THE COST CURE?
ASSESSING CLINICAL QUALITY RESPONSES TO MARYLAND'S GLOBAL BUDGET MODEL

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By

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ABSTRACT

In 2014, Maryland implemented a new global budgeting system to complement its unique rate-setting regime. The new global budget model (GBM) sets both individual hospital rates for goods and services, as well as annual maximum allowed revenues for hospitals. This study uses a census of hospital admissions in Maryland from before and after the implementation of the GBM (2012-2015) and compares clinical outcomes to those in Washington State for the same period using a difference-in-differences analysis. The analysis considers shifts in probabilities of inpatient mortality and 30-day readmissions. The results predict shifts of very low magnitude in an uncertain direction, suggesting that the changes in provider incentives created by global budgeting and rate-setting do not have a certain effect on clinical quality, and could possibly play no major role in quality outcomes.

This Thesis is dedicated to the friends and colleagues I have had the good fortune to meet in Washington, D.C. In particular, I must thank Jean Mitchell for crucial guidance in both the early conceptual and data-gathering stages of the project. Additionally, I would like to thank my parents for their support, and of course, Clareanne.

*A note on visualizations in this thesis:

All graphs were produced by the author using publicly available or licensed data sets. The sources for those data are noted below each graph.

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Introduction

Metaphor in the design of health policy has a tendency for the dramatic. Rising costs are cliffs we hurtle toward, various policies or actors in the health sector are analogized to deadly diseases, and the (American) system itself is a Gordian knot of contradictions, or in more modern metaphor, a piece of software that has only ever been patched and never overhauled into version "2.0." Changes to this system inevitably interact with existing incentive structures, creating a policymaking environment rife with potential unintended consequences. In *The Quality Cure*, David Cutler refers to the "Three Horsemen of the Apocalypse" – quality, access, and cost (Cutler 2014.) These three concepts are useful to focus on, to conceive of the design of an overall health system as a maximization problem between these variables. Plainly, the goal is to provide: 1) quality health care (implying the most appropriate procedure, done with as few mistakes as possible, in as timely a manner as possible), 2) access to that care for as many people as possible, 3) that care at a sustainable cost. There are a host of policy tools to try to improve each of these vectors, but a fundamental question arises for any of these tools. Does a given tool that improves one aspect of the system affect the others? If so, does that tool help or harm efforts to improve the other two aspects?

The American system is famously fragmented, and both public policy and the discretion of insurers, hospital managers, and doctors have at different times been used to address all three of the vectors. However, due to the aforementioned fragmentation there has never been a national, system-wide attempt to control costs. Since the 1980s, Medicare fee-for-service has engaged in prospective rate-setting along the lines of public insurance systems such as the National Health Service (NHS) in Great Britain. So-called

"Beveridge" systems, named for one of the system's early proponents, Liberal Party MP and economist Lord William Beveridge, provide universal coverage and tend to both publically own and employ hospitals and physicians, respectively. This level of central control, and removal of price signals from the health sector, requires careful setting of both reimbursement rates and overall budgets for hospitals and doctors.

In contrast to Medicare Fee-For-Service, Medicare Advantage and the Affordable Care Act (ACA) marketplace plans resemble the tightly regulated, statutorily mandated plans offered by private insurers in the Netherlands or Switzerland. However, a plurality of Americans gets insurance through their employers in a system unique among industrialized nations. While all-payer rate-setting, i.e. mandating prices for goods and services across insurer types, has not been attempted at a national level, it has been implemented at a state level. More detail on the history of rate-setting in the US will be discussed below, but at the present time only the state of Maryland is engaged in setting rates across payers, and, importantly, is now using that tool, along with an overall, or "global" budget, to try to reduce cost to the system. Such an experiment in price controls has both major potential upsides in terms of freeing up resources to expand access and possibly improve quality incentives, or conversely, the potential to have a detrimental effect on quality by reducing the supply of care. Further access would be achieved by redirecting savings to either guaranteeing coverage or expanding market incentives for the uninsured to buy plans. However, such allocative decisions are not the focus of this paper. Rather, the focus is on the possible quality outcomes.

This study asks if, through a specific model of cost management via supply-side global budgeting and rate-setting, Maryland's Global Budget Model (GBM) improved

clinical quality in the inpatient hospitals to which it was initially applied. Rate-setting involves central planners, in this case the Maryland Health Services Cost Review Commission (HSCRC), calculating reimbursement rates for medical products services paid by insurers to hospitals. All-payer rate-setting allows those rates to apply to private insurers, not just government programs. Global budgeting involves setting an overall cap on health spending for the state. In the United States, the only state to implement such a system is Maryland. In 2009, Maryland received an update on its Medicare waiver that began shifting its hospitals to the GBM, beginning with certain rural hospitals in 2010 and then expanding to nearly all others by 2014. In this model, each hospital is allowed a maximum annual revenue, as determined by risk and population adjustments for that specific hospital calculated by the HSCRC. In 2019, this model will extend to physician practices including outpatient specialists and primary care physicians, as well as skilled nursing facilities (SNF) in the state. Can lower costs be achieved in this manner while improving quality, or at least not degrading it?

Background

It is important to consider the Maryland health care system in two distinct phases, occurring separately but in parallel to the wider national trends in health policy. First, was the introduction of all-payer rate-setting in the late 1970s. The second period began with the introduction of the GBM transition in 2009. In the first period, Maryland was only one of ten states to use rate-setting. In a rate-setting regime, a planner prospectively sets the amounts that a given provider (hospital, physician, etc) will be reimbursed for a given service (surgery, diagnostic test, antibiotic intravenous therapy, etc). Such prospective

systems dominate Medicare payments from the Inpatient and Outpatient Prospective Payment Systems for hospitals to the Physician Fee Schedule for physician labor reimbursements. At the federal level, as a result of the Social Security Reform Amendments Act of 1983, these systems replaced the 'customary and usual' standard by which hospitals and physicians' offices set their own reimbursements, in the face of rapidly rising costs to the Medicare system. The ten states undertaking their own rate-setting regimes received waivers from the Medicare system to impose their own state-level controls on Medicare reimbursement. Importantly, these states also determined the rates at which private insurers would reimburse providers. Private payers generally must rely on their relative market power vis-à-vis providers to bargain down prices, and as a result, almost universally pay higher rates than the Medicare system.

However, health experts began to favor managed care models in the 1980s as a means to control costs, and all the rate-setting regimes but Maryland's were abandoned. The Health Maintenance Organization (HMO) is in many ways the converse of the GBM. It is also a system that seeks to place constraints on costs, but by constraining patients rather than doctors. Rather than budgeting doctors, the HMO capitated, i.e. budgeted per enrollee, annual care dollars a patient could receive. Such models moved significant power to the insurers, but quickly became unpopular. Obviously, a capitated fee does not solve the problem of a disproportionate cost burden falling on certain individuals, and the patient experience, too, became one of suspicions that doctors were skimping on care.

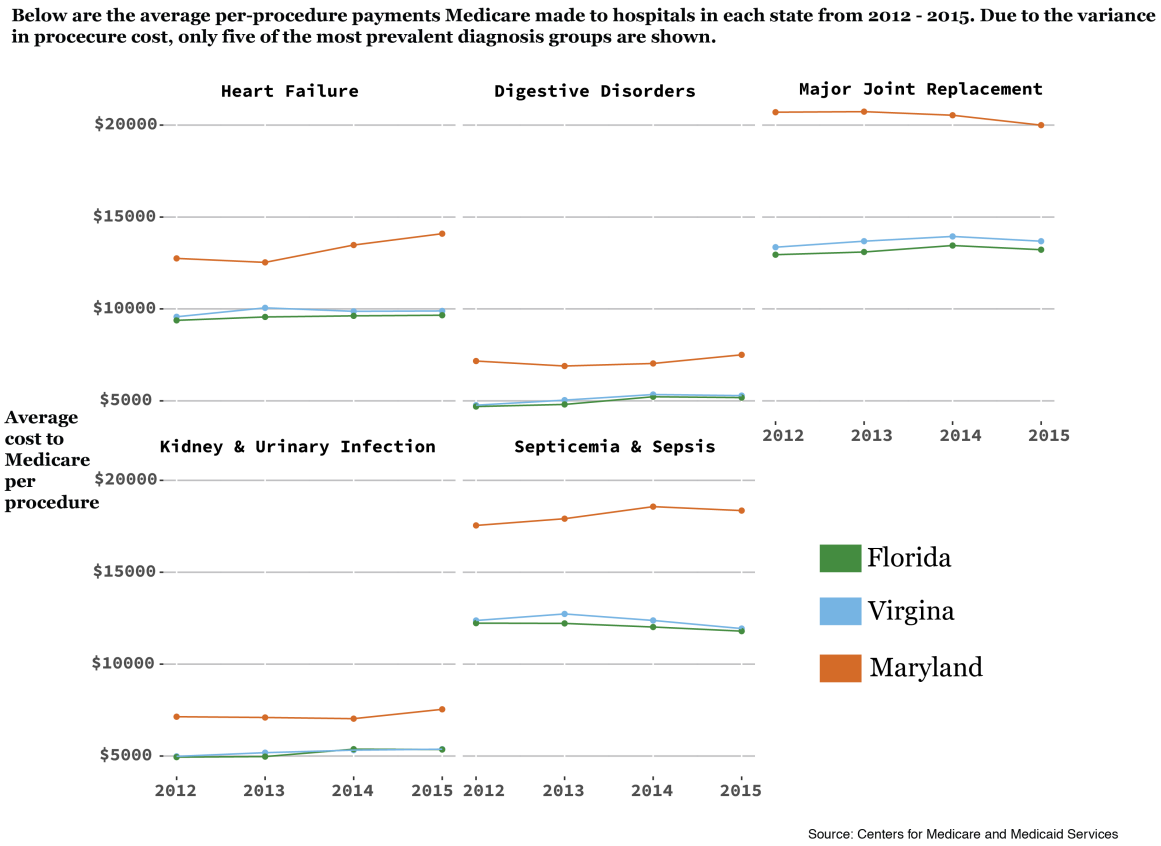

Figure 1. Total Medicare Payments in Maryland, Virginia, and Florida by DRG.

Following a backlash against HMOs in the 1990s and the failure of the "Hillarycare" initiative during the Clinton Administration, a new paradigm emerged – the quality cure. Returning to David Cutler, in *The Quality Cure*, Cutler sees improvements in quality as the beginning of a virtuous cycle that lowers aggregate costs, which makes expanded access more tenable, which then improves quality further. This perspective is a good one through which to understand the Patient Protection and Affordable Care Act's (ACA) pay for performance programs in the Medicare system. For example, the Hospital Readmission Reduction Program (HRRP) penalizes hospitals that have high rates of readmissions. If one takes reducing readmissions as a sign of quality – then that quality improvement also leads to fewer charges to Medicare and therefore lower total costs.

Those savings then could be pumped back into the system to fund both the premium subsidies for the new health care exchanges, as well as the matching funds the law committed the federal government to provide for states expanding the Medicaid program under the ACA. So, the quality improvement measures would save money that could expand access to those who need it and would get the services they needed without delaying care, thus further improving quality.

High costs though, still bedevil the health system. Cost is the biggest concern the public has with the health care system (Cutler 2014), and importantly, cost has a deleterious effect on the other aspects of the system. A 2016 survey by *Health Affairs* found that a third of sampled adults had foregone medically recommended care due to high costs (Osborn et al 2016.) It is hard to frame this inability to get care as anything but an access issue – whether or not one has insurance. There is a semantic confusion that has arisen in the age of the ACA. Proponents of the law, faced with bitter and intransigent partisan opposition, began conflating insurance with access exactly at the time those two concepts began to diverge. Because the ACA gets its savings from incentives it has baked into the Medicare system, there has been little effect on the patterns of treatment in the private sector. It should not be surprising that insurers have had to significantly raise premiums and especially deductibles to compete in a market where they could not deny services to sick patients certain to lose the company money. But the deductibles driving Osborn et al's finding have ushered in an era where not all of the insured can be said to have access. So, if costs were to come down, then one would expect access to care to be improved. But what about the quality of care itself? Surely, the provision of high quality care at the volume it is demanded is expensive.

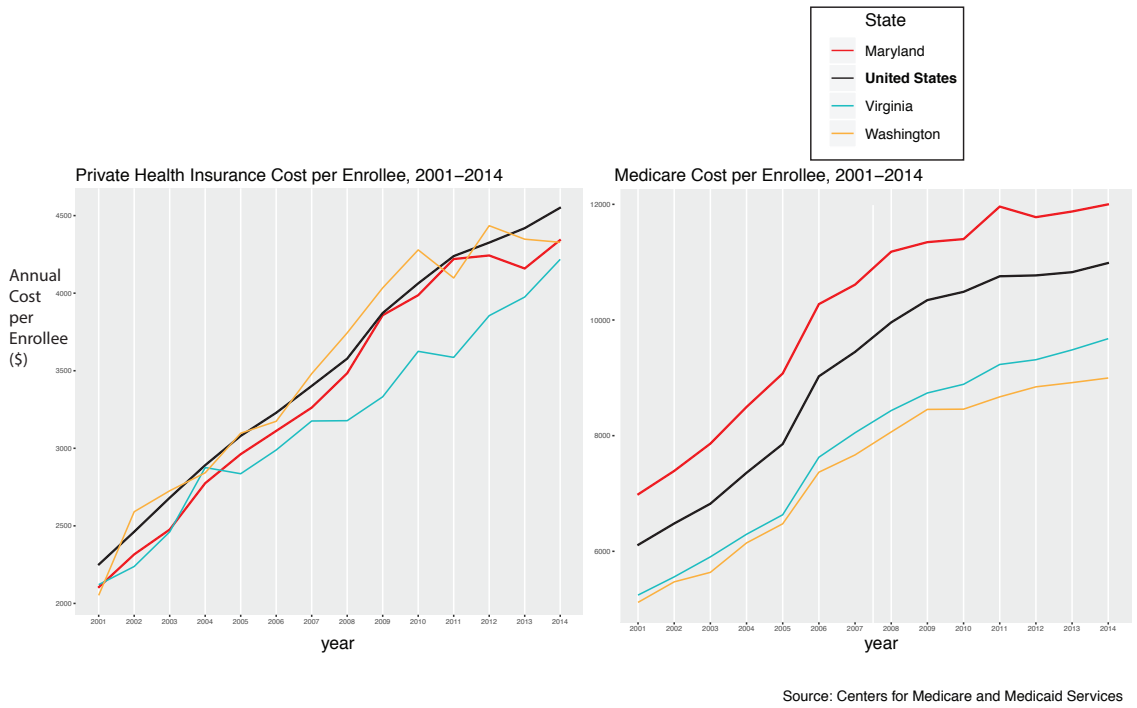

Figure 2. Spending per Capita in Private Health Insurance and Medicare, 2001-2014.

While the Maryland experience was varied, it is worth noting that Medicare expenditures per procedure remain higher in Maryland than the national average. See Figure 1 for a recent comparison between Maryland, Florida, and Virginia for total Medicare costs per procedure for five of the most common diagnosis related groups (DRG). It is likely that higher Medicare payments served to cross-subsidize savings elsewhere in the system – specifically employer-sponsored private insurance. See Figure 2 for an illustration of how the HSCRC managed to keep both levels of private health spending, as well as cost growth in both public and private spending, below national averages by setting rates of reimbursement for Medicare services significantly higher

than the national average. Thus, though Maryland (in red in both graphs) has the highest GDP-per-capita of any state in the Union, its private health costs remain under the national average (in black in both graphs). However, this arrangement changed in 2014.

With the introduction of the GBM, Maryland entered the second phase of its all-payer regime and was compelled to attempt to contain its costs. The GBM prospectively sets maximum allowed revenues for each of Maryland's hospitals. Though reimbursement rates differ by hospital, the overall budgets ensure a pre-determined level of total spending. Maryland committed to saving $330 million in Medicare dollars in five years, and has done so. Indeed, it had saved $586 million compared to the national average in just three years (DuVernay 2018). As mentioned before, the Centers for Medicare and Medicaid Services (CMS) has approved an expansion in Maryland's waiver to include more types of providers under the GBM. This interim period offers a valuable opportunity to examine the GBM and isolate its effects on quality.

Literature Review

In this section, I discuss broad motivations for structuring health care systems, the economics literature dealing generally with the rate-setting and global budgeting mechanisms, and finally empirical econometric work on global budgets and the GBM itself. I first contrast the motivating logic of Michael Walzer's *Spheres of Justice* with traditional economic treatments of health care markets. Then, I turn to the literature on global budgets more specifically. I counter-pose research that suggests rate-setting based on quality measures that can have a positive impact on clinical quality against theoretical

concerns about the effects of price controls on quality. Finally, I briefly discuss the existing literature on global budgets and the GBM specifically.

Distributive Justice and Economic Constraints

Before launching into the specific investigation of the GBM, it is worth briefly discussing the implicit assertion that policymakers should be in the business of pursuing interventions that maximize the cost, quality, and access vectors as described above. In *Spheres of Justice*, Michael Walzer argues for what he calls "complex equality," in which different social goods are distributed by different, socially established, criteria. Famously, he uses health care in the United States as an example of a good that the public recognizes as properly distributed based on need (Walzer 1983). If need is the just criterion for distributing health care, then money cannot be allowed to mediate access. This claim, in a stronger or weaker form, is really an essential axiom for designing health policy. One must recognize that a market, even an insurance market, wherein 1.9 million people, many poor and/or disabled, account for $1 trillion in annual spending (Agency for Healthcare Research and Quality (AHRQ) 2006), would be unsustainable without being heavily organized and managed by the government.

Walzer explains the implications of such a system. He refers to "conscripting" doctors into public service, making the comparison to public school teachers and others who "serve for the sake of the social need and not, or not simply, for their own sakes" (ibid). The "not simply" in this last statement is important. Walzer recognizes the underlying need for compensation, production, and a supply chain to pay highly skilled physicians, produce the materials and technology necessary for care, and to

distribute those resources. No medical system in the developed world is completely decommodified, because the majority of industries in all developed countries are organized with markets. I return to the difficulty of fitting a need-based health care system into a market-organized economy in detail. For the time being, though, I merely observe that any health care system will inevitably be "piecemeal," but if one acknowledges Walzer's larger point, that health care is a good essential to human happiness and the functioning of a just society, one that should be socially produced to meet biological need rather than willingness to pay as defined by economists, then some metric other than those policymakers use to judge the need for interventions in other consumer markets, such as profitably, concentration, and consumer safety must be used to evaluate the health sector. Thus: quality, cost, and access. In other words, while anti-trust and consumer safety regulators are concerned with the structure and inputs into a market – in health care, both price and outcomes become a concern for government as well.

However, one might note that even in national systems that do guarantee access universally and that do employ their doctors as public servants (e.g. UK, New Zealand, the Scandinavian nations), the underlying cost of production is still a concern. These "Beveridge" systems create budgets for their health spending the way the GBM does, so rationing rather than individual ability to pay becomes the primary constraint. This is not to draw a false equivalence between the outcomes in the American system and the Beveridge systems, but merely to emphasize that cost is an inevitable consideration, even in decommodified systems. While the GBM is certainly not an example of

decommodification, it does strictly budget hospitals and uses some of the tools of the Beveridge systems to set prices lower.

In his critique of Walzer, Richard Arneson elaborates on this argument about underlying costs, contending that distributive spheres are only easily separable in theory. In reality, these spheres overlap because health care has both market and non-market elements (Arneson 1990.) This is particularly true in the United States but also in the "Bismarck" systems (most of Western Europe and parts of Latin America) that have created sickness funds covering their whole populations, yet a market for medical care continues to exist in these countries, layered over the needs-based provision. The economics of any system involving markets, then, as Maryland's GBM certainly does, must contend with the peculiarities of health markets.

Pros and Cons of Global Budgets and Rate-Setting

There is some evidence that systems under rate-setting and global budget regimes deliver better quality outcomes than the fragmented U.S. system (Commonwealth Fund 2013). If clinical outcomes in the UK are better than those in the US, as they seem to be, then there is some possibility that the design of reimbursements plays a role in that difference in quality. Indeed, the NHS' National Institute of Clinical Excellence (NICE) uses Cost Effectiveness Analysis (CEA), wherein the estimated production cost of services is compared to its value in terms of Quality Adjusted Life Years (QALYs), or predicted years of functional life imparted to the patient from the procedure. CEA along these lines has two effects. First, it controls the menu of options available to physicians within a certain bound, so treatments that do not produce enough QALYs to justify their

price are prohibited. As a secondary result, however, more effective treatments may be used more often – improving overall quality on average. Indeed, while the United States now does some evidence gathering on the effectiveness of treatments via the Patient-Centered Outcomes and Research Institute (PCORI), the findings of that organization are not binding for any U.S. providers, public or private, and government researchers and policymakers are explicitly banned from using CEA based on QALYs (Glick et al 2015). While Maryland's HSCRC does not use the sorts of detailed CEA that NICE does when considering the rates for the GBM, Maryland hospitals do now face constrained budgets and mandates to improve quality. So, it is possible that following the implementation of the GBM, improving quality will have taken precedence over profit and produced better clinical outcomes.

However, three major concerns in the health economics literature are readily applicable to the GBM: instability of supply created by eliminating cross-subsidization, the agency problem, and an extrapolation of the inefficiencies of community rating. In Gerald Faulhaber's game-theoretical model, publically regulated enterprises, such as hospitals, will engage in cross-subsidization, in which "coalitions" of goods are priced together, some above and some below equilibrium prices (Faulhaber 1975). Moreover, these pricing arrangements are unstable and invite entry shocks at non-subsidized prices that can dismantle the cross-subsidized coalition. Cross-subsidies are widely assumed to allow hospitals to provide less lucrative services, particularly psychiatric and substance abuse care. David, Lindrooth, Helmchen, and Burns demonstrate this phenomenon in their study using the shock to hospital markets created by the entry of single specialty facilities (David et al 2011). They argue that the advent of these single specialty facilities

compelled hospitals to decrease their less lucrative services in favor of higher cost services – specifically neurosurgery. A price-setting system that generally charged well-above cost for services, as Maryland's system did, might see a reduction in supply as prices are pushed down. However, it is possible such a reduction would be temporary, as the least efficient procedures and services are substituted out for more cost-effective procedures to remain within the hospital's budget. The primary concern for quality, then, is that whole classes of treatment, e.g. the aforementioned psychiatric care, would be eliminated from hospitals if no treatment option in that class is reimbursed above cost.

Additionally, the agency problem that haunts health care generally could be heightened under the GBM. The basic element of the agency problem is the information asymmetry between doctor and patient (Dranove & White 1987.) In Walzer's formulation, a patient may have a need for medical care, but only doctors have the knowledge to identify what that need is. Because the patient must rely on the doctor for a diagnosis, the patient has no idea of the extent to which the doctor is making economic decisions alongside medical ones. So, it might be possible for the physician to induce demand in the patient for services that the patient would not want if she had full information. Importantly, the Medicare Physician Fee Schedule is not affected by the GBM. So, while hospital revenues are controlled, the reimbursement for Medicare patients paid directly to the physician for her labor is not. Thus, if the volume of inpatient services is controlled by broad practice guidelines made by the hospitals cognizant of their budgets, then physicians might rely more on unit-price labor costs to maintain their wages. Specifically, physician compensation for Medicare is predicated on a formula using Resource Value Units (RVUs). RVUs are out of HRCSC's control and so could not

be considered directly in the creation of the hospitals' budgets. Such an unintended incentive might lead to suboptimal quality decisions.

The final concern relates to the concept of community rating. Mark Pauly discusses the inherent inefficiencies in a community rated system (Pauly 1970), and there's reason to believe the GBM may lead, in effect, to a kind of community rating. By controlling prices, the GBM removes the one competitive tool private insurers have – price negotiation with providers. The GBM may have the effect of flattening the insurance market and forcing private insurers to converge at one premium for all Marylanders – too expensive for the healthy, and too cheap to make a profit from the sick. This potential disruption to the private insurance market could have negative consequences for quality, and even access, as well.

Empirical Literature on Global Budgets and the GBM

I now consider studies generally analyzing systematic policy changes, examining global budget regimes and the GBM specifically. There is a wealth of econometrics literature quantifying the effect of new programs on the three vectors mentioned earlier – cost, access, and quality. In recent years, the standard methodology for examining the implementation of new programs, such as the GBM, into existing health regimes has been some form of difference-in-differences analysis (Saltrelli 2015, Figueroa et al 2016, and Roberts et al 2018.) The new programs are treated as exogenous shocks affecting the trends in whichever metric is being studied. This theoretical approach will be vital in my analysis of the GBM.

The literature examining global budgeting is generally focused on non-U.S. cases where entire national systems exist under global budgets. Ray Chang, Chi-Jeng Hsieh, and Robert Myrtle studied the effect on utilization and cost of Taiwan's decision to implement a global budget for outpatient dialysis providers. They found strong evidence through a difference-in-differences estimation that in the period after the imposition of the global budget there was evidence of dialysis providers practicing "unbundling." (Chang et al 2011). This refers to a provider shift toward offering more lucrative services. In this case, while End-Stage Renal Disease (ESRD) hemodialysis utilization did not increase in other contexts, outpatient providers began providing many more non-hemodialysis services, outside of the scope of the budget. While Maryland's GBM is on schedule to apply to all of the state's healthcare services, it had not by 2014. Thus, the potential for unbundling services does exist as a potential limitation of this analysis. On the other hand, a letter from the Secretary General of the Canadian Medical Association from 1973 demonstrates an interesting physician's perspective – in the choice between a health insurance regime based on universal state insurance like Canada's, physicians might have reason to opt for a global budget model:

> I do not think that we need to adopt a completely negativistic viewpoint on our ability to work within a prescribed global amount of funds allocated on the basis of open and fair negotiations between representatives of government and of the doctors that provide the service. Positive medical involvement in the planning process is likely to assure a better "system" than might be the case if government for one reason or another decided to go it alone. (Wallace 1973)

The global budget can be portrayed as government overreach, but thus far in the United States it has mainly been pursued via administrative, rather than legislative, efforts. It is worth considering how a legislature-driven global budget regime might differ from, and perhaps be more supportive of, physician interests. Finally, an early study of a Massachusetts global budget experiment provides positive evidence both of cost savings

vis-à-vis providers outside the pilot program, as well as clinical quality improvements in chronic care management, adult preventive care, and pediatric care (Song et al 2012.)

Turning specifically to Maryland, the largest study done on the GBM thus far has been RTI International's 2017 report on the initial impacts of the model (Haber et al 2017). The paper finds significant savings due to the global budget, with a concurrent reduction in readmissions. Importantly as well, the paper addresses possible exogenous effects from three major Maryland health initiatives that pre-dated or coincided with the GBM: Quality-Based Reimbursement (QBR), Maryland Hospital Acquired Conditions (MHAC) programs, and the Chesapeake Regional Information System for our Patients (CRISP), the lattermost of which facilitates the transfer of electronic health records. In attempting to isolate the effect of the GBM, it is vital to consider the separate effects of these programs. The results of this study are indeed good first signs for the GBM. However, the RTI study does not include private pay patients in its sample, relying on Medicare beneficiaries, and does not consider other quality metrics – such as mortality rates and hospital acquired conditions (HACs). In widening the aperture of payer types, I hope to analyze the program's effect across the system, including to the very different populations not included among Medicare beneficiaries.

Apart from the RTI study, one additional perspective appears pervasive in the recent literature in that the results of the GBM have been worse for rural hospitals. In a large study of the effect of the GBM on rural hospitals, researchers found that the GBM did not reduce acute care use or cost for those hospitals (Roberts et al 2018), though they did not study quality directly. This study is still relevant, however, for two reasons. First, the levers through which the GBM could potentially improve quality rely on reducing

volume of unnecessary services, which would also reduce overall cost. If the GBM did not succeed on these metrics, then it is hard to see how quality might have improved. Additionally, rural hospitals largely made up the pilot program for the GBM, called the Total Patient Revenue (TPR) model, meaning that they were the early adopters of the GBM. The "rolling" nature of GBM adoption will be addressed in the subsequent section on methods.

Theoretical Framework

I now formalize the difference between GBM and non-GBM U.S. state health regimes to identify where budgeting would affect hospital treatment. The basis of this framework is a Macro Health System view that depicts the patient-level experience of traveling through the health care system (Hall et al 2013.) The model I propose (Figure 3) flattens the iterative design of Hall et al's original model to depict a discrete hospital visit.

The model tracks a patient's treatment experience while demonstrating the point at which state interventions affect clinical behavior. Since this study takes Washington State as its control state standing in for the non-rate-setting states, it is placed on a parallel track with Maryland. The patient experience is linear and straightforward: some unique social determinants of health influence the incidence of a negative health condition. Then, depending on the patient's insurance status, she pursues treatment. After hospitalization, the patient receives a course of treatment determined by her physicians. The result is a health discharge, death, or some form of Post Acute Care (PAC), which

might include a readmission. In the lattermost case, the process would start over, with the same exogenous policy forces affecting the next course of treatment.

Rate-setting, while unique to Maryland, is viewed as inextricable from the global budget, and so the two should be considered part of the same GBM. The remaining sources of exogenous policy-driven variation in Maryland and Washington hospitals, therefore, should be the GBM in total, alongside state and national quality improvement interventions.

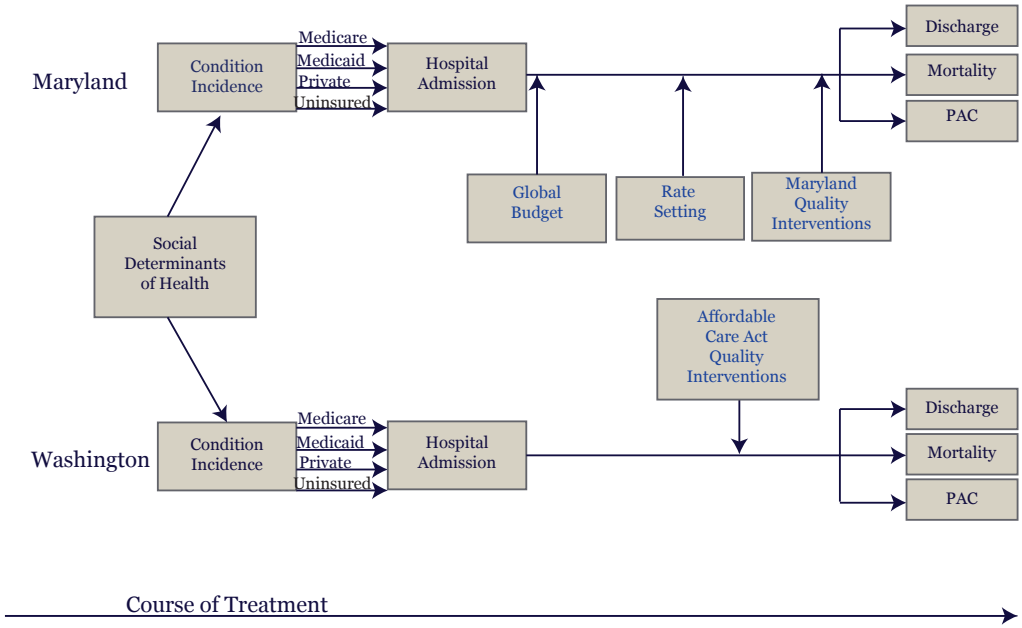

Figure 3. Theoretical Framework.

Those quality interventions include, for Maryland, the MHAC and QBR programs. Washington has the Coordinated Quality Improvement Program as well as the programs created by the ACA – HRRP and Hospital Value Based Purchasing (HVBP.) Maryland was exempted from these ACA programs by the Center for Medicare and Medicaid Innovation (CMMI) on the condition that they update MHAC and QBR, making them analogous to HRRP and HVBP, respectively, to ensure they achieve the same results or better as the national programs, thus the mechanics of the ACA programs are reflected in both systems.

Data

The study sample is drawn from the Health Cost and Utilization Project (HCUP) State Inpatient Databases (SID) for Maryland and Washington for the years 2012 – 2015. The SID is at the discharge-level and includes the universe of discharges for the states in question: 2,637,129 discharges for Maryland and 2,522,881 for Washington state. Both datasets also include hospital identifiers, variables identifying treatment types, complications, and patient demographic information. Additionally, both include information on readmissions. Due to this database containing a census of information, no weighting is undertaken, though robust standard errors are used due to a small number of missing observations.

In the population demographic makeup presented below (Table 1), gender and age distributions are very similar between the states. Washington's racial makeup is more heavily white, and Maryland hospitals seem to have lower unadjusted mortality rates,

Table 1.
Descriptive Statistics

	Maryland			Washington		
	Proportion	Mean	SD	Proportion	Mean	SD
Age		49	27		48	28
Male	43%			43%		
Female	57%			57%		
White	57%			81%		
Black	31%			5%		
Hispanic	6%			7%		
Asian / Pacific Islander	3%			6%		
Other	2%			1%		
Average Chronic Conditions, Statewide		5.1	4.1		4.4	3.9
State Hospital Mortality Rate	1.80%			2.20%		
Primary Payer:						
Medicare	38%			35%		
Medicaid	23%			20%		
Private Insurance	33%			39%		
Self-Pay	3%			3%		
No charge	1%			~0%		
Other	2%			3%		

Source: Prepared by author with data from the Healthcare Cost and Utilization Project

along with slightly higher rates of chronic conditions – the severity of those conditions however, is not reflected in the table. Additionally, the distribution of primary payer types is similar, with a slightly higher percentage of Marylanders enrolled in public programs vis-à-vis private insurance than in Washington.

Washington was selected as a comparator to Maryland for several reasons. Both states expanded Medicaid in the period following the passage of the ACA (though at slightly different times), and Washington and Maryland ranked 10th and 11th respectively among the states in real GDP per capita in 2017 (Bureau of Economic Analysis, 2017.) So, in terms of resources and broad health policy design, the states are similar, with the exception of the GBM. Moreover, a key assumption of difference-in-difference analysis is that changes in the dependent variables in both the treatment and control populations were parallel prior to the intervention, i.e. Maryland and Washington mortality and readmission rates were changing at similar rates prior to the GBM. See figure 4 for a visual representation of the similar trends in an all cause mortality indicator for both states since 1999. While arguments could certainly be made for other means of determining a control population, the structure of HCUP data, the descriptive and political similarities, and the operational integrity of the parallel trends assumption informed the selection of Washington.

The study will examine two outcomes of interest: mortality and 30-day readmissions. An increase in the probability of a patient's visit ending in death is a rough estimate of something as subtle as clinical outcomes, but it is as objective an outcome as can be assessed. 30-day readmission is a stand-in for likelihood of a patient getting a

HAC such as a bacterial infection from a botched catheterization. HACs and their resultant readmissions are both costly and major causes of worse clinical outcomes.

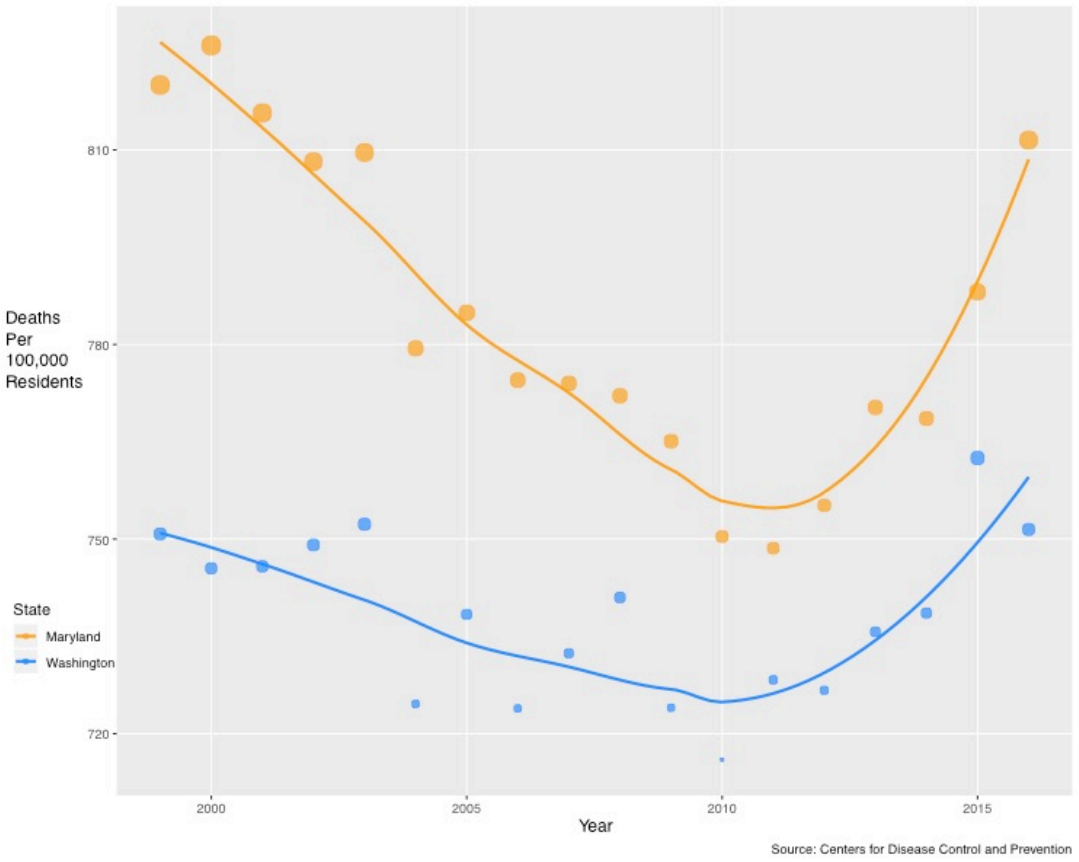

Figure 4. All Cause Mortality in Maryland and Washington State, 1999-2016.

The literature on how policy affects inpatient mortality is not settled. In responding to high profile claims that insurance status affects mortality rates, Richard Kronick concluded, "you get what you control for" (Kronick 2009). In comparing four other large studies on insurance status and mortality, Kronick notes extremely wide confidence intervals in most of the studies, leaving very imprecise estimates. He also demonstrates that the significance of the findings at all is left in doubt when controlling

for socio-economic status. However, this study takes the view that controlling for socio-economic status, region, and in this study's case, payer type, constitutes over-controlling. A large, systemic change in payment design may have differential effects on these groups, and thus they should not be removed from the analysis. Still, large marginal effects on the probability of mortality should be viewed with caution.

The study of readmissions is more settled methodologically, but faces a more programmatic disagreement. Some researchers find that reduction programs such as Medicare's HRRP unfairly target hospitals with more severe case-mixes and less well off patient populations (Barnett et al 2015.) The conclusion is that readmissions are not a universal standard that one can use to compare unlike hospitals. Rather, a more equitable system might be one where hospitals are stratified by the socio-economic status of their patients, and compared to peer hospitals.

Methods

The study will use several specifications of a Difference-in-Differences (D-in-D) model to detect variation in probabilities for mortality and readmission before and after hospitals were placed on the global budget. The model accounts for both year and hospital-level fixed effects. The variable of interest is an indicator that identifies admissions occurring at hospitals under the global budget regime. The model uses a linear probability model (LPM) for its parametric form. The distribution of predicted probabilities was plotted to ensure minimal predicted probabilities below zero or over one. While some below-zero predicted probabilities were identified, the LPM was still

chosen for two reasons. First, it has been observed that linear models more easily control for time-invariate effects to deliver consistent results (Newey 2007). Second, the ready interpretability of the LPM's estimated marginal effects vis-à-vis non-linear models was prioritized over the full range of its predicted probabilities (Woolridge 2002.)

The D-in-D design controls for concurrent national-level policy changes, specifically the ACA clinical quality standards, as well as state-level fixed effects. The study examines the implementation of the global budget specifically as an exogenous independent variable affecting clinical quality. The dependent variables are the aforementioned measures of quality. Additional controls are included for age, sex, and race. The linear equation takes the form:

$$Y_{it}^{j} = \alpha + \lambda_t + \rho^{j} + \beta d_t^{j} + \chi_{it}^{j} + \varepsilon_{it}^{j}$$

Where **λ** represents year fixed effects and **ρ** represents time-invariate hospital fixed effects. **X** stands in for the vector of individual demographic control regressors while **ε** is the unobserved error term. The coefficient **β** represents the D-in-D effect of the global budget, *d* standing as the D-in-D indicator. Since D-in-D isolates marginal effect independent of state and confounding endogenous causes, it is particularly suited to pulling out the effect of the global budget on clinical quality.

The D-in-D approach is applied to separate models to test if the GBM is associated with increased or decreased probabilities of inpatient mortality and inpatient 30-day readmission rates. Two different strategies were undertaken for identifying the treatment effect. First, my strategy for defining the adoption of the global budget was a

hospital-level variable. Admissions coming from Maryland hospitals were identified as coming either before or after the date by which that hospital had reached an agreement to become part of the global budget. Because of the TPR pilot program, some rural hospitals were under a global budget as early as 2010. Thus, some hospitals never experienced a switchover to the GBM within the time frame of this study. One can picture the Washington hospitals standing as a permanent control population, while Maryland hospitals act as a gradient, crossing over into "on" when they sign an agreement to switch over to the GBM. Admissions before the switch are pre- and admissions after, are post. In the second iteration, rather than a gradient, the standard date of Jan 1, 2014 was used as the pre-post cutoff.

Model Design Strategy

For both the mortality and readmissions measures, a model with group and time fixed effects was implemented in all cases (see Table 2 and Table 3 for a summary of results). All models include controls for age, sex, race, as well as time and hospital-level fixed effects. Besides the dependent variable of interest, an additional specification of the independent variable was considered as a sensitivity analysis. Both mortality (Table 2) and readmissions (Table 3) have two specifications each, Model I and Model II.

In Model I, the gradient method is used to determine at which point in time hospitals are among the treatment group. Model II uses a different specification. In considering the thought processes of hospital managers, it is possible that once the global budget was announced, hospital administrators viewed the adoption of the global budget at their hospital as inevitable, and so began making preparations with the first roll-out of

the global budget at the beginning of 2014. Here, the first signal that the GBM was not only here to stay but would indeed be applied to all inpatient providers is used as a "hard cut" point for the difference-in-differences estimator.

Results for both models are included for two reasons. First, as a sensitivity analysis, the results demonstrate the similarity both of point estimates and standard errors. Even in the case where statistical significance was found, the point estimate and standard error were very close, in terms of magnitude, to the complementary model, which found no statistically significant results. Secondly, since both models for both variables deliver similar results, one does not have to worry about considering exactly when decisions to adopt clinical practices to prepare for the GBM occurred, if significant adaptations occurred at all. One could argue that individual hospitals would not be able to disseminate such practices until the full extent of the agreement on how that hospital fit into the GBM was reached. Yet, it could just as plausibly be argued that all hospitals, even those without a formal agreement on January 1, 2014, could see the inevitability of the GBM and would all have implemented changes by then. While this paper does not make a judgment about which of those narratives was closer to the truth, the similarity of results renders the point mostly moot, as far as this study is concerned.

Table 2.
Mortality Models

		Model I	Model II
age		-0.000401***	-0.000402***
		(2.72e-05)	(2.72e-05)
age^2		1.14e-05***	1.14e-05***
		(4.48e-07)	(4.48e-07)
female		-0.00492***	-0.00492***
		(0.000257)	(0.000257)
GBM INDICATOR		**-0.000924**	**-0.00159****
		(0.000689)	**(0.000701)**
black		0.00155***	0.00155***
		(0.000558)	(0.000558)
hispanic		-0.000294	-0.000300
		(0.000447)	(0.000447)
otherrace		0.00290***	0.00289***
		(0.000445)	(0.000446)
	2013	0.000503*	0.000505*
		(0.000274)	(0.000273)
	2014	0.00134***	0.00189***
		(0.000393)	(0.000451)
	2015	0.00153***	0.00197***
		(0.000515)	(0.000552)
Constant		0.00595***	0.00588***
		(0.000860)	(0.000853)
Observations		4,803,871	4,803,871
Number of hospitals		151	151
R-squared		0.016	0.016

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Prepared by author with data from the Healthcare Cost and Utilization Project

Results

Findings on both measures were small in magnitude and mostly not of statistical significance. For mortality, the gradient approach (Model I) produced an estimated associated reduction in the probability of mortality by 0.09 percentage points with a

standard error of 0.07 percentage points, suggesting statistical insignificance. The hard-cut approach, (Model II) produced an estimated reduction in the probability of mortality of -0.16 percentage points with a standard error of 0.07 percentage points, suggesting statistical significance at the 95% level.

For readmissions, both the gradient and hard-cut models returned statistically insignificant results of small magnitude. The gradient model estimated an associated increase in the probability of readmissions of 0.2 percentage points with a standard error of 0.7 percentage points, while the hard-cut model predicted an associated decrease in the probability of readmissions of 0.3 percentage points with a standard error of 0.6 percentage points.

Discussion

This study utilized the census set of hospital admissions between 2012-2015 in Maryland and Washington. The models that were specified examined the marginal effect of an admission occurring in a hospital using the Global Budget on the probability of that admission resulting in either the death of the patient or requiring another inpatient admission within thirty days of a given observed admission. Using fixed effects models that grouped admissions at the hospital level and controlled for hospital and year effects, I found that the global budget is associated with almost no statistically significant variation in the probability of either measure, with only a very small negative effect on mortality recorded for Maryland hospitals after January 1, 2014.

Table 3.
Readmissions Models

		Model I	Model II
age		0.00251***	0.00251***
		(0.000192)	(0.000191)
age^2		-1.26e-05***	-1.26e-05***
		(1.79e-06)	(1.79e-06)
female		-0.0180***	-0.0180***
		(0.00169)	(0.00169)
GBM INDICATOR		**0.00222**	**-0.00335**
		(0.00789)	**(0.00642)**
black		0.0143***	0.0143***
		(0.00201)	(0.00201)
hispanic		-0.000240	-0.000210
		(0.00219)	(0.00219)
otherrace		-0.00261	-0.00265
		(0.00169)	(0.00169)
	2013	-0.00103	-0.000963
		(0.00194)	(0.00196)
	2014	-0.00355	-0.00112
		(0.00295)	(0.00225)
	2015	-0.00553	-0.00274
		(0.00355)	(0.00226)
Constant		0.0501***	0.0502***
		(0.00502)	(0.00493)
Observations		4,807,290	4,807,290
Number of hospitals		151	151
R-squared		0.014	0.014

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Prepared by author with data from the Healthcare Cost and Utilization Project

These results do not reflect a negative impact on quality, but neither do they suggest that the current level of rate-setting and budgeting has a positive impact as the most optimistic supporters of the GBM might have hoped. Returning to the prior trends in Maryland will be illustrative. While under the original rate-setting regime, Maryland had been allowed to maintain higher unit prices in Medicare to keep private insurance

costs lower. This is in contrast to the divergence between Medicare (lower) and private insurance (higher) rates outside of Maryland. However, with the Global Budget and the commitment to curbing price growth vis-à-vis other states, the Global Budget put a permanent check on the state's ability to use Medicare rates to "subsidize" the lower rates set for private insurance, while still imposing those lower prices on private insurance. Without the safety valve of raising private rates, the GBM has resulted in much slower medical cost growth in Maryland.

But these lower-than-previously-planned rates of reimbursement do not seem to have had an effect on clinical quality outcomes, including vis-à-vis a non-rate-setting state such as Washington. The primary policy objection to a universal health system from an outcomes perspective has been a fear that rationing by ability to pay would be replaced with rationing by central planner, to the detriment of overall welfare. However, it appears that other factors, potentially including those outside the immediate scope of policymakers, play a far larger role in determining clinical outcomes than does the overall design of the insurance regime.

On the other hand, it appears that slowing the rate of growth of provider reimbursement also does little to directly discourage over-prescribing, at least in terms of how theoretical over-prescription might affect the mortality or readmission probabilities of patients. With no signal in either direction, then, it might make sense to take each of the vectors of health policy discussed earlier, i.e. quality, cost, and access, and focus on proximate indicators for each, rather than worrying so much about second order effects to a different vector from even major changes– at least in the case of cost controls.

Opportunities for Future Research and Study Limitations

With that observation in mind, future research into the Maryland system should likely focus on trying to directly measure the effect of discrete programs in comparison with national or other state interventions. For example, a better picture of the overall effect of the global budget regime broadly understood, rather than restricted to the specific mechanism that is considered in this paper, might come from a direct comparison of the marginal effects of the HRRP that came from the ACA with the substitutive program Maryland designed – the Readmission Reduction Incentive Program. Contrasting the policy mandates in each program would empower any econometric measurement of their variable results with plausible causal mechanisms arising from the statutory structures of each program. Moreover, residual differences between the systems unexplained by programmatic differences or fixed effects could likely provide a more valuable insight into the actual second-order effects on quality produced by the overall system.

Additionally, future studies should consider longer time frames in both directions. The TPR model that presaged the Global Budget began in 2010, and so capturing that element within a larger data set could be fruitful, and might change the overall picture of the GBM's effect from the relatively narrow window considered in this study. Additionally, year after year since 2014, the system has continued to apply downward pressure on provider reimbursements and has been expanded to include outpatient, primary care, and all other aspects of the health care sector. A follow up study to see if noticeable effects have arisen since the scope of this study would also be useful. Also, while the HCUP data is incredibly valuable in its completeness, additional control

variables were difficult to implement, due to a significant loss of data and therefore concerns of bias surrounding missing observations. Future studies that include richer socio-economic variables, so long as they avoid over-controlling for the subtle effects of changes to reimbursement and in particular patient selection, future research will likely be able to arrive at more accurate estimates of the GBM's effect. A final limitation is the study's parametric form. Further analyses utilizing alternative specifications that avoid some of the pitfalls of the LPM would also be instructive.

Policy Implications

In line with the observation that insurance regime seems to have a negligible effect on quality indicators, it is possible that policymakers should feel more comfortable confronting problems head-on, rather than becoming discouraged at the size of the system and its many interconnections. If price signals are unconnected to both the overall supply of care and the quality of that care, then policymakers should be less concerned about interfering in a working market – because the market is clearly not working in a competitive fashion. State governments in particular are generally very restricted in their financing options, with tight budgets and multifarious responsibilities. However, the Maryland case seems to offer evidence that state governments can take a direct hand in controlling all-payer costs without harming the quality of the care their citizens receive. If this is the case, something like a state universal insurance regime seems much more feasible.

By the same token, rate-setting is likely not a silver bullet to improve quality. This observation would seem to bear out among the wide variety of developed countries that

use rate-setting. Noting the UK in particular, while rates and budgets are set tightly, aggressive CEA are also applied to all programs. So policymakers should likely pursue programs designed specifically to improve quality, just as they should pursue them to specifically increase access or reduce cost. As mentioned at the beginning of this paper, health care policy in the United States is uneven in design and is written about in dramatic and mystifying tones. Perhaps the answer is not to design policies that are hamstrung by gaming budgeting rules and that rely on imputed outcomes to affect unrelated vectors of the health system, but instead to make big, bold policies that are designed to tackle specific problems with specific solutions.

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