Medicare Reimbursement Policy and Capacity Constraints: Evidence from Nursing Homes

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Abstract

The U.S. nursing home market has experienced a substantial reduction in its utilization rate and at the same time a significant shift in focus from long-term care covered by Medicaid to short-term care covered by Medicare. This study analyzes the effects of Medicare reimbursement policy on these trends. In particular, it examines how an increase in Medicare's fee crowds out Medicaid residents from nursing homes. I exploit variation in the number of certificate–of–need and moratorium laws across states as well as variation in Medicare reimbursement policy over time to disentangle the causal effects of Medicare payment incentives on nursing home use by Medicaid beneficiaries. I use novel data collected at the provider–year level to measure the responses of nursing homes at the extensive and intensive margins. I find that an increase in Medicare fees reduces admissions of Medicaid beneficiaries to nursing homes in capacity–constrained states relative to what occurs in unconstrained states by 15.5%. Likewise, facilities in capacity–constrained states decrease the average length of stay of Medicaid residents by 12.5%. The findings support the presence of an important role played by Medicare reimbursement policy in healthcare use of Medicaid beneficiaries and enrich the ongoing debate over the allocation of resources under certificate–of–need laws by showing that Medicaid beneficiaries, who are low-profit residents, bear the burden of these prescriptive laws.

JEL codes: I11, I18, L11, L25
Keywords: access to care, competition in nursing home market, administrative pricing, spillovers.

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1 Introduction

Medicare is the largest insurer in the U.S. healthcare industry, accounting for 20.1% of total healthcare expenditures. Healthcare providers typically offer services to both Medicare and non–Medicare patients, so a change in the reimbursement policy of a large payer such as Medicare could affect the number of services offered to both Medicare and non–Medicare patients (Sloan et al. 1978, McGuire and Pauly 1991 and Glazer and McGuire 2002). Empirical studies have found a positive effect of increases in Medicare fees on the number of services provided to Medicare beneficiaries (Gillis and Lee 1997, Clemens and Gottlieb 2014, Eliason et al. 2018, Einav et al. 2018); there is less evidence, however, regarding the spillover effects of Medicare reimbursement policy on the supply of services to non-Medicare beneficiaries.

In this paper, I assess how an increase in Medicare fees affects providers' willingness to treat Medicaid beneficiaries in nursing homes. Both Medicare and Medicaid offer health insurance, but Medicare covers acute care for individuals above 65 years of age (hereafter "seniors"), while Medicaid covers acute care and long–term care for eligible low–income individuals. More importantly for the purpose of this study, payment incentives for healthcare providers may diverge between the programs because the federal government establishes payment rules for Medicare, while each state establishes payment rules for Medicaid. The nursing home market is an interesting setting in which to study interaction between the two government programs, for several reasons. First, Medicaid beneficiaries in need of nursing home care are among the most vulnerable subpopulations of non–Medicare beneficiaries, as they include seniors and disabled persons who have limited income and resources. Second, the majority of Medicaid residents (95% by 2011) receive care in nursing homes that also care for Medicare residents (skilled nursing facilities); thus, a change in reimbursement by one payer, i.e., Medicare, may have first-order consequences for the *other* payer's beneficiaries, i.e., Medicaid residents. Third, the senior population has grown by 40% since the early 2000s, but the number of nursing home residents has remained constant (Figure 1). Surprisingly, this pattern differs between Medicare and Medicaid residents, with the average number of Medicare beneficiaries served in nursing homes increasing by 25.4% and the average number of Medicaid beneficiaries served decreasing by 4.76% (Figure 2).

The cause of the shift from Medicaid towards Medicare in nursing homes is unclear, but I hypothesize that interaction between capacity constraints and a larger gap between Medicare and Medicaid profit margins is responsible for an important share of the observed substitution pattern. Specifically, capacity–constrained facilities, i.e., facilities with high occupancy rates, incur high opportunity costs for admitting a low–profit residents today (Medicaid patients), as this will prevent them from using a given bed in the future for a high–profit resident (Medicare patients).

In contrast, facilities working below capacity, i.e., experiencing low occupancy rates, have empty beds and hence incur no opportunity costs for admitting low–profit residents today. Therefore, capacity–constrained facilities may disproportionately substitute away from low–profit residents when payment incentives differ across payers.

In the case of nursing homes, Medicare and Medicaid cover distinct services. In particular, Medicare covers short–term skilled nursing care and pays up to 100 days of residency,[1] while Medicaid covers long–term custodial care for people needing help with daily self–care activities,[2] and it pays until the resident dies or her condition improves. Thus, admitting a Medicaid resident has dynamic implications for future capacity constraints on nursing homes, as assigning a bed to a Medicaid resident will prevent the facility from using the bed for future Medicare residents. Although Medicare residents are by definition more costly to care for than Medicaid residents, in this market, as in other healthcare markets, Medicare residents generate higher profit margins than Medicaid residents (Troyer 2002, MedPAC 2005, Floyd 2004, Feinstein and Fischbeck 2005 (as cited in Grabowski 2007)). Thus, an increase in the payment gap may induce capacity–constrained facilities to substitute Medicaid for Medicare residents.

Any attempt to measure the impact of the payment gap and capacity constraints on the population of Medicaid residents in nursing homes faces two challenges: the payment gap is endogenously determined by the case mix (the severity of patients' conditions) chosen by each facility, and both supply and demand jointly determine the occupancy rate. To address the first challenge, I use quasi-experimental policy variations following a large increase in Medicare fees mandated in the *Medicare, Medicaid, and SCHIP Balanced Budget Refinement Act* (BBRA) of 1999, and the *Medicare, Medicaid, and SCHIP Benefits Improvement and Protection Act* (BIPA) of 2000. These laws increased by 6.7% and 20%, respectively, the daily fees that Medicare pays to nursing homes for severely ill Medicare patients, especially those with rehabilitation needs and clinically complex cases. The increase in fees was effective from fiscal years 2001 to 2005, and was motivated by concerns regarding beneficiaries' access to nursing home services (OIG 1999, OIG 2000, and OIG 2001). The new payments were considered overly generous by the Medicare Payment Advisory Commission (MedPAC), which estimated an aggregate Medicare profit margin of 15.3% in 2004 (MedPAC 2005).

The second challenge that complicates measuring the impact of the payment gap and capacity constraints is that occupancy rates are endogenous and thus estimating the causal effects of ca-

[1]For example, physical therapy, speech therapy and also more complex care such as intravenous therapy and specialized feeding. Such care is delivered by therapists, registered nurses, and licensed vocational nurses.

[2]Custodial care involves helping with activities of daily life such as toileting, eating, medication aid, and bathing. Such care is provided mainly by aides.

pacity constraints is less straightforward. To overcome this limitation, I exploit variation in the number of certificate–of–need (CON) laws and moratorium laws that *restrict* the growth and entry of new participants in the long–term–care sector across states. These laws regulate the supply of nursing home services and also of substitutes for nursing home services such as home–based care, residential care, and adult day care. I show that nursing homes in heavily CON–restricted states have higher occupancy rates than facilities in states with comparatively lax regulation, and thus capacity constraints are on average more binding in the regulated states. Using the total number of rules in place in 1998, I divide states into two regimes: constrained and unconstrained. I then use a difference–in–differences (DD) identification strategy to estimate the induced substitution effect of an increase in Medicare fees. The underlying identification assumption is that nursing homes in constrained and unconstrained states would have responded similarly to the rise in Medicare profit margins absent the capacity constraints.

Using information at the state–year level, I find that in the presence of capacity constraints a more generous Medicare fee crowds out Medicaid residents from nursing homes. In particular, I find that the increase in Medicare fees in the early 2000s induced a decrease in the relative number of residents whose stay is covered by Medicaid (hereafter "Medicaid persons served") in constrained states by 6.1%. The coefficient estimate is statistically significant and negative across multiple model specifications. Similarly, estimates for the effects on Medicaid expenditures suggest a decrease of 5.3% in expenses. In terms of the number of residents whose stay is covered by Medicare (hereafter "Medicare persons served") and Medicare expenditures, the results indicate that nursing homes in constrained states do not react differently from those in unconstrained states to the increase in Medicare fees. Hence, the findings suggest that the reaction to the federal increase in Medicare fees is similar across regimes for the Medicare segment, but the interplay between capacity constraints and Medicare reimbursement induced varying responses in the Medicaid segment.

I then analyze data at the facility–year level, an approach that offers several advantages over analyzing the state–year level data. First, using data at the facility–year level enables me to distinguish between responses at the extensive and intensive margins. Both margins have specific policy implications such as changes in admissions, i.e., at the extensive margin, reflecting changes regarding who is admitted to nursing homes; while changes in the length of stay, i.e., at the intensive margin, reflect changes in the intensity of care conditional on admission. Second, I can confirm that time–invariant characteristics of facilities do not drive my results. Third, the data include information about residents who pay out–of–pocket, which is an ideal group with which to perform falsification tests because they also receive long–term care but pay higher daily fees than

the administrative fees paid by Medicare and Medicaid. Fourth, these data enable me to control for contemporaneous changes in state policy.

Adding facility fixed effects and county–level time–varying controls produces coefficient estimates that are in line with those obtained in the aggregate analysis. In particular, I find that the increase in Medicare fees decreases the number of Medicaid admissions in constrained states relative to unconstrained states by 15.5%. Regarding responses at the intensive margin, the coefficient estimate for the average length of stay suggests a decrease of 12.5%, although the coefficient is not statistically significant at conventional levels. Nonetheless, the combined effect on admissions and the average length of stay is a statistically significant decrease of 25.5% in total Medicaid days in nursing homes in constrained states relative to those in unconstrained states.

While the previous findings provide evidence of a crowding–out effect of Medicare on Medicaid, it is important to verify that contemporaneous changes in state policy do not confound the analysis of the reforms of interest. To do this, I redefine the capacity–constraint indicator in terms of the occupancy rate observed for each facility in the pre–period and include state–year fixed effects. In particular, I define capacity–constrained facilities as those with occupancy rates higher than 90%. The coefficient estimates from this exercise are less precise, but the signs and magnitudes are in line with those of the previous findings. Importantly, I show that my findings are driven by restrictions on supply as the effect comes mainly from capacity–constrained facilities located in states previously identified as constrained. For example, I find that, within constrained states, facilities with high occupancy rates relative to those with low occupancy rates reduce their Medicaid admissions by 7.9% and their Medicaid days by 21.4%. In contrast, I find that, for unconstrained states, Medicaid admissions decrease by 3.4% and Medicaid days by 1.3%.

This study makes several contributions to the literature. This paper provides, to the best of my knowledge, the first causal evidence of the role of Medicare in the decline in nursing home utilization by Medicaid residents. Building on extensive empirical evidence indicating how Medicare and Medicaid policies influence the provision of services to their own beneficiaries, I pursue a novel approach to shed light on how Medicare and Medicaid interact to affect healthcare use of beneficiaries in the other program. Although providers can respond along margins such as quality (Glazer and McGuire 2002 and Konetzka et al. 2006), pricing to other payers, and coding procedures, the supply of services is the most important factor regarding social cost (McGuire and Pauly 1991). Due to the concurrent surge in substitutes for nursing home care, such as assisted living and in–home care, previous studies provide only suggestive or anecdotal evidence pertaining to the shift in focus from long-term care covered by Medicaid to short-term care covered by Medicare (Bishop (1999) and Wiener et al. (2009)). I use a large variation in financial incentives induced

by the increase in Medicare fees and variation in states' CON/Moratorium regulations to show that capacity constraints and payment divergence between Medicare and Medicaid disproportionately affect healthcare use by Medicaid beneficiaries. The findings reported in this study provide empirical evidence of the effects of conflicting incentives between Medicare and Medicaid in the long–term–care market, an issue that Grabowski (2007) discusses in detail.

This paper also contributes to the broader literature on the behavior of healthcare providers working with multiple payers. Empirical studies of spillover effects at the provider level are scarce partly due to the need to carry out separate data–collection processes for each payer. Databases with standardized information at the provider level about the services rendered to each payer and for all U.S. states are either not publicly available or the data are hard to collect because there is no centralized source. Thus, studies of hospitals and physicians tend to focus on the direct effects of changes in Medicare reimbursement on services rendered to Medicare beneficiaries (Gillis and Lee 1997, Clemens and Gottlieb 2014, Eliason et al. 2018, Einav et al. 2018) or use national surveys where access is measured through categorical variables (see Brunt and Jensen 2014). In the case of nursing homes, the Minimum Data Set contains detailed information by payer but these data are not publicly available, and thus many empirical studies use a subsample of U.S states. For example, in a recent working paper Hackmann and Pohl (2018) analyze how patient and provider incentives drive utilization of nursing homes in California, New Jersey, Ohio, and Pennsylvania. Although this latter paper is similar to my study insofar as both estimate how providers' financial incentives affect Medicaid utilization in nursing homes, my analysis differs from theirs since they consider only patients in long–term care (Medicaid vs paying out–of–pocket), while I consider the substitution of long–term–care Medicaid residents with short–term–care Medicare residents induced by Medicare reimbursement policy. Also, I have information for all U.S. states, which allows me to exploit variation in CON regulations, and thus conclude that the effects of capacity constraints on Medicaid access are driven mainly by supply.

The paper is organized as follows. Section 2 provides institutional details such as the benefits covered, the method of payment, and trends in nursing home markets that distinguish between Medicaid and Medicare. Previous studies related to supply and spillover effects are reviewed in Section 3. In Section 4, I present my econometric framework. In Section 5, I describe my data and variables. In Section 6, I present results that suggest that the interaction between capacity constraints and an increase in the payment gap between Medicare and Medicaid affects the access of Medicaid beneficiaries to nursing homes. In Section 6, I present robustness test, and I discuss my results and conclude in Section 7.

2 Background

2.1 Medicaid for Aged and Disabled Persons

2.1.1 Eligibility

Medicaid eligibility criteria for aged and disabled persons have been relatively stable through time when compared with those for other groups. For instance, the Children's Health Insurance Program and the Affordable Care Act (ACA) substantially expanded Medicaid eligibility for children and adults in the 1990s and 2000s, respectively, while the largest change in Medicaid eligibility for aged and disabled individuals dates back to 1972 with the establishment of the Supplemental Security Income (SSI) program. Since 1972, states have been required to provide Medicaid coverage to all SSI recipients or to aged and disabled persons who are eligible using the state's Medicaid eligibility standards that were put in effect in 1972. States that cover all SSI recipients automatically are known as Section 1634 states; states that use the same SSI criteria as Social Security but make their own Medicaid eligibility decisions are known as SSI Criteria states, and states that use the eligibility standards of 1972 are known as Section 209(b) states. States that opted for Section 209(b) may use more restrictive criteria than SSI does when determining Medicaid eligibility. As of 2017, only Connecticut, Hawaii, Illinois, Minnesota, Missouri, New Hampshire, North Dakota and Virginia are Section 209(b) states (Table A1).

There are additional pathways that enable aged and disabled persons with incomes above the SSI benefit rate to obtain Medicaid coverage. The first pathway is the Special Income Rule that extends Medicaid coverage to aged and disabled individuals with at least 30 consecutive days of institutional care and incomes up to 300 percent of the SSI rate. The second pathway is the Medically Needy Programs that extend Medicaid coverage to aged and disabled persons of any income level if, after deducting their medical expenses from their incomes ("spend down"), they become eligible for Medicaid. Third, in some states aged and disabled persons with incomes up to 100 percent of the Federal Poverty Line are eligible for Medicaid. As can be seen in Table A1, the availability of these pathways varies widely between states and thus access to nursing home care depends heavily on the state of residence. Finally, all states are required to provide full or partial Medicaid benefits to the poorest Medicare beneficiaries. These individuals are termed "dual eligible."

2.1.2 Benefits

Medicaid covers Long Term Services and Supports (LTSS), which include nursing home care and home and community-based care. For these services the number of covered days is not limited, and beneficiaries are entitled to receive them until their conditions improve or they die. Care in a nursing home requires that the beneficiary reside in the facility, where she will be assisted with her activities of daily living (ADLs) and medical-treatment-related care. On the other hand, home and community-based care enables beneficiaries to stay in their homes, and Medicaid will provide in-home care such as home health services, personal care services (PCS), and adult daycare. Nursing home care and home health services are federally mandated benefits. All Medicaid-eligible individuals in every state are entitled to these services when they are medically necessary. The large majority of home and community-based services (HCBSs) are, however, optional benefits for states. Thus, their availability varies state by state.

Although HCBSs are optional benefits, the Federal government has provided multiple stimuli to encourage states to shift from nursing home care toward HCBS care in an effort to rebalance the overall Medicaid long-term care system in favor of HCBSs. Figure A1 shows that Medicaid expenditures on HCBSs increased markedly after 2000, driven mainly by the expansion of personal care services in California and Florida. HCBSs are generally preferred over institutional care by the aged and disabled population and are also substantially cheaper than nursing home care. According to the Genworth 2017 Cost of Care Survey, the median annual cost of a semi-private room in a nursing home is $85,775, while the median annual cost of a home health aide is $49,192. Nevertheless, evidence pertaining to the cost-effectiveness of expanding HCBSs is mixed (Kane et al. 2013, Wysocki et al. 2014 and Newcomer et al. 2016), and it is difficult to target HCBSs only to individuals who would otherwise enter nursing homes (Grabowski, 2006).

Initiatives designed to expand HCBSs followed the 1999 U.S. Supreme Court ruling in Olmstead v. Zimring that required states to provide community-based services to persons for whom institutional care is inappropriate. Following that ruling, the Center for Medicare and Medicaid Services created Real Choice System Change (RCSC) Grants that provided funds to develop the HCBS infrastructure in awardees' states. The work done through RCSC grants laid the basis for the enactment in 2005 of the Money Follows the Person (MFP) Demonstration Program, the largest demonstration program designed to transition individuals living in long-term care institutions back into the community. By the end of 2015 there were 44 states with active MFP grants and a cumulative 63,337 individuals who transitioned into communities from institutions (Mathematica Policy Research, 2016). The most recent expansions of HCBSs occurred with the implementation of the ACA in 2010. The ACA increased funding for MFP and created the Balancing Incentive Program

(BIP) and Community First Choice Option (CFC). The BIP provided financial incentives to enable states to increase access to HCBSs, and the CFC (also known as 1915 (k) waivers) allowed states to provide attendant services with an emphasis on self-directed services.

Lastly, it should be noted that, even though states have made significant progress in shifting toward HCBSs, access to these services is often restricted because states have only predetermined numbers of slots, generating long waiting lists for the waivers. O'Malley and Musumeci (2018) find that in 2016 there were 656,195 individuals on waiting lists who had waited on average 23 months to be assigned a slot. Moreover, in some states the financial eligibility criteria have been stricter for HCBSs than for nursing home care. For example, in 1998, the only year in my study period for which I have data on the Medicaid financial eligibility requirement, 19 states denied income/asset protection to spouses of HCBS recipients while they offered protection for spouses of nursing home residents.

2.1.3 Medicaid Reimbursement Policy for Nursing Homes

States have autonomy in designing the payment system for their Medicaid programs but most have converged on a Prospective Payment System (PPS) for nursing homes (MACPAC 2016). Under PPS, facilities are paid daily fees that are set in advance and without adjustment to reflect actual costs. The base fee is determined by a facility's costs in previous years (facility-specific rates) or by the costs for all facilities in a class/group (flat rates). Because under the flat-rate scheme there is no relationship between an individual facility's costs and the base fee, such a scheme is considered less generous than the facility–specific rate (Grabowski, 2001). Additionally, most states adjust base fees to account for patient characteristics (case mix), and some states make supplemental payments. Supplemental payments are often made to public facilities and correspond to lump-sum payments that equal the difference between Medicaid payments and an Upper Payment Limit (UPL). The UPL corresponds to what Medicare would have paid for the same services and it applies to hospitals, nursing homes, and intermediate care facilities for individuals with intellectual disabilities. As of 2011, UPL supplemental payments accounted for 2.4% of total Medicaid payments to nursing homes, while it accounted for 25.3% of Medicaid payments to hospitals (MACPAC 2012)

2.2 Medicare for the Elderly and Permanently Disabled

2.2.1 Eligibility

Medicare is available for people aged 65 years or older who are eligible for Social Security, for persons with end–stage renal disease, and for disabled individuals who qualify for Social Security Disability Insurance (SSDI). SSDI covers disabled persons who have worked and paid Social Security taxes for a specified period of time.

2.2.2 Benefits under Part A

Medicare covers skilled nursing care for beneficiaries with doctor referrals and recent three-day or longer inpatient hospital stays. If a beneficiary needs only part-time skilled nursing care then she can apply for home health services, but if she requires more than part-time skilled nursing care then the service is provided in a nursing home. Medicare covers room and board, medications, and rehabilitation therapy at nursing homes. In general, Medicare covers acute healthcare needs and thus pays for only up to 100 days of a nursing home stay. The beneficiary does not pay for the first 20 days of the stay, but after that pays a daily co–payment of $167.5 (as of 2017).

2.2.3 Medicare Reimbursement for nursing homes under Part A

Since 1998, Medicare has reimbursed nursing homes under a PPS, or a predetermined fee per day of stay. The base fee is adjusted to account for patient characteristics and geographic location. The following formula represents a simplified version of the Medicare per-day fee in year t:

$$Fee_{j,u,a(i),t} = \text{Labor Related}_{j,u,t} x \text{Wage Adjustment}_{a(i),t} + \text{Non-Labor Related}_{j,u,t} \quad (1)$$

where j is the group in which a patient is classified according to the level of care she needs; u is an adjustment factor for facilities located in urban areas, and $a(i)$ is an additional adjustment for nursing homes in Metropolitan Statistical Areas (MSA). During the study period there were 44 Resource Utilization Groups (RUG) into which patients were classified. Table 1 reflects the use of a simplified version of the RUG categories and presents the nursing–time index, the therapy–time index, and the average fee for three major classes of RUGs: Rehabilitation, Medium-Care and Low-Care. As can be seen in Table 1, patients classified in Rehabilitation RUGs are the only ones that use therapy resources, while Medium-Care patients have the highest average nursing index (1.07). These differences in resource utilization translate into higher average fees for these two groups of patients compared with Low-Care patients (Column 3 Table 1).

2.2.4 Medicare Price Shock

The Medicare, Medicaid, and SCHIP BBRA of 1999, and the Medicare, Medicaid, and SCHIP BIPA of 2000 increased the fees that Medicare pays to nursing homes. In November 1999, Congress authorized a 16.66% increase in the nursing component of the fee and a 4% increase in the fee for all RUGs for fiscal years (FYs) 2001 and 2002. Additionally, in response to concerns over the adequacy of payments, Congress authorized a 20% fee increase for Medium-Care RUG groups that went into effect for FYs 2001 through 2005. One year later, the BIPA raised the fee for Rehabilitation RUG groups by 6.7% for FYs 2002 through 2005 (see columns 4 and 5 in Table 1). Figure A2 displays the evolution of three supply indicators of nursing home services to Medicare: persons served, covered days of care, and charges to the Medicare program. All three indicators exhibit accelerated growth after the implementation of BBRA and BIPA. It is worth noting that covered days of care and charges to the program grow at the same rate from 2000 to 2008, with an average real growth rate of 38% relative to 2000 levels.

3 Literature Review

Healthcare providers can respond to a fee change along many margins. Providers can adjust the services they supply, their coding procedures, and the manner in which they produce services (quality). Supply of services is however the most important category in terms of social cost. For this reason much of the literature on the effect of Medicare reimbursement policy has focused on finding the direction and magnitude of the supply effect. Most studies estimate supply responses in the Medicare segment, while far less is known about the spillover effects on other insurers (Medicaid and private insurers). In studies of direct effects, findings suggest that most providers respond to increases in Medicare fees by providing more care to Medicare beneficiaries. For example, Clemens and Gottlieb (2014) find that physicians provide on average 3% more services to Medicare beneficiaries when the program increases its fee by 2%. In more recent work, Eliason et al. (2018) show that long–term acute–care hospitals (LTCHs) increase the length of stay by 23% in response to an increase in daily Medicare's daily fees.[3] On the other, Dafny (2005) finds no evidence of changes in hospitals' intensity or quality of care after Medicare increased the fee for some diagnosis-related groups (DRGs). Dafny finds, however, a strong upcoding effect with a rise of 0.022 in the fraction of patients classified in the DRGs with the largest fee increases.

Theory predicts the existence of spillover effects of Medicare reimbursement policy when

[3]Using the same setting, Einav et al. (2018) find that discharges from LTCHs increase substantially after Medicare fees increase, and they find no evidence of an impact on patient mortality.

the same healthcare provider serves patients from separate insurers, but empirical studies on the spillover effects on healthcare use by non-Medicare patients remain scarce. In their seminal work McGuire and Pauly (1991) propose a model of physician inducement behavior under multiple payers. The model indicates that physicians respond to a change in payments by adjusting their inducement behavior across segments. The magnitude of the cross effect is predicted to be stronger the larger the payer and the higher the payer pay gap. Sloan et al. (1978) and Brunt and Jensen (2014) show that even without inducement behavior, a payment change can affect the provision of physicians' services to other programs if capacity constraints are binding. This result follows from the fact that profit-maximizing physicians will choose to treat the high–profit patients over low–profit patients. Empirical studies on spillover effects of Medicare reimbursement policy on supply of services to non-Medicare beneficiaries are scarce or inconclusive.[4] For instance, Clemens and Gottlieb (2014) test for effects on private patient care, but their estimates are too noisy and thus uninformative about substitution effects. In contrast, Brunt and Jensen (2014) find that a 10% increase in Medicare fee generosity produces a small effect on physician acceptance of new Medicare beneficiaries, but an increase by 3% of the probability that a physician will accept new Medicaid patients.

Nursing homes have long been thought to face capacity constraints. The literature has identified CON laws and construction moratorium legislation designed to limit the expansion of existing facilities and the entry of new participants as the main sources of excess demand in this market (Nyman 1988,1989, 1993; Zinn 1994; Harrington et al. 1997). Empirical studies have found that Medicaid residents, the less-profitable type of nursing home resident, bear the burden of these capacity constraints (Scanlon 1980, Gertler 1989, Grabowski et al. 2004, He and Konetzka 2015). In a recent working paper Hackmann and Pohl (2018) show that nursing homes discharge relatively healthy Medicaid residents when capacity constraints are binding so they can allocate beds to more profitable residents who can afford out–of–pocket payments (private–pay residents). The authors also estimate the effects of patient incentives on utilization and find that private–pay residents relax their efforts to leave a home once Medicaid starts paying for their stays. Although this latter paper is similar to my study in that we both estimate how providers' financial incentives affect Medicaid utilization in nursing homes, my analysis differs from theirs insofar as they consider substitution among long–term care patients (Medicaid vs Private), while I consider substitution in which long–term care Medicaid residents are replaced by short–term care Medicare residents.

Since the late 1990s occupancy rates and other measures of excess demand in the nursing

[4]Many studies examine the effects of Medicare Advantage (MA) on Traditional Medicare (TM) (Chernew et al. 2008, Baicker et al. 2013, Baicker and Robbins 2015 and Callison 2016). These studies vary in focus, but in general they find a negative spillover effect of MA reimbursement policy on healthcare use by TM beneficiaries.

home market have been declining (Strahan 1997, Bishop 1999, Grabowski 2001, Wiener et al. 2009). Demographic and policy forces are responsible for these changes as substitutes for nursing home care have been emerging (Bishop 1999). For instance, Grabowski et al. (2012) find that a 10% increase in assisted living capacity decreases by 1.4% the utilization of nursing homes by private–pay patients. On the other hand, the descriptive analysis of Wiener et al. 2009 suggests that expanding assisted living facilities and Medicaid HCBSs have little effect on the number of nursing home residents. In contrast, Wiener and colleagues find that states witnessing the largest increases in the percentage of Medicare residents experienced consistent declines in nursing home use. I use variation in occupancy rates and increments in Medicare fees to disentangle the causal effects of Medicare policy on the decrease in Medicaid residents in nursing homes.

4 Empirical Strategy

My empirical strategy exploits variation in the number of laws that restrict the growth of long–term care services across states, and variation in Medicare profit margins over time. I use the fact that capacity constraints are on average more binding in states that heavily regulate the supply of long–term care services to hypothesize that a change in payment incentives–such as the increase in Medicare fees–disproportionately impacts the payer–mix choice of facilities in heavily regulated states compared with what occurs in facilities in states with laxer regulation. This happens because facilities with sufficiently high occupancy rates (capacity–constrained) face high opportunity costs for admitting low-profit residents, as this prevents them from using those beds in the future for high-profit residents. In contrast, facilities working below capacity have large numbers of empty beds and thus no opportunity costs for admitting low-profit residents. In the nursing home industry, as in other healthcare sectors, Medicare residents are associated with higher profit margins than Medicaid residents (Troyer 2002, MedPAC 2005, Floyd 2004, Feinstein and Fischbeck 2005 (as cited in Grabowski 2007)). Thus an increase in Medicare fees is expected to induce capacity–constrained facilities to substitute away from Medicaid residents.

I use information on the number of CON laws and moratorium states' laws to divide states into two regimes: constrained and unconstrained. I first compare the effects of the Medicare fee increase on access of Medicaid beneficiaries to nursing homes separately for each regime. I then construct DD estimates of the induced substitution effect of the increase in Medicare reimbursement. This model relies on the identifying assumption that the response of nursing homes in constrained and unconstrained states would have evolved similarly in the absence of capacity constraints.

With this background in mind, I divide the empirical analysis into two parts. First, I examine evidence at the state–year level using data for the number of persons served in nursing homes and the charges covered for rendered services in these facilities. Second, I run the analysis at the facility–year level using information on the number of admissions, length of stay, and census of residents by 'type of payer' (Medicare, Medicaid and Other) in nursing homes. My study period runs from 1998 through 2004 whenever the data are available for the earliest year. Throughout the analysis, I date the introduction of the fee increase in 2000 because the rule was first published for comments during that year. Additionally, my study period ends in 2004 so I exclude the effects of the implementation of the MFP program, the largest Medicaid demonstration program to transition individuals living in nursing homes back into the communities.

4.1 State–Level Analysis

I first group states into constrained and unconstrained states according to the number of CON/ Moratorium laws that were in place in each state in 1998. In Column 10 of Table A2 I report the total number of laws that regulated the supply along the long–term care continuum, i.e., the growth of nursing homes, home and health agencies, hospital bed conversion, residential care, and adult day care. The state with the highest number of restrictions is Mississippi with 8 laws in place out of the 9 possible laws, and the states with the lowest number of restrictions are Arizona, California, Idaho, Kansas, Nevada, New Mexico and Pennsylvania, which have no CON/Moratorium laws.

The scope and stringency of CON/Moratorium laws may vary across states and because of this a high number of restrictions does not necessarily translate into a high occupancy rate. Thus, I conduct a graphical and linear regression analysis to examine the relationships between the above mentioned variables. Figure 3 shows that there is a positive relationship between the number of restrictions and occupancy rates, and Table 2 indicates that the relationship is statistically significant. Column 2 in Table 2 indicates that adding one CON/Moratorium law is associated with 1 percentage point increase in the occupancy rate. Moreover, I construct a binary measure to divide states into either the constrained or the unconstrained category to avoid relying on the linear relationship between the number of restrictions and the occupancy rate. I identify constrained states as those with 4 or more CON/Moratorium laws and unconstrained states as those with fewer than 4 laws. The threshold corresponds to the 75th percentile of the variable number of CON/Moratorium laws. As can be seen in Column 2 of Table 2, the binary measure has greater explanatory power than the count variable as measured by F-statistics.

I now move on to estimate the reaction to the increase in Medicare fees along the two regimes: constrained and unconstrained states. The basic idea behind the identification strategy is that a

more generous Medicare fee will induce facilities to increase services rendered to Medicare beneficiaries and this will negatively impact the access of Medicaid beneficiaries to the extent that capacity constraints are binding. A first approximation is to perform a before/after comparison of the outcomes while separating along the two regimes:

$$logY_{s,t,r} = \theta_s + \delta \times POST + \varepsilon_{s,t,r}, \tag{2}$$

where $Y_{s,t,r}$ is an outcome variable for state s in year t in regime r; $POST$ is an indicator variable that takes the value of one for years after 2000, and θ_s is a state fixed effect. Throughout the analysis I estimate the equations with weighted least squares where the weight is the square root of the population that is over 75 years of age, which is the population that is more likely to need long–term-care services. In this way I account for differences in the precision with which state means are estimated. Also, I cluster standard errors at the state level.

To measure the direct effects of the fee change I use as outcome variables expenditures for nursing home services covered by Medicare and the number of Medicare persons served in nursing homes. I use the same outcome variables for Medicaid to measure spillover effects. Previous studies find a positive direct effect of Medicare reimbursement on care provided to Medicare beneficiaries, and therefore I expect δ to have a positive sign for Medicare-related outcomes. The research hypothesis regarding spillover effects is that the effects will vary between the regimes. Other things being equal, a raise in Medicare fees will induce an increase in the opportunity cost for admitting a Medicaid resident in constrained states, as admitting a Medicaid resident in any of those states will prevent the facility in question from using that bed in the future for a higher-profit Medicare resident. In contrast, unconstrained states bear no opportunity costs for admitting a Medicaid resident today because there are a large number of empty beds available for future Medicare residents in those states.

After examining the simplified before/after comparison, I estimate a DD model where the dependent variables are Medicaid expenditures and the number of Medicaid beneficiaries served, and the treatment is the increase in the opportunity cost for admitting a resident whose stay is paid by Medicaid. This model is based on the identifying assumption that the expenditures and the number of Medicaid persons served would have evolved similarly in both regimes in the absence of capacity constraints. I first estimate an event study to test for pre–existing trends. In particular:

$$\log Y_{s,t} = \theta_s + \gamma_t + \sum_{t=1999, t\neq 2000}^{2004} \beta_t \times \text{Constrained}_s + \mathbf{Z}_{s,t}\vartheta + \varepsilon_{s,t}, \tag{3}$$

where $Y_{s,t}$ is an outcome variable for state s in year t; θ_s and γ_t are state and year fixed effects; $\mathbf{Z}_{s,t}$ are time–varying state control variables. I omit $t = 2000$ so that each β_t is estimated relative to the year immediately preceding the change in Medicare's fees. Estimates for β_t for years before 2000 capture the importance of pre–existing trends that are correlated with the status of being a constrained or an unconstrained state. The estimates for β_t for years following 2000 measure the effects of the induced increase in opportunity cost on the outcome variables $Y_{s,t}$.

Following the event–study analysis, I estimate the DD version of equation Equation 3, i.e., I hold the δ_t coefficients constant within the before and after periods. The estimation equation then becomes:

$$\log Y_{s,t} = \theta_s + \gamma_t + \beta \times POST \times \text{Constrained}_s + \mathbf{Z}_{s,t}\vartheta + \varepsilon_{s,t}. \tag{4}$$

4.2 Facility–Level Analysis

The aim of this section is to reinforce my findings by showing that they are not driven by time–invariant facility characteristics or by concurrent reforms in state policy. First, I replicate the results from the state-level analysis but I add controls for state time–varying variables, county time–varying variables, and facility fixed effects. My main specification is:

$$\log Y_{i,t} = \alpha_i + \beta \times POST \times \text{Constrained}_{s(i)} + \mathbf{Z}_{s(i),t}\vartheta_1 + \mathbf{X}_{c(i),t}\vartheta_2 + \varepsilon_{i,t}, \tag{5}$$

where α_i are facility fixed effects; $\text{Constrained}_{s(i)}$ indicates that a facility is located in a constrained state, and $\mathbf{Z}_{s(i),t}$ and $\mathbf{X}_{c(i),t}$ are state and county covariates. Throughout the analysis I estimate the equation with weighted least squares where the weight is the square root of the total number of beds in the pre–period, and I clustered standard errors at the state level. The coefficient of interest is δ, which captures the differential effects of the increase in Medicare fees on constrained and unconstrained facilities. I also estimate the event–study version of Equation 5 to test for pre–existing trends.

The dependent variables that I use here vary with respect to the state-level analysis because in this case I sort the total number of admissions and the average length of stay by 'type of payer.' Assessing the effects on these variables is another advantage of the facility-level data as I can estimate the impact on the extensive (admissions) and intensive (length of stay) margins. These margins have very different implications for policy purposes. The extensive margin reflects changes in decisions about whom to treat, while the intensive margin pertains to the intensity of care provided

to residents.

Second, I redefine my constrained treatment indicator and allow it to vary by nursing home. To do so, I compute the occupancy rate by facility using the closest resident census before fiscal year 2000. The resident census is collected during health inspections of all the nursing homes in the U.S., which are conducted every 12–15 months. I redefined capacity–constrained facilities as those with an occupancy rate equal or greater to 90%. Figure 4 provides evidence that at 90% there is a sharp decline in the share of residents that are Medicaid beneficiaries at the time of the inspection. This break suggests a decrease in preferences for low-profit residents. To avoid a mechanical relationship between the share and the occupancy rate I use the occupancy rate from the Medicare Cost Reports to construct Figure 4. It is important to note that the 90% threshold is in line with the findings in Hackmann and Pohl (2018), which show that facilities increase their efforts to discharge Medicaid residents after they reached a 89% occupancy rate. I also introduce variation over time in payment incentives while keeping the constrained classification constant, and thus any unobserved invariant characteristic across facilities would cancel out. More importantly, the redefinition of the treatment variable allows me to include state–year fixed effects in Equation 5 and in this way control for contemporaneous changes in state policy variables such as the expansion of Medicaid HCBSs.

Third, I run all previous equations for residents paying with 'Other' sources as they are an ideal group on which to perform falsification tests. The category 'Other' residents includes out–of–pocket payments for which nursing homes are free to charge higher fees than their publicly insured counterparts. Therefore, I should not see any effect on this group as they are the highest–profit residents.

5 Data and Sample

I obtain information on Medicare reimbursement policy for nursing homes from the Federal Register for fiscal years 1999 to 2004. With this information I construct Table 1, which summarizes the increase in Medicare fees by RUG. To measure variation in the number of CON/Moratorium laws, I use information collected by Harrington et al. (1998) to construct the capacity–constrained proxy by state. I define capacity–constrained states as those with 4 or more CON/Moratorium laws in place in 1998. Table A2 displays the rules that apply in each long–term care sector: nursing homes, home and health agencies, hospital bed conversion, residential care, and adult daycare. In the main analysis I exclude New York because the state differs significantly from other states in important regulation dimensions. On the one hand, the majority of facilities in New York participated in the

Nursing Home Case-Mix and Quality (NHCMQ) Demonstration, a demonstration that transitioned facilities from the Medicare cost–based payment system to the new Medicare prospective-payment system (PPS). Facilities in New York had been paid under the new PPS system since 1995, while the rest of the country adopted that system later, in 1998. Thus, it is expected that the increase in Medicare fees affects facilities in New York differently from the way it affects facilities in other states. On the other hand, New York is the only state in the U.S. that did not allow facilities to certify only a fraction of their beds for Medicare (a practice known as distinct parts) while requiring them to certify all beds if they were to offer services to Medicare. Anecdotal evidence suggests that this practice was used to ration Medicare access, although OIG (2000a) do not find strong evidence for this claim. Because of this difference in regulation I exclude New York from my main analysis.

I draw the main outcome of interest for the state–level analysis, persons served in nursing homes and expenditures, from Medicare and Medicaid Statistical Supplemental records. To obtain results for outcome variables for the facility–level analysis I use information on the number of admissions, average length of stay, and days of care by 'type of payer' from Medicare Cost Reports (MCRs). I exclude from my sample facilities that were hospital-based or government-owned as they are reimbursed differently from free-standing facilities (see section 2).[5] To compute the occupancy rate by facility I use the Online Survey, Certification and Reporting (OSCAR) database. Information available in the OSCAR database is collected through the standard certification survey that is an unannounced on-site health inspection (mentioned above) performed on all certified nursing facilities in the U.S. every 12–15 months. OSCAR reports the resident census by 'type of payer' at the time of the survey, the total number of health deficiencies, the number of nurses, beds, and other facility characteristics such as for-profit status and ownership.

Lastly, I obtain state and county–level covariates from the County Business Pattern (CBP), the Survey of Epidemiology and End Results (SEER), the Area Health Resource File (AHRF), the U.S. Bureau of Economic Analysis (BEA), and the Bureau of Labor Statistics (BLS). From CBP I compute the number of assisted-living facilities by county, adding the number of establishments in NAICS 623311 (continuing care retirement communities) and 623312 (assisted living facilities for the elderly). From the SEER I construct demographic variables such as total population, and population by age brackets, gender, and race. From the AHRF I obtain the total number of long–term care providers and personal income per capita by county, and from the BEA and the BLS I obtain state economic variables such as personal income per capita and unemployment rates.

[5]Free-standing facilities are entities that are neither integrated with nor departments of any hospital.

6 Results

6.1 Trends and Descriptive Statistics

To illustrate changes in the payer mix of facilities during my study period, I plot the evolution of the average number of individuals served in nursing homes by type of payer and constrained status in Figure 5. Figure 5a shows that in constrained and unconstrained states the average number of Medicare persons served increases between 1999 and 2004. In constrained states the mean increases from 23,662 to 28,876 and in unconstrained states it increases from 28,797 to 33,976. Figure 5b shows that unconstrained states behave differently to constrained states in the Medicaid segment. In particular, in unconstrained states the average number of Medicaid persons served increases from 31,470 to 32,837, while in constrained states the average number of Medicaid persons served decreases from 28,667 to 27,538.

In Table 3 I report summary statistics for the outcome variables used in the state–level analysis and the facility–level analysis. Results reported in Panel A indicate that there are on average 29,578 Medicare beneficiaries served in nursing homes in a given state–year, while there are on average 31,132 Medicaid beneficiaries served. This difference translates more than proportionally into a difference in total expenditures, with the average Medicare expenditure at $429,937,320 and the average Medicaid expenditure at $662,664,620. The total expenditures reflect differences in prices, total numbers of individuals served, and average length of stay. At the state level I do not have information indicating lengths of stay or total numbers of days of care for Medicaid residents, so I use facility-level information to shed light on these separate margins. The results reported in Panel B indicate that on average a Medicare resident stays 45.9 days while a Medicaid resident stays 378.3 days. The difference in the average length of stay highlights the dynamic implications of assigning a bed to a Medicaid resident on future capacity constraints. Specifically, if a capacity–constrained facility admits a Medicaid resident the bed will be occupied for at least a year, while if it reserves the bed for Medicare residents the bed could be used to treat multiple Medicare residents over the course of a year. The difference in length of stay also translates into a higher number of Medicare admissions (102.07) compared with Medicaid admissions (40.76).

6.2 Main Findings

I first report and interpret the results for the state–level analysis. Table 4 illustrates the before/after estimator for the effects of an increase in Medicare fees on Medicare expenditures, Medicare persons served, and Medicaid persons served, distinguishing by regime. Throughout this section the

dependent variables always refer to values observed for nursing home services. The results reported in columns 1 and 2 indicate that an increase in Medicare fees is associated with an increase in Medicare expenditures and the number of Medicare persons served. The coefficient estimates are positive and statistically significant for both regimes, and are in line with previous studies of other markets that find a positive supply effect. In contrast, the results reported in column 3 indicate that the number of Medicaid persons served in constrained states decreases by 2.6% while it increases by 3.5% in unconstrained states. Both coefficients are statistically significant at the 10% level. I further test the equality of coefficients between constrained and unconstrained states for each dependent variable, and find that the coefficient estimates are statistically different only for the number of Medicaid beneficiaries served in nursing homes (Row 3). These results provide suggestive evidence that the reaction to the federal increase in Medicare fees is similar across regimes for the Medicare segment, but the interplay between capacity constraints and Medicare reimbursement induced varying responses in the Medicaid segment.

I now show graphically how the number of Medicaid persons served and Medicaid expenditures evolved over time between 1999 and 2004 in constrained and unconstrained states. Figure 6a plots estimates of the event–study model in Equation 3 for the number of Medicaid persons served. The coefficients are normalized to the base year 2000, the year before the fee increase. First, note that in the pre–period there is no statistically significant difference between the figures for constrained and unconstrained states which supports the identifying assumption of no pre–existing trends. However, the coefficient estimates for the years after 2000 show that after Medicare increased its fees the number of Medicaid persons served declines in constrained states relative the number served in unconstrained states and the effect becomes stronger during the later years of the study period. Figure 6b shows the coefficient estimates for Medicaid expenditures, and as can be seen they follow a similar trend to the trend in the number of beneficiaries served. The figures point to an overall decrease in nursing home services rendered to Medicaid beneficiaries in constrained states relative to those served in unconstrained states as a result of the Medicare policy change.

In Table 5 I report the coefficient estimates for the DD specification in Equation 4. For reference, in column 1 I report the mean for each of the dependent variables. In column 2 I report the estimates for the weighted linear model without controls beyond state and year fixed effects. To obtain the results reported in column 3 I add controls for time–varying state variables such as a state's population, personal income, the unemployment rate, and the percentage that is female, among other variables. In column 4 I present the estimates without weights and without controls. I report my preferred specification in column 2 because the weights account for differences in the precision with which state means are estimated, and some of the control variables might

also change as a result of the policy change. Therefore, the magnitudes analyzed from here on correspond to those reported in column 2. The DD exercise for the state–level analysis suggests that the increase in Medicare fees led to a 6.1% decrease in the relative number of Medicaid persons served in constrained states. This coefficient is negative and statistically significant at 5% through all specifications. The coefficient estimate for Medicaid expenditures indicates a decrease of 5.3% that is statistically significant at 16%. The remaining panels show the effects on Medicare supply. Like the results reported in Table 4, the DD exercise shows that there are no statistically significant differences between the responses to the increase in Medicare fees in constrained and unconstrained states.

I now evaluate the response using facility–level information. The available data include neither the number of individuals served nor expenditures by payer, but it does provide the number of admissions, average length of stay, and days of care by payer. As was true for the results reported in Table 4, here I first estimate the before/after specification for each regime with controls for state covariates. The results reported in Table 6 indicate that after the increase in Medicare fees the Medicate segment in constrained states exhibits no statistically significant change but there is a slowdown in the Medicaid segment. For Medicaid residents the coefficient estimates suggest that the number of admissions decreases by 7%, the average length of stay by 10.8%, and the total days of care by 19.8%. In contrast, in unconstrained states there is no statistically significant change in either the Medicare or the Medicaid segment. When testing for the equality of coefficient estimates across regimes (the results are reported in Row 3), one can observe that the more likely differences in the responses are in Medicaid admissions and Medicaid days.

I impose additional structure on the estimation by evaluating an event–study specification where I add controls for time–varying county-level variables. In Figure 7a I plot the coefficients for the event–study model of admissions on interaction between year dummies and the constrained state indicator. Similar to the pattern observed for the state–level analysis, the pattern revealed in Figure 7a suggests that there are no pre–existing trends, and more importantly the facility–level data corroborates the finding that, after the Medicare fee increase, there is clear evidence of a relative decline in Medicaid admissions in facilities located in constrained states. Figure 8a displays results of a similar exercise for the number of Medicaid days. As can be seen, the coefficient estimates are noisier although the point estimates continue to suggest a decline.

In Table 7 I report the coefficient estimates for the DD specification. The results reported in column 2 indicate that the increase in Medicare fees induced a 15.5% decrease in Medicaid admissions in constrained states relative to admissions in unconstrained states. More importantly, the coefficients on average length of stay and total days of care suggest that providers also responded

in the intensive margin. The effect on the average length of stay suggests a decrease of 12.5% although the coefficient is not statistically significant at 10%. The combined effect on admissions and average length of stay resulted in a statistically significant decrease of 25.5% in the total numbers of Medicaid days in constrained states relative to the corresponding numbers in unconstrained states

7 Robustness

In this section, I check that my results are robust to changes in the specification, namely, to redefinition of the constrained indicator and also present falsification tests. For the falsification tests I use information about Medicaid utilization in settings other than nursing homes such as physician and dental service facilities. For the facility–level analysis I use data on residents paying from other sources, a group that includes people making out–of–pocket payments for long–term–care services. The results are all consistent with those presented in section 6.

7.1 Alternative Measure for Capacity Constraints

A concern regarding my main results is that time–varying state covariates and county covariates might not adequately capture contemporaneous changes in state policy. I therefore redefine my treatment variable (capacity–constrained) as a function of the observed facility occupancy rate in the pre–period. Specifically, I define high-occupancy-rate facilities as those with occupancy rates equal to or greater than 90%. Once I have variation at the facility level, I can include state-by-year fixed effects in the regressions and in this way control for possible contemporaneous changes in state policy. In Table 8 I report the results for the DD coefficient estimator using this new treatment variable separated by regime. The coefficient estimates are less precise but the signs and magnitudes are in line with those of previously reported findings. The results reported in column 1 indicate that, in constrained states, facilities with high occupancy rates relative to those with low occupancy rates decrease their Medicaid admissions by 7.9% and their Medicaid days by 21.4%. In contrast, in unconstrained states Medicaid admissions to high-occupancy-rate facilities declined by 3.4% relative to admissions in low-occupancy-rate facilities while Medicaid days declined by 1.3%). The difference between the estimated coefficients for facilities in constrained and unconstrained states is significant at 11% for the number of days, but it is insignificant for the number of admissions.

7.2 Falsification Tests

Table 9 shows the results for the DD coefficient estimator of Equation 4 using as dependent variables the number of Medicaid beneficiaries served and expenditures on other services, namely physicians, hospitals, dental services, and X-rays. As can be seen, there is no statistically significant change in these other services between constrained states and unconstrained states. This provides evidence that my coefficient estimator for $POST \times Constrained$ in the results section captures changes in the nursing home market and not changes in the Medicaid program as a whole.

For the facility-level analysis I use the group of residents paying with other sources, which includes the highest-profit residents, i.e., residents making out–of–pocket payments, to further confirm that my research design captures the effect of payment divergence between Medicare and Medicaid but not other contemporaneous changes. The idea behind the test is that capacity constraints should affect access of low-profit residents only, as profit-maximizing facilities will prioritize the admission of high-profit residents. Moreover, residents making out–of–pocket payments are an ideal comparison group because they require long–term care under Medicaid but do not face access restrictions due to capacity constraints because profit–maximizing facilities will likely privilege their admission. Figure 7b and Figure 8b display the coefficient estimates for the event–study regression framework. The results reported in column 3 indicate that there are no statistically significant effects of an increase in Medicare fees on the number of admissions or days of care for this category. These results support the research hypothesis that capacity constraints disproportionately affect access of low-profit residents, in this case Medicaid residents.

8 Discussion and Conclusion

The utilization rate of nursing homes decreased over the first two decades of the twenty–first century, although the elderly population was growing rapidly during that period. This pattern differs by type of payer with the number of Medicare residents in nursing homes increasing and the number of Medicaid residents decreasing. In this paper, I formulate an empirical test of the crowding–out effect of Medicare on Medicaid based on a difference–in–differences identification strategy. I find that the interplay between capacity constraints and more generous Medicare fees has produced a decline in the number of Medicaid admissions and the average length of stay of Medicaid residents in facilities in constrained states compared with facilities in unconstrained states. In contrast, the results for Medicare residents and residents making out–of–pocket payments show no relative change, which raises concerns about the financial incentives created by a generous Medicare fee and confirms the hypothesis that the divergence between Medicare and Medicaid payments in a

market with binding capacity constraints disproportionately affects access for Medicaid residents.

Despite theoretical predictions regarding the spillover effects of a change in payer payment incentives on the healthcare use of other payers, previous empirical studies have found it difficult to quantify this effect. This paper uses a novel multi–sourced dataset to study spillover effects on the extensive and intensive margins. The margins have distinct policy implications. Changes in admission patterns reflect changes in who is admitted to nursing homes, and changes in length of stay reflect changes in intensity of care conditional on admission. I find that both of these margins are decreasing as a consequence of an increase in Medicare fees and state policies that restrict the supply of long–term–care services. Quantifying these spillover effects is essential for policy design because the indirect effects of a change in Medicare policy may compensate for or weigh against the direct/intended effects. This is particularly true for the nursing home industry in connection with which studies have already identified conflicting incentives associated with Medicare and Medicaid programs.

The analysis in this paper is concerned most directly with the impact of Medicare fee increases on the utilization of nursing homes. A broader study could also examine the effects of the increase in Medicare fees on the use of in–home care. If Medicaid beneficiaries who are not admitted into nursing homes are receiving alternative care through home and community–based programs, this would imply that Medicare reimbursement policy induced "cost shifting" from nursing home care to in–home in constrained states. On the other hand, if Medicaid beneficiaries are not receiving in–home care or if in–home care is not appropriate for their health conditions, then the decrease in Medicaid admissions to nursing homes could translate into worse health outcomes and an increase in hospitalizations of Medicaid beneficiaries. These questions set a natural direction for future research.

Lastly, the Center for Medicare and Medicaid Services will launch a new case mix model for nursing homes in fiscal year 2020 that aims to correct the current bias towards rehabilitation care. The new Patient–Driven Payment Model (PDMP) focuses on clinical factors rather than minutes of therapy to devise a formula for determining Medicare payments. The change in the case–mix model responds to concerns regarding the role of Medicare in motivating the provision of services based on a facility's financial motives rather than Medicare resident needs. This paper shows that this misalignment of Medicare payment schemes also affected the provision of services to Medicaid residents, raising questions about the consequences for Medicaid residents of this new Medicare payment system.

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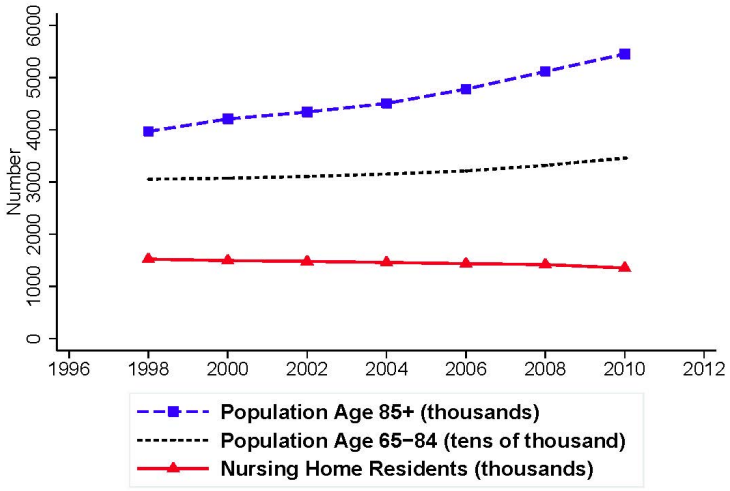
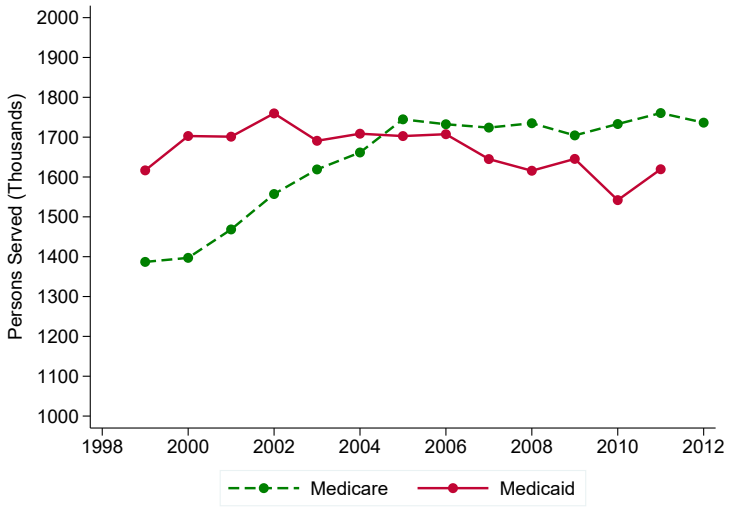
Figures and Tables

Figure 1: Population likely in Need of Long–term Care and Nursing Home Residents



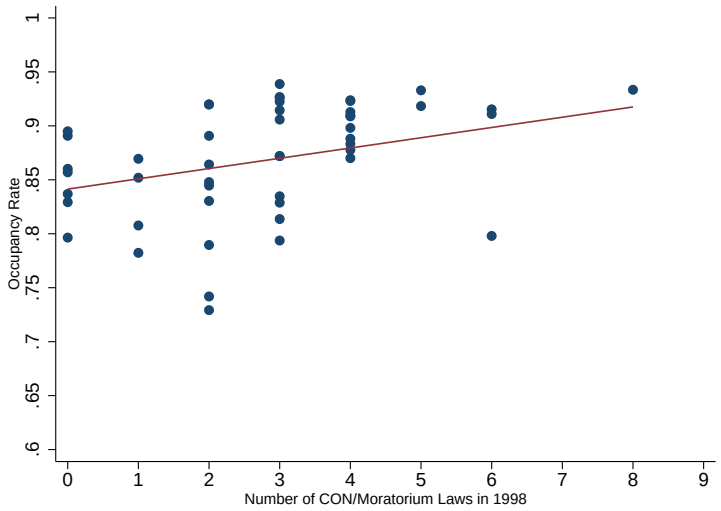
Note: Trends for the population aged 65 and older are computed from Survey of Epidemiology and End Results Population Data. The trend for the number of nursing home residents is computed from Online Survey, Certification and Reporting data.

Figure 2: Persons Served in Nursing Homes by Type of Payer



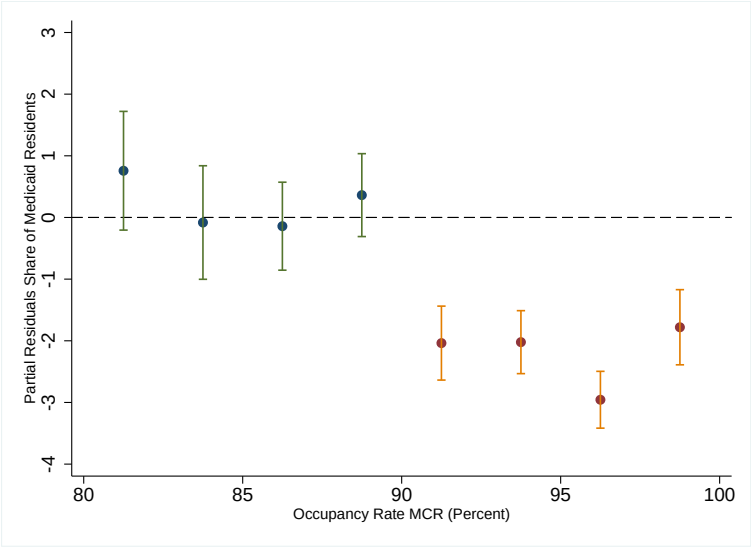
Note: Trends are computed from Medicare and Medicaid Statistical Supplement for the study period.

Figure 3: Relationship between Occupancy Rates and the Number of CON/Moratorium Laws



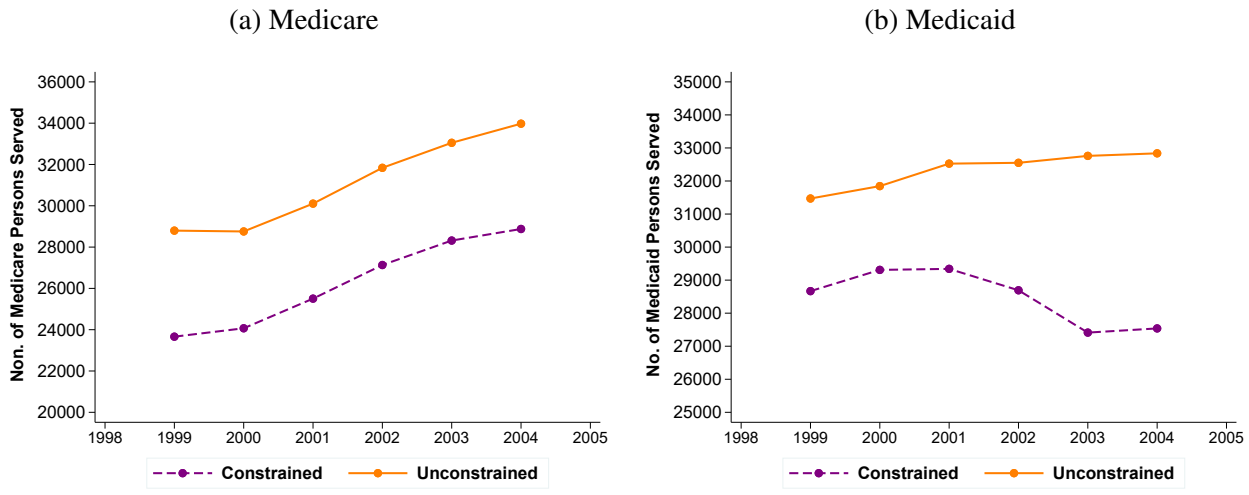
Note: The figure plots occupancy rates and the total number of CON/Moratorium laws. I compute the number of CON/Moratorium laws using information reported Harrington et al. (1998).

Figure 4: Relationship between the Share of Medicaid Residents and Occupancy Rates



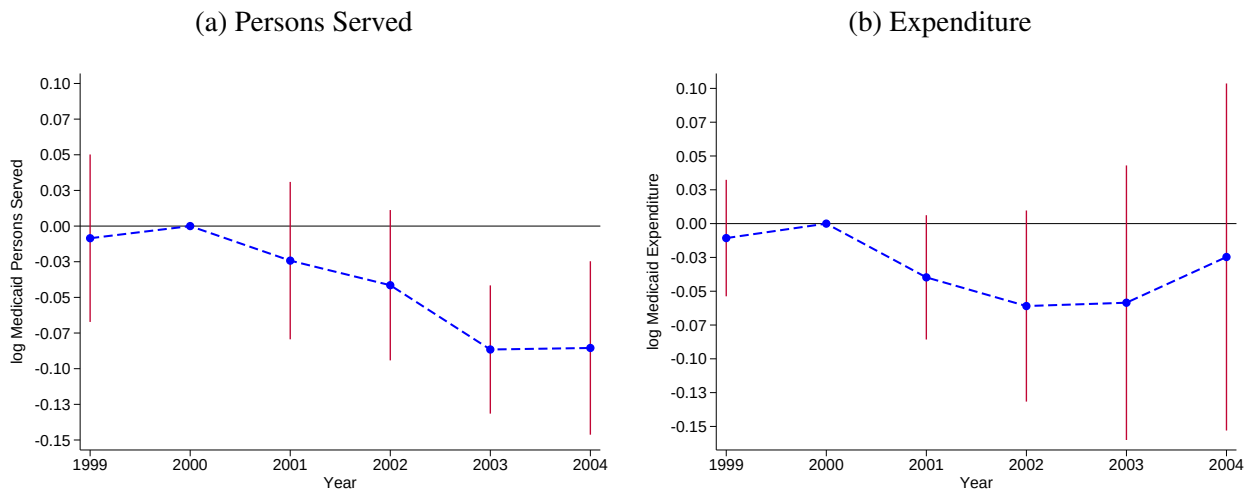
Note: The figure shows the relationship for facilities that serve Medicare and Medicaid residents in the pre–period. Facilities that serve only Medicare residents or only Medicaid residents are excluded. The y–axis corresponds to partial residuals from a regression of the share of Medicaid residents on county covariates. The occupancy rate corresponds to the ratio of the total number of days of care and bed days available from the Medicare Cost Reports (MCR).

Figure 5: Evolution of Persons Served in Nursing Homes by Type of Payer and Regime



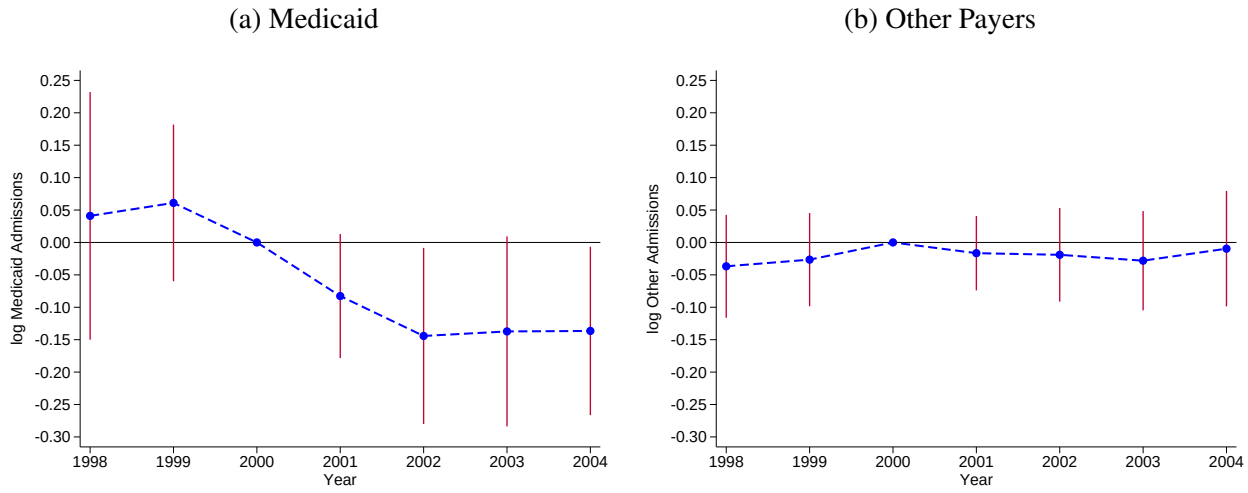
Note: Trends are computed from Medicare and Medicaid Statistical Supplement for the study period.

Figure 6: Event–Study Plot of the DD Effects of the Increase in Medicare Fees on Medicaid Beneficiaries Served and Medicaid Expenditure in Nursing Homes (State–Level Analysis)



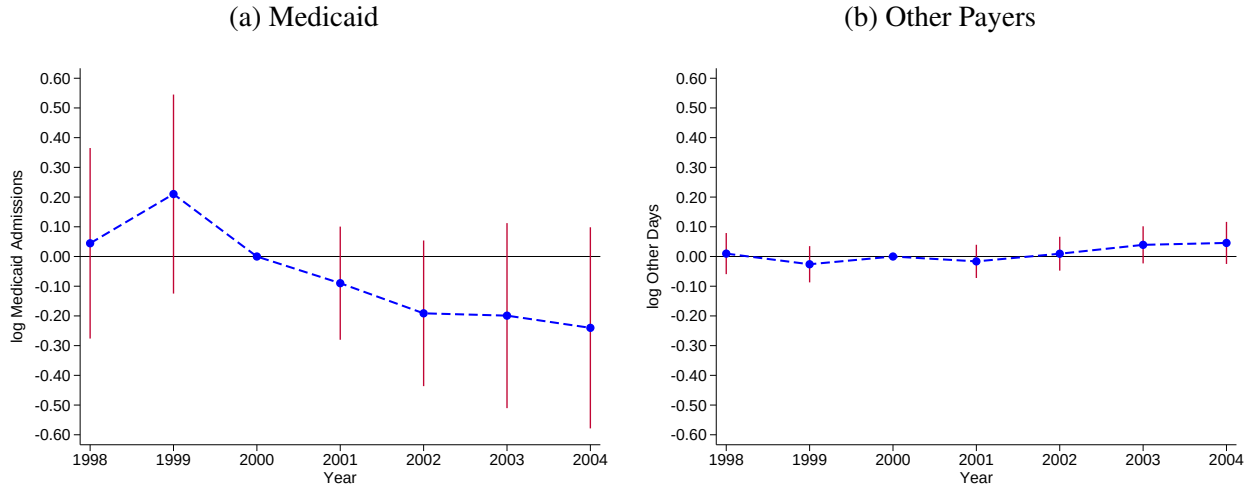
Note: The figure plots the interaction between year dummies and the constrained indicator from Equation 3.The estimates are weighted by state populations of individuals over 75 years of age in the pre–period. Standard errors are clustered at the state level.

Figure 7: Event–Study Plot of the DD Effects of the Increase in Medicare Fees on Medicaid Admissions and Other Payer Admissions (Facility–Level Analysis)



Note: The figure plots the interaction between year dummies and the constrained indicator using facility–level information. The regressions include time–varying state and county controls. The estimates are weighted by number of beds in the pre–period and standard errors are clustered at the state level.

Figure 8: Event–Study Plot of the DD Effects of the Increase in Medicare Fees on Medicaid Days of Care and Other Payer Days of Care (Facility–Level Analysis)



Note: The figure plots the interaction between year dummies and the constrained indicator using facility–level information. The regressions include time-varying state and county controls. The estimates are weighted by number of beds in the pre–period. Standard errors are clustered at the state level.

Table 1: Medicare Fee Schedule and Increments Implemented in BBRA and BIPA

	(1)	(2)	(3)	(4)	(5)
	Time Requirement		Average Fee	Price Increase	
	Nursing	Therapy	FY 1999	BBRA	BIPA
Rehabilitation 14 RUGs	1.04	1.21	$269.56	4%	6.7%
Medium–Care 12 RUGs	1.07	0	$184.39	20%	
Low–Care 18 RUGs	0.61	0	$134.06	4%	

Source: Author's calculations using information obtained from Federal Register issues for FYs 1999 through 2005.

Table 2: Relationship between Occupancy Rates and the Number of CON/Moratorium Laws

	(1)	(2)
No. Restrictions	0.010**	
	(0.004)	
Constrained		0.049***
		(0.015)
Mean	0.86	
Observations	49	
F statistic	5.52	10.99

Note: The table reports coefficient estimates from linear models. The dependent variable is the occupancy rate in a $state \times year$. The independent variables are the total number of CON/Moratorium laws (Column 2), and the binary indicator for states with 4 or more CON/Moratorium laws (Column 3). The regressions include the contiguous United States and DC.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3: Summary Statistics, 1998–2004

	Mean	Standard Deviation	Minimum	Median	Max
Panel A: State Level Analysis					
Medicare Persons Served (number)	29,578.58	27,332.01	758	20,836	120,507
Medicare Expenditure (thousand dollars)	429,937.32	461,093.81	14,988	277,277	2,587,323
Medicaid Persons Served (number)	31,132.23	29,613.21	893	23,067	126,159
Medicaid Expenditure (thousand dollars)	662,664.62	654,407.06	15,062	445,289	3,070,522
Panel B: Facility Level Analysis					
Medicare Admissions (number)	102.07	87.11	0	78	520
Medicare Average Length of Stay (days)	45.91	25.94	0	40	219
Medicare Days of Care (number)	3,311.53	2,450.62	0	2,724	13,348
Medicaid Admissions (number)	40.76	49.29	0	24	280
Medicaid Average Length of Stay (days)	378.31	385.04	0	307	2,489
Medicaid Days of Care (number)	17,430.15	14,573.66	0	17,029	67,313

Note: The table reports unweighted summary statistics for outcome variables used in the state–level analysis and the facility–level analysis. Data span the years 1999 through 2004 for the state–level analysis and 1998 through 2004 for the facility–level analysis. The data source for the state–level outcome variables is Medicare and Medicaid Statistical Supplemental reports, and for the facility–level outcome variables Medicare Cost Reports.

Table 4: Effect of Medicare Reimbursement Policy on Access to Nursing Home Services (State–level Analysis)

Regime	(1) Expenditure Medicare	(2) Persons Served Medicare	(3) Persons Served Medicaid	(4) Observations {States}
Constrained	0.305***	0.140***	-0.026**	90 {15}
	(0.035)	(0.026)	(0.009)	
Unconstrained	0.266***	0.111***	0.035*	198 {33}
	(0.018)	(0.012)	(0.020)	
p–value of difference[a]	[0.309]	[0.322]	[0.009]	

Note: Each cell of the table presents the estimated coefficient for the *POST* variable in Equation 2 from separate regressions of the column variable using the sample of states in each regime: constrained/unconstrained. The observations are made at the state–year level. All the regressions are weighted by the pre–period population over 75 years of age. Standard errors are clustered at the state level.

[a] I compute these statistics from a pooled linear model of the column variable on *POST* , the interaction term *POST* $\times$ *Constrained* and the state covariates interacted with the dummy for Constrained. The p–values are for the coefficient estimates of the interaction term.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5: DD Effects of Medicare Fee Increase on Number of Individuals Served and Expenditures in Nursing Homes by Type of Payer (State–Level Analysis)

	Mean	Coefficient on $POST \times Constrained$		
	(1)	(2)	(3)	(4)
Medicare Persons Served	52441.73	0.028	0.000	0.013
		(0.029)	(0.024)	(0.021)
Medicare Expenditure	$23852.82	0.040	0.025	0.014
		(0.039)	(0.032)	(0.029)
Medicaid Persons Served	58264.19	-0.061***	-0.061***	-0.038**
		(0.022)	(0.017)	(0.017)
Medicaid Expenditure	$127174.29	-0.053	-0.074**	-0.035
		(0.038)	(0.029)	(0.028)
Weights		Y	Y	N
Controls		N	Y	N

Note: In each cell of the table I report the DD estimator $POST \times Constrained$ from separate regressions of the dependent variables in each row on the DD estimator, state fixed effects, and year fixed effects. In the first column I report coefficient estimates from a weighted linear model without controls. In the second column I report the coefficient from a specification that includes controls and uses weights. In the third column I report the same coefficient but without weights and without controls.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6: Effect of Medicare Reimbursement Policy on Access to Nursing Home Services (Facility–level Analysis)

	Admissions		Average length of stay		Days of Care		Observations
	Medicare	Medicaid	Medicare	Medicaid	Medicare	Medicaid	{Facilities}
Constrained	0.008	-0.070	-0.005	-0.108**	0.001	-0.198***	18917{3048}
	(0.025)	(0.045)	(0.018)	(0.044)	(0.044)	(0.058)	
Unconstrained	0.028	0.058	-0.019	0.012	0.008	0.039	50987{8463}
	(0.022)	(0.072)	(0.019)	(0.086)	(0.026)	(0.156)	
p–value of difference[a]	[0.53]	[0.13]	[0.60]	[0.22]	[0.89]	[0.16]	

Note: Each cell of the table presents the estimated coefficient for the *POST* variable from separate regressions of the column variables using the sample of facilities in each regime: constrained/unconstrained. The observations are made at the facility–year level. All regressions are weighted by the pre–period number of beds. Standard errors are clustered at the state level. All regressions include controls for time–varying state covariates, namely per capita income, unemployment rate, percentage of the population below 19 years of age, percentage of the population between 20–29 years of age, percentage of population between 40–64 years of age, percentage that is female, percentage that is white, and percentage that is black.
[a] I compute the statistics from a pooled linear model of the column variable on *POST* , the interaction term $POST \times Constrained$, and the state covariates interacted with the dummy for Constrained. The p–values are for the coefficient estimates of the interaction term.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: DD Effects of Medicare Fee Increase on Number of Admissions and Days of Care in Nursing Homes by Type of Payer (Facility–Level Analysis)

	(1) Medicare	(2) Medicaid	(3) Other
Panel A: Admissions			
POST × *Constrained*	-0.007	-0.155**	0.001
	(0.040)	(0.065)	(0.039)
Mean	108.40	54.40	86.93
Panel B: Average Length of Stay			
POST × *Constrained*	-0.033	-0.125	.
	(0.026)	(0.097)	.
Mean	50.21	425.80	.
Panel C: Days of Care			
POST × *Constrained*	0.001	-0.255*	0.022
	(0.028)	(0.150)	(0.029)
Mean	3447.53	22038.77	19169.04
Facilities	11511		
Observations	69904		

Note: Each cell of the table reports the DD estimator *POST* × *Constrained* from separate regressions of the dependent variables on the DD estimator, facility fixed effects, year fixed effects, state covariates, and county covariates (refer to Equation 5). The dependent variable for Panel A is the logarithm of the number of admissions, for Panel B the logarithm of the average length of stay, which is not available for 'Other' residents, and for Panel C the logarithm of days of care. I run a separate regression for each payer in the columns and dependent variables. All regressions are weighted with the number of beds observed in the pre–period. Standard errors are clustered at the state level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 8: DD Effects of Medicare Fee Increase on Number of Medicaid Admissions, Average Length of Stay, and Days of Care using an Alternative Measure for Capacity–Constrained Facilities (Facility–Level Analysis)

	(1) Constrained States	(2) Unconstrained States	(3) p–value of difference[a]
Panel A: Medicaid Admissions			
$POST \times High$	-0.079	-0.034	[0.53]
	(0.065)	(0.032)	
Mean	52.29	55.18	
Panel B: Medicaid Average Length of Stay			
$POST \times High$	-0.084	0.028	[0.14]
	(0.054)	(0.051)	
Mean	418.44	428.53	
Panel C: Medicaid Days of Care			
$POST \times High$	-0.214*	-0.013	[0.11]
	(0.105)	(0.070)	
Mean	24131.61	21262.22	
Observations	18917	50987	69904
Facilities	3048	8463	11511

Note: Each cell of the table presents the estimated coefficient for the $POST \times High$ variable where High is the alternative definition of capacity constraints using the observed occupancy rate in the pre–period. Facilities with occupancy rates greater or equal to 0.9 were classified as High. The columns define the sample that I use for estimation. For example, the first cell in the table represents the coefficient for $POST \times High$ using facilities in states classified as constrained using the number of CON/Moratorium laws. All the regressions include facility and state–year fixed effects, and are weighted by beds observed in the pre–period. Standard errors are clustered at the state level.

[a] I compute these statistics from a pooled linear model of the panel variable on the interaction term $POST \times High$ and the triple interaction $POST \times High \times Constrained$. The p–values correspond to the triple interaction terms.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: Falsification Tests. Medicaid Persons Served through Other Services (State–Level Analysis)

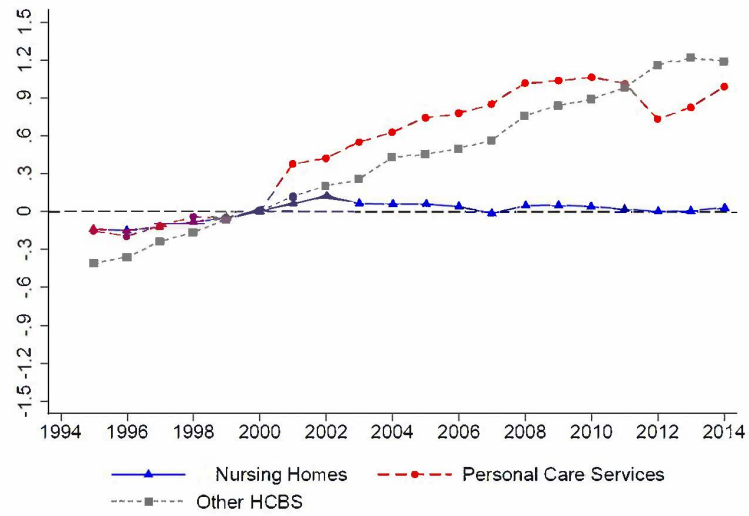
	Coefficient on *POST* × *Constrained*			
	(1)	(2)	(3)	(4)
	Physicians	Hospitals	Dental	X–Ray
Medicaid Persons Served	0.022	0.165	-0.056	0.001
	(0.132)	(0.127)	(0.537)	(0.140)
Mean	756676.75	187616.08	169918.27	471702.69
Medicaid Expenditure	-0.008	0.081	0.183	0.030
	(0.121)	(0.194)	(0.599)	(0.265)
Mean	$264980.97	$829281.21	$37433.18	$57933.52
Observation	288			
States	48			

Note:: Each cell of the table reports the DD estimator *POST* × *Constrained* from separate regressions of the dependent variables in each row on the DD estimator, state fixed effects, and year fixed effects for each of the services listed in the columns. All regressions are weighted with the population over 75 years of age in the pre–period.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

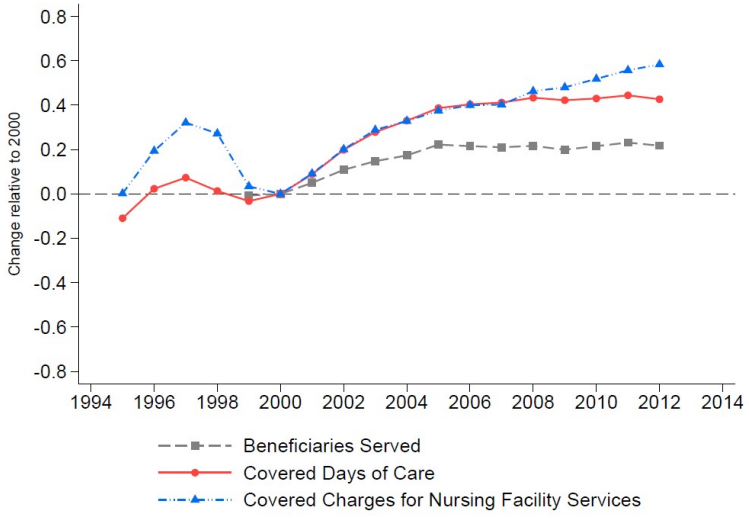
APPENDIX

Figure A1: Medicaid Expenditures on Nursing Homes, Personal Care Services, and Other HCBSs.



Note: Trends are computed from Medicaid Long Term Services and Supports (LTSS) Expenditure Reports.

Figure A2: Persons Served in Nursing Facilities whose Stays are Covered by Medicare, and Covered Days of Care and Charges to Medicare



Note: Trends are computed from Medicare and Medicaid Statistical Supplement for the study period.

Table A1: Medicaid Income Eligibility Levels as a Percentage of the FPL for Individuals Aged 65 and Older and Persons with Disabilities by State (2017)

	As Percentage of FPL			
State	State eligibility type	Special income level	Medically needy	Poverty level
Alabama	1634	219	—	—
Alaska	SSI criteria	176	—	—
Arizona	1634	219	—	100
Arkansas	1634	219	11	80 (aged only)
California	1634	—	60	100
Colorado	1634	219	—	—
Connecticut	209(b)	219	63	—
Delaware	1634	183	—	—
District of Columbia	1634	219	64	100
Florida	1634	219	18	88
Georgia	1634	219	32	—
Hawaii	209(b)	—	41	100
Idaho	SSI criteria	219	—	76
Illinois	209(b)	—	100	100
Indiana	1634	219	—	100
Iowa	1634	219	48	—
Kansas	SSI criteria	219	47	—
Kentucky	1634	219	22	—
Louisiana	1634	219	10	—
Maine	1634	219	31	100
Maryland	1634	219	35	—
Massachusetts	1634	219	52	100 (aged);133 (disabled)
Michigan	1634	219	41	100
Minnesota	209(b)	219	80	100
Mississippi	1634	219	—	—
Missouri	209(b)	128	85	85
Montana	1634	—	52	—
Nebraska	SSI criteria	—	39	100
Nevada	SSI criteria	219	—	—
New Hampshire	209(b)	219	59	—
New Jersey	1634	219	37	100
New Mexico	1634	219	—	—
New York	1634	—	82	82
North Carolina	1634	—	24	100
North Dakota	209(b)	—	83	—
Ohio	1634	219	—	—
Oklahoma	SSI criteria	219	—	100
Oregon	SSI criteria	219	—	—
Pennsylvania	1634	219	42	100
Rhode Island	1634	219	88	100
South Carolina	1634	219	—	100
South Dakota	1634	219	—	—
Tennessee	1634	219	—	—
Texas	1634	219	—	—
Utah	SSI criteria	219	100	100
Vermont	1634	219	110	—
Virginia	209(b)	219	46	80

Table A1 continued from previous page

	As Percentage of FPL			
Washington	1634	219	73	—
West Virginia	1634	219	20	—
Wisconsin	1634	219	59	81
Wyoming	1634	219	—	—

Source: Medicaid and CHIP Payment and Access Commission (2017)

Table A2: Certificate of Need Laws and Moratorium Rules by State (1998)

State	Nursing Homes		Other Long Term Care Services							
	Moratorium[a]	CON[b]	Moratorium HHA[c]	CON HHA	Moratorium Hospital Bed Conversion	CON Hospital Bed Conversion	Moratorium Residential Care[d]	CON Residential Care	CON Adult Day Care	Total Restrictions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Alabama	0	1	0	1	0	1	0	0	0	3
Alaska	1	1	0	1	0	1	0	0	0	4
Arizona	0	0	0	0	0	0	0	0	0	0
Arkansas	0	1	0	1	0	0	0	1	0	3
California	0	0	0	0	0	0	0	0	0	0
Colorado	1	0	0	0	1	0	0	0	0	2
Connecticut	1	1	0	0	1	1	0	1	0	5
Delaware	0	1	0	0	0	1	0	0	0	2
D.C.	0	1	0	1	0	1	0	1	1	5
Florida	0	1	0	1	0	1	0	0	0	3
Georgia	0	0	0	0	0	1	0	1	1	3
Hawaii	0	1	0	1	0	1	0	1	0	4
Idaho	0	0	0	0	0	0	0	0	0	0
Illinois	0	1	0	0	0	1	0	1	0	3
Indiana	0	1	0	0	0	0	0	0	0	1
Iowa	0	1	0	0	0	1	0	0	0	2
Kansas	0	0	0	0	0	0	0	0	0	0
Kentucky	0	1	0	1	0	1	0	1	1	5
Louisiana	1	1	0	0	0	0	0	0	0	2
Maine	1	1	0	0	1	1	0	0	0	4
Maryland	0	1	0	1	0	1	0	1	0	4
Massachusetts	1	1	0	0	1	1	1	1	0	6
Michigan	1	1	0	0	0	1	0	0	0	3
Minnesota	1	0	0	0	1	0	1	0	0	3
Mississippi	1	1	1	1	1	1	1	1	0	8
Missouri	1	1	0	0	1	1	1	1	0	6
Montana	0	1	0	1	0	1	0	0	0	3
Nebraska	0	1	0	0	0	0	0	0	0	1
Nevada	0	0	0	0	0	0	0	0	0	0
New Hampshire	1	1	0	0	0	1	0	0	0	3
New Jersey	0	1	0	1	0	1	0	1	0	4
New Mexico	0	0	0	0	0	0	0	0	0	0
New York	0	1	0	1	0	1	0	0	1	4
North Carolina	0	1	0	1	0	1	1	0	0	4

Table A2 continued from previous page

State	Nursing Homes		Other Long Term Care Services							
	Moratorium[a]	CON[b]	Moratorium HHA[c]	CON HHA	Moratorium Hospital Bed Conversion	CON Hospital Bed Conversion	Moratorium Residential Care[d]	CON Residential Care	CON Adult Day Care	Total Restrictions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
North Dakota	1	0	0	0	1	0	1	0	0	3
Ohio	1	1	0	0	0	0	0	0	0	2
Oklahoma	0	1	0	0	0	1	0	0	0	2
Oregon	0	1	0	0	0	1	0	0	0	2
Pennsylvania	0	0	0	0	0	0	0	0	0	0
Rhode Island	1	1	0	0	1	1	0	0	0	4
South Carolina	0	1	0	1	0	1	0	0	0	3
South Dakota	1	0	0	0	1	0	0	0	0	2
Tennessee	0	1	0	1	0	1	0	1	0	4
Texas	1	0	0	0	1	0	0	0	0	2
Utah	1	0	0	0	0	0	0	0	0	1
Vermont	0	1	0	1	0	1	0	1	0	4
Virginia	0	1	0	0	0	1	0	0	0	2
Washington	0	1	0	1	0	1	0	0	0	3
West Virginia	1	1	0	1	0	1	0	1	1	6
Wisconsin	1	1	0	0	1	1	0	0	0	4
Wyoming	0	1	0	0	0	0	0	0	0	1

Note: The table identifies every state with a certificate–of-need Law (CON) and/or a Moratorium Law in 1998. A value of one indicates that the state had a program in place; however, the specific criteria and enforcement may vary state by state. Column 10 reports the sum of columns one through nine and shows the total number of programs that the state had to limit supply growth.

[a] Moratorium: Prohibits the addition of any new beds.

[b] Certificate of Need Laws (CON): Each state may establish its own criteria for entry of new providers, expansion of existing number of beds, and purchase of new equipment, among other things related to the supply of services.

[c] Home Health Care Agencies (HHAs): Agencies that serve people who need frequent medical treatment along with personal care. The service is provided in the beneficiary's home.

[d] Residential Care: Facilities that provide services to individuals not requiring skilled nursing care. They provide supportive care and supervision services such as foster care, family homes, group homes among others.

Source: The table summarizes information reported in Harrington et al. (1998).