

**Commentary on “The Price Ain’t Right?
Hospital Prices and Health Spending on the Privately Insured”**

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The release on December 15 of the report, “The Price Ain’t Right? Hospital Prices and Health Spending on the Privately Insured,”¹ has garnered much media attention.² Two of its findings have been frequently cited:

- There is little relation between the level of per capita medical spending for the Medicare population and the level of per capita spending for privately insured individuals across local geographic areas (Hospital Referral Regions); and
- The prices for hospital services that are negotiated by three large commercial payers are positively associated with hospital market structure.

The first finding contradicts many previously held assertions that conclusions based on analyses of readily available Medicare data can be extrapolated to private sector health care markets, for which data have generally been less accessible. As such, it is arguably more interesting and newsworthy than the second empirical finding, which is consistent with general economic theory applicable across all industries, which teaches that firms that face little actual or threatened competition can obtain higher prices than they would when they are constrained by competition. In this brief commentary, however, I discuss the second empirical finding, which, properly interpreted, at best suggests an association (rather than a causal link) between hospital market structure and prices. Indeed, the authors are careful to note that, because of potential issues in the specification of the model and limitations in the data available, “the estimates [of the relation between hospital market structure and negotiated prices for hospital services] **should be interpreted as an association, not causal effects**”³ (emphasis added). This distinction is important because it acknowledges that the study cannot support many of the conclusions that have been drawn from it in the press, such as “the reason why health insurance for the privately insured is expensive is because the prices from hospitals with market power are higher.”⁴

Below, I highlight various issues with the data and methodology that the study utilizes. I also note some of the study’s results that cast doubt on the validity of the study’s findings and subsequent public interpretations of them. Fundamentally, the study only measures a correlation between hospital prices and variables that the authors claim measure hospitals’ market power. This correlation can be interpreted as indicative of a causal relationship between

¹ Zack Cooper, Stuart Craig, Martin Gaynor, John Van Reenen. “The Price Ain’t Right? Hospital Prices and Health Spending on the Privately Insured?” National Bureau of Economic Research Working Paper 21815. December 2015. http://www.healthcarepricingproject.org/sites/default/files/pricing_variation_manuscript_0.pdf (hereafter, “The Price Ain’t Right?”)

² See, for example, the front page New York Times article: Kevin Quealy and Margot Sanger-Katz “The Experts Were Wrong About the Best Places for Better and Cheaper Health Care.” December 15, 2015. <http://www.nytimes.com/interactive/2015/12/15/upshot/the-best-places-for-better-cheaper-health-care-arent-what-experts-thought.html> (hereafter, “The Experts Were Wrong”) or Melanie Evans, “Data Suggest Hospital Consolidation Suggests Higher Prices for Privately Insured.” Modern Healthcare, December 15, 2015. <http://www.modernhealthcare.com/article/20151215/NEWS/151219906>.

³ The Price Ain’t Right? page 25.

⁴ The Experts Were Wrong attributes this statement to study author, Zack Cooper.

hospitals' market power and hospital prices *only* if 1) the variables are reliable measures of market power, and 2) the analysis controls for all other determinants of variation in hospital prices. To the extent that the data and methodology do not satisfy these two criteria, any conclusions regarding the relation between hospital price and market structure are unsupported, in that they may be attributable to unmeasured associations with other unmeasured factors.

Data Issues

The study uses a relatively new database compiled by the Health Care Cost Institute (HCCI) that includes most of the employer-sponsored health insurance (ESI) claims for three large major payers, Aetna, Humana and United, during the 2008-2011 time period. These data are used to estimate the prices negotiated between hospitals and these three payers.⁵ The data purport to represent the experience of 27.6 percent of individuals with ESI coverage.⁶ Notably absent from the HCCI data, however, is any information from the Blue Cross Blue Shield (BCBS) plans, including Anthem, which most frequently represent the largest payer in a market area. It is also not clear whether the data provide a representative sample of all ESI in terms of their distribution between, for example, fully insured and self-insured claims or by geographic region.⁷

In addition, many measures that the study relies upon to control for other sources of variation in hospital prices appear to be unreliable or insufficient in their ability to measure what they are intended to reflect. As just one example,⁸ quality is acknowledged to be an important determinant of both the cost of and demand for hospital services and, therefore, is expected to be an important determinant of prices. Most economic models of hospital-insurer bargaining recognize that insurers compete in part on the attractiveness of their provider networks to patients and, therefore, are willing to pay more to include in their networks those hospitals that appeal to patients and their physicians. Yet, the measures of quality employed in the study are inadequate.

- Select condition-specific clinical measures drawn from the Centers for Medicare & Medicaid Services' Hospital Compare website such as the percentage of Acute Myocardial Infarction patients who receive aspirin within one hour of arrival at the hospital do appear to identify an association between low quality hospitals and lower hospital prices but are only narrowly focused on specific clinical processes of care.⁹ The authors could have used other more

⁵ The study assesses average case-mix adjusted prices for each hospital and year combination across all inpatient services as well as separately analyzing the prices associated with five specific inpatient services and two hospital-based procedures that are generally performed on an outpatient basis. The specific inpatient services include hip replacement, knee replacement, vaginal delivery, caesarian section, and angioplasty, while the outpatient services are colonoscopy and MRI.

⁶ Humana is a relatively small player in ESI, with only 2.3 million members nationally. (Aetna to Acquire Humana, Aetna's July 3, 2015 Investor Briefing, page 13).

⁷ There is substantial variation in the coverage of the HCCI data across states. Figure A1 in the Appendix to the study shows a range in coverage of 1.9% (Hawaii) to 44.6% (Georgia.) This large range likely understates the range within the more local market areas that are actually analyzed.

⁸ Additional examples are discussed in the appendix.

⁹ Specifically, the quality regressions identify hospitals in the bottom 25% of "% AMI patients given aspirin" and find that their prices are 4.2 percent lower than hospitals in the top 75%. By construction, this variable is unable to distinguish between hospitals in the first, second, and third quartiles, i.e., between the best and average or below average hospitals by that measure. The three process measures appear to have the expected effect (hospitals in

general patient experience-focused measures such as those collected in the Hospital Consumer Assessment of Health Care Providers and Systems Survey (HCAHPS), for example, that measure patients' overall rating of a hospital or their willingness to recommend the hospital to identify more completely the role of variation in different dimensions of quality in price determination.

- Similarly, while a measure of whether US News identifies a hospital as having a reputation for excelling in one or more services appears to explain price variation,¹⁰ the analysis treats hospitals that are recognized for a single service as identical in quality to those that are recognized for multiple services.¹¹ A richer specification of reputation would have exploited this variation in the data available and might do a better job of estimating the role of reputation for the provision of complex services¹² in explaining variation in hospital prices, thereby more effectively isolating the effect of market structure on price.
- A simple count of 151 technologies that range from fitness centers and meals on wheels programs up to robotic surgery and solid organ transplants unsurprisingly does not appear to have any measurement ability.¹³ More useful would have been the identification of truly complex services such as Level 1 Trauma, solid organ transplants, or neonatal intensive care units.¹⁴

Methodological Issues

Economic models of the hospital prices negotiated between hospitals and health insurance payers recognize that these prices are, in part, determined by the relative bargaining positions of the involved hospital(s) and health insurers.¹⁵ As the study's authors are clearly aware, in order to measure a causal relationship between prices and market power, it is necessary to identify variation in relative bargaining power across markets that is independent of other market factors. The study could have exploited the four years of data available (2008-2011) to analyze directly the effect of *changes* in hospital market structure on hospital prices. That is, it could have directly measured whether hospitals merging in 2009 or 2010 subsequently received higher prices. Such an analysis would focus directly on the questions asked in an antitrust analysis of a hospital merger. Instead, the study focuses only on simple static cross-sectional

lowest quartile have lower prices), while the fourth measure -- a 30-day mortality rate is insignificant. The latter, while risk-adjusted, may suffer from inadequate control of variation in patient severity.

¹⁰ Hospitals that have been denoted by US News receive on average a price premium of 13.5 percent.

¹¹ In 2015, US News ranked hospitals based on 16 services. US News also denotes an "honor roll" of 15 hospitals that ranked in at least six services (out the 137 hospitals that are ranked in at least one service).

<http://health.usnews.com/health-news/best-hospitals/articles/2015/07/21/best-hospitals-2015-16-an-overview?int=af6809>

¹² US News acknowledges that its methodology is designed to identify the "best medical centers for the most difficult patients" and it only rates approximately half of all general acute care hospitals. As such, US News does not identify the perceived or actual clinically best hospitals for average patients. <http://www.usnews.com/pubfiles/BH2015-16MethodologyReport.pdf>.

¹³ Curiously, the descriptive statistics in Table 2 of *The Price Ain't Right?* indicate that the technology count variable takes on a value of 0 for some hospitals, even though one of the services is "general medical and surgical care."

¹⁴ See, for example, Chapin White, James Reschovsky and Amelia Bond. *Understanding Differences Between High- and Low-Price Hospitals: Implications for Efforts to Rein in Costs*. *Health Affairs* 33 (2014): 324-331. <http://content.healthaffairs.org/content/33/2/324.full.html>.

¹⁵ See, for example, Gautam Gowrisankaran, Aviv Nevo, and Robert Town. "Mergers when Prices are Negotiated: Evidence from the Hospital Industry." *American Economic Review* 2015. 172-203.

analyses, treating each hospital-year observation as an independent data point. As a result, the conclusions that can be drawn are limited at best.

Moreover, hospital-insurer bargaining generally occurs at the individual hospital system-insurer level, but the analysis pools the shares of the three payers that contributed data, treating them as a single entity.¹⁶ Conversely, models of hospital competition generally recognize that hospitals that are part of the same system do not compete with each other. However, it is not clear that the study appropriately groups hospitals that belong to the same system into a single bargaining unit.¹⁷ Both of these measurement issues potentially further undermine the validity of any findings.

While an appendix to the study presents the results of several alternative specifications of the model, the study glosses over the implications of some of these alternative specifications. For example, when the sample is divided into areas in which a BCBS plan has a statewide share that is larger or smaller than 20 percent, there is a two-fold difference between the estimated price premium across the two samples that hospital “monopolists” achieve relative to hospitals in areas with at least four competitors.¹⁸ Moreover, in the high penetration BCBS areas, there is no difference between the prices that Aetna, Humana and United pay in duopoly and triopoly areas relative to those containing at least four hospitals. These patterns imply that the share of the local BCBS plan in a local market may affect the pricing dynamics across the market and should be directly measured in the model.

Perhaps, most importantly, these data, as well as the data underlying other commonly cited studies of hospital pricing, predate many recent health reform initiatives fostered in both the public and private sectors.¹⁹ These payment reform initiatives reflect increasing concern about the costs of health care and are designed to foster more informed, price-based purchasing by patients, as well as to move providers away from simple fee-for-service payment approaches into value-based incentives that reward providers for delivering cost-effective care. While provider competition is still important in this new value-based payment environment, the need for providers to integrate to be able to deliver cost-effective care is also more important and

¹⁶ Based on the data dictionary available on HCCI's website, it appears that the authors may not have been able to distinguish the claims submitted by each data contributor. If so, that would explain this important limitation in interpreting their results.

¹⁷ The report refers only to counts of hospitals and HHIs measured at the hospital level, with no indication that hospitals that belong to the same system within a market have been combined. At least in urban areas, this could have a strong effect on the resulting measures of hospital market structure.

¹⁸ While the authors acknowledge that the 15-mile radius areas they define around each hospital in their sample are “approximations to hospitals’ geographic markets,” (footnote 50), they treat them as if they are meaningful geographic markets for antitrust purposes. Such an assumption is likely inappropriate for many of the hospitals.

¹⁹ For example, ESI enrollment in high deductible health plans increased from 13% in 2010 to 24% in 2015, while the percentage of ESI enrollees with a deductible of at least \$1,000 for single coverage went from 27% to 46% over the same time period. (Kaiser Family Foundation and Health Research and Educational Trust, Employer Health Benefits 2015 Annual Survey, hereafter “KFF 2015 Annual Survey”, Exhibits F and 7.9.) Federal and State Exchanges, which have fostered the growth of narrow network and tiered products only began operation in 2014. Similarly, a recent Avalere study found that tiered networks are growing in popularity with 17% of employers offering tiered networks in their plan with the largest number of enrollees. <https://www.whatthehealthcarecostsnj.com/wp-content/uploads/2015/10/Avalere-Whitepaper.pdf>. Risk sharing arrangements between payers and providers have also expanded substantially over the last few years. For example, Accountable Care Organizations have grown rapidly, increasing in number from 81 in 2011 to 782 at the end of 2015. (Leavitt Partner. Projected Growth of Accountable Care Organizations. December 2015. <http://leavittpartners.com/2015/12/projected-growth-of-accountable-care-organizations/>)

must be assessed simultaneously. None of the traditional studies of hospital markets and their measures are designed to reflect this new environment. As a more thoughtful recent commentary indicated: “Antitrust authorities are examining these consolidated systems as they form, but broad conclusions are difficult to draw because typically the creation of a system will generate both benefit and harm and each set of facts will be different.”²⁰

Questionable Results

When the estimated results of a model do not comport with predictions that economic theory provides, that suggests that there may be measurement error in the data and/or that the model may be misspecified. I have cited several examples relating to both sources of misspecification above, however, it is worth noting select examples of findings that raise suspicions.

Many of the regression specifications attempt to estimate the association with price of a monopoly, duopoly or triopoly area, relative to one that contains four or more hospitals. The general pattern shows remarkably little apparent difference in the price increase associated with duopoly areas relative to triopoly areas. Specifically, the model specification cited most frequently by the authors implies a price difference of only 1.6 percent (6.4 - 4.8).²¹ When the antitrust authorities challenge a merger that reduces the number of hospitals from three to two, they generally believe the price effect is larger. Thus, generalizing from these findings to recommendations for antitrust policy seems suspect.

In addition to analyzing the association between an average case-mix adjusted price for all hospital inpatient services and hospital market structure, the study assesses the association between the prices for each of seven specific hospital services and hospital market structure. The patterns in these results cast doubt on the validity of the underlying data and model. Specifically, economic theory would indicate that, all else constant, monopoly providers would have more market power than providers in duopoly markets, which would, in turn, have more market power than those in triopoly markets, which might have more market power than providers in markets with at least four competitors. Instead, the procedure-specific results provide a variety of patterns that are inconsistent with this economic theory:

- Hip Replacement: The estimated coefficients imply hip replacement prices are lower in areas with only two hip replacement providers than in areas with three or more providers, although the monopoly, duopoly, and triopoly coefficients are all insignificant.
- Knee Replacement: The estimated coefficients imply knee replacement prices are lower in areas with only two knee replacement providers than in areas with three or more providers, and prices are lower in areas with three providers than in areas with four or more providers, although the duopoly and triopoly coefficients are insignificant, implying perhaps that only monopolist knee replacement providers are associated with any price premium.
- Caesarean Section: The estimated coefficients imply that prices are statistically indistinguishable across areas with two, three, and more than three providers

²⁰ David Cutler and Fiona Scott-Morton. “Hospitals, Market Share and Consolidation.” *Journal of the American Medical Association* 310 (November 13, 2013.)

²¹ The Price Ain’t Right? Page 29. The authors do not provide sufficient information to determine whether prices in duopoly markets are significantly higher than in triopoly markets. However, based on the standard errors the authors do report, it is very unlikely this is the case.

- Vaginal Delivery: The estimated coefficients imply prices are statistically indistinguishable across areas with two, three, and more than three providers.
- PTCA: The estimated coefficients imply that prices are higher in duopoly areas than in monopoly areas, although prices are statistically indistinguishable across areas, regardless of number of providers.
- Colonoscopy: The estimated coefficients imply higher prices in areas with three providers than areas with two providers, although prices are statistically indistinguishable in areas, regardless of number of providers.
- MRI: This is the only service for which the relationship between prices and market structure is consistent with economic theory and statistically significant. However, this finding is surprising, in the context of the others. Given that MRIs are largely done on an outpatient basis and often in free-standing facilities unaffiliated with hospitals,²² it is not clear why hospital-based measures of market structure should be associated with hospital MRI prices. (The same can be said for colonoscopies, which are also frequently performed in freestanding outpatient facilities.)

It is also not obvious why the market structure effects should vary between services that are likely to face similar demand and supply conditions, e.g., hip and knee replacements.²³

In summary, while the recently released report "*The Price Ain't Right?*," has been widely cited as demonstrating the need to curb hospital realignment,²⁴ its findings do not merit such strong proscriptions and cannot appropriately be used for policy recommendations.

²² One recent study based on claims data from commercial Blue Cross Blue Shield in the Northeast, Midwest and Southeast regions of the U.S. found comparable volumes of outpatient MRIs performed in hospital and freestanding settings. (Sze-jung Wu *et al.*, Price Transparency for MRIs Increased Use of Less Costly Providers and Triggered Provider Competition. *Health Affairs* 33 (2014): 1391-1398, <http://content.healthaffairs.org/content/33/8/1391.full.pdf+html?sid=c5bbfe47-3985-4f1d-b102-c1cfce2139a9>)

²³ The differing results for hip and knee replacements may be attributable to very different sample sizes -- according to Table 8, the hip replacement regression is based on 1,250 hospital-year observations, while the knee replacement regression includes 2,677 -- perhaps because of the greater overall frequency with which knee replacement procedures are performed.

²⁴ For example, study author, Martin Gaynor, who recently served as chief economist for the Federal Trade Commission, was cited by the New York Times as saying that "the new data is strong evidence that the federal government needs to enforce antitrust laws vigorously to prevent health care markets from becoming monopolists." (The Experts Were Wrong.)

Appendix Additional Data and Measurement Issues

This appendix provides further detail and additional examples of issues related to the data used in the study, *“The Price Ain’t Right?”* While it is not possible to demonstrate that these issues undermine the validity of the report’s findings without access to the underlying data, the results presented in the report raise a sufficient number of questions and misgivings as to limit the appropriateness of drawing policy conclusions from the analysis.

Hospital market structure: The study and related press reports focus substantial discussion on the association that the study purports to measure between local hospital market structure and hospital prices. From a theoretical perspective, the role of hospital market structure in determining hospital prices is relevant to the extent that it reflects the bargaining strength of a hospital in its negotiations with payers. However, problems in the way that hospital market structure is measured prevent definitive conclusions regarding its role.

- The main model specification presented in the study measures hospital-specific market structure as the number of hospitals within a 15 mile radius of the hospital. Specifically the study accounts separately for areas with one, two, three, and four or more hospitals²⁵ within 15 miles of each hospital. This specification of hospital market structure does not follow the hospital-insurer bargaining framework, however, which focuses on the hospital choices that the members of a health plan have available to them and recognizes that health insurers’ preferences for certain hospitals are derived from patient preferences. That framework suggests that measuring the number of hospital options that each patient of a hospital has available to him/her would be more appropriate than measuring the number of hospitals that are near that hospital.
- It is also unclear from the study’s discussion whether the measured hospital count reflects individual hospitals or hospital systems. The text suggests the former, but the latter is clearly more appropriate when considering the nature of hospital bargaining hospitals within the same system in a local geographic area are generally negotiated as a package, or at least do not compete with each other.
- As an alternative specification of market structure, the study also estimates the effect of a hospital Herfindahl-Hirschman Index (HHI) measured in the same 15-mile radius area, as well as in alternative areas with varying radii. These results are depicted in Appendix Table A8. Curiously, the effect of the HHI appears to increase as the breadth of the geographic area increases. While, in a 5 mile radius area, a 10 percent increase in the measured HHI is associated with a 1.6 percent increase in hospital prices, in a 30 mile radius, a 10 percent HHI increase is associated with a 4.0 price increase (more than double the magnitude of effect.) The antitrust authorities often define hospital geographic markets quite narrowly, e.g., at the county level. If their definition of markets is correct, then it is not clear why

²⁵ Presumably the authors don’t separately account for the number of hospitals when there are more than four because hospital antitrust enforcement has rarely challenged hospital mergers that involve a market where four participants remain post-merger. Regardless, by grouping all these markets together they are including 62% of their observations into a single hospital count category. For some specific services, an even larger fraction of hospitals are located in areas with at least four competitors, e.g., 84 percent of hip replacement providers are located in such areas. (The Price Ain’t Right?, Table A1)

market concentration measured in the 30 mile radius area (*i.e.*, an area that is 60 miles wide) should be associated with a larger price increase than concentration measured in a smaller area. In addition, as noted previously, it is not clear from the study whether hospitals have been appropriately grouped by system.

Health insurer market structure: Since models of negotiated hospital prices recognize that they result from hospital-insurer bargaining, it is important also to control for health insurer bargaining leverage. However, the study's attempts to control for variation in health insurer market power across markets are inadequate, relying on data that are too incomplete to provide reliable measures.²⁶

- Using state-level data that are limited to enrollees in fully-insured health plans, the study includes a payer HHI to measure insurer structure. Not surprisingly, this measure appears to have no explanatory power in the price regression models. First, the HHI measure is limited to fully insured lives, which are declining as a proportion of total ESI, from 45 percent in 2008, the beginning of the study period, to 40 percent in 2011 and further to 37 percent in 2015.²⁷ Second, insurance markets are generally considered to be more local in analyses of health insurer competition: typically Metropolitan Statistical Areas, or sometimes even counties, are used to define health insurance markets. There is substantial variation in payer market structure within a state: the average difference between the minimum and maximum HHIs measured at the MSA level for each state is 234 percent for all commercially insured lives and 253 percent for fully insured lives, *i.e.*, the maximum MSA-level HHI is 253 percent of the minimum HHI for the average state.²⁸
- The study also includes a measure of the combined share of the three HCCI data contributors. This variable does appear to be related to the average price that these three insurers pay the higher their combined share, the lower the average price they receive. However, given that presumably each of the three contributing payers negotiates separately with hospitals, a more appropriate measure of insurer bargaining power would be the share of each payer separately (and a more appropriate pricing analysis would focus on the prices paid by each payer to each hospital.)
- The study does not control directly for the role of other insurers, such as the BCBS plans that are often the largest health insurer in a local market. As discussed above, the study does present alternative model specifications that distinguish between "high-share" and "low-share" BCBS areas, (presumably calculated from the same inadequate CMS data that include only enrollees in fully-insured plans) and the alternative specifications do vary in their findings. Therefore, it might have been useful to include a variable that reflected the share of the local Blues plan directly into the model.

²⁶ The study claims that "there are limited data and few reliable sources of information on market concentration in the health insurance industry" (The Price Ain't Right?, page 26.) However, substantially more detailed data are available that provide estimates of individual insurer shares for both fully insured and self-insured ESI plans at the county level from Decision Resources Group (generally known as HealthLeaders-Interstudy.)

²⁷ KFF 2015 Employer Health Benefits Survey, Section 10. <http://kff.org/report-section/ehbs-2015-section-ten-plan-funding/>

²⁸ CRA analysis of HealthLeaders-InterStudy Managed Market Surveyor, January 2015. Data include enrollment in HMO, PPO, POS, Indemnity and Exchange plans.

Hospital costs: Hospital costs clearly are generally recognized as a large determinant of hospital prices; however, it is not clear whether the study adequately controls for variation in costs since the measures used are generally statistically insignificant or have coefficients that are inconsistent with theory.

- The study relies on a calculated Medicare base price for each observation²⁹ as a measure of the underlying cost of the particular care episode, since Medicare-administered prices attempt to reflect the underlying costs of providing the service. However, in most of the regression models that the study presents, this variable is statistically insignificant and its coefficient is small, suggesting that it may not be explaining much variation in price. Given the important role that costs play in determining prices, this is a potentially serious measurement problem.³⁰
- Similarly, a variable that denotes teaching hospitals appears to explain little variation in hospitals costs, even though teaching hospitals are known to have higher costs.³¹ A more sophisticated approach would have measured variation within hospitals classified as having some teaching role, for example by a count of residents/bed.
- Variation in patient severity is also measured in the initial standardization of hospital prices,³² using the Charlson Index (CI). However, the CI was developed to estimate the likelihood of patient mortality within a year, which is not necessarily correlated with hospital cost. Indeed a discussion, cited by this study, of a recent update to the initial methodology indicates “Because the Charlson comorbidity index was developed to predict hospital mortality, its performance for predicting health-resource use, such as length of stay, service utilization, and cost, requires further investigation.”³³ Therefore, it is not surprising that the study finds that hospital prices are not monotonically related to increases in the CI, and in some cases, the estimated coefficients even indicate that patients with higher CIs have lower costs.

²⁹ That is, each ESI inpatient stay and hospital-based outpatient procedure is “repriced” as if it were a Medicare claim.

³⁰ When “fixed effect” variables denoting Hospital Referral Regions are omitted from the model, the Medicare Base Payment Rate measure becomes significant. This implies that it is largely explaining geographic variation in hospital costs. It is not possible to determine from the information provided whether the lack of significance of the cost measures is attributable to collinearity or mis-measurement.

³¹ See, for example The Lewin Group. “Comparing Hospital Costs: Adjusting for Differences in Teaching Status and Other Characteristics.” http://www.leapfroggroup.org/media/file/Hospital_efficiency_adjustment_factors.pdf.

³² Prices are initially standardized for DRG, age, gender, and severity, using the Charlson Score. (See Table A3).

³³ Hude Quan et al. “Updating and Validating the Charlson Comorbidity Index and Score for Risk Adjustment in Hospital Discharge Abstracts Using Data from 6 Countries.” *American Journal of Epidemiology* 173, February 17, 2011. P. 681.