–	–	–
SBC 20–40th percentile	–0.004+ (0.002)	–0.006** (0.002)	–0.007** (0.003)
SBC 40–60th percentile	–0.008** (0.002)	–0.009** (0.002)	–0.010** (0.002)
SBC 60–80th percentile	–0.009** (0.002)	–0.011** (0.003)	–0.012** (0.003)
SBC >80th percentile	–0.007** (0.003)	–0.009** (0.003)	–0.010** (0.003)
Observations	20,209	20,209	20,209

Note: Hospital sample includes all general, acute, short-stay hospitals that are in continuous operation between 1990 and 2000. Additional control variables include hospital system membership and urban location indicators, hospital volume (total inpatient discharges and outpatient visits, log transformed), hospital market characteristics (Herfindahl index, wage index, county population, per capita income, all log transformed). Year dummies and census region dummies are also included. Standard errors based on 1000 Bootstrap samples.

** Significant at 1%.

* Significant at 5%.

+ Significant at 10%.

Table 3
Interactive effect between ownership and soft budget constraints on hospital access and quality.

Hazard ratio for services; coefficients for mortality (SE)	Service survival (1990–2005)				AMI mortality (1994–2004)		
	Inpatient substance abuse	Outpatient substance abuse	HIV/AIDS services	Emergency department	30-day	90-day	1-year
Not-for-profit ownership							
SBC <20 percentile (reference group)	1.00	1.00	1.00	1.00	–	–	–
SBC 20–40th percentile	0.77 (0.18)	0.87 (0.20)	0.85 (0.17)	0.52* (0.16)	–0.004+ (0.002)	–0.006* (0.003)	–0.007* (0.003)**
SBC 40–60th percentile	0.70 (0.17)	0.72 (0.15)	0.85 (0.16)	0.38** (0.13)	–0.008** (0.002)	–0.010** (0.003)	–0.010** (0.003)
SBC 60–80th percentile	0.63+ (0.15)	0.59* (0.13)	0.70+ (0.14)	0.33** (0.14)	–0.011** (0.003)	–0.013** (0.003)	–0.014** (0.003)
SBC >80th percentile	0.42** (0.12)	0.43** (0.11)	0.56* (0.15)	0.33** (0.13)	–0.008** (0.003)	–0.010** (0.003)	–0.010** (0.003)
For-profit ownership							
FP X SBC 20–60th percentile	1.45 (0.46)	1.10 (0.30)	1.24 (0.31)	1.30 (0.42)	0.013** (0.005)	0.014** (0.005)	0.014* (0.006)
FP X SBC >80th percentile	0.71 (0.33)	1.34 (0.53)	1.10 (0.35)	2.24+ (1.00)	–0.002 (0.005)	–0.004 (0.006)	–0.007 (0.006)
Government ownership							
GOV X SBC 20–60th percentile	1.41 (1.33)	1.21 (0.46)	1.15 (0.30)	0.71 (0.24)	0.007 (0.007)	0.004 (0.008)	0.009 (0.008)
GOV X SBC >60th percentile	1.08 (1.09)	0.69 (0.32)	1.02 (0.31)	1.49 (0.66)	–0.001 (0.008)	0.004 (0.009)	0.002 (0.009)
Observations	5863	9327	11,639	43,981	20,209	20,209	20,209

Hospital sample includes all general, acute, short-stay hospitals that are in continuous operation between 1990 and 2000.

Standard errors based on 1000 bootstrap samples.

* Significant at 5%.

+ Significant at 10%.

** Significant at 1%.

4. Empirical results

4.1. Descriptive information on ownership and SBCs

Our empirical findings are consistent with the SBC property rights theory of ownership in general, and with both theoretical propositions above in particular. Appendix Table 1 shows that a hospital's own ownership form is not a statistically significant determinant of the softness of budget constraints, but the lower the percentage of government (G) hospitals within a 15-mile radius, the softer a hospital's budget constraint. This finding is consistent with G hospitals serving as safety net providers; their absence increases the rationale for other hospitals to receive financial support to provide access to safety net services.

Appendix Table 2 reports descriptive statistics. Compared to private hospitals, G hospitals are more likely to be small, rural, have negative operating profit margins, and be located in counties with lower per capita income. F hospitals are more likely to face harder budget constraints: almost a third of F hospitals are in the lowest SBC category (facing hard budget constraints), compared to 14% and 21% of N and G hospitals, respectively.

4.2. The effect of ownership on access and quality, controlling for SBC

We do find that, consistent with Proposition 1, for-profit hospitals (F) are more likely to drop some safety net services compared to N hospitals. Table 1 shows that conditional on the SBC index, F have a higher hazard of shutting down most of the safety net services than N.² Without controlling for SBC, the magnitude of the F effect is larger for most of the safety net services, whereas G and N hospitals remain statistically identical (results available upon request).

Table 2 shows that conditional on the SBC index, both F and G display higher mortality rates than N, by about 0.8–1.3 percentage

² Full regression results including coefficients on control variables are available upon request.

points. The coefficient on G might be confounded by casemix, but such confounding is unlikely for F because they generally attract similar or less severely ill patients compared to other ownership forms. Therefore, for-profits' higher mortality rates, controlling for softness of budget constraint, provide some evidence in support of the theoretical prediction that firms under F ownership are generally of lower cost (Proposition 1), and may engage in excessive cost control that damages non-contractible quality (Proposition 2),.

We also estimate models with interactions between the SBC index and hospital ownership. Table 3 shows that for safety net services, the effect of SBCs appears to be similar across ownership types: all interactive terms are statistically insignificant except for the comparison between F and N emergency department services. Specifically, while SBCs appear to reduce the hazard of shutting down emergency departments for not-for-profit and government hospitals, it does not influence F hospitals' decisions to shut down this service: the estimated coefficients of SBC for F hospitals are statistically significantly different from that of not-for-profit hospitals, but the SBC effect for F ownership is statistically insignificantly different from zero.³ When we allow the effect of SBCs to differ by ownership, the apparent mortality gap between N and G disappears, but the gap between N and F hospitals remains. We do not find evidence that the presence of other ownership forms in the hospital's market interacts with SBC in affecting service survival or mortality rates (results available upon request).

5. Conclusion

Our empirical evidence from US hospitals is consistent with the incomplete contracting (property rights) theory of ownership as modified to incorporate SBCs (HSV; Eggleston, 2008). Controlling for SBCs, for-profit hospitals are more likely to shut down safety net services

³ One can compute the hazard ratio for the highest SBC category for for-profit hospitals, for example, by backing out the coefficients of SBC and the interactive term first, then exponentiating the combined effect as follows: $\exp(\log(0.45) + \log(4.16)) = 1.87$. However, the 1.87 hazard ratio is statistically insignificant.

and exhibit higher mortality rates for elderly heart attack patients, suggesting aggressive cost control that damages non-contractible quality. Health care, particularly for elderly, frail, or otherwise vulnerable patients, may be a sector in which the latter quality-shaving effect is of special concern. We also show that the apparent gap in mortality rates between N and G hospitals can partly be explained by the effect of SBCs. In addition, we find weak evidence that the effect of SBCs on emergency service shut down decisions might differ between N and F hospitals. Further research developing metrics for SBCs and identifying exogenous variation in such metrics across a range of countries and sectors would contribute to better understanding of financial contracting and ownership.

Appendix A1. Estimating probability of hospital closure to capture softness of budget constraints

Variables	Coefficients
<i>Hospital ownership</i>	
For-profit hospital	0.150 (0.113)
Government hospital	−0.051 (0.110)
<i>Market ownership mix</i>	
% of for-profit beds among competing hospitals within 15-mile radius	−0.036 (0.218)
% of government beds among competing hospitals within 15-mile radius	0.352* (0.138)
<i>Hospital financial characteristics</i>	
Indicator for reporting negative net income in current year	0.667** (0.093)
Indicator for reporting negative net income in previous year	0.510** (0.088)
Operating margin in current year	−0.273* (0.120)
Operating margin in previous year	−0.255* (0.120)
<i>Other hospital characteristics</i>	
Teaching hospital	−1.360+ (0.743)
Indicator for urban location	0.312* (0.145)
Indicator for hospital system membership	−0.199* (0.089)
Log (hospital herfindahl index)	−0.149 (0.147)
Log (hospital case mix index)	0.418 (0.302)
Log (total inpatient discharges)	−0.199** (0.046)
Log (total outpatient visits)	−0.172** (0.046)
Log (hospital wage index)	0.588 (0.441)
<i>Other market characteristics</i>	
Property tax per capita (in \$1000, county level)	−0.289* (0.128)
% elderly in the county	0.863 (1.227)
Log (county population)	0.147** (0.044)
Log (per capita income)	−0.032 (0.286)
Constant	(0.178)
Observations	4058

Standard errors in parentheses. +Significant at 10%; *significant at 5%; **significant at 1%.

Region dummies are included.

Appendix A2. Descriptive statistics of study variables by ownership categories 1990–2005

	Whole sample	By ownership categories		
		Not-for-profit	For-profit	Government
<i>Hospital ownership</i>				
Not-for-profit ownership	0.63 (0.48)			
For-profit ownership	0.11 (0.32)			
Government ownership	0.26 (0.44)			
<i>Hospital market ownership mix</i>				
% of for-profit beds among competing hospitals within 15-mile radius	0.09 (0.21)	0.07 (0.19)	0.21 (0.28)	0.07 (0.22)
% of government beds among competing hospitals within 15-mile radius	0.10 (0.24)	0.07 (0.20)	0.16 (0.27)	0.13 (0.31)
<i>SBC category distribution</i>				
SBC <20th percentile	0.18 (0.38)	0.14 (0.35)	0.32 (0.47)	0.21 (0.41)
SBC 20–40th percentile	0.20 (0.40)	0.19 (0.39)	0.28 (0.45)	0.21 (0.41)
SBC 40–60th percentile	0.21 (0.41)	0.21 (0.41)	0.21 (0.41)	0.20 (0.40)
SBC 60–80th percentile	0.21 (0.41)	0.22 (0.42)	0.13 (0.34)	0.20 (0.40)
SBC >80th percentile	0.20 (0.40)	0.24 (0.43)	0.07 (0.25)	0.18 (0.38)
<i>Other hospital characteristics</i>				
Member of a hospital system	0.47 (0.50)	0.50 (0.50)	0.84 (0.37)	0.24 (0.43)
Urban location	0.52 (0.50)	0.61 (0.49)	0.67 (0.47)	0.25 (0.43)
Operating profit margin	0.01 (1.05)	0.01 (0.73)	0.09 (0.46)	−0.02 (1.69)
Hospital Herfindahl index	0.35 (0.11)	0.36 (0.11)	0.32 (0.10)	0.33 (0.09)
Medicare casemix index	1.26 (0.23)	1.30 (0.23)	1.31 (0.21)	1.13 (0.20)
Total inpatient discharges	7011 (71,453)	8588.03 (90,167.14)	5522.49 (4607.83)	3885.33 (6625.54)
Total outpatient visits	97,763 (138,577)	118,037 (149,478)	52,004 (65,797)	69,039 (124,007)
<i>Market characteristics</i>				
County property tax per capita	770.71 (538.58)	825.63 (538.59)	616.03 (352.00)	705.77 (581.85)
County population	592,277 (1,505,253)	659,570 (1,519,533)	1,064,296 (2,208,590)	235,054 (916,172)
County per capita income	23,336 (8143)	24,506 (8560)	23,053 (7228)	20,676 (6730)
County percent elderly (>64)	0.14 (0.04)	0.14 (0.04)	0.13 (0.05)	0.15 (0.04)
Hospital wage index	0.97 (0.18)	1.00 (0.18)	0.97 (0.16)	0.89 (0.16)
Observations	50,864	31,797	5693	13,374

Standard deviations in parentheses.

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