Can Health Spending Be Reined In through Supply Constraints?

An Evaluation of Certificate-of-Need Laws

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Abstract

For 50 years, US policymakers and economists have searched for ways to slow the growth of spending on health care. One approach currently taken by 35 states is to restrict the supply of health care by requiring new and growing providers to show that they serve an "economic need." Hospitals and certain other health providers must obtain a certificate of need (CON) from a state board before opening or expanding. I show that in a simple model where CON restricts supply, the effect of CON on spending depends on the price elasticity of market demand for health care. CON will work to restrain spending when demand is elastic; however, most estimates show the demand for health care to be quite inelastic. I therefore predict that CON will increase prices for health care without much reducing its use, leading to an increase in spending. Using data from the National Health Expenditure Accounts, I estimate that CON laws do not reduce spending by any major payer or for any major type of provider and that they increase spending on some types of health care.

JEL codes: I11, I18, H75

Keywords: healthcare spending, certificate of need, healthcare supply, regulation

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Can Health Spending Be Reined In through Supply Constraints?

An Evaluation of Certificate-of-Need Laws

James Bailey

1. Introduction

Certificate-of-need laws require health providers to obtain the permission of a state board before opening, expanding into new lines of service, or making large capital expenditures. These laws were passed rapidly between 1964 and 1980 in the hope of restraining the growth of health spending; by 1980 every state but Louisiana had a CON program, and the federal government was pushing states to adopt CON. Since the Medicare payment reform and the end of the federal push for CON in the 1980s, 15 states have repealed their CON laws. In this paper, I aim to determine whether these CON-repealing states saw an increase in total spending relative to CON-maintaining states or whether instead CON fails to restrain health spending.

Earlier attempts to estimate the effects of certificate-of-need laws on spending have suffered from a lack of theory, in particular with regard to how the effect of the laws should differ for different payers and different types of health services. I model CON laws as a reduction in supply and argue that they will only reduce spending when the demand for health care is price elastic. However, health care is generally estimated to be price inelastic, suggesting that CON laws are likely to backfire and increase total spending on health care for two reasons. First, inelastic demand means CON will increase the price of the services it targets more than it will reduce their use. Second, CON is not completely comprehensive. To the extent that sectors covered and uncovered by CON are substitutes, CON that succeeds in restraining the use of covered care will increase the demand for, and spending on, uncovered care. I further show that CON likely reduces total welfare in the healthcare market. I show that results of the simple

supply-and-demand model still hold after considering relevant complications such as moral hazard and point out other complications that more sophisticated theoretical work should explore.

I then turn to the data to estimate whether CON laws are effective in practice. Using 1980–2009 National Health Expenditure Accounts data, I show that CON states do not experience lower spending overall or for any major type of provider (hospitals, physicians) or payer (Medicare, Medicaid). I find some evidence that CON backfires and leads to increased spending. I estimate that CON leads to a statistically significant 3.1% increase in total spending and a 6.9% increase in Medicare spending. While the finding that CON does not reduce spending is quite robust, the finding that it increases spending is sensitive to the time period considered and the measure of CON used. Using data from the Healthcare Cost and Utilization Project (HCUP), I show that CON has no effect on hospital volumes, though it is associated with up to a 5% increase in the average length of an inpatient hospital stay and a 0%–5% increase in hospital charges.

2. Background and Literature Review

2.1. Certificate-of-Need Laws: History and Intentions

The first certificate-of-need law was passed by New York in 1964. Other states rapidly followed suit, and 23 states had programs in place by 1974. The rapid progress of CON laws was accelerated further when Gerald Ford signed the National Health Planning and Resources Development Act of 1974 (Pub. L. No. 93-641). The law incentivized states to create CON programs, offering funding to those that did and threatening to withhold Medicare and Medicaid funds from those that did not. By 1980, every state except Louisiana had a CON program in place.

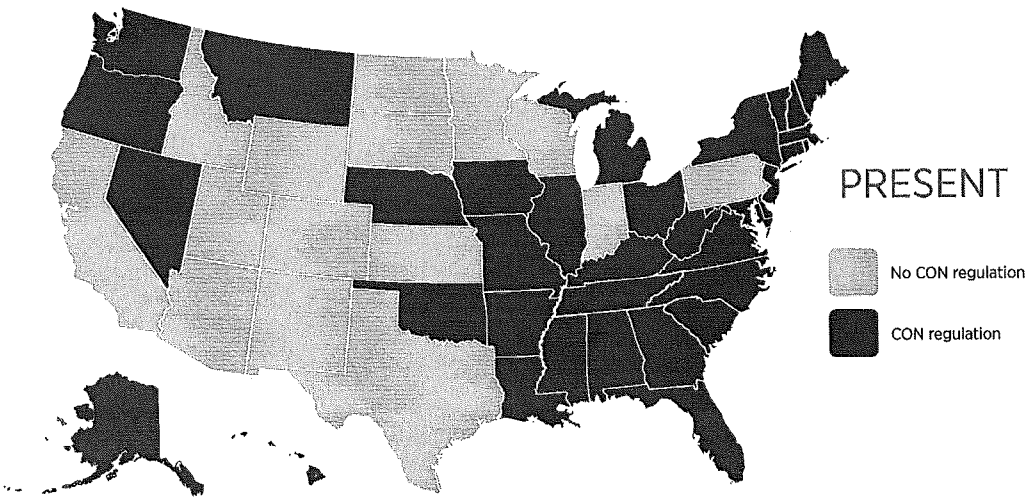
The text of the 1974 federal law promoting CON identifies two main goals for the legislation: promoting equal access to health care and restraining cost growth. The law makes

clear its intention to restrain health spending: "The massive infusion of Federal funds into the existing health care system has contributed to inflationary increases in the cost of health care. . . . Increases in the cost of health care, particularly of hospital stays, have been uncontrollable and inflationary, and there are presently inadequate incentives for the use of appropriate alternative levels of health care, and for the substitution of ambulatory and intermediate care for inpatient hospital care" (Pub. L. No. 93-641, § 2a). The law plans to reduce spending growth through state-led planning: "In recognition of the magnitude of the problems described in subsection (a) and the urgency placed on their solution, it is the purpose of this Act to facilitate the development of recommendations for a national health planning policy, to augment areawide and State planning for health services, manpower, and facilities, and to authorize financial assistance for the development of resources to further that policy" (Pub. L. No. 93-641, § 2b).

These planning agencies are expected to achieve spending reductions by "preventing unnecessary duplication of health resources" (Pub. L. No. 93-641, § 1513). State CON programs are expected to "provide for review and determination of need prior to the time such services, facilities, and organizations are offered or developed or substantial expenditures are undertaken in preparation for such offering or development, and provide that only those services, facilities, and organizations found to be needed shall be offered or developed in the State" (Pub. L. No. 93-641, § 1523).

The federal statute promoting CON was repealed in the mid-1980s (Pub. L. No. 99-660, Title VII). Most states have been slow to respond to this, but 15 have repealed their CON programs, as shown in figure 1. These CON repeals offer an opportunity to study the effect of CON: What happened to healthcare access, outcomes, and spending in the states that dropped CON compared to those that did not?

Figure 1. States with and without CON Programs



Source: Matthew Mitchell and Christopher Koopman, "40 Years of Certificate-of-Need Laws across America," Mercatus Center at George Mason University, October 14, 2014.

2.2. Effect of CON on Access and Quality

In addition to controlling spending on health care, CON legislation had an express goal of improving equality of access to health care, both by inducing providers to provide more indigent care and by limiting "cream-skimming," where hospitals take only profitable patients while leaving unprofitable patients to others. One theory of how CON could reduce cream-skimming is by restricting the creation of suburban and specialty hospitals in order to protect urban and rural hospitals serving poorer patients.

Another theory is that CON boards could use their power over the approval of new projects to induce providers to offer more indigent care. Zhang [2008] finds this to be the case, estimating that CON laws result in a very slight (.07%) increase in the admission of uninsured patients. However, most of the literature indicates no effect or a negative effect of CON on access to care. Cutler et al. [2010] find that CON increases travel distance for coronary artery bypass graft surgery, and DeLia et al. [2009] find that CON increases racial disparities in care.

Stratmann and Russ [2014] find that CON programs do not increase the amount of indigent care provided.

More recently, CON advocates have argued that CON increases the quality of care by promoting regionalization, moving patients into high-volume facilities that are associated with better health outcomes (Vaughan-Sarrazin et al. [2002]). The literature on CON and quality has focused almost entirely on the quality of heart surgery and has indicated that CON may decrease heart surgery mortality (Ho [2006]), increase it (Cutler et al. [2010]), or have no effect (Popescu et al. [2006]). The only papers to examine how CON affects more general outcomes have found that it has no effect (Bailey [2015]) or worsens mortality (Shortell and Hughes [1988]).

2.3. Previous Literature on CON and Spending

In addition to the goals of improving quality and expanding access to care, CON laws are meant to reduce spending on health care. The empirical literature on how CON laws affect spending has found mixed results, as I summarize in table 1. These mixed results may stem from the fact that the studies measure different types of spending.

Table 1. Summary of Literature on CON and Spending

Study	Empirical strategy	Findings: Effect of CON
Conover and Sloan (1998)	State FE	Decreases hospital spending 5%, overall spending 0%
Hellinger (2009)	GEE	Decreases hospital beds by 10%, which in turn decreases spending by 1.8%
Grabowski et al. (2003)	State FE	Changes Medicaid nursing home expenditures 0%
Rivers et al. (2010)	State FE, hospital controls	0% effect on hospital spending; strict CON increases hospital spending 4.9%
Lanning et al. (1991)	2SLS	Increases hospital spending 20.6%, overall spending 13.6%

Note: FE is fixed effects. GEE is generalized estimating equations. 2SLS is two-stage least squares.

Conover and Sloan [1998] find that CON reduces spending on acute care by 5% but does not reduce overall health expenditures. Hellinger [2009] finds that CON reduces the number of hospital beds by 10% and argues based on other literature that this should translate into a 1.8% reduction in spending. Grabowski et al. [2003] find that repealing CON for nursing homes has no effect on Medicaid nursing home spending, and Rivers et al. [2010] find no effect of CON on hospital spending per patient. Lanning et al. [1991] find that CON fails in its goal, increasing hospital spending by 18% and total health spending by 12%.

What accounts for these differences? There is some variety in the empirical techniques employed by the literature; most papers use fixed-effects estimators, while Hellinger [2009] uses generalized estimating equations and Lanning et al. [1991] use two-stage least squares. Some papers use a binary definition of CON, while others test the effect of CON stringency; moreover, different authors allow different lag times for the introduction or repeal of CON to take effect. But while these differences in specification can lead to different results, I argue that most of the previous literature used reasonable empirical strategies. The key reason the researchers find different results is that they set out to measure different things.

First, the effect of CON may change over time; the previous literature used a variety of time periods, anywhere between 1969 and 2003. Second, the literature has used a variety of expenditure measures. It is reasonable to expect that CON will have different effects on nursing homes or independent physicians than on hospitals and different effects on Medicare than on Medicaid. The limitation of the previous literature was not in its estimation techniques but in its theory—or rather, its lack thereof.

Previous work has only rarely come close to providing explicit mathematical or graphical models of how CON laws should affect spending.[1] But I argue that an explicit model of how CON affects total expenditures is necessary. In fact, the model I put forward helps to explain why the empirical literature on the effect of CON has found wildly varying results.

3. Modeling the Effects of Certificate-of-Need Laws

3.1. Basic Supply and Demand

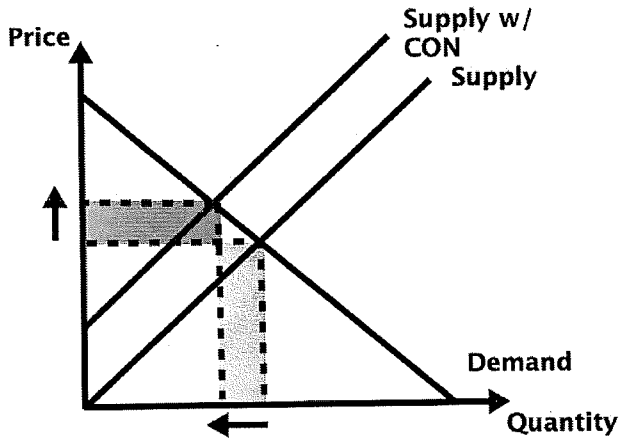
3.1.1. CON as supply shift. While the market for health care is infamously complex, confounded by third-party payment and possibly supplier-induced demand, basic supply and demand can still describe the market well to a first approximation. I argue that CON laws are best represented as causing a leftward shift in the supply curve.[2] Seeking CON approval is time consuming and expensive, increasing the cost of production. Some facilities are entirely denied the opportunity to open or expand as CON boards try to prevent "duplication" of services, reducing the number of firms operating in the relevant markets. This should lead to a lower quantity produced at any given price—a classic supply shift.

How do CON laws affect spending in this model? The reduction in supply will reduce quantities and increase prices; which effect predominates depends on the elasticity of demand (see figure 2). If demand is perfectly elastic, prices will remain the same while quantities drop, and CON laws will be effective tools for reducing total spending. If, on the other hand, demand is perfectly inelastic, prices will increase while quantities stay the same, meaning that CON laws

[1] The closest previous work is from Ford and Kaserman [1993], who state that CON shifts the supply of regulated services to the left, which is likely to increase spending; and from Nyman [1994], who models CON for nursing homes as a constraint on bed capacity that creates excess demand and leads to increased prices and markups.
[2] To be more precise, CON laws prevent supply from shifting rightward when it would otherwise do so; the repeal of CON laws should cause a rightward shift in the supply curve. In the graphs and arguments to follow, I elide this distinction in favor of simplicity and simply say that CON causes a leftward shift in supply.

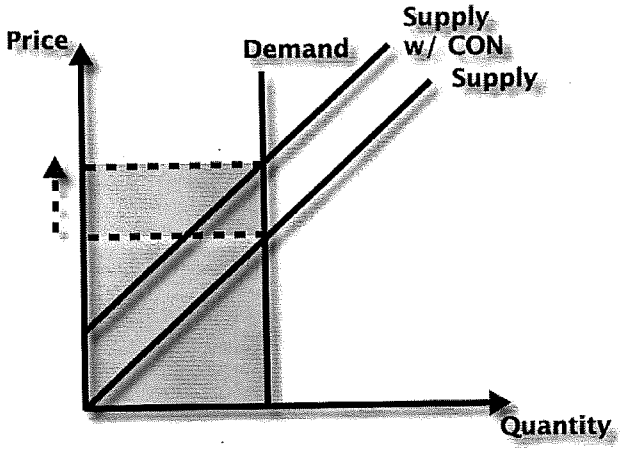
will increase total spending (see figure 3). Applying the total revenue test, we can see that CON will reduce spending when demand is elastic and increase spending when demand is inelastic.

Figure 2. Effect of CON Laws on Price, Quantity, and Total Spending



Note: Blue area represents the increase in spending caused by CON (due to higher prices). Green area represents the decrease in spending caused by CON (due to lower quantities).

Figure 3. Effect of CON Laws When Demand Is Perfectly Inelastic



Note: Green area represents total spending on health care before CON. Orange area represents the additional health care spending generated by CON.

3.1.2. Probable implications given realistic elasticities. Most estimates of the elasticity of demand for health care find it to be inelastic, often close to zero.[3] This suggests that CON laws are likely to increase total spending, rather than decreasing it as intended.

Health care, however, is not a single, homogenous good. While the demand for goods and services in the healthcare sector is inelastic on average, it is certainly elastic in some particular cases. Demand for certain services such as plastic surgery is elastic (Krieger and Shaw [1999]). Significantly, certain payers may also have elastic demand. Most estimates of the elasticity of demand focus on elasticity with respect to the out-of-pocket costs faced by consumers—even though this only accounts for 12% of the market in the United States. But insurers also have some ability to choose what treatments and providers they are willing to cover, and these choices are price sensitive.

Medicare Parts A and B in the modern era[4] set prices each year using a complex formula. Their demand would now seem to be nearly perfectly elastic, given that Medicare will not reimburse charges above its set rates. Charging a lower price than that set by Medicare could still attract additional patients, given that Medicare enrollees often face substantial coinsurance. Furthermore, the formula Medicare uses to set prices still accounts for provider costs ("geographic practice cost indices"). Therefore, Medicare patients' demand may still be inelastic, meaning that CON would result in increased spending.

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[3] Ringel [2002] reviews the literature on the elasticity of demand for medical care and finds that estimates approximate −.17, close to the famous RAND Experiment estimate. The literature has taken great pains to cancel out the effects of insurance and estimate the elasticity of demand consumers have with respect to out-of-pocket costs. This is unfortunate when considering demand elasticity, as this exercise does, from the perspective of a health provider. Providers are interested in the quantity response of all payers, insurers as well as consumers, to an increase in price. The effect of insurance is discussed further in the following section.

[4] Medicare operated very differently during its first two decades than it does today, using retrospective cost-based reimbursement rather than the current prospective-payment system that began in 1983. Under the old system, Medicare would pay providers for whatever costs they incurred in caring for Medicare patients—a system that made their demand close to perfectly inelastic. Under this system, a supply-and-demand model suggests that CON would increase spending rather than decrease it. Between 1983 and 2001, Medicare transitioned to prospective payment based on the expected cost for a patient with a given diagnosis (see Acemoglu and Finkelstein [2008] for details).

Medicaid also attempts to set prices, making its demand perfectly elastic over a one-year horizon. Medicaid enrollees, in contrast to Medicare, pay little to nothing in the way of deductibles and coinsurance. Medicaid reimbursement rates do eventually move upward to reflect increased costs, but are known to do so slowly, leading many providers to turn down Medicaid patients. Therefore, CON is more likely to reduce spending by Medicaid than by Medicare or private insurance.

3.2. Welfare Implications of the Basic Model and Moral Hazard

In a standard market, a leftward shift in supply will reduce both consumer and producer surplus.[5] With such a straightforwardly negative welfare implication coming out of such a straightforward model, why were CON laws ever passed in the first place? Clearly, it is unusual for laws to have the goal of "reducing spending"; more often, the government aims to increase GDP.

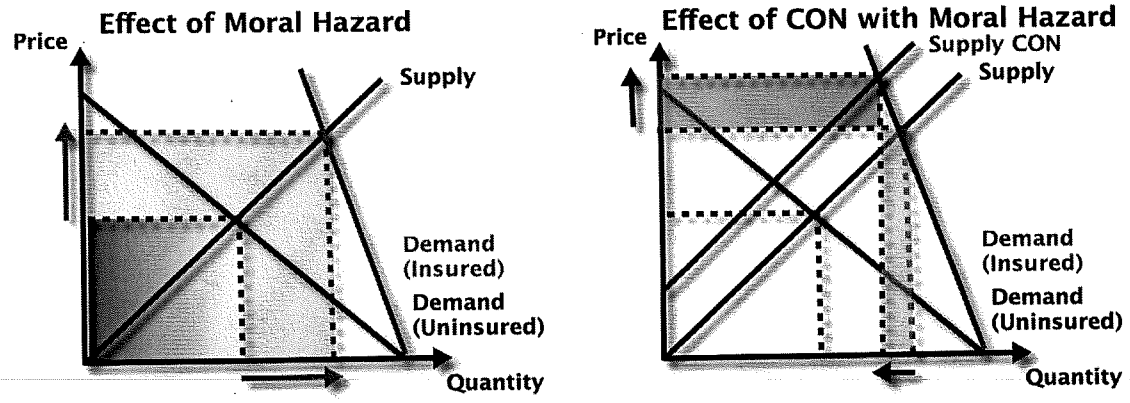
One possibility is that legislators are serving special interests at the expense of the public. Certificates of need are required in order to expand, but purchases and construction done by incumbents before the advent of CON are grandfathered in, meaning that CON could give a competitive advantage to incumbent providers. Regulators on CON boards could also be captured by industry, fast-tracking the applications of favored providers (perhaps expanding incumbents) while denying others (perhaps new entrants).

On the other hand, legislators and regulators may be acting for the perceived public interest, to correct market failures that are particularly likely in health care. They may perceive overspending on health care caused by the moral hazard of the third-party-payer system, and they may believe that CON could reduce this overspending. CON laws became much more popular

[5] Except in the case of perfect elasticities or inelasticities—but total surplus is always reduced, and neither consumer nor producer surplus is ever increased.

following the introduction of Medicare, which Finkelstein [2007] found led to a large increase in total spending on health care. In a standard moral-hazard model, as shown in figure 4, insurance means that consumers face a price below the market price and thus have a demand higher than their willingness to pay, leading to an inefficiently high consumption of health care.[6] A CON law that shifts supply left reduces the quantity of care back toward an efficient level. However, it still increases prices. So, once again, the effect on total spending depends on the elasticity: CON laws will only reduce total spending if demand is elastic.

Figure 4. Effect of CON on Spending in the Presence of Moral Hazard



Note: On the left, gray area represents total spending without moral hazard, whereas red area represents the increase in spending caused by moral hazard. On the right, blue area represents the increase in spending caused by CON (due to higher prices), whereas green area represents the decrease in spending caused by CON (due to lower quantities).

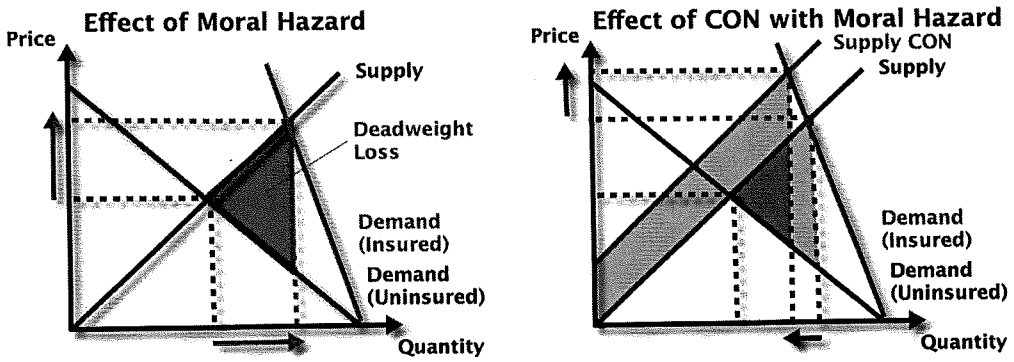
In the case of insurance-induced moral hazard, however, effective demand is much more likely to be inelastic because consumers do not bear the full cost of price increases. In the case of 80% coinsurance (assuming for the moment that CON laws do not change insurance plan design), consumers only pay 20 cents of each $1 price increase—so their true elasticity of demand would

[6] More recently, some authors have argued that much of the increased consumption caused by moral hazard is in fact efficient; in this case, there would be no market failure for CON to correct. The following analysis gives CON proponents the benefit of the doubt by assuming moral hazard to be inefficient.

have to be above 5 for their insured elasticity of demand to be above 1. This makes it quite likely that CON laws will actually result in increased total spending by insured patients.

In this model, CON laws can reduce the deadweight loss of moral hazard, but only by simultaneously increasing deadweight loss through added inefficiency of production. It is not enough to push the quantity back down toward the efficient level because the shift in supply shows that CON laws increase the cost of providing a given quantity of care (see figure 5).

Figure 5. Effect of CON on Welfare in the Presence of Moral Hazard



Note: In both figures, the gray area represents the deadweight loss caused by moral hazard. On the right, the green area shows the extent to which CON reduces the deadweight loss from moral hazard by reducing quantity; the blue area shows the extent to which CON creates its own deadweight loss by increasing costs.

3.3. Hospital vs. Nonhospital Care: CON's Effect on Markets for Substitutes

CON laws do not affect all parts of the healthcare sector equally. The laws most commonly charge CON boards with reviewing hospitals and nursing homes that wish to open or add beds. Some CON programs also review large capital expenditures on health equipment or providers wishing to open a new type of service, such as open-heart surgery or burn care. Many states target nonhospital providers, such as dialysis, rehabilitation, or home health facilities. Physicians

are generally able to open practices without needing a CON,[7] though they may have to go through the CON process to obtain capital equipment such as an MRI machine, and they may find it more challenging than hospitals do to navigate this process (Stratmann and Baker [2016]).

While CON boards may not directly regulate every type of provider (for instance, family-medicine clinics), CON restrictions on other providers could still affect them. For instance, nonhospital providers are a partial substitute for hospitals. CON restrictions on hospitals could increase the demand for nonhospital services by increasing the price of a substitute.[8] In a standard supply-and-demand model, an increase in demand leads straightforwardly to an increase in spending.

3.4. Summary of Empirical Predictions

The main conclusion of the baseline model is that CON laws will increase spending when demand for the regulated service is inelastic and decrease spending when demand is elastic. Because health care is generally estimated to be quite inelastic, the baseline model means we should generally expect CON to lead to increases in spending.

The simplest baseline model does not consider insurance and thus applies only to those paying out of pocket. Adding insurance to the model makes it even more likely that patient demand will be inelastic and that CON will result in increased spending on the regulated service. This conclusion, though, is sensitive to how exactly the insurer will react to increasing prices. To the extent that insurers respond to CON-induced price increases by raising co-pays and deductibles, narrowing networks, or denying procedures, they effectively raise the elasticity of

[7] As of 2011, only the Vermont and Washington, DC, CON programs directly restrict medical offices, though it is more common for CON to regulate ambulatory surgery centers.
[8] Economists have recognized since at least 1980 that noncomprehensive CON programs could lead to increased costs in uncovered sectors; see Sloan and Steinwald [1980] for one example.

demand and make it more likely that CON reduces spending. To the extent that insurers do not react and simply keep paying the increasing prices, CON will increase spending by insurers. The Affordable Care Act, together with older state health-insurance regulations, limits the ability of insurers to react in these ways, making an increase in spending more likely.

Finally, to the extent that CON laws target certain types of providers, those providers will increase their prices. This will lead in turn to an increase in demand for and spending on substitute services not covered by CON.

4. Estimating the Effects of CON Laws in Practice

The key to determining the effects of CON will be to use data on spending, usage, and (to the extent possible) prices; data that report these separately by type of payer and provider; and a sufficiently long dataset. The prediction of the main theoretical model is that CON laws will decrease spending when demand is price elastic but increase spending when demand is price inelastic.

4.1. CON Data

Data on the entire history of when states enacted and repealed their overall CON programs are available from the National Conference of State Legislatures. The general pattern is clear: by 1980 (when my spending data begins) every state except Louisiana had a CON program in place. The tide then reversed, and 15 states have ended their programs since 1983. Only Wisconsin has reinstated its CON program after ending it entirely, so most of the identification of the effect of CON is coming from CON repeals.

The main analyses of this paper use this binary data on whether a state has CON in place or not, as well as data on how long CON has been repealed. But not all CON programs are equally

strong. Some programs can review any new spending by providers, while others review only spending over a certain threshold, such as $1 million. Some programs have the authority to review as little as a single type of spending, such as adding acute-care hospital beds, while others—such as Vermont's—review 28 separate types. Unfortunately, data on the strength and stringency of CON programs are not as easily available as data on their presence or absence. Stratmann and Russ [2014] compile data from the American Health Planning Association (AHPA) on the separate types of spending that CON programs can review. I use this dataset for robustness checks but not for the main spending analysis, since it is available only from 1992 to 2011.

4.2. National Health Expenditure Accounts Data and Methodology

Data on total annual health spending in each state are from the National Health Expenditure Accounts (NHEA). These data are available from 1980 to 2009 and are published by the US Centers for Medicare & Medicaid Services. The NHEA gives overall health spending and also breaks down spending somewhat by type of payer (Medicare, Medicaid) and type of provider (hospitals, physicians, nursing homes, etc.).[9] I adjust the NHEA data for inflation using the Consumer Price Index; all dollar amounts reported are in 2014 dollars. In all spending regressions I divide total spending by state population (annual estimates from the US Census) to give real per capita spending.

Control variables come from the Integrated Public Use Microdata Series compilation of the Current Population Survey. They include state-level measures of age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Table 2 shows the summary statistics for the NHEA data and the control

[9] Some of these distinctions are difficult to make; in particular, many physicians work inside hospitals. In this case, spending is counted under physician services if the physicians bill independently from the hospital but under hospital spending if not.

variables. The baseline regression is as follows (γ_t represents year fixed effects, and θ_s represents state fixed effects):

$$lnPerCapitaSpending_{st} = \beta_0 + \beta_1 \times CON_{st} + \boldsymbol{Controls_{st}} \times \boldsymbol{\beta_2} + \gamma_t + \theta_s + \epsilon_{st}. \quad (1)$$

Table 2. State-Level Summary Statistics for NHEA and Current Population Survey Data

Variable	Mean 1980	Mean 2009
% CON	98.0	72.5
Total health expenditure per capita	2,656	7,736
Hospital expenditure per capita	1,235	2,977
Physician expenditure per capita	580	1,765
Nursing home expenditure per capita	189	510
Age	32.7	34.7
% male	48.4	48.5
% black	9.9	11.6
% Hispanic	6.3	12.3
% college	4.3	18.9
% poor	12.0	12.8
Income per capita	25,765	37,028
% employer insurance	28.8	29.6
% Medicaid	7.7	14.7
% Medicare	10.8	12.0

Note: All expenditure figures are in 2014 dollars.

5. Results

5.1. Effect of CON on Total Spending

Table 3 shows the effect of CON laws on various types of health expenditures. It shows that CON laws have the opposite of their intended effect, actually increasing spending rather than decreasing it. CON increases total health spending by a statistically significant 3.1%. Increases are especially high for spending on physician care—a statistically significant 5.0%. Table 4 shows the effect of CON on Medicare spending. CON is estimated to increase overall Medicare spending by a statistically significant 6.9%. Table 5 shows that CON is estimated to have no

statistically significant effect on Medicaid spending. This matches the prediction from section 3.1.2 that CON was less likely to increase spending by Medicaid than by other insurers.

Table 3. Effect of CON Laws on Overall Per Capita Spending by Type of Provider

	Total	Hospital	Physician	Nursing home
CON	.031**	.014	.050**	.043
	(.014)	(.024)	(.023)	(.043)
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Overall R^2	.69	.30	.69	.46
Observations	1,530	1,530	1,530	1,530

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Spending is measured using the 1980–2009 NHEA.

Table 4. Effect of CON Laws on Per Capita Medicare Spending by Type of Provider

	Total	Hospital	Physician	Nursing home
CON	.069***	.065**	.062*	−.150
	(.025)	(.027)	(.032)	(.161)
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Overall R^2	.62	.43	.55	.65
Observations	1,530	1,530	1,530	1,530

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Spending is measured using the 1980–2009 NHEA.

Table 5. Effect of CON Laws on Per Capita Medicaid Spending by Type of Provider

	Total	Hospital	Physician	Nursing Home
CON	−.007	.048	.018	.030
	(.079)	(.082)	(.077)	(.095)
State Fixed Effects	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes
Overall R^2	.65	.62	.60	.15
Observations	1,528	1,528	1,520	1,526

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Spending is measured using the 1980–2009 NHEA.

5.2. Effect of CON on Prices and Quantities

Next I turn to Healthcare Cost and Utilization Project (HCUP) data on hospital discharges to determine how much of the spending increase in hospitals found using NHEA spending data is driven by increased prices and how much is driven by increased quantities (or is happening in spite of falling quantities). While the NHEA data are the best measure of total health spending, they do not distinguish the extent to which increases in spending are driven by price as opposed to quantity. The theoretical model predicts that if CON increases spending, it will do so by increasing prices, not quantities; in fact, it is predicted to reduce quantities in any case except that of perfectly inelastic demand. To test whether the mechanism of action is working as predicted, we need data on prices and quantities.

The Healthcare Cost and Utilization Project (HCUP), distributed by the US Agency for Healthcare Research and Quality, draws on state administrative records to provide data on hospital discharges. HCUP quantifies the use of specific diagnoses and procedures down to the ICD-9 level.[10] These data are of excellent quality; nearly all hospitals in participating states are included back to 1997. However, only hospital inpatient discharges are included; data on nonhospital care are harder to come by. Data on prices are notoriously difficult to obtain in health care, both for patients and for researchers. HCUP does not provide prices but does provide two important pieces of information—charges (what payers were billed for a procedure, which they usually bargain down substantially) and estimated hospital costs.

While HCUP collects restricted data at the individual discharge level, for this paper I use the publicly available HCUPnet, which is at the state-year level. Specifically, I use the HCUPnet State Inpatient Database (SID), which summarizes data from the universe of community hospitals

[10] The International Classification of Diseases, Ninth Revision (ICD-9), classifies diseases and procedures into one of approximately 17,000 categories.

back to 1997 in states that provide data to HCUP. The public SID began with 14 states in 1997 and expanded to include 36 states as of 2011.[11] HCUPnet SID includes data on the total number of hospital discharges, average hospital charges, and average length of hospital stay by state. Table 6 gives the means of these variables, which can also be broken down by payer type and diagnosis.

Table 6. State-Level Summary Statistics for HCUP Data

Variable	Mean 1997	Mean 2011
Hospital discharges (thousands)	928	796
Hospital discharges per capita	0.11	0.12
Average charges ($ thousands)	15.8	31.4
Average length of stay (days)	4.7	4.4

Note: All expenditure figures are in 2014 dollars. Data are from the Healthcare Cost and Utilization Project.

To evaluate the effect of CON laws on these variables, I use regressions similar to those in the previous section:

$$Y_{st} = \beta_0 + \beta_1 \times CON_{st} + \boldsymbol{Controls}_{st} \times \boldsymbol{\beta_2} + \gamma_t + \theta_s + \epsilon_{st}. \quad (2)$$

There are two differences from the previous regressions. The first, of course, is the new dependent variables, Y_{st}, meant to measure the quantity and price of care—the natural logs of hospital discharges per capita, inflation-adjusted mean hospital charges, and average length of hospital stay. The second difference is that the regressions are now run using random effects rather than fixed effects. The reason for using random effects is that HCUPnet SID data are only available back to 1997 (unlike the NHEA, which is available back to 1980). Since 1997, Wisconsin is the only state to add or drop its entire CON program. Because fixed-effects estimation uses only within-state variation, fixed-effects estimates with this sample would be

[11] Table A1 in the appendix shows the states and years included in the HCUPnet SID.

based only on Wisconsin. Random effects, by contrast, uses cross- as well as within-state variation in its estimates.[12]

The results are shown in table 7. CON laws do not appear to have a statistically significant effect on hospital discharge volumes, length of inpatient stay, or average charges.[13]

Table 7. Effect of CON Laws on Hospital Volumes, Length of Stay, and Charges

	Hospital volumes	Length of stay	Charges
CON	.028	.054*	.006
	(.017)	(.030)	(.023)
State random effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Overall R^2	.28	.43	.50
Observations	433	433	432

* indicates p-value < .10. ** indicates p-value < .05. ***indicates p-value < .01.

Note: Hospital volumes are measured as the natural log of the number of hospital discharges per capita per year in a state. Charges are measured in 2014 dollars. Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Outcomes are measured using the 1997–2011 HCUPnet SID.

6. Robustness

6.1. Long-Run Effect of CON Repeals: Reconciling NHEA and HCUP?

Hospitals cannot be built overnight; even if CON is the binding constraint keeping a hospital from opening or expanding, it could take several years for the full effects of CON repeal to be felt. Previous studies of cardiac CON have found that new surgery centers opened at a higher rate for 5 to 10 years after CON repeal before the new equilibrium was reached (Ho [2006], Cutler et al. [2010]).

[12] Cross-state variation is also considered more likely to be biased by endogeneity; I address this concern in section 6.3 by using variation in the scope of CON laws to obtain fixed-effects estimates with HCUP data.

[13] This remains the case when the sample is narrowed to include only the 14 states that are in the sample for the entire time period, though there remains a near-significant increase in length of stay. Results are available upon request.

I therefore consider the delayed effects of CON repeal by using a new independent variable that measures the number of years since a state CON program was repealed, up to a maximum of five (and thereafter taking the value of 5). Equation 3 gives the new regression:

$$Y_{st} = \beta_0 + \beta_1 \times YearsCONrepealed_{st} + \boldsymbol{Controls}_{st} \times \boldsymbol{\beta_2} + \gamma_t + \boldsymbol{\theta}_s + \epsilon_{st}. \quad (3)$$

Table 8 shows that each year of CON repeal reduces total expenditures by a statistically significant 0.8%, so that after five years, total spending has fallen by 4%. This result is driven by the fall in physician spending, which drops a statistically significant 1.4% per year, while hospital spending drops only a statistically insignificant 0.3%.

Table 8. Long-Run Effects of CON Repeals on Overall Per Capita Spending by Type of Provider

	Total	Hospital	Physician	Nursing home
Years CON repealed	−.008**	−.003	−.014**	−.011
	(.004)	(.006)	(.006)	(.012)
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Overall R^2	.69	.30	.69	.46
Observations	1,530	1,530	1,530	1,530

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Years since CON was repealed are measured up to a maximum of five; states that repealed CON more than five years ago maintain a value of 5. Spending is measured using the 1980–2009 NHEA.

In table 9, I use this new CON measure with the HCUP data. I find that CON repeal does not affect hospital volumes, though it is associated with a statistically significant reduction in the average length of hospital stays and a statistically significant 1.1% reduction in average hospital

charges per year (a 5.5% reduction for a mature CON repeal). This reduction in charges is consistent with the reduction in prices predicted by the model.[14]

Table 9. Long-Run Effects of CON Repeals on Hospital Volumes, Length of Stay, and Charges

	Hospital volumes	Length of stay	Charges
Years CON repealed	.002	−.007***	−.011**
	(.003)	(.002)	(.005)
State fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Overall R^2	.09	.19	.43
Observations	433	433	432

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Hospital volumes are measured as the natural log of the number of hospital discharges per capita per year in a state. Charges are measured in 2014 dollars. Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Years since was CON repealed are measured up to a maximum of five; states that repealed CON more than five years ago maintain a value of 5. Outcomes are measured using the 1997–2011 HCUPnet SID.

6.2. CON and Medicare Reform

The effect of CON may also change over the 30-year period being studied. This seems particularly likely in the case of Medicare, which drastically changed its reimbursement policy during this period. Before 1983, Medicare used cost-plus reimbursement, which gave providers very little incentive to keep costs low. Indeed, it was the high and rapidly growing cost of Medicare that led to the federal push for CON in the 1970s, but since the 1980s, the federal government has turned instead to payment reform. In 1983 Medicare moved to prospective payment system reimbursement for labor, and in 1992 it began the same move for capital equipment. Because large capital outlays are the biggest target of CON, I expect this 1992

[14] Prices paid are correlated with charges, but they tend to be substantially but variably lower (and unfortunately much harder to observe) than charges following negotiations between hospitals and payers. When the sample is narrowed to include only the 14 states that are in the sample for the entire time period, the statistical significance of each variable stays the same while magnitudes increase somewhat. Results are available upon request.

reform to change the effect of CON. Table 10 shows the effect of CON on Medicare spending before and after 1992. The estimated magnitude of CON is similar before and after 1992 at about a 4% spending increase, though it is only statistically significant for hospitals after 1992.

Table 10. Effect of CON Laws on Total Medicare Spending by Medicare Era

	Total pre-1992	Total 1992 and after	Hospital pre-1992	Hospital 1992 and after
CON	.045*	.039*	.042	.043**
	(.031)	(.020)	(.028)	(.019)
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Overall R^2	.31	.41	.25	.19
Observations	612	918	612	918

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Spending is measured using the 1980–1992 and 1992–2009 NHEA.

6.3. CON Scope: Do Broader CON Programs Have Bigger Effects?

Not all CON programs are created equal; some are charged with much broader mandates than others. Broad CON programs that regulate many different types of providers may have stronger effects than narrow programs that only regulate a few. In this section, therefore, instead of measuring CON with a binary variable indicating whether a state has CON, I measure the scope of each state's CON program—how many separate types of hospital care they restrict. The American Health Planning Association has catalogued the scope of each state's CON program since 1992, and Stratmann and Russ [2014] compiled each year's AHPA data. These data count 28 separate CON restrictions. Most of these restrictions apply to hospitals—for example, providers must get a certificate before opening or expanding a psychiatric service or a neonatal intensive care unit. However, I estimate that eight of these CON restrictions do not apply to hospitals (see table A2 for a complete list). I form the variable $CONindex_{st}$ by adding up the

number of separate CON restrictions each state has for hospitals in each year. The number ranges from 0 in states with no CON program to 20 in Vermont and Washington, DC, which have the strictest programs; the average state with a CON program has 10.3 separate restrictions on hospitals (see table A3 for more summary statistics of this index).

In table 11, I show how the CON index affects total spending from 1992 (when the AHPA/Stratmann and Russ [2014] CON index data begin) to 2009 (when the NHEA spending data end). I estimate that states with broader CON programs have higher total spending, but these estimates are not statistically significant.

Table 11. Effects of CON Intensity on Overall Per Capita Spending by Type of Provider

	Total	Hospital	Physician	Nursing home
CON index	.002	.003	.002	−.002
	(.001)	(.002)	(.001)	(.002)
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Overall R^2	.37	.07	.23	.11
Observations	918	918	918	918

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Spending is measured using the 1992–2009 NHEA.

Next I estimate the effect of CON scope on hospital volumes, charges, and length of stay. Here, the index has the advantage of adding variance to the data, allowing fixed-effects estimation to be used. (Previously, random-effects estimation was used with the HCUP data because of a lack of post-1997 variation in binary CON laws.) As shown in table 12, I find that this CON index has no statistically significant effect on hospital volumes (as measured by the natural log of total discharges in a state) or average charges; in fact, the estimated magnitudes are slightly negative. Each CON restriction also leads to a statistically significant 0.5% increase in

the average length of hospital stay (implying a 5% increase in the average CON state, which has 10 such restrictions).

Surprisingly, broader CON programs do not have statistically stronger effects, except for extending the average length of hospital stays.

Table 12. Effect of CON Laws on Hospital Volumes, Length of Stay, and Charges

	Hospital Volumes	Length of Stay	Charges
CON Index	-.001	.005**	-.002
	(.002)	(.002)	(.010)
State Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Overall R^2	.08	.36	.42
Observations	397	397	396

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Hospital volumes are measured as the natural log of the number of hospital discharges per capita per year in a state. Charges are measured in 2014 dollars. Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Outcomes are measured using the 1997–2011 HCUPnet SID.

6.4. Endogeneity

One natural concern with the regressions of this paper is that they ignore the potential endogeneity of CON laws. Perhaps CON appears to increase spending because the states that passed CON earlier and kept it in place longer were different from the others; in particular, they may have been experiencing more rapid spending growth and turned to CON to fight it. This concern lead Lanning et al. [1991] to use instruments for CON, though the difficulty of finding instruments for CON that truly satisfy the exclusion restriction for spending is great.[15] Table 13 shows the 1980 demographics of states that eventually repealed CON and of states that have

[15] For instance, the instruments used by Lanning et al. [1991] are state-level measures of Medicaid expenditures per capita, budget revenues per capita, percentage of insurance premiums that are commercial, hospital beds per capita, percentage of beds in for-profit hospitals, ideology, and the party of the state government. These variables could all affect total spending in ways other than by affecting CON laws, violating the exclusion restriction; this is especially clear in the case of Medicaid spending, which adds directly into total spending.

maintained it. With the exception of the size of minority populations, the states do not appear to be substantially different.

Table 13. Endogenous CON Repeal? 1980 Demographics of CON-Maintaining and CON-Repealing States

Variable	Maintained	Repealed
Total health expenditure per capita	2,691	2,561
Hospital expenditure per capita	1,272	1,135
Physician expenditure per capita	578	584
Nursing home expenditure per capita	189	189
Age	33.1	31.6
% male	48.2	49.0
% black	12.3	3.4
% Hispanic	3.6	13.6
% college	4.4	4.1
Income per capita	25,708	25,915
% poor	12.3	11.2
% employer insurance	29.3	27.5
% Medicaid	8.3	6.1
% Medicare	11.1	10.1
Population	4,154,753	5,201,425

Note: All expenditure figures are in 2014 dollars. Repeal states are those that had repealed their CON program as of 2011.

As a way to partially address this potential problem, I rerun the main regressions while adding controls for state-specific linear time trends. The results, as shown in table 14, are similar to the results without state-specific time trends in table 3. As before, I estimate that CON laws lead to a statistically significant increase in overall spending and spending on physicians (though now slightly smaller than the increase shown in table 3), while having no statistically significant effect on spending in hospitals and nursing homes.

Table 14. Effect of CON Laws on Overall Per Capita Spending by Type of Provider, with State-Specific Time Trends

	Total	Hospital	Physician	Nursing home
CON	.028***	.025	.044**	.007
	(.009)	(.018)	(.017)	(.035)
State fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
State-specific time	Yes	Yes	Yes	Yes
Overall R^2	.68	.35	.65	.34
Observations	1,530	1,530	1,530	1,530

* indicates p-value < .10. ** indicates p-value < .05. *** indicates p-value < .01.

Note: Standard errors clustered by state are in parentheses. Control variables included in the regression but omitted from the table include age, gender, race (black, Asian, Hispanic; white omitted), income, poverty, education, and health insurance (private, Medicare, Medicaid). Spending is measured using the 1980–2009 NHEA.

7. Discussion

CON laws do not appear to have achieved their goal of reducing health care spending. Despite using a wide variety of empirical specifications, I find no statistically significant estimate of CON reducing spending. In fact, CON laws have the unintended but foreseeable consequence of increasing such spending by 3%–4% overall and 7% for Medicare. Broader CON laws, however, do not seem to generate higher spending in the states which maintain such laws.

For the most part, the NHEA results themselves support my theoretical model. CON has at best no effect on spending, as predicted. The spending increases are most apparent in the case of physicians, who benefit from CON raising the cost of a substitute. Spending increases are least apparent for Medicaid, which is generally thought to be the least generous and most price-conscious payer.

The NHEA data only include total spending; when I turn to HCUP data to disambiguate how much of the spending increase is driven by price increases, I find that in some specifications CON increases hospital charges by 5%, but in others it has no effect. While hospital charge data

are notoriously unreliable as a guide to actual prices paid, this finding casts some doubt on the idea that CON actually increases hospital spending.

The HCUP State Inpatient Database used in this paper is quite comprehensive in its coverage of hospitals but makes no attempt to measure the use of physician services outside hospitals. Future work could access data on the price and quantity of nonhospital services from at least one major payer to determine CON's effect there. The HCUP SID itself also allows for a deeper look into how specific CON restrictions affect the charges for and quantity of more specific procedures and diagnoses.

In the following section, I consider whether the simple supply-and-demand model I put forward in section 3 is adequate or whether it misses some crucial considerations.

7.1. Alternative Perspectives: Beyond the Basic Model

7.1.1. Supplier-induced demand. Overspending on health care may be caused by supplier-induced demand rather than (or in addition to) moral hazard. Perhaps there is no real need for a new hospital or MRI machine in a city, but once it exists, doctors will find a way to talk patients into using it. In this case, by restricting supply, CON also shifts demand to the left. The leftward shifts in supply and demand imply that CON will reduce quantity while having an indeterminate effect on price. As in the basic model, CON could increase or decrease total spending depending on elasticities; with supplier-induced demand, the effect of CON on total spending now also depends on the relative size of the supply and demand shifts. The presence of supplier-induced demand makes CON more likely to succeed in reducing spending. It also improves the welfare case for CON, as it now moves demand closer to its "true" level.[16] Unfortunately,

[16] Auster and Oaxaca [1981] go so far as to call supplier-induced demand the only possible reason CON could be in the public interest: "Current certificate of need (CON) plans require new hospitals, even if private and for profit, to

supplier-induced demand is incredibly difficult to identify in practice because its implications for observed prices and quantities do not differ from more standard models (see Auster and Oaxaca [1981]). The exogenous supply shift provided by CON improves matters: A finding that CON leads to lower prices would provide strong evidence for the presence of supplier-induced demand. However, a finding that CON increases prices would not rule out the possibility of supplied-induced demand.

7.1.2. CON as monopoly maker. So far, I have been modeling the market for health care as perfectly competitive, when in fact it is often characterized by a high degree of market power. Suppose that there is currently only one hospital in a market, but a second hospital plans to enter and engage in price competition. This will dissipate the monopoly rents of the existing provider, unless CON laws can be used to prevent the second hospital from entering the market. In this case, CON laws hurt consumers and society but benefit incumbent providers.

However, in a market with moral hazard, the market may be producing an inefficiently high amount of health care. In this case, the reduced quantity that a monopoly produces may not be so bad, as it would push the market back toward the efficient level of care. When considered as a monopoly creator, CON has a better chance to improve total welfare than when considered as a supply shift. When modeled as a supply shift, CON increases the cost of care for all providers. But in an alternative model where an incumbent monopolist is grandfathered in and incurs no costs related to seeking or being denied certificates of need, the monopolist will provide a quantity below the competitive equilibrium. In this monopoly case, CON does not directly increase costs, and there is no shift in the supply curve (though it will lead the monopolist to

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be approved on the basis of planners' assessments of community needs. If SID [supplier-induced demand] is not present, the only purpose such plans serve is to prevent competition through which the efficient may take business away from the nonefficient." Oddly, proponents of CON rarely consider SID as a justification for it.

charge prices higher than marginal cost, and costs could increase indirectly if an incumbent protected by CON engages in X-inefficiency). In the absence of a reaction by insurers, this reduction in the quantity of care may move the market back toward the efficient level that would exist with competitive supply and no moral hazard. This may describe the market for care for Medicare and Medicaid patients. Of course, the monopoly will charge higher prices than a competitive market and thus could still increase total spending even as it restricts quantity.

Furthermore, profit-maximizing private insurers are likely to adjust plan design in the face of monopoly providers. Gaynor et al. [2000] show in a very general theoretical model that competitive insurance markets will always adjust plan design in such a way that consumers are better off with competitive health care providers than monopoly providers, even in the presence of moral hazard. This logic suggests that CON will be relatively more effective at restraining spending by public insurers (though perhaps still not effective in an absolute sense).

7.1.3. CON as a barrier to excess entry. In the presence of fixed costs, the free market can yield an inefficiently high level of firm entry (Mankiw and Whinston [1986]; Suzumura and Kiyono [1987]). Excess entry is most likely in homogenous product markets, but it can still occur in the differentiated product markets that characterize most of health care. Excess-entry theorems have been used to argue for CON-style regulatory entry barriers.[17] The Mankiw and Whinston [1986]

[17] Mankiw and Whinston [1986] state that "in a homogenous market entry restrictions are often socially desirable. . . . [I]n heterogeneous product markets the direction of any entry bias is generally unclear, although efficient levels of entry remain an unlikely occurrence." Suzumura [2012] states that "the control of excessive competition has been counted as one of the major rationales of interventionist industrial policy. To the extent that the Suzumura–Kiyono excess entry theorem could identify a wide class of industries where social excessiveness of interfirm competition strenuously prevails, it is almost inevitable that industrial policy for the sake of keeping excessive competition under control is construed to be thereby rationalized."

CON laws predate formal economic statements of excess-entry theorems, and to my knowledge, proponents of CON restrictions in particular have not picked up on these papers as potential justifications of CON. Some economists, though, have realized the connection. Cutler et al. [2010] use the excess-entry framework to study the repeal of CON in Pennsylvania. They find that the repeal led many firms to enter the surgery market, leading to

model predicts that excess entry and duplication of fixed costs will be greatest in markets where products are more homogenous and where the fixed costs of entry for an individual firm are greater. This latter criterion suggests that CON entry barriers could be more effective for hospitals than for nursing homes or family physicians.

The leap from concluding that markets are imperfect to concluding that regulation can improve them must always be taken carefully, and there are good reasons to be especially suspicious in this case. Suzumura [2012] warns that "we should be careful enough not to be exploited by those who call for protection from 'excessive' or 'destructive' competition for the hidden cause of their private interests. . . . [T]he Suzumura–Kiyono excess entry theorem . . . does not necessarily mean that regulation by less than omnipotent and down-to-earth government can achieve better performance than competition in the free market place."

Laffont and Tirole [1993] put game-theoretical flesh on the bones of Stigler [1971], detailing how regulators with the power to restrict entry are likely to be captured by industry incumbents to allow an inefficiently low amount of entry, unless they are forced by a benevolent Congress to err on the side of allowing entry. Kim [1997] shows that even a benevolent and well-informed regulator of entry that selects the subgame-optimal level of entry can be tricked by incumbents into allowing too little entry. Incumbents do this by investing in excess capacity, thereby worsening the very problem entry regulation was meant to fix. In Kim's words, "It is not the government payoff but the payoff of the incumbent monopolist that is maximized under entry regulation. As capture theorists predict, entry regulation by the second-best government is captured by and works for the incumbent monopolist, not for the society as a whole."

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excess spending on fixed costs. However, they find that total welfare was not harmed because the increase in fixed costs was offset by an increase in quality.

8. Conclusion

Certificate-of-need laws aim to bend the health cost curve downward by slowing the entry of new providers and the adoption of new technology. I show that such laws could be effective in a market where demand is price elastic. But in a market with inelastic demand, as our actual market for health care seems to be, my model predicts that CON will increase spending by raising prices. The data partially bear out these predictions, showing that CON does not reduce any type of spending and may actually increase spending on hospitals and physicians, especially by Medicare. Since the late 1970s, many crude restrictions on supply have disappeared in the US, most notably in the airline and trucking industries, generally leading to a surge in entry and lower prices for consumers. This change has been relatively slow to come to health care, as only 15 states have repealed their certificate-of-need programs. The theoretical and empirical work in this paper suggests that these supply restrictions are particularly ineffective when it comes to health care. Enforcing CON imposes certain costs while predicting possible spending reductions that have not materialized. For policymakers looking for a way to reduce healthcare spending, CON isn't the way to go, though repealing CON might be.

Appendix: Additional Data Tables

Table A1. States and Years Included in HCUPnet State Inpatient Database

State	Years	State	Years
Arizona	1997–2013	New Hampshire	2003–2009
Arkansas	2004–2013	New Jersey	1997–2013
California	1997–2013	New Mexico	2009–2013
Colorado	1997–2013	New York	1997–2013
Florida	1997–2013	North Carolina	2000–2013
Hawaii	1997–2013	North Dakota	2011–2013
Illinois	2009–2013	Oklahoma	2005–2013
Indiana	2011–2013	Oregon	1997–2013
Iowa	1997–2013	Rhode Island	2002–2012
Kansas	1997–2013	South Carolina	1997–2013
Kentucky	2001–2013	Tennessee	2001–2013
Maine	2001–2012	Texas	2007–2013
Maryland	2005–2013	Utah	1997–2013
Massachusetts	1997–2013	Vermont	2001–2013
Michigan	2001–2013	Washington	1997–2013
Minnesota	2001–2013	West Virginia	2001–2013
Missouri	2001–2013	Wisconsin	2001–2013
Nebraska	2001–2013	Wyoming	2007–2013
Nevada	2002–2013		

Table A2. Components of CON Index

Hospital		Nonhospital
PET scanners	Lithotripsy	Home health
Gamma knives	Organ transplant	Rehabilitation
Swing beds	Ultrasound	Intermediate care facility w/ mental
Radiation therapy	CT scanners	Residential care/assisted living
Burn care	Open-heart surgery	Substance abuse
MRI scanners	Cardiac catheterization	Ambulatory surgery center
Long-term acute care	Obstetric services	Medical office buildings
Acute-care hospital beds	Air ambulance	Renal dialysis
Mobile high tech	Neonatal intensive care unit	
Sub-acute services	Psychiatric services	

Table A3. Summary Statistics for CON Index

Variable	Mean 1997	Mean 2011
CON Index (all states)	11.2	9.5
CON Index (CON states)	15.0	13.5
CON Hospital Index (all states)	8.1	7.0
CON Hospital Index (CON states)	10.9	9.9

Note: Index is based on data from the American Health Planning Association and author calculations.

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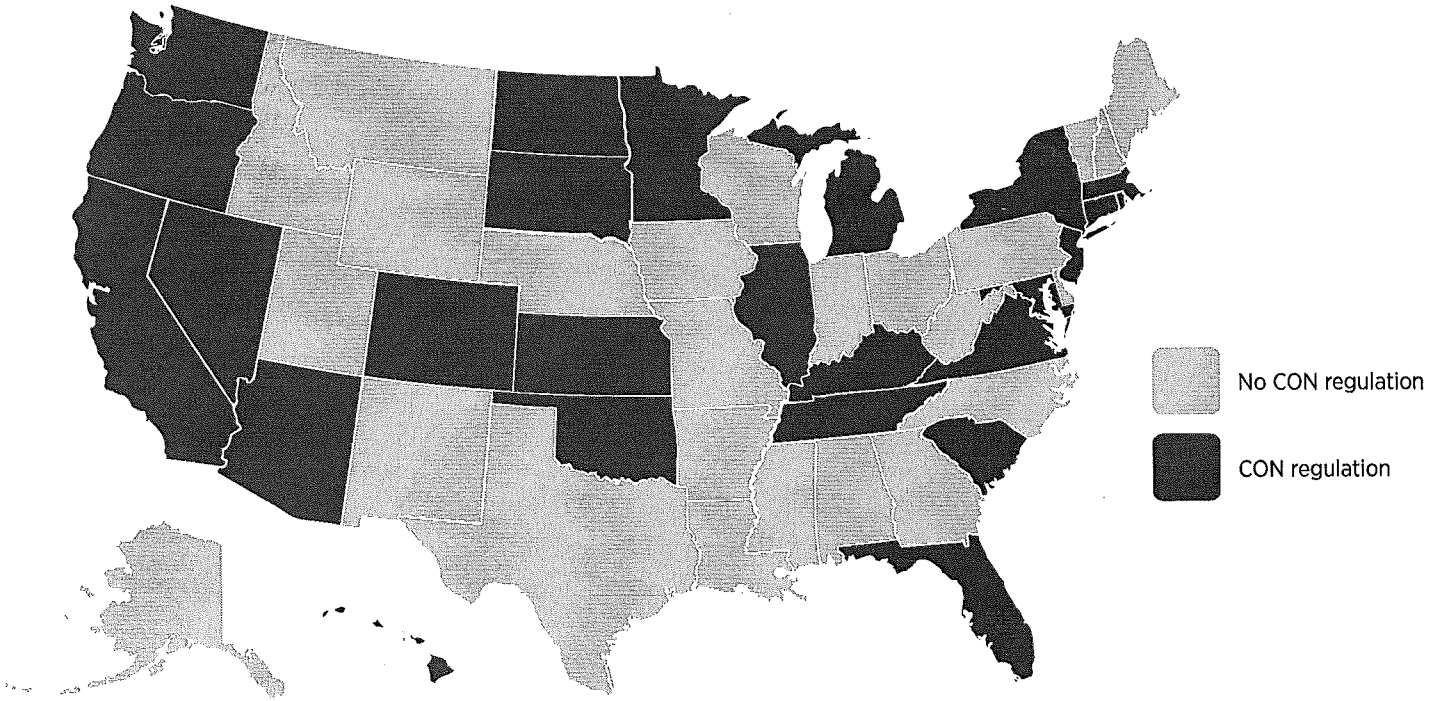
CERTIFICATE-OF-NEED (CON) REGULATION IN THE UNITED STATES (1974)



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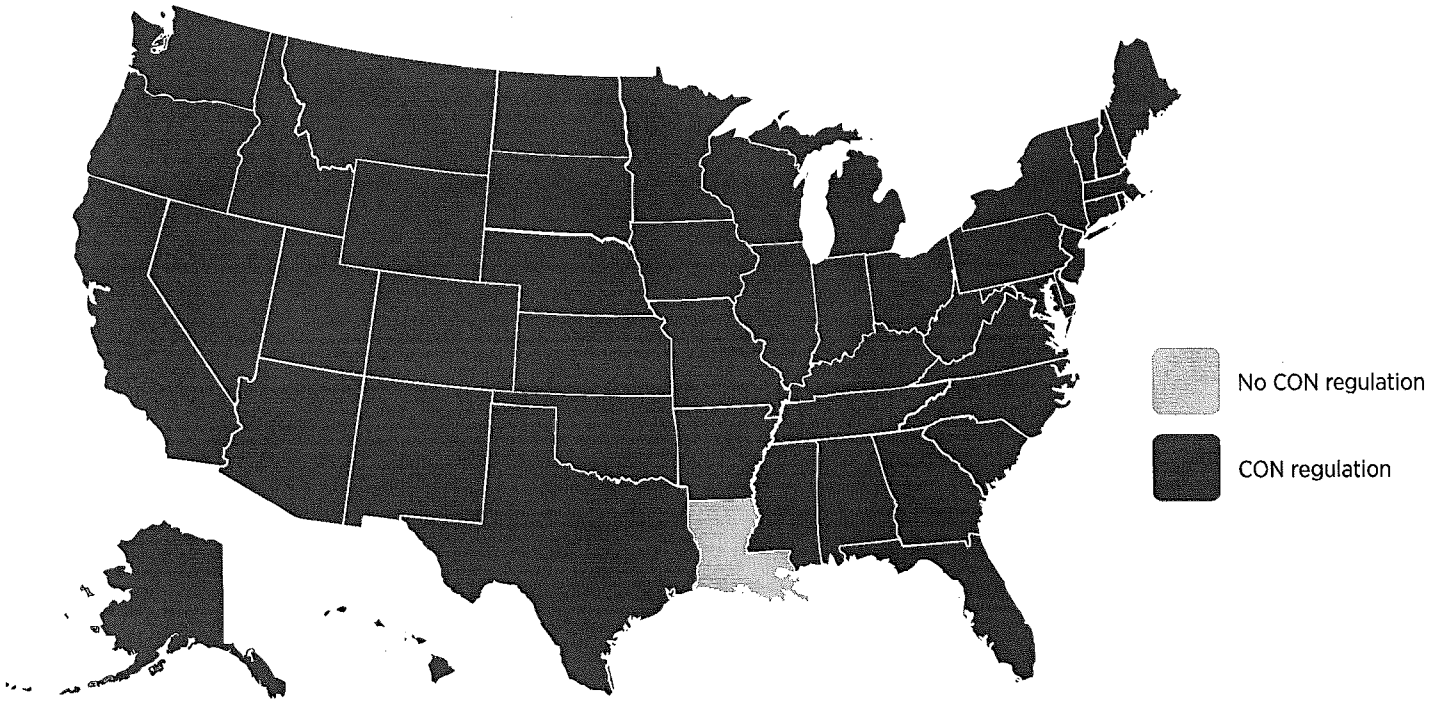

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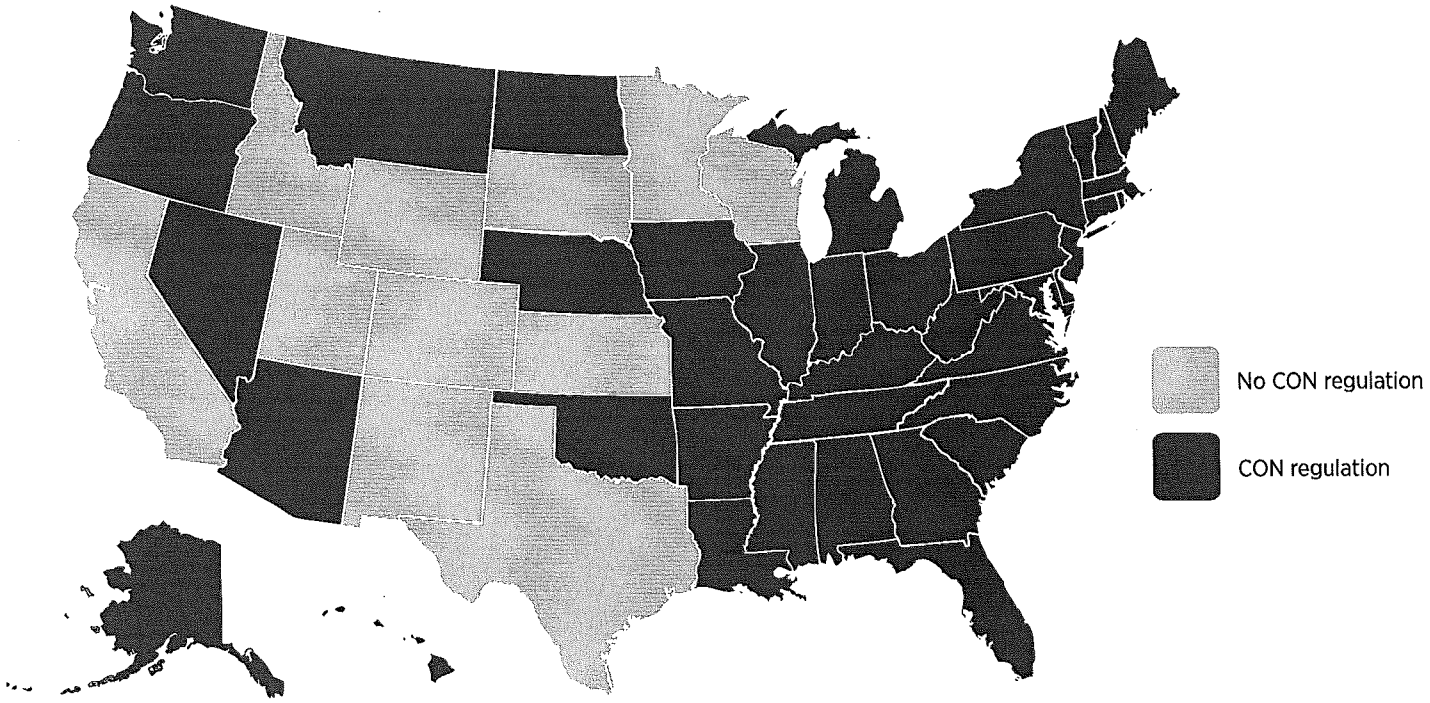

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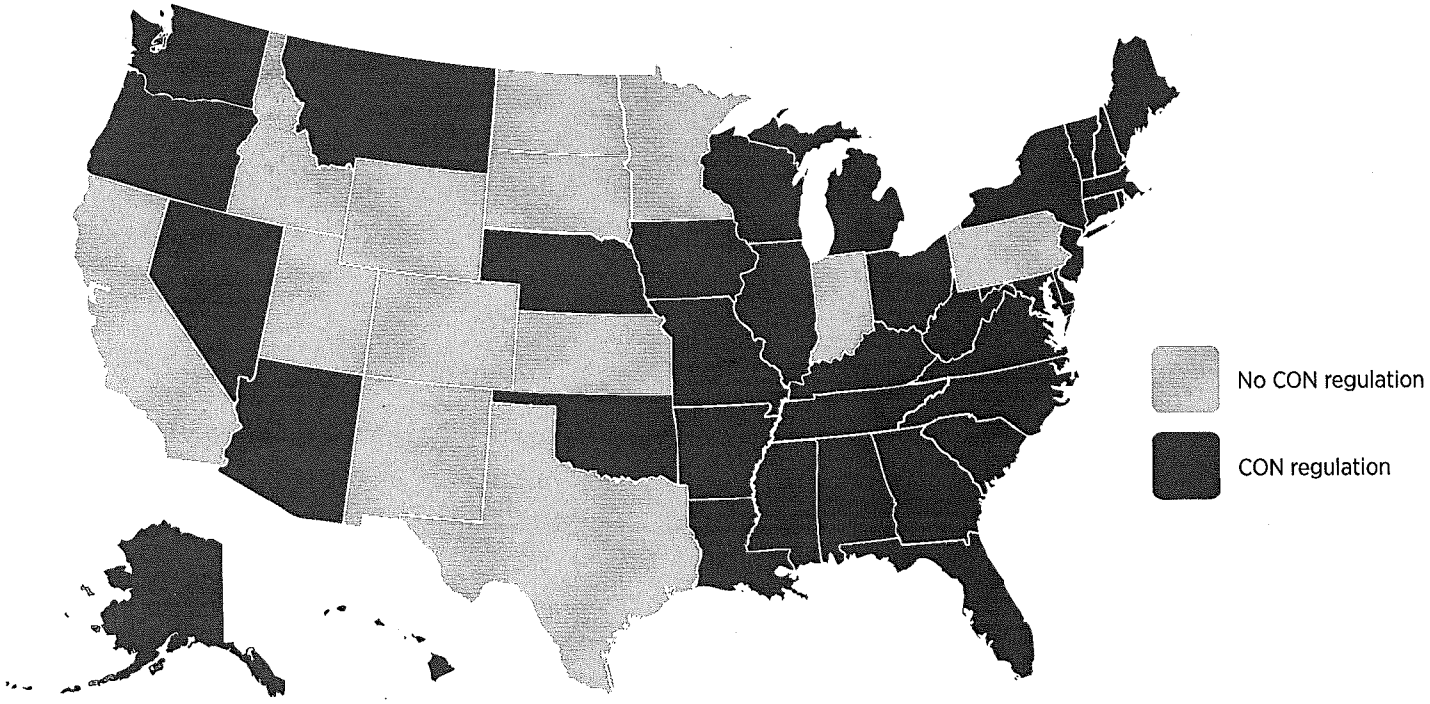

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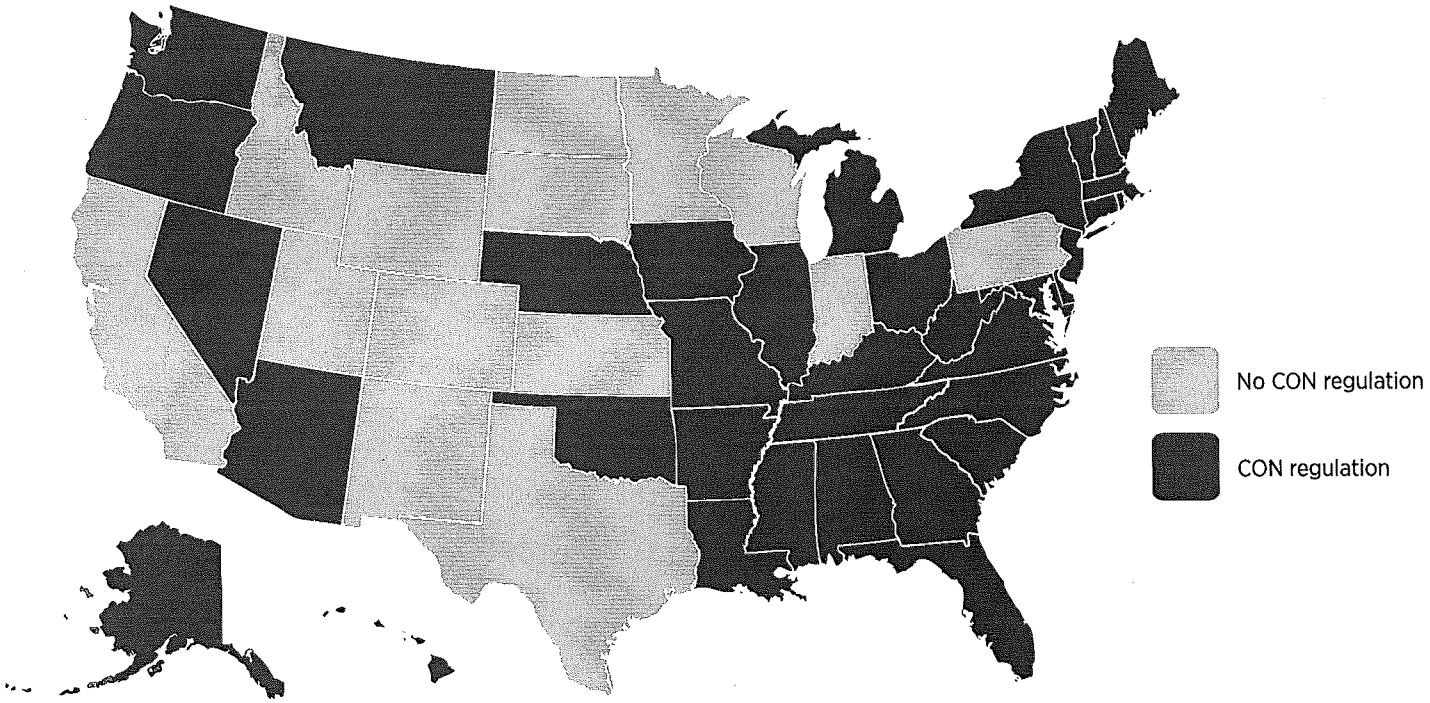

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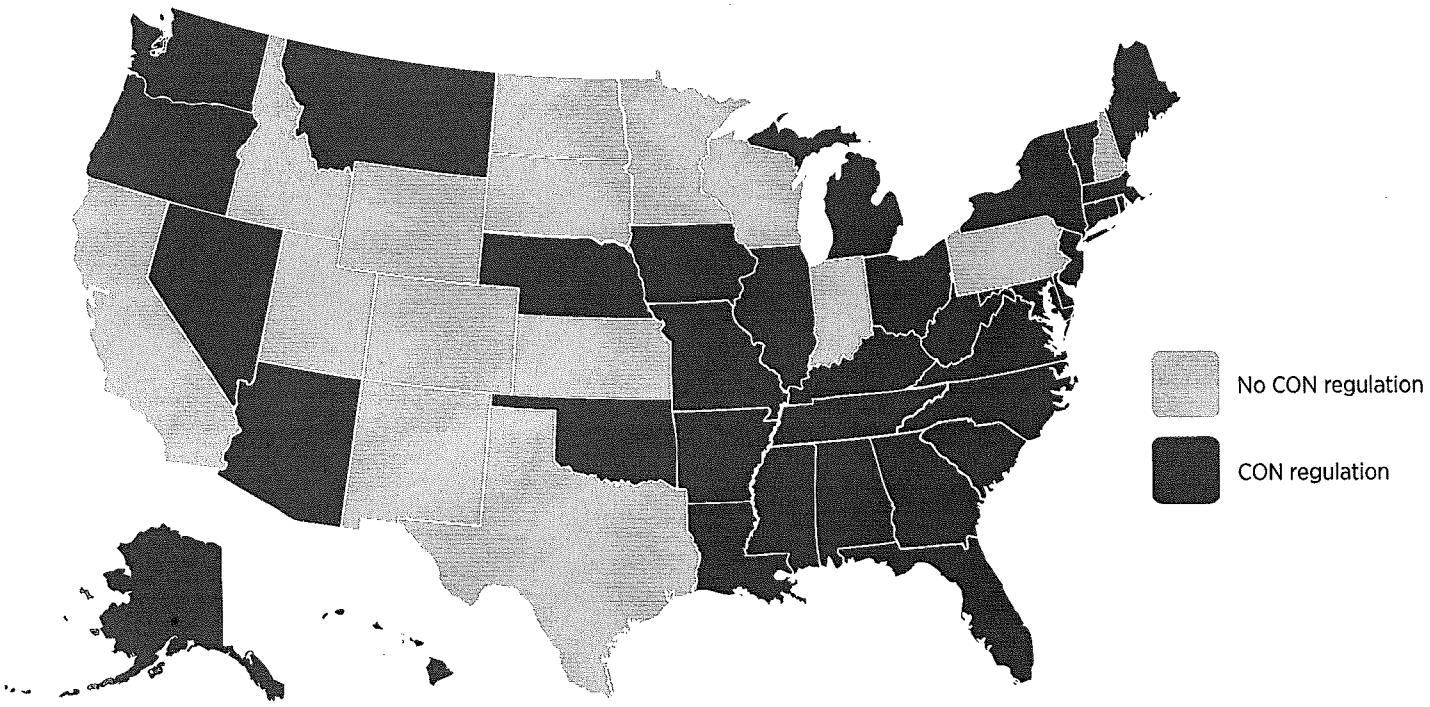
CERTIFICATE-OF-NEED (CON) REGULATION IN THE UNITED STATES (Present)



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