November 2020

Capping Prices or Creating a Public Option: How Would They Change What We Pay for Health Care?

Matthew Fiedler

USC-Brookings Schaeffer Initiative for Health Policy

This report is available online at: https://www.brookings.edu/research/capping-prices-or-creating-a-public-option-how-would-they-change-what-we-pay-for-health-care/

USC Schaeffer
Leonard D. Schaeffer Center for Health Policy & Economics

Economic Studies at BROOKINGS

EDITOR'S NOTE

This white paper is part of the USC-Brookings Schaeffer Initiative for Health Policy, which is a partnership between the Economic Studies Program at Brookings and the USC Schaeffer Center for Health Policy & Economics. The Initiative aims to inform the national health care debate with rigorous, evidence-based analysis leading to practical recommendations using the collaborative strengths of USC and Brookings. The Robert Wood Johnson Foundation provided a grant to the Brookings Institution that supported the writing of this paper.

ACKNOWLEDGEMENTS

I thank Loren Adler, Aviva Aron-Dine, Michael Chernew, Michael Cohen, Erin Duffy, John Holahan, Benedic Ippolito, Emily Gee, Paul Ginsburg, Tim Gronniger, Greg Leiserson, Christen Linke Young, and Erin Trish for helpful comments on a draft of this paper. I thank Kathleen Hannick, Sobin Lee, and Conrad Milhaupt for excellent research assistance, and Brieanna Nicker for excellent editorial assistance. All errors are my own.

Contents

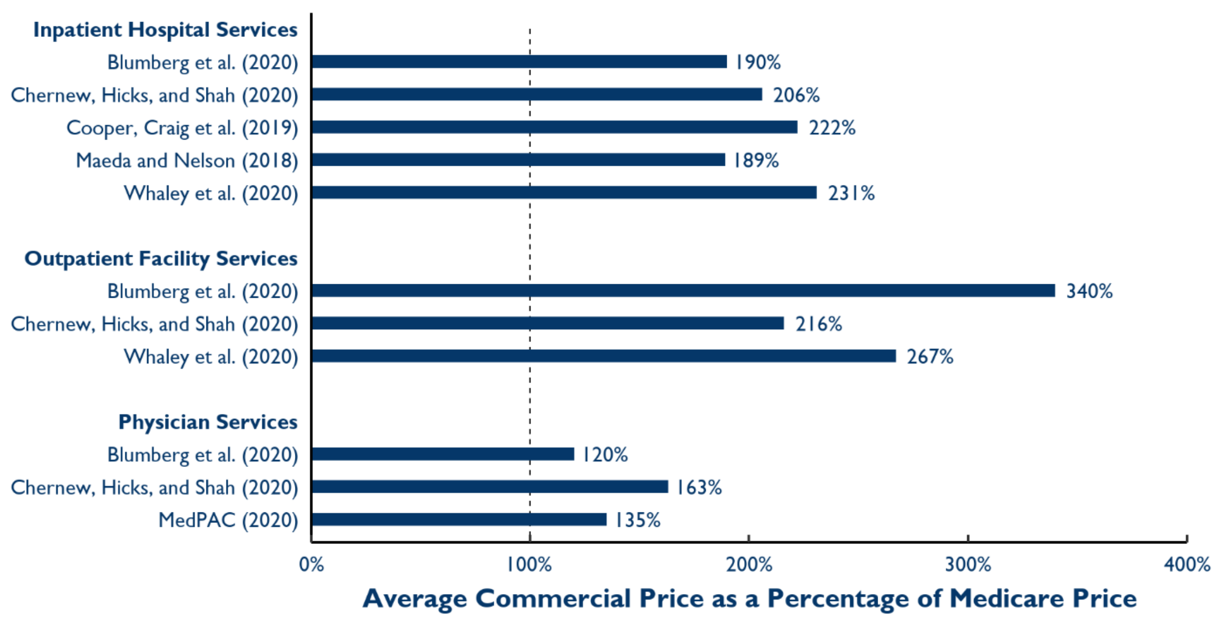
1 Executive Summary

Commercial health insurers pay much higher prices for health care services than public insurance programs like Medicare or Medicaid.[1] Commercial insurers pay around twice what Medicare pays for inpatient care on average, and the gap is even larger for outpatient care, as illustrated in Figure 1.1. Commercial insurers also generally pay more for physician services, although the gap is smaller.

These differences arise because commercial insurers and the Medicare program determine provider prices in different ways. In commercial insurance, provider prices are negotiated between providers and insurers. In practice, many health care providers face limited competition (e.g., Fulton 2017), which can often allow a provider to extract prices well above the minimum prices that would make serving an insurer's enrollees attractive to the provider. By contrast, Medicare generally sets provider prices administratively (i.e., via fee schedules established through legislative and regulatory processes). Historically, Medicare's prices have been set high enough to ensure that Medicare beneficiaries have a broad choice of providers (e.g., MedPAC 2020a), but policymakers' desire to contain the cost of the Medicare program has kept them well below commercial prices.

The large differential between the prices paid by Medicare and commercial insurers has led some policymakers to propose using some form of regulated or administered pricing in commercial insurance markets.[2] This paper examines three tools policymakers might use: (1) capping prices for out-of-network services; (2) regulating prices for both in-network and out-of-network services; and (3) creating a public option, a publicly operated plan that would set prices administratively and could be purchased in lieu of private plans. To gain insight into these policies, this paper develops economic models that combine economic theory with available empirical evidence. The main text summarizes the main insights from those models, and the appendices provide full mathematical details.

Figure 1.1: Average Commercial Prices as a Percentage of Medicare Prices



USC Schaeffer BROOKINGS

[1] Throughout, I use the term commercial insurance to encompass private insurance plans sold in the individual, small group, or large group markets, as well as self-insured group health plans offered by employers.

[2] This paper focuses on approaches to reducing the prices of health care services and largely does not consider prescription drugs in light of the major differences between prescription drugs and health care services.

The focus of this paper is understanding how these different policy tools would affect provider prices and premiums, which is of obvious interest in ongoing policy debates. Importantly, however, this paper does not seek to answer the question of whether policymakers *should* use these tools to reduce prices and, if so, how aggressively. To answer that question, it is necessary to understand how price changes caused by these policies would cause providers to change their service offerings and care delivery processes over the long run, as well as how those changes would affect the quantity and quality of the health care services patients received and the real economic resources consumed by the health care sector. Analyzing those downstream effects is beyond the scope of this paper.

1.1 Capping Prices for Out-of-Network Services

The paper first examines proposals to limit what providers can collect for out-of-network services, such as by limiting collections to some multiple of what Medicare would pay for the same services (e.g., Murray 2013; Berenson et al. 2015; Song 2017; Chernew, Pany, and Frank 2019; Melnick and Fonkych 2020b). This type of policy would directly reduce prices for out-of-network services. However, because out-of-network services account for only several percent of commercial market spending (Pelech 2020; Song et al. 2020; Chernew, Dafny, and Pany 2020), an out-of-network cap's most important effects would likely occur by changing the in-network prices negotiated by providers and insurers.

I reach the following main conclusions about this policy:

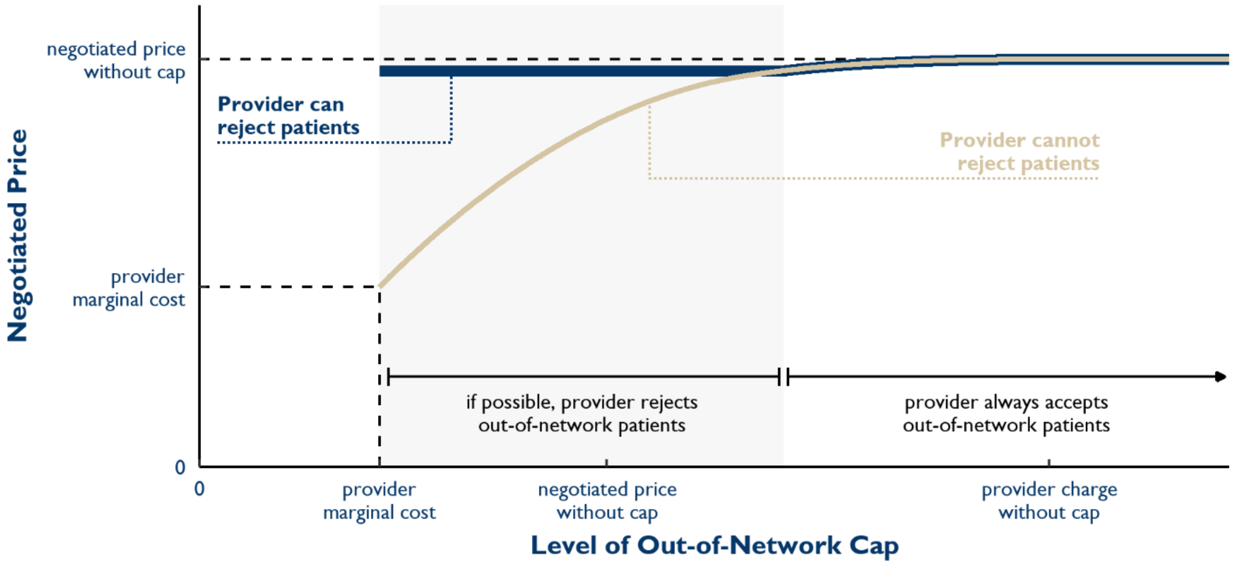
- **For services delivered in emergency situations, limiting out-of-network prices would also, in effect, limit negotiated in-network prices.** With an out-of-network cap, an insurer always has the option to break off negotiations with a provider and pay the provider the capped price. If the insurer can do this without jeopardizing its enrollees' access to the provider's services, then this option offers the insurer an attractive alternative to a negotiated agreement that would allow it to insist on an in-network price no higher than the cap. In fact, the insurer could often negotiate a price below the cap by offering the provider greater volume (via more generous coverage for the provider's services) in exchange for a lower price.

  Because federal law requires hospitals to accept patients in emergency situations, the logic above implies that an out-of-network cap could greatly reduce the prices of services delivered in emergency situations. Using the Medical Expenditure Panel Survey, I estimate that emergency department visits and ensuing inpatient stays account for 13% of health care spending for people with commercial insurance; this share is 34% for hospital services, which is arguably the service category where market power concerns are most acute.

  Naturally, the amount an out-of-network cap reduced prices would depend on where the cap was set. The gold line in Figure 1.2 illustrates the qualitative relationship between the level of the cap and the negotiated price using the formal model developed in this paper. As shown in the figure, an out-of-network cap set at a high enough level (specifically, above the provider's pre-policy charge) would have no effect on the negotiated price. But as the cap fell below that level, it would generate progressively larger reductions in the negotiated price.

- **Outside of emergency situations, an out-of-network cap may have much less scope to affect negotiated prices.** In non-emergency situations, providers are generally legally permitted to decline to treat out-of-network patients. As a result, if an insurer broke off negotiations and paid the provider the capped price, the provider could respond by turning away the insurer's enrollees (or otherwise limiting their access to its services). For this reason, an out-of-network cap would give the insurer much less leverage in non-emergency situations unless non-legal barriers (e.g., fear of public disapproval) prevented providers from turning away patients, which, as discussed further in the main text, seems unlikely.

Figure 1.2: Negotiated Prices Under an Out-of-Network Cap



USC Schaeffer BROOKINGS

Even when a provider can turn away patients, an out-of-network cap would still weaken the provider's bargaining position to some degree. Today, a provider can generally treat *some* of an insurer's patients in the absence of a network agreement, but, with a cap, the provider's best option would often be to forgo *all* of the insurer's patients absent an agreement. How much a cap weakened the provider's bargaining position would depend on how much volume a provider can retain when out-of-network—and at what price—under the status quo. While evidence on this question is imperfect, most providers' ability to attract non-emergency out-of-network volume is likely limited.[3] Combining the fragmentary empirical evidence with the formal model developed in this paper, I conclude that an out-of-network cap could reduce negotiated prices for non-emergency services by around 10% or less.

Once again, outcomes under an out-of-network cap would depend on the level of the cap, as illustrated by the blue line in Figure 1.2. For an out-of-network cap set at a high level, serving out-of-network patients would remain lucrative, so the provider's best option would be to accept out-of-network patients at the capped price, and incrementally tightening the cap would cause small reductions in the negotiated price. But for a low enough cap, it would be in the provider's interest to forgo out-of-network patients, and further tightening the cap would have no effect on negotiated prices or other outcomes of interest.

- **Capping out-of-network prices could make it harder to obtain non-emergency out-of-network services.** The analysis above concludes that, for a stringent enough out-of-network cap, providers would wish to turn away out-of-network patients in order to protect their bargaining leverage vis-à-vis insurers. In practice, providers might find ways to accept out-of-network patients in cases where doing so would not undermine their bargaining

[3] One notable exception is services delivered by ancillary physicians (radiologists, anesthesiologists, pathologists, or assistant surgeons) during a hospitalization. As noted in recent debates over surprise billing, these physicians often retain substantial volume even when out of network (e.g., Adler, Fiedler, Ginsburg, Hall, et al. 2019; Cooper, Scott Morton, and Shekita 2020). Spending on these services is a modest, but not trivial, share of commercial spending (Cooper et al. 2020; Duffy et al. 2020).

position (e.g., uninsured patients and traveling patients). Nevertheless, it still might become harder for insured patients to routinely access care from out-of-network providers.

The paper also briefly considers a related policy that would place *both* a cap on what providers can collect for out-of-network services *and* a floor on what insurers must pay for out-of-network services (and how much coverage insurers must offer for that care). Unlike an out-of-network cap, this policy has the potential to *increase* negotiated prices if the floor is set at a high level. In particular, a provider has no reason to accept a negotiated price below the floor price because, even if negotiations break down, the policy's floor on how much coverage the insurer must offer for out-of-network care would ensure that the provider could continue to attract significant volume and be paid the floor price.

Notably, in non-emergency situations, this type of policy could increase prices on average even if the floor is set at a moderate level, such as the average negotiated price under the status quo. This is because the floor portion of the policy would place upward pressure on the prices negotiated by low-priced providers, but high-priced providers could keep the cap portion of the policy from substantially reducing the prices they receive by threatening to turn away out-of-network patients.

1.2 Regulating Both In-Network and Out-of-Network Prices

Because an out-of-network cap would likely have little effect on negotiated prices for non-emergency services, policymakers might wish to consider policies that would directly regulate both in-network and out-of-network prices. The next section of the paper thus considers two approaches to doing so, which I call the "comprehensive price cap" and "default contract" approaches.

A comprehensive price cap, as I define it here, would directly limit the amounts providers can receive for delivering health care services, both in and out of network (e.g., Skinner, Fisher, and Weinstein 2014; Murray and Berenson 2015; Blumberg et al. 2019; Roy 2019; Chernew, Dafny, and Pany 2020). The paper reaches the following conclusions about the effects of a comprehensive price cap:

- **A comprehensive price cap could reduce prices for all health care services, including in settings where providers can turn away out-of-network patients.** When providers must accept out-of-network patients, a comprehensive price cap and an out-of-network cap would be equally effective in reducing prices. But when providers can turn away out-of-network patients, a comprehensive price cap would have much greater scope to affect negotiated prices than an out-of-network cap. While a provider could keep the out-of-network portion of a comprehensive price cap from undermining its bargaining position by threatening to turn away out-of-network patients, the in-network portion of the cap would prevent the provider from translating a strong bargaining position into high prices.

- **Under a comprehensive cap, providers could use the leverage that they could not translate into higher prices to extract other concessions, which could undermine the cap or have other undesirable effects.** As noted above, a comprehensive price cap would reduce prices partly by directly limiting the prices providers and insurers could agree to rather than by reducing how much leverage providers held in network negotiations. But the leverage that providers could not translate into higher prices would not disappear, and providers could use that "excess" leverage to extract other types of concessions from insurers.

  Providers might, for example, use their excess leverage to resist contract provisions intended to discourage inefficient utilization, such as prior authorization requirements or new payment models. Providers' incentives to increase volume was historically a concern under state hospital rate setting systems (e.g., Pauly and Town 2012; Murray and Berenson 2015).

Alternatively, providers might circumvent the cap by demanding insurers pay higher prices for service lines where the cap does not apply (or does not bind). For example, a health system with a high-priced flagship hospital could seek higher prices for its lower-priced community hospitals or its physician practices; systems might also accelerate acquisitions of hospitals or physician practices to maximize their ability to use this strategy. Evasion concerns would likely also require policymakers to limit use of alternative payment models, like bundled payments or shared savings contracts, since such contracts could be used to "hide" payments to providers. Policymakers would have options for addressing these problems, but it is unclear how effective they would be, and some might have undesirable side-effects of their own.

Motivated by the enforcement challenges that could arise under a comprehensive price cap, this paper also considers an alternative way of regulating health care prices that I call the "default contract" approach.[4] Under this approach, the government would publish a model network agreement (the "default contract") that specified both the prices the insurer would pay the provider *and* a minimum level of access the provider would be required to offer to the insurer's enrollees. A provider would be required to enter a default contract with any insurer that requested one, but providers and insurers would also be allowed to negotiate any alternative payment terms they wished. An insurer would be permitted to request a default contract with some providers but not others at its discretion.

The paper reaches the following main conclusions about the default contract approach:

- **A default contract approach could reduce prices for all health care services, while avoiding the main enforcement challenges of a comprehensive price cap.** Under a default contract policy, the insurer would always have the option to break off negotiations and give its enrollees access to the provider's services via a default contract. This option would allow the insurer to insist on prices at or below those in the default contract, at least if the default contract's access standards were reasonably stringent and effectively enforced.

  Importantly, the default contract approach would limit prices by directly weakening a provider's leverage in network negotiations, rather than by limiting the provider's ability to translate leverage into high prices. For this reason, unlike a comprehensive price cap, it would not spur provider efforts to use leverage they cannot translate into higher prices to extract other concessions, such as higher volume or higher prices for service lines not subject to the price cap. Nor would it be necessary to limit use of alternative payment models.

- **The core challenge of the default contract approach would be enforcing the access standards.** The default contract approach would only be effective in reducing prices if implementing a default contract gave an insurer's enrollees real access to the provider's services, which would require the default contract's access standards to be effectively enforced. While not easy, enforcing these access standards would likely be easier than overcoming the various enforcement challenges that could arise under a comprehensive price cap.

  Notably, enforcement efforts could focus on a single problematic behavior—provider attempts to turn away enrollees covered under a default contract—rather than the many different problematic behaviors that could arise under a comprehensive price cap. Additionally, provider compliance with the access standards would be comparatively straightforward to monitor directly via insurer or consumer complaints and, if necessary, audit studies.

  Importantly, a default contract policy could be effective in reducing prices even if access standards were enforced imperfectly. While imperfect enforcement would reduce the leverage

[4] Glied and Altman (2017) describe a version of this approach that would apply to a narrow subset of hospital services.

insurers derived from the ability to demand a default contract, policymakers could compensate for imperfect enforcement to some degree by specifying lower prices in the default contract.

1.3 Creating a Public Option

Another way to introduce regulated or administered pricing in the commercial market is to create a "public option," a publicly operated plan that consumers could purchase in lieu of a private plan. Introducing a public option was considered during the debate over the Affordable Care Act (ACA), and President-elect Biden's campaign platform included a public option. Many Congressional and think tank proposals also envision introducing a public option (T. Neuman et al. 2019).

Public option proposals vary widely in design. This paper focuses on a public option that would pay health care providers some percentage of the prices Medicare pays providers, require providers to accept public option patients, and charge a premium that covers its average costs. However, I also discuss how the effects of alternative public option designs might differ.

Market outcomes with a public option, including the prices providers received, the premiums enrollees paid, and the market share captured by the public option would depend on how private plans—and, particularly, private plans' negotiations with providers—changed in response to creation of a public option. To gain insight on these dynamics, this paper develops a formal model of health insurance markets in the presence of a public option. The main text presents the main insights from that model and the results of simulations using that model. Appendix B presents full details.

This analysis reaches the following main conclusions about the effects of introducing a public option:

- **If a public option was much more attractive to consumers than existing private plans, then private plans would end up paying providers prices close to the public option's prices.** The introduction of a public option that was much more attractive to consumers than existing private plans would reshape provider-insurer negotiations in two important ways. First, consumers would be unwilling to pay too much more for a private plan than for the public option, which would force private plans to set premiums close to the public option's premium. That, in turn, would make it unprofitable for private plans to pay providers prices too far above the public option's, making insurers willing to walk away from network negotiations rather than pay prices that high. Second, providers would recognize that if they did not join private plans' networks, some of their patients would instead enroll in the public option, and they would be paid the public option's prices. Thus, providers would be willing to walk away from negotiations rather than accept prices too far below the public option's prices.

  Virtually any coherent economic model of provider-insurer bargaining predicts that a provider and insurer will negotiate a price that lies between the maximum price that makes an agreement profitable for the insurer and the minimum price that makes an agreement profitable for the provider. Thus, the considerations above imply that prices providers and insurers negotiated would end up neither too far above nor too far below the public option's prices. This conclusion contradicts assumptions in some prior analyses that introducing a public option would not meaningfully change the prices private plans could negotiate (Antos and Capretta 2019; FTI Consulting 2019; Koenig et al. 2019; Schaefer and Moffit 2020). This analysis also suggests that a public option that paid most providers less than existing private plans but paid some providers more could increase the prices that private plans paid those specific providers, even as it reduced the prices that private plans paid providers overall.

  Importantly, the conclusions above depend on the public option being a strong competitor for private plans. If a public option had non-price cost disadvantages relative to private plans that partially offset its pricing advantages (a possibility discussed below), then it would set correspondingly higher premiums and do less to constrain the premiums private plans set and the prices they paid providers. Indeed, if the public option had non-price cost disadvantages large enough to fully offset its pricing advantages, it would likely attract little enrollment and have little effect on market outcomes. Similarly, a public option that paid all providers more than existing private plans would also have little effect on market outcomes.

- **A public option that paid providers less than existing private plans could both offer consumers a new lower-premium option and reduce the premiums of private plans.** The preceding discussion implies that, in cases where the public option was more attractive to consumers than existing private plans, both private plans and the public option would pay providers prices that were reasonably close to the public option's prices. Thus, if a public option paid providers less than existing private plans and did not have large non-price cost disadvantages, the premiums set by both the public option and the private plans competing with it would likely be lower than the premiums of existing private plans.

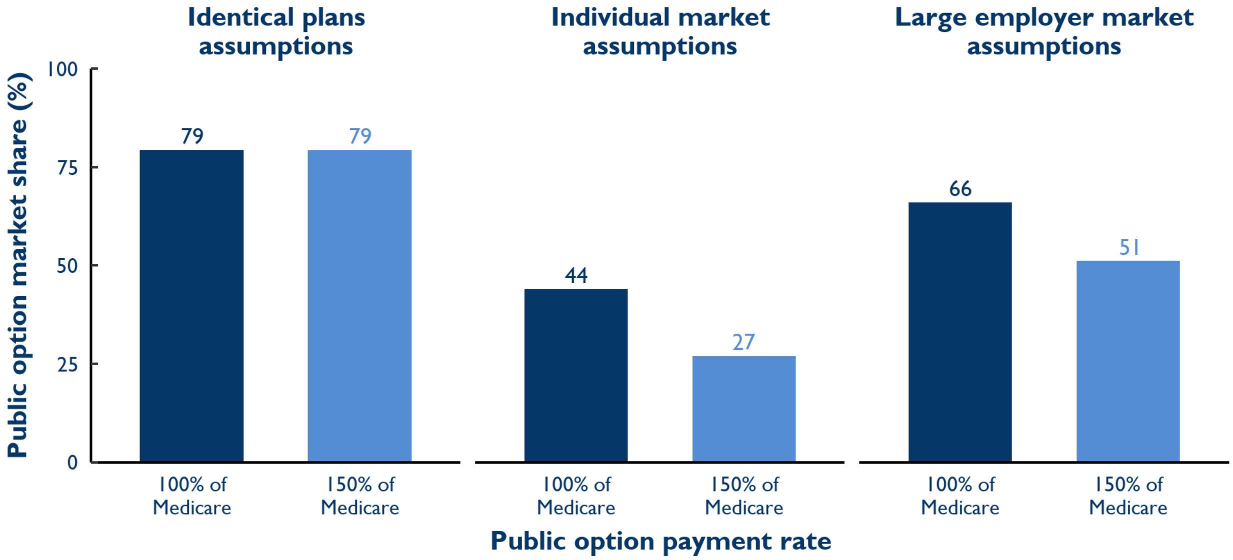
  Notably, employer plans pay providers very different prices in different parts of the country (e.g., Chernew, Hicks, and Shah 2020), and it is generally believed that individual market plans pay providers less than employer plans (e.g., Blumberg et al. 2020). Thus, if a public option paid providers the same prices in all settings, it would likely have different effects on premiums and prices in different geographic areas and different insurance markets. Specifically, it would tend to reduce premiums the most in areas and markets where private plans currently pay the highest prices, but generate smaller, if any, savings in lower-priced areas or markets.

- **A public option would differ from private plans in ways other than what it paid providers, including non-price determinants of plan costs (e.g., utilization, non-claims costs, risk selection, and diagnosis coding) and how it set premiums.** In particular, experience from Medicare Advantage (e.g., Curto et al. 2019) suggests that a public option would have higher utilization than its private competitors for comparable enrollees, at least in the individual market, where private plans are often tightly managed. On the other hand, data on non-claims expenses in traditional Medicare and existing private plans suggests that a public option might have lower non-claims expenses than competing private plans.

  In the individual and small group markets, the public option would likely also differ from private plans in what types of enrollees it attracted and how aggressively it coded diagnoses for risk adjustment purposes. Experience from Medicare Advantage suggests that private plans might attract a healthier mix of enrollees and succeed in making comparable enrollees look sicker for risk adjustment purposes (e.g., Curto et al. 2019; Geruso and Layton 2020). Both factors would tend to increase the public option's costs relative to private plans.

  A public option would also set premiums differently from private plans. While the public option would set a premium to cover its average costs, private plans set premiums to maximize their profits. Correspondingly, private plans would set premiums that incorporate a markup over their costs, ceding some enrollment to the public option in exchange for positive margins. Because of this difference in premium-setting behavior, introducing a public option could be particularly consequential in areas with few competing insurers (and, thus, high markups).

Figure 1.3: Public Option Market Share



Note: The figure reflects a scenario in which existing plans pay providers 180% of Medicare rates, on average.

USC Schaeffer BROOKINGS

- **The public option's market share could vary widely depending on how it compared to private plans, but private plans would retain substantial enrollment in most plausible scenarios.** Figure 1.3 illustrates this fact using the simulations conducted in this paper. The figure examines several scenarios in which a public option is introduced in a market where existing private plans pay providers 180% of Medicare rates. (As discussed in the main text, the model used here includes only a single private plan, which may cause it to overstate private plans' premiums and understate their market share. However, while the results displayed in Figure 1.3 should not be taken too literally, they do help illustrate how and why the public option's market share would likely vary across different scenarios.)

  The first set of scenarios assumes that the public option and private plan are identical, except for determining provider prices and premiums differently. These scenarios are unrealistic but offer a useful benchmark. In these scenarios, the public option captures about four-fifths of the market. This occurs because the private plan's premium incorporates a markup over its costs and thus charges a higher premium despite having an identical cost structure.

  The second set of scenarios reflects assumptions plausible for a public option offered in the individual market. For these scenarios, I assume that the public option has higher utilization than the private plan, attracts sicker enrollees, and codes diagnoses less aggressively in risk adjustment, but has lower non-claims costs. The private plan also has a narrower network that allows it to negotiate prices modestly below the public option's prices. Thus, the public option charges a higher premium than the private plan and captures only a minority of the market.

  The final scenarios reflect assumptions plausible for a public option offered to large employers. Since private plans in the employer market have broader networks and weaker utilization controls, I assume that a public option offered to employers would have a smaller utilization disadvantage; the private plan's broader network also causes it to pay prices closer to the public option's. Additionally, because I assume that an employer market public option would only offer third-party administrator services, risk selection is no longer relevant. Consequently, the public option's premium is lower relative to the private plan's than in the second set of scenarios, so the public option captures half or more of the market.

The consequences of introducing a public option would differ if the design of a public option differed from the one considered in this paper's primary analyses. In particular:

- **If providers could opt out of serving public option patients, many providers might do so, potentially leading to a very different market equilibrium.** A provider that opted out of the public option would become more valuable to private plans—because private plans could now offer exclusive access to the provider's services—and thus be able to negotiate higher prices with private plans. While opting out would also have costs for providers, primarily lost profits on public option volume, it is plausible that many providers would opt out, at least if the public option set low payment rates. Providers that command high prices under the status quo would likely have the most to gain by opting out.

  The consequences of provider opt outs would depend on how widespread they were. If the public option's network ended up far narrower than existing private plans, then introducing a public option might have little effect on market outcomes, either because the public option would attract little enrollment or because policymakers would be forced to pull the public option from the market. If the public option ended up with a narrow, but viable network, the situation is more complex. Relative to the case where providers must participate in the public option, private plans would likely pay providers more and charge higher premiums, while the public option might have lower utilization and suffer from less adverse selection (Liu et al. 2020). The net change in the public option's market share relative to the case with mandatory provider participation from a narrower network and a lower relative premium is uncertain.

- **If a public option negotiated prices with providers rather than setting them administratively, it is doubtful that a public option would pay lower prices than existing private plans.** If policymakers wished to make participation in the public option voluntary for providers but still allow the public option to attract a broad network, they could implement a public option that set prices through negotiation with providers, rather than administratively. However, there is little reason to believe that a public option would be able to negotiate lower prices than existing private plans since it would not have access to any negotiating tools beyond those available to private plans. A public option might still charge a modestly lower premium by virtue of setting a premium that does not incorporate a profit margin or by having lower non-claims costs, but these advantages might be offset in practice if the public option had higher utilization or experienced adverse selection.

1.4 Effects on Provider Networks

Most of the analysis in this paper focuses on how a price cap or public option might affect prices and premiums generally, but these policies would likely have different effects on plans with broader and narrower networks and change what types of networks enrollees select. While this paper does not offer a full analysis of potential effects of these policies on plans' networks, I reach the following qualitative conclusions about the effects of a price cap or a public option on these outcomes:

- **These policies would likely reduce the difference in premiums between broad and narrow network private plans.** Because all of the policies considered in this paper would reduce the overall level of provider prices, they would reduce the savings insurers could realize using narrow networks; when the overall level of prices is lower, an insurer's scope to use a narrow network to negotiate still lower prices is smaller, and the potential savings from using a narrow network to steer enrollees away from high-priced or high-utilizing providers is smaller too. Correspondingly, these policies are likely to shrink the gap in premiums between broad and narrow network plans. For a public option offered in the individual market or small group market, changes in risk selection patterns could also affect the relative premiums of broad and narrow network plans, although the direction of this effect is uncertain.

- **While reductions in the relative premiums of broad network plans would generally push consumers toward broader networks, some factors could push in the opposite direction.** In particular, the price cap policies would reduce consumers' exposure to balance billing when they receive out-of-network care, which could make narrow network plans modestly more appealing, perhaps partially offsetting the fact that opting for a narrow network plan would now offer smaller premium savings. Under a public option, the public option might siphon off many enrollees who prefer broad network plans, which could cause *private plan* enrollment to shift toward narrower networks even though narrow networks would now offer smaller premium savings, although *overall* enrollment (inclusive of public option enrollment) would still likely shift toward broader networks.

Any shift toward broader networks in private plans would tend to partially offset the downward pressure on average provider prices and premiums created by a price cap or public option.

1.5 Strategies for Ensuring Provider Compliance

Either a price cap or a public option would impose requirements on health care providers, and a natural question is how those requirements would be enforced. Policymakers would have two broad categories of options. First—and most straightforward—they could directly penalize non-compliant providers. For example, policymakers could fine non-compliant providers, and state policymakers could consider making compliance a condition of provider licensure.

Second, federal policymakers could require providers to comply with a price cap or accept patients under a public option in order to serve patients with various forms of federally subsidized coverage. A narrow version of this approach might encompass only public programs like Medicare and Medicaid, while a broader version could also encompass private insurance plans offered on the group and individual markets, which are subsidized via the tax exclusion for employer-provided coverage and the ACA's Marketplace subsidies. Naturally, the more types of subsidized coverage included, the more successful this approach would likely be in ensuring compliance with the price cap or public option.

Importantly, one risk of this approach is that providers might opt out of the relevant forms of publicly subsidized coverage rather than comply with the price cap or public option. That concern would be most acute for a price cap that was set at a low level or that affected a broad array of services, as well as public option that paid low prices. It would also be larger for a price cap or a public option that was implemented in the group market in addition to the individual market. On the other hand, it would tend to be smaller if all (or almost all) forms of federally subsidized coverage were included in this type of approach. Virtually all existing coverage is federally subsidized in some way, so being locked out of all forms of federally subsidized coverage would likely be viable for few, if any, providers.

1.6 Experience from Medicare Advantage

Experience with most of the policy tools considered in this paper is relatively limited in the United States. But the Medicare program is an important exception. In Medicare, private Medicare Advantage (MA) plans compete alongside traditional Medicare, which plays the role of a public option, and providers are subject to an out-of-network cap set at traditional Medicare rates when treating MA enrollees. The Medicare program thus offers an interesting empirical setting in which to assess and apply the largely theoretical analysis presented in the rest of this paper.

A striking fact is that MA plans pay hospitals and physicians prices very close to traditional Medicare's prices in almost all cases, a stark contrast with the much higher and widely varying prices paid by commercial plans (Berenson et al. 2015; Baker et al. 2016; Trish et al. 2017; Maeda and Nelson 2018; Pelech 2020). Applying this paper's theoretical analysis to MA yields two conclusions, which offer both some support for this paper's analysis and some insight into dynamics in MA:

- **The presence of traditional Medicare can largely explain the prices observed in MA.** Medicare program rules make it impossible for institutional providers to turn away traditional Medicare patients while still serving MA enrollees, and traditional Medicare's large market share likely makes turning away traditional Medicare patients unattractive to physicians too. Traditional Medicare is thus analogous to a public option with mandatory provider participation. Correspondingly, the analysis of a public option in this paper implies that the presence of traditional Medicare should allow MA plans to negotiate prices close to traditional Medicare's, consistent with the prices actually observed in MA. This echoes some prior analyses of MA that have also posited a major role for traditional Medicare in explaining the prices observed in MA (e.g., Berenson et al. 2015; Trish et al. 2017).

- **While the MA out-of-network cap likely plays at least a supporting role in explaining the prices observed in MA, that role may be smaller than sometimes suggested.** There do not appear to be clear legal or other barriers keeping providers from turning away out-of-network MA enrollees (or otherwise limiting access) in non-emergency situations. Thus, the analysis of an out-of-network cap in this paper suggests that the out-of-network cap likely has only modest effects on the prices MA plans can negotiate for non-emergency services. This conclusion differs from prior work that assigns the out-of-network cap a more central role in shaping prices in MA (e.g., Maeda and Nelson 2018; Pelech 2020).

  The presence of an out-of-network cap may nevertheless play a supporting role in shaping negotiated prices in MA. Even when providers can turn away patients, an out-of-network cap does have some limited scope to reduce prices. This may matter in cases where competitive pressure from traditional Medicare leaves the prices negotiated by MA plans modestly above traditional Medicare's prices. In these cases, the out-of-network cap may push negotiated prices the rest of the way toward traditional Medicare's, which may help explain why MA prices are *uniformly* close to traditional Medicare's across different providers and geographic areas.

1.7 Conclusion

The analysis in this paper demonstrates that an appropriately designed price cap or public option can reduce the prices of health care services. It also offers some guidance on how policymakers that wished to use a price cap or a public option to reduce prices should choose among these policies:

- **Neither an out-of-network cap nor a comprehensive price cap is likely to be policymakers' best option to reduce provider prices.** It is questionable at best whether an out-of-network cap could reduce the prices of services delivered in non-emergency situations, and it could reduce patients' ability to access out-of-network care. A comprehensive price cap could, on paper, reduce prices in all settings, but enforcement challenges might threaten the integrity of the cap, and the cap could have various undesirable side effects, including increased utilization, greater consolidation, and less adoption of alternative payment models. By contrast, a default contract policy could reduce prices in all settings while avoiding the main enforcement challenges and undesirable side-effects of the other approaches.

- **If policymakers' sole goal is to reduce provider prices, a default contract policy is a simpler and more flexible tool than a public option.** A default contract policy could be applied solely to specific services (à la Glied and Altman 2017; Roy 2019), whereas a public option would need to set prices for all types of services and, correspondingly, would affect prices for all types of services. Additionally, a default contract policy could be targeted primarily at the highest-priced providers (à la Chernew, Dafny, and Pany 2020) by specifying high prices in the default contract. By contrast, a public option that paid all providers more than existing private plans would be uncompetitive and thus have little or no effect on prices, and a public option that paid somewhat lower prices would increase prices received by low-priced providers in addition to reducing the prices received by high-priced providers.

Implementing a public option would also entail operating an insurance plan, which would be administratively complex. Related, if the public option had disadvantages in utilization, risk selection, or diagnosis coding, that could undermine its ability to reduce provider prices.

- **A public option can address insurer market power, which the price cap policies cannot.** Policymakers may have goals other than reducing provider prices. Notably, many insurance markets are concentrated (Fulton 2017), which can allow insurers to charge higher premiums (e.g., Dafny, Duggan, and Ramanarayanan 2012; Dafny, Gruber, and Ody 2015). Introducing a public option could reduce premiums by forcing insurers to accept smaller profit margins (although such margins are already generally modest) or by creating pressure for insurers to operate more efficiently along other dimensions. These considerations can provide a rationale for implementing a public option instead of or in addition to a price cap.

While this paper focuses on the substantive effects of these policies, policymakers would also need to consider the political feasibility of alternative policy approaches. Political considerations might be particularly important to the choice between a public option and some form of price cap. Notably, introducing a public option would threaten the interests of health insurers in addition to health care providers and thus could spark broader industry opposition. However, health insurers are deeply distrusted by the public (Commonwealth Fund, New York Times, and Harvard T.H. Chan School of Public Health 2019; KFF 2020a), so a public option that offered consumers a concrete alternative to private insurance plans could have broad public appeal. Indeed, this antipathy for private insurers may well be part of the reason that public opinion survey data show that public option proposals command broad public support (Kirzinger, Kearney, and Brodie 2020).

2 Overview of Current Pricing Institutions and Outcomes

To provide a foundation for the rest of the paper, I begin by briefly describing the decentralized, negotiation-based processes used to determine provider prices in commercial insurance and the administrative processes used to determine provider prices in public programs. I then briefly review literature documenting that provider prices in commercial insurance are far higher than in Medicare and discuss what features of health care provider markets may lead to this outcome.

2.1 Determination of Prices in Commercial Insurance

In commercial insurance, the vast majority of health care services—accounting for more than 90% of total spending—are delivered by providers included in the insurer's network, the list of providers for which the insurer offers more generous coverage (Pelech 2020; Song et al. 2020; Chernew, Dafny, and Pany 2020). Indeed, many commercial plans, including more than two-thirds of individual market plans (Hempstead 2018; Coe, Luterek, and Oatman 2018), offer no coverage for services delivered by providers outside the plan's network.[5] Even when private plans do provide out-of-network coverage, as most employer plans do (KFF 2020b), enrollee cost-sharing obligations are generally higher.

The prices of in-network services are determined through provider-insurer negotiations. When successful, these negotiations result in an agreement under which the provider commits to accept a specified price and the insurer commits to including the provider in its network. As discussed in much greater detail in the rest of the paper, the prices providers and insurers negotiate are shaped by a wide variety of factors, including how much competition a provider faces (e.g., Gaynor and Town 2011; Cooper et al. 2019; Koch and Ulrick 2017), the provider's reputation (e.g., D. G. Pope 2009), the rules governing out-of-network care (as I discuss in the context of an out-of-network cap), and the insurer's ability to extract high premiums from enrollees (as I discuss in the context of a public option).

The prices of out-of-network services are determined very differently. Each provider unilaterally sets a "charge" that, at least in principle, is its price for services delivered in the absence of a network agreement. Charges tend to be very high, roughly double negotiated in-network prices, on average (Bai and Anderson 2017; Cooper et al. 2019).[6] In practice, providers often fail to collect their full charges since many insurers refuse to pay full charges and collecting the remaining amount due from patients via "balance billing" is often challenging, although systematic data on this point is scarce. Nevertheless, providers' typical out-of-network collections likely exceed typical negotiated prices. Even though out-of-network care accounts for a small minority of the care actually delivered, expected out-of-network outcomes play a major role in shaping negotiated in-network prices, as discussed in section 4.

2.2 Determination of Prices in Public Programs

The decentralized approach used to determine the prices of health care services in commercial insurance contrasts sharply with the administered pricing systems generally used in public insurance

[5] Due to data limitations, Hempstead (2018) and Coe, Luterek, and Oatman (2018) estimate the share of individual market *plans* without out-of-network coverage, not the share of enrollees with such coverage. To the extent that individual market enrollees gravitate toward lower-premium plans, the share of enrollees lacking out-of-network coverage may be higher.

[6] Bai and Anderson (2017) only compare physicians' charges to Medicare rates. However, in a sample of Medicare claims, they estimate that, for the median claim, physicians' charges were 2.5 times what Medicare pays in 2014. For comparison, MedPAC (2016) estimates that negotiated prices in commercial coverage were 1.28 times Medicare's payment rates for the same services, on average, in the same year. While these estimates are not precisely comparable, they are consistent with the view that charges are roughly twice commercial prices, on average.

programs. I focus on traditional Medicare's payment system since most proposals for making greater use of administered prices, at least at the federal level, are based upon Medicare's prices.[7]

The Centers for Medicare and Medicaid Services (CMS) generally directly sets the prices that the traditional Medicare program pays for health care services.[8] The precise methods used vary by type of service, but the systems used to pay for most services—including hospital and physician services—have a similar broad structure.[9] CMS starts by producing estimates of the relative resource intensity of delivering different services. It then adjusts those amounts for differences in input costs across areas, generating various area-specific relative resource intensities. In a final step, CMS converts those relative resource intensities to dollar terms by multiplying them by a common dollar amount.[10]

An important goal of federal policymakers is for Medicare beneficiaries to have robust access to health care providers, which generally requires that Medicare's prices exceed providers' marginal cost of delivering services. Medicare's prices achieve that objective in practice. Based on data from hospitals' cost reports to CMS, the Medicare Payment Advisory Commission (MedPAC) estimates that Medicare hospital payments were 8% higher than hospital's marginal cost of treating an additional Medicare patient in 2018, on average across providers, although about 9% lower than hospitals' average cost of treating Medicare patients. (MedPAC 2020a). Similar cost data are not available for physician services. However, only a tiny fraction of physicians have opted out of Medicare, and beneficiary surveys indicate that Medicare beneficiaries generally have little trouble finding a physician when they need one (MedPAC 2020a). This suggests that treating an additional Medicare patient is financially attractive to most physicians and, therefore, implies that Medicare's payment rates must generally exceed physicians' marginal cost of delivering those services.

State Medicaid programs also generally set provider prices through administrative mechanisms, at least in the fee-or-service portions of their programs, but the precise methods used vary tremendously from state to state, so I do not review them here.[11] On average, however, the prices Medicaid pays for inpatient services are comparable to Medicare's, while the prices Medicaid pays for physician services tend to be lower (MACPAC 2017; Zuckerman, Skopec, and Epstein 2017), although in both cases there is very wide variation in payment levels across states.

2.3 Comparing Commercial and Medicare Prices

Many studies compare the prices commercial insurers pay for health care services to the prices that the federal government pays for the same services under traditional Medicare. This literature supports two main conclusions: (1) commercial insurers pay much higher prices than Medicare, particularly for hospital services; and (2) the gap between commercial and Medicare prices for a given service varies widely across and within regions. This section closes by considering *why* commercial prices are higher.

---

[7] Increasing fractions of both Medicare and Medicaid enrollees receive care through managed care plans, which generally negotiate prices with health care providers, like commercial plans. I consider the illuminating experience under the Medicare Advantage program in section 9.

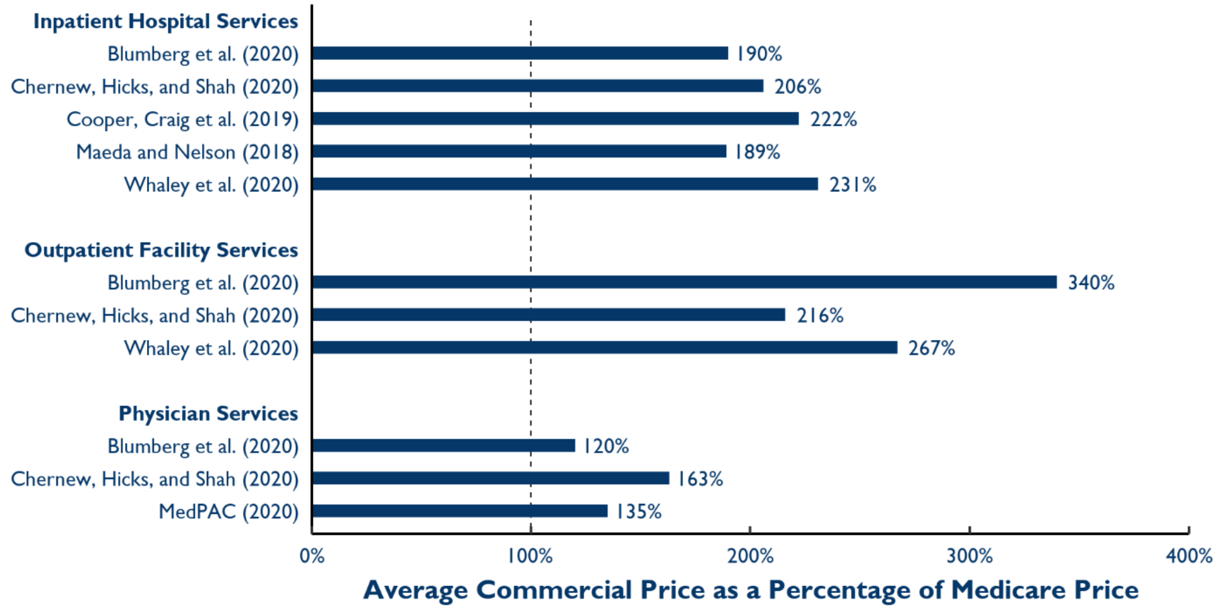
[8] There are exceptions. For example, prices for durable medical equipment are now set partially through competitive bidding, and prices for laboratory services are set based on average prices paid in the private market.

[9] For a more detailed description of Medicare's payment systems, see MedPAC (2020b).

[10] In practice, Medicare rates also incorporate other adjustments. For example, CMS adjusts most payment rates up and down based on measures of the quality and efficiency of the care providers deliver. Teaching hospitals and hospitals that treat high numbers of low-income patients also generally receive higher payment rates. CMS also increasingly uses "alternative payment models," which may link payment to the overall cost and quality of the care patients receive during a year (in the case of accountable care organization models) or a clinical episode (in the case of bundled payment models).

[11] For an overview of Medicaid payment systems, see MACPAC (n.d.).

Figure 2.1: Average Commercial Prices as a Percentage of Medicare Prices



2.3.1 Average Differences Between Commercial and Medicare Prices

Figure 2.1 summarizes several recent studies that used health care claims databases to compare commercial and traditional Medicare prices for broad categories of services. [12] While there are slight differences in methodology across the studies, each study reports an estimate that reflects the ratio of what commercial insurers pay for the relevant services to what Medicare pays for the same services. The claims data sources used in these studies are briefly summarized in Table 2.1.

The differential between commercial and Medicare prices varies substantially by service category. For inpatient hospital services, commercial insurers pay around twice what Medicare pays, on average, although point estimates vary modestly across the studies shown. Differentials for outpatient facility services are generally larger, but estimates are more variable, with commercial prices ranging from more than twice to more than three times Medicare prices depending on the study.[13]

Differentials for physician services are generally smaller, ranging from 20% in the lowest estimate to 63% in the largest estimate, but still substantial. Other analyses that examine specific physician services find that the differential between commercial and Medicare prices varies by type of service, with office visits generally showing small differentials and specialty and imaging services often showing much larger payment differentials than office visits (Pelech 2020; Trish et al. 2017).

There are exceptions to the general pattern of private insurers paying more than Medicare for health care services. Using data from one larger insurer, Trish et al. (2017) report that private insurers historically paid about 25% less than Medicare, on average, for certain common lab services and varieties of durable medical equipment, although this may no longer be true in light of recent changes

[12] The research team responsible for the Whaley et al. (2020) estimates has reported multiple generations of estimates using related methodologies. I include only the most recent estimates in Figure 2.1.

[13] The studies examining outpatient facility services vary in which services they include, which may be part of why these estimates vary. While Chernew, Hicks, and Shah (2020) examine all outpatient facility services, Whaley et al. (2020) examine only hospital services, excluding the roughly 10 percent of services that Chernew, Hicks, and Shah estimate happen in other settings. Blumberg et al. (2020) examine a set of common services that account for about half of total outpatient facility spending.

Table 2.1: Studies Comparing Commercial and Medicare Payment Rates

Study	Data Year	Data Source and Description
Blumberg et al. (2020)	2017-2018	FAIR Health, which holds claims for commercial insurers and third-party administrators with 150 million covered lives.
Chernew, Hicks, and Shah (2020)	2017	IBM Marketscan, which holds claims for employer-sponsored plans with 27 million covered lives.
Cooper, Craig et al. (2019)	2011	Health Care Cost Institute, which holds claims from Aetna, Humana, and United Healthcare.
Maeda and Nelson (2018)	2013	Health Care Cost Institute, which holds claims from Aetna, Humana, and United Healthcare.
MedPAC (2020a)	2018	Preferred provider organization plans offered by a large national insurer.
Whaley et al. (2020)	2018	Convenience sample of self-insured employers, health plans, and state all-payer claims databases.

to Medicare's payment policies in these areas (MedPAC 2019a; 2019b). Even within physician services there are some exceptions. For example, commercial insurers' payment rates for common in-network mental health services were 13-14% lower, on average, than the corresponding Medicare payment rates (Pelech and Hayford 2019), possibly reflecting efforts by commercial insurers to reduce claims spending by making their plans less attractive to people with significant mental health care needs.

The estimates presented above generally reflect prices in employer-sponsored coverage because the authors either entirely exclude claims from individual market plans or use claims databases that include only a small number of such claims. The narrow network insurance products that insurers have tended to offer in the individual market may have allowed them to negotiate lower prices with providers in that market, and there is some qualitative evidence in support of that view (Holahan et al. 2019). Unfortunately, systematic quantitative comparisons of how individual market provider prices compare to those in the employer market and Medicare are not available.

2.3.2 Variation in Prices Across and Within Geographic Areas

The prices paid by commercial insurers vary widely across the country, both in absolute terms and relative to Medicare rates (e.g., Blumberg et al. 2020; Cooper et al. 2019; Chernew, Hicks, and Shah 2020; Maeda and Nelson 2018; Pelech 2020; Whaley et al. 2020). It is, however, uncommon for commercial insurers to pay less than Medicare. Maeda and Nelson (2018) find that commercial insurers pay 144% of what Medicare pays in the metropolitan area at the 10th percentile of the distribution, and 248% of what Medicare pays in the metropolitan area at the 90th percentile of the distribution. For physician services, Blumberg et al. (2020) estimate that that commercial insurers pay 150% of what Medicare pays in the 90th percentile geographic market and about 90% of what Medicare pays even in the 10th percentile geographic market. Area-level prices are positively correlated with measures of provider market concentration (e.g., Cooper et al. 2019; Dunn and Shapiro 2014), suggesting that at least part of this variation reflects differences in competitive conditions across areas.

The prices that commercial insurers pay providers also vary widely *within* a geographic area (Cooper et al. 2019; Maeda and Nelson 2018; Pelech 2020; Whaley et al. 2020). For physician services, Pelech (2020) estimates that, for the specific services she examines, the price commercial insurers pay to the

90th percentile provider is at least 50% higher than the price paid to the 10th percentile providers in at least half of metropolitan areas. For inpatient services, Cooper et al. (2019) report that the within-area standard deviation of prices is about 22% of the mean price; roughly speaking, that level of dispersion implies around a 78% difference between the 10th percentile and the 90th percentile provider in a typical geographic area.[14] This variation may reflect many factors, including differences in providers' costs, reputations, and quality (e.g., D. G. Pope 2009; Garthwaite, Ody, and Starc 2020).

2.3.3 Why Are Commercial Prices So Much Higher?

The large gap between commercial and Medicare prices reflects the different processes used to set them. As noted above, Medicare's prices are set administratively and, by design, roughly approximate providers' cost of delivering services, whereas commercial prices are set via negotiation. In well-functioning markets, commercial insurers would be expected to negotiate prices that, like Medicare's prices, approximate providers' costs, but in practice that clearly does not occur.

One important ingredient in this outcome is that many health care provider markets are highly concentrated. Fulton (2017) estimates that the hospital markets in 90% of metropolitan statistical areas would have been considered highly concentrated under federal merger guidelines in 2016. The situation is better for physician services, but only modestly so; Fulton estimates that 65% of specialty physician markets and 39% of primary care physician markets were highly concentrated in 2016. In practice, markets may be even more concentrated than these estimates would suggest since the relevant geographic market may often be smaller than a metropolitan statistical area.[15]

High market concentration might not give providers that much pricing power if consumers viewed different providers as interchangeable, but that is clearly not the case. Indeed, the value consumers place on broad choice of providers is likely why take-up of narrow network plans has been so limited in the employer market (KFF 2020b) despite the fact that plans with narrower networks frequently offer much lower premiums (e.g., Dafny et al. 2017; Gruber and McKnight 2016).

In an environment where there are few competing providers and many consumers strongly prefer receiving care from *particular* providers, an insurer that excludes any particular provider from its network is likely to see a substantial reduction in demand for its plans because many consumers will view the plan as lacking acceptable substitutes. As a result, insurers are likely to place a high value on reaching agreement with each specific provider, allowing providers to insist on high prices. Indeed, empirical analyses of provider mergers in hospital and physician markets find that they substantially increase prices (e.g., Gaynor and Town 2011; Cooper et al. 2019; Koch and Ulrick 2017), consistent with the view that limited competition is a driver of high commercial prices.

Public policy likely magnifies the pricing power that providers derive from the underlying lack of competition and consumers' preferences from receiving care from particular providers. For example, certain regulatory requirements on health insurers (e.g., network adequacy and any willing provider requirements) limit insurers' leverage in network negotiations. Similarly, the tax exclusion for employer-sponsored coverage may reduce employers' sensitivity to high premiums, which may in turn make insurers more willing to agree to high prices. Additionally, in some cases, market concentration may itself be a consequence of poor public policy, particularly inadequate enforcement of antitrust laws. Gaynor, Mostashari, and Ginsburg (2017) and Gaynor (2020) review the role of these public policy failures in more detail and examine a variety of potential solutions.

---

[14] This calculation converts the coefficient of variation reported by Cooper et al. to a 90/10 ratio under the assumption that the underlying distribution is normal, so it only approximates the actual 90/10 ratio.

[15] This proviso applies to Fulton's estimates of market concentration for hospital and specialty physician services, but not his estimates for primary care services, which use a geographically smaller market definition.

As a final note, it is sometimes argued, particularly by health care providers themselves (e.g., AHIP et al. 2008), that high commercial prices result from "cost shifting," not provider market power. The cost shifting explanation posits that providers demand high prices from commercial plans to compensate for inadequate payment rates under public programs. But this explanation has both theoretical and empirical problems. As a theoretical matter, it supposes that providers would not exploit the pricing power they hold—and thus leave substantial money on the table—if public programs paid more, which seems unlikely. As an empirical matter, recent research has found that reductions in Medicare's prices tend to *reduce* the prices paid by commercial insurances, the opposite of what would be expected under a cost-shifting explanation of high commercial prices (Clemens and Gottlieb 2016; White 2013).

3 Framework for Policy Analysis

The remainder of this paper analyzes how three policy tools—capping what providers can collect for out-of-network care, regulating both in-network and out-of-network prices, or creating a public option—would affect the prices paid for health care services in commercial insurance markets, as well as other outcomes of interest to policymakers, particularly enrollee premiums. To gain insight on the potential effects of these policies, this paper develops economic models that combine economic theory with available empirical evidence. The main text presents the main insights from these models, and appendices present the models in their full mathematical detail.

In the interest of tractability, I limit the scope of this analysis in two important ways.[16] First, I do not consider effects these policies might have on the structure of the health care delivery system, including how many providers offer health care services and how those providers deliver care. In reality, changing provider prices would likely spur delivery system changes over the long run, particularly if implemented in the employer market in addition to the individual market.

These types of delivery system changes could, in turn, cause price changes that are not captured in this analysis. For example, if revenue pressure created by these policies caused providers to reduce their costs of delivering care, that could reinforce any downward pressure on prices generated by these policies. On the other hand, if lower prices caused some providers to shut down, thereby reducing competition, that could create countervailing upward pressure on prices, although the scope for this type of effect would be more limited for policies that placed a tight upper limit on prices.

Perhaps more importantly, delivery system changes could also have consequences for the quantity and quality of the services providers deliver, as well as the real resources consumed by the health sector. Understanding these effects would be necessary to answer the normative question of whether policymakers *should* use the policy tools considered in this paper and, if so, how aggressively. Expanding the analysis to account for these effects is thus an important area for future work.

The second way I limit the scope of this analysis is that I generally take as given commercial insurers' networks, as well as enrollees' preferences for different types of networks. This approach is born largely of necessity, as modeling insurer network determination is difficult (e.g., Shepard 2016; Ho and Lee 2019). However, section 7 offers an informal discussion of how the policies in this paper might change plan networks, as well as how changes in plan networks might alter the conclusions in the rest of the paper. Further analyzing effects related to plan networks is a useful area for future work.

[16] I also confine my attention to polices under which price limits (or the prices paid by a public option) exceed providers' marginal cost of delivering services so that it would be in providers' interest to serve patients. As a practical matter, this is not a particularly important limitation. As noted above, even Medicare rates appear to exceed providers' marginal costs.

4 Capping Out-of-Network Prices

One commonly discussed approach to regulating provider prices is limiting how much providers can collect for out-of-network services (e.g., Murray 2013; Berenson et al. 2015; Song 2017; Chernew, Pany, and Frank 2019). Such a policy could directly reduce amounts paid for out-of-network care and limit patients' exposure to large medical bills if they inadvertently see an out-of-network provider.

But importantly, capping out-of-network prices could also reduce in-network prices by reducing the leverage providers derive from the ability to collect high prices for out-of-network care. In practice, the overwhelming majority of care is delivered in-network (Pelech 2020; Song et al. 2020; Chernew, Dafny, and Pany 2020), and a majority of care is delivered in-network even in emergency situations (Garmon and Chartock 2017; Cooper, Scott Morton, and Shekita 2020). Thus, a cap's effects on in-network prices may be much more important than its effect on out-of-network prices.

For this reason, this section focuses on how introducing an out-of-network cap would affect in-network prices. I start by specifying the features of the out-of-network cap policy I analyze in this paper and briefly discuss how the policy I consider compares to those considered elsewhere. I then describe the model I use to assess the effects of an out-of-network cap, the full details of which are presented in Appendix A, and use that framework to quantify the potential effects of an out-of-network cap.

In brief, I conclude that capping out-of-network prices would reduce in-network negotiated prices in instances where providers cannot credibly threaten to turn away out-of-network patients, particularly emergency situations. But for most other services, an out-of-network cap would likely have limited ability to reduce negotiated prices since providers would retain the ability to turn away out-of-network patients and thus retain most of the bargaining leverage they have today. In these cases, an out-of-network cap might also have the unintended consequence of making it harder to access out-of-network care. I also show that a policy that paired an out-of-network cap with a lower limit on what insurers must pay for out-of-network services could increase, rather than reduce, negotiated prices.

4.1 Design of an Out-of-Network Cap

An out-of-network cap limits what providers can collect for services delivered in the absence of a contract between the provider and the patient's insurer. Such caps generally limit the total amount providers can collect for such services from all sources, including the patient and the patient's insurer.

Policymakers wishing to implement an out-of-network cap would need to define the types of health care services the cap would apply to, which insurance markets it would apply in, and how price limits themselves would be set. Below, I briefly discuss the options policymakers would have along each dimension and specify the characteristics of the form of out-of-network cap I analyze in this paper:

- **Scope of services included:** A cap could apply to some services but not others. For the purposes of this analysis, I consider an out-of-network cap that applies to all health care services, consistent with the focus of this paper on strategies to broadly reduce provider prices. However, some out-of-network cap proposals encompass a narrower set of services. For example, some proposals encompass only emergency services (e.g., Melnick and Fonkych 2020b), while many recent Congressional proposals aimed at addressing "surprise billing" encompass only emergency services and physician services delivered at an in-network facility.

- **Insurance markets included:** An out-of-network cap could be applied broadly or limited to specific insurance markets. Some proposals to introduce an out-of-network cap only do so for people with individual market coverage (e.g., Song 2017), while others envision imposing a cap in employer coverage too (e.g., Murray 2013; Chernew, Pany, and Frank 2019). For this analysis, I do not specify where the out-of-network cap would apply since an out-of-network cap would likely function similarly in any market in which it applied.

- **Methodology for setting price limits:** To implement a price cap, policymakers would need to: (1) define the units of care to which price limits applied; and (2) specify a methodology for determining the price limit for each unit of care. In general, I assume that an out-of-network cap would apply at the service level and use service definitions similar to those embodied in Medicare's various fee schedules. Given the nature of out-of-network care, applying the cap at anything other than the service level (e.g., applying the cap to bundles of services delivered by multiple different providers) might not be administratively viable.

  Policymakers could set price limits for each such service in many ways. One commonly discussed approach is to set each limit as a multiple of the price traditional Medicare pays for the same service (e.g., Murray 2013; Song 2017). Alternatively, limits could be set based on negotiated commercial prices observed before the cap took effect (e.g., Adler, Fiedler, Ginsburg, Hall, et al. 2019; Chernew, Pany, and Frank 2019); several recent Congressional proposals to address surprise billing have taken this approach. For the purposes of this analysis, I leave the methodology for setting price limits largely unspecified, as the details of how they are set are largely unimportant to the analysis that follows. I do, however, assume that price limits are set at the level of specific services and that neither insurers nor providers can influence the applicable price limits through their contracting decisions.[17]

Policymakers might consider placing *both* an upper limit on what providers can collect for out-of-network care *and* a lower limit on what insurers must pay for out-of-network care (and how much coverage insurers must offer for that care). Most of this section focuses on policies that would only cap out of-network prices, but section 4.4 discusses policies that would also place requirements on how much coverage insurers must offer for out-of-network care.

I note that federal law already places these types of requirements on insurers in the context of emergency care, so implementing an out-of-network cap would, in effect, bring about this type of "cap and floor" policy in the context of emergency care. The analysis in section 4.4 shows that the distinction between a pure out-of-network cap and a "cap and floor" policy is of limited importance in the context of emergency care but could be considerably more important in the context of other types of care.

4.2 Economic Model of the Effects of an Out-of-Network Cap

To analyze the effect of introducing an out-of-network cap, I develop a stylized model of provider-insurer network negotiations. In the model, a provider and insurer bargain over the price the provider will receive for its services and the level of coverage the insurer will offer for those services. If network negotiations break down, then the provider unilaterally sets its price (or "charge"),[18] and the insurer unilaterally sets its level of out-of-network coverage. In either case, enrollees decide how much of the provider's services to use based on the provider's price and the insurer's level of coverage.

---

[17] Under some recent Congressional proposals to address surprise billing, price limits would have been set based on typical in-network rates and would have been updated as in-network rates changed over time (e.g., Adler, Fiedler, Ginsburg, and Linke Young 2019a).This type of approach would have complicated effects on provider-insurer negotiations because insurers and providers could affect the price limits that applied in the future through their current contracting decisions. These dynamics would make an out-of-network cap policy much harder to analyze.

[18] As discussed in section 2, providers are often unable to collect their full charges when they deliver out-of-network care. Thus, while I use the term "charge" for simplicity, this amount is likely better understood to be the provider's expected out-of-network collection, which is determined by both its actual charge and other factors.

Given this landscape, the parties are assumed to negotiate agreements in which each party gains a meaningful amount from a network agreement, measured relative to outcomes with no agreement.[19] Economists refer to this type of model as a "Nash bargaining" model, and it has recently become the workhorse approach for modeling how health care providers and private insurers negotiate network agreements and prices (e.g., Gowrisankaran, Nevo, and Town 2015; Clemens and Gottlieb 2016; Ho and Lee 2017; Cooper, Scott Morton, and Shekita 2020).[20] Crucially, this modeling approach implies that the prices providers and insurers negotiate depend strongly on what they expect to happen absent an agreement, a point that has also been emphasized in other recent work modeling provider-insurer bargaining (e.g., Cooper, Scott Morton, and Shekita 2020; Prager and Tilipman 2020).

This section summarizes the conclusions that emerge from this model, as well as the logic underlying them, with full details in Appendix A. The model implies that the effects of an out-of-network cap would depend strongly on whether a provider could credibly threaten to turn away an insurer's enrollees if the provider and insurer failed to reach a network agreement. Thus, I first consider cases where providers *cannot* turn away patients, and then consider cases where they can do so.

4.2.1 Effects When Providers Cannot Credibly Threaten to Turn Away Patients

In some cases, providers will be not be able to credibly threaten to turn away an insurer's enrollees if the provider and insurer fail to reach a network agreement. Notably, under the Emergency Medical Treatment and Labor Act (EMTALA), hospitals must treat people seeking emergency services regardless of their insurance status or ability to pay. (There may also be other reasons providers may be unable to credibly threaten to turn way out-of-network patients, a point I return to in section 4.3.)

In this scenario, implementing an out-of-network cap would reduce in-network prices by giving the insurer a more attractive alternative to a negotiated agreement. With an out-of-network cap in place, the insurer always has the option to break off negotiations and let its enrollees access the provider's services on an out-of-network basis at the capped price. If the insurer wishes, it can even treat those services as in-network for cost-sharing purposes, making the lack of a network agreement largely invisible to enrollees. A network agreement at a price above the cap is thus worse for the insurer than no agreement at all, allowing the insurer to insist on a negotiated price at the capped price or below.

This discussion makes clear that the negotiated prices that emerge under an out-of-network cap would depend on where the cap was set. The gold line in Figure 4.1 illustrates the qualitative relationship between the level of the cap and the level of negotiated prices that emerges from the formal model presented in Appendix A. Two features of this relationship are worth noting.

First, the negotiated price is always *strictly* below the level of the out-of-network cap (except when the cap exactly equals the provider's marginal cost of delivering services). This is because, even with a cap in place, it will generally be optimal for an insurer to offer something short of full in-network coverage for out-of-network services.[21] Signing a network agreement with an insurer thus typically increases a provider's volume, which the insurer will only agree to if the provider accepts a price below the cap.

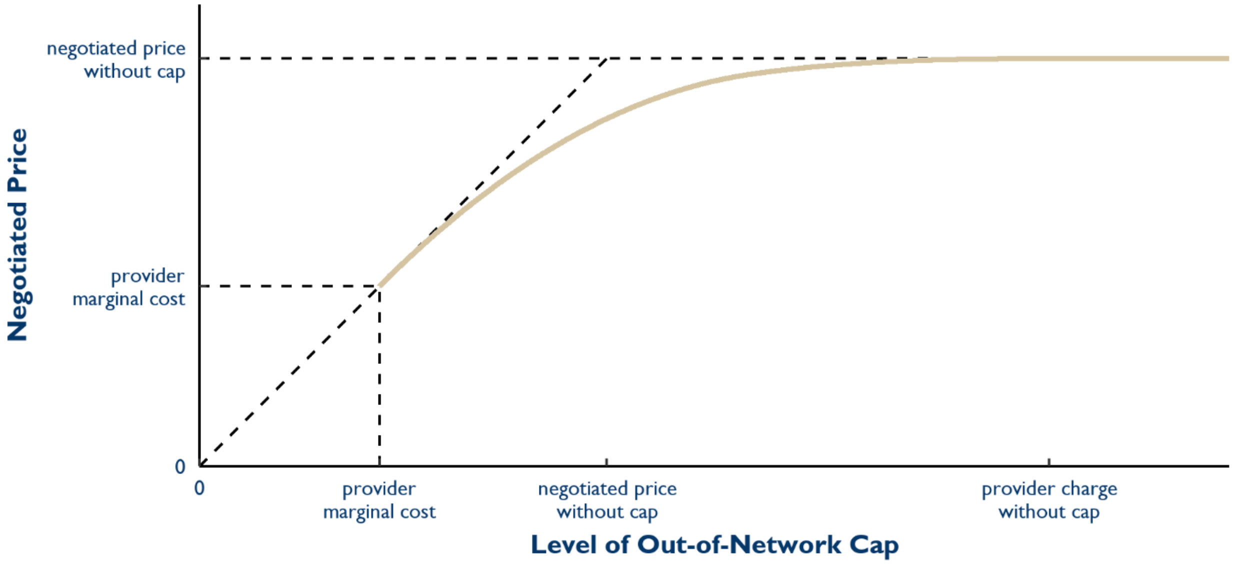
---

[19] This split is sometimes assumed to be exactly 50/50, but the model used here allows for an arbitrary split.

[20] This approach is intuitive. If a provider offers terms under which the insurer gains little from an agreement, then the insurer is likely to reject that offer; the insurer loses little by doing so and can hope to secure a better deal later. For similar reasons, the provider is likely to reject offers slanted toward the insurer. Thus, the parties are only likely to agree when the provider is paid a price at which both parties gain substantially from an agreement. There is a long theoretical literature on when Nash bargaining is a reasonable modeling approach. Osborne and Rubenstein (1994) provide a textbook introduction.

[21] Insurers may provide less than full-in network coverage for two reasons. First, the insurer may wish to discourage its enrollees from seeking high-priced care. Second, the insurer may strategically offer stingy out-of-network coverage to make failing to reach agreement unappealing to the provider. Both reasons are explored in more detail in Appendix A.

Figure 4.1: Negotiated Prices Under an Out-of-Network Cap When the Provider Cannot Reject Out-of-Network Patients



USC Schaeffer BROOKINGS

Second, an out-of-network cap will reduce negotiated prices when it is set below the *charge* the provider would have set in the absence of the policy—even if it is set above the price the provider and insurer would negotiate without a cap. This is because such a cap worsens the provider's options in the absence of an agreement and, thus, weakens its bargaining position. However, a cap set only modestly below the charge the provider would set without a cap will often cause only small reductions in the negotiated price, the scenario illustrated in Figure 4.1.[22] Indeed, if the provider chooses its charge with the goal of putting itself in the strongest possible bargaining position, then it will set its pre-policy charge at a level where an incremental increase (or decrease) in that charge has no effect on its bargaining position. Correspondingly, forcing the provider to slightly reduce its charge will have little effect on its bargaining position, as will any adjustments the insurer makes in response.

More generally, the precise level of a provider's charge can only meaningfully affect the provider's bargaining position if substantial out-of-network care is delivered. But when the provider sets a high charge, out-of-network volume will typically be small (with the possible exception of emergency and "surprise billing" situations) since it will generally be in the insurer's interest to offer stingy out-of-network coverage. Correspondingly, forcing a provider that currently sets a high charge to slightly reduce that charge will have only a small effect on the negotiated price. This will remain true until the charge falls low enough that the insurer wishes to offer reasonably generous out-of-network coverage.

4.2.2 Effects When Providers Can Credibly Threaten to Turn Away Patients

In the preceding section, an out-of-network cap reduced negotiated prices because the insurer could give its enrollees access to the provider's services at the capped price even in the absence of a network agreement. But if the provider can credibly threaten to turn away patients in the absence of a network agreement, then the provider can keep the insurer from doing this, and the scope for an out-of-network cap to reduce negotiated prices is much smaller—and potentially negligible.

---

[22] As discussed in Appendix A, under certain conditions, an out-of-network cap set just below the charge the provider would set without a cap actually raise negotiated prices. In practice, however, the relevant conditions are unlikely to hold in practice, and any real-world cap is likely to be set low enough to avoid this possibility.

Table 4.1: Upper Bound on Maximum Possible Reduction in Negotiated Prices Under an Out-of-Network Cap When Providers Can Reject Patients

Share of Volume Retained in Absence of Network Agreement, Pre-Policy Status Quo	Ratio of Price for Out-of-Network Care to Negotiated Price, Pre-Policy Status Quo		
	1.25	1.5	2
1 percent	< 1%	1%	1%
5 percent	1%	3%	5%
10 percent	3%	6%	11%
25 percent	8%	17%	33%

Note: Proposition A4 in Appendix A provides a formal statement of the upper bound.

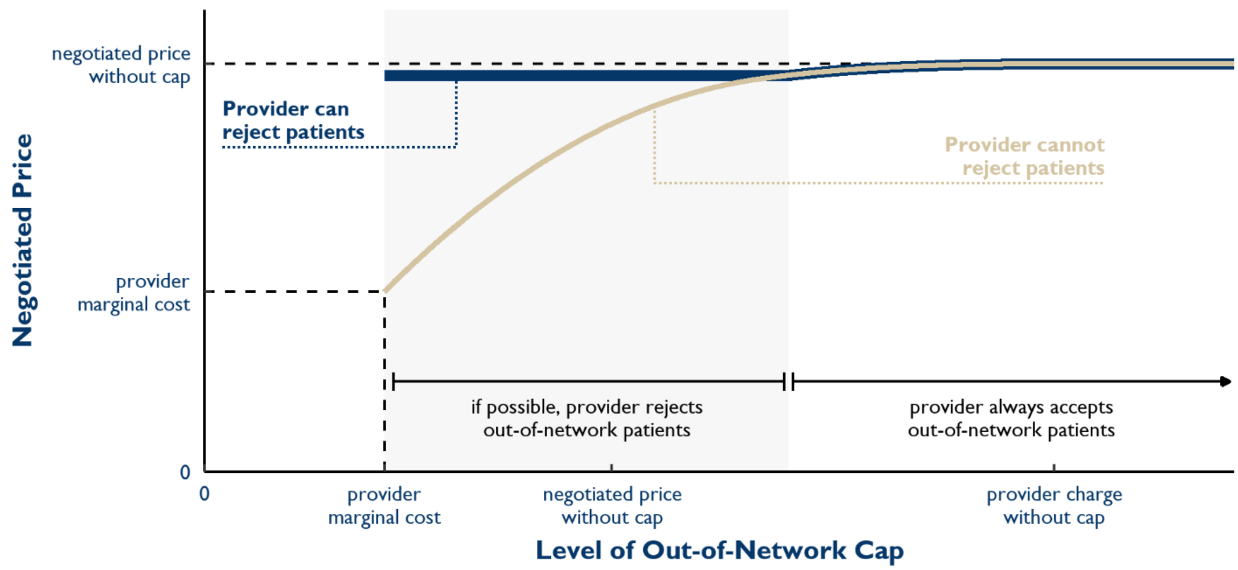
In this scenario, the scope for an out-of-network cap to reduce negotiated prices depends on how much volume the provider could have attracted in the absence of a network agreement—and at what price—under the pre-policy status quo. If the provider would have received little volume in the absence of a network agreement under the pre-policy status quo, then threatening to turn away the insurer's enrollees in the absence of a network agreement under an out-of-network cap allows the provider to almost exactly reproduce its pre-policy bargaining position, so an out-of-network cap has little scope to reduce negotiated prices. By contrast, if the provider would have received considerable volume at a high price in the absence of a network agreement under the pre-policy status quo, then threatening to turn away the insurer's enrollees puts the provider in a much weaker bargaining position than under the pre-policy status quo, and an out-of-network cap will have more scope to reduce prices.

The formal model presented in Appendix A can be used to derive an upper bound on the maximum possible reduction in negotiated prices achievable with an out-of-network cap. Consistent with the discussion presented in the preceding paragraph, that bound depends on two parameters, both measured under the pre-policy status quo: (1) the share of the volume associated with a particular insurer that a provider can retain if it exits the insurer's network; and (2) the ratio of the price the provider receives for out-of-network care to the negotiated in-network price.

Table 4.1 reports this upper bound for a range of parameter values; it should be emphasized that these are upper bounds, and the actual potential reduction in negotiated prices under an out-of-network cap may, in fact, be meaningfully smaller. In general, the potential effectiveness of an out-of-network cap is larger when the provider can retain more volume or charge a higher price when out-of-network under the status quo. In section 4.3, I examine what parameter values are most plausible in practice and, thus, which cells of Table 4.1 are most relevant to predicting the effects of an out-of-network cap.

Naturally, whether it is actually in the provider's interest to turn away the insurer's enrollees in the absence of a network agreement depends on the level of the cap. Figure 4.2 illustrates the qualitative relationship between the level of the cap and the provider's decision about whether to accept out-of-network patients, again using the formal model in Appendix A. For an out-of-network cap modestly below the provider's pre-policy charge, the profits the provider earns from treating out-of-network patients (and the corresponding costs incurred by the insurer and its enrollees) are large enough that accepting out-of-network patients at the capped rate puts the provider in the strongest bargaining position. But once the out-of-network cap falls below some critical level, the profits the provider earns on out-of-network patients (and the corresponding costs incurred by the insurer and its enrollees) become small enough that turning away out-of-network patients puts the provider in a stronger bargaining position than accepting them. Beyond this point, the level of the out-of-network cap becomes irrelevant and negotiated prices do not change as the out-of-network cap tightens further.

Figure 4.2: Negotiated Prices Under an Out-of-Network Cap



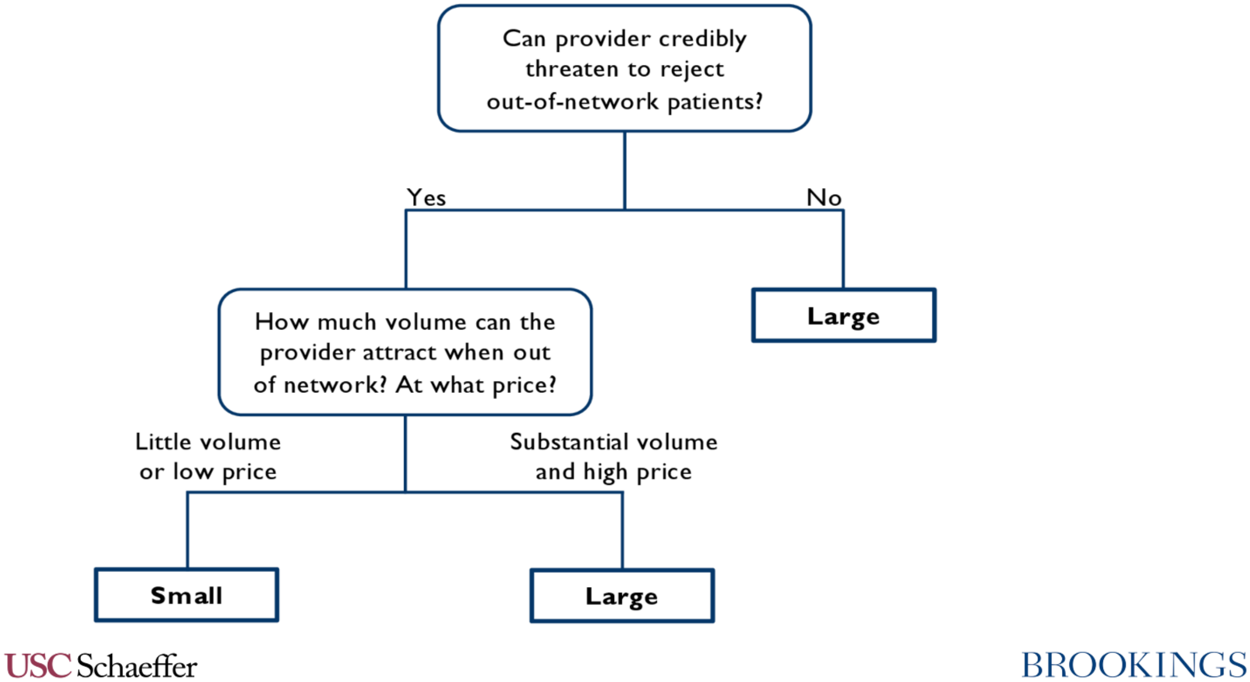
Importantly, this discussion implies that capping out-of-network prices may have the unintended consequence of making it harder for patients to obtain out-of-network care in some cases. Indeed, a provider's threat to refuse to treat out-of-network enrollees is only likely to be credible if the provider actually follows through on this threat when it is relevant. A provider likely could continue to accept out-of-network patients in some circumstances that are unlikely to meaningfully affect its bargaining position vis-à-vis the insurer. For example, providers could likely continue to deliver non-network care to uninsured patients or to patients covered by insurers that the provider does not expect to contract with in the future (e.g., patients traveling away from home). But providers would likely need to turn away out-of-network patients in many other circumstances.

4.3 Quantifying the Effects of an Out-of-Network Cap

Building on the preceding analysis, I now seek to quantify the breadth and depth of the effects of an out-of-network cap on negotiated prices. Following the schematic laid out in Figure 4.3, I first seek to understand when providers cannot credibly threaten to turn away out-of-network patients and, thus, when an out-of-network cap is likely to be highly effective in reducing negotiated prices. I then seek to understand the likely effects of an out-of-network cap in situations where providers *can* credibly threaten to turn away out-of-network patients by drawing on (fragmentary) evidence on how much volume a provider can attract when out of network—and at what price—under the status quo.

In brief, I conclude that while providers are legally barred from turning away patients in emergency situations, they are likely to be able to credibly threaten to reject out-of-network patients in most non-emergency situations, which account for a large majority of health care spending. Furthermore, most providers' ability to attract out-of-network volume in non-emergency situations is likely limited, suggesting that an out-of-network cap will have limited scope to affect prices in these situations.

Figure 4.3: Scope for Out-of-Network Cap to Affect Negotiated Prices



4.3.1 When Can Providers Credibly Threaten to Reject Out-of-Network Patients?

While it is clearly illegal for a hospital to turn away patients seeking emergency services, there are generally no legal barriers to turning away patients in non-emergency settings. There could, however, be other obstacles. Notably, turning away patients is not in the hospital's short-run financial interest and could harm its reputation. This section considers these obstacles and concludes that they likely would not keep providers from credibly threatening to turn away out-of-network patients in non-emergency settings. I then use the Medical Expenditure Panel Survey to estimate the share of health care spending in commercial coverage that occurs in emergency situations.

Tension between providers' long-run and short-run interests. While threatening to turn away an insurer's enrollees in the absence of a network agreement improves a provider's long-run bargaining position vis-à-vis an insurer, following through on that threat can make the provider worse off in the short-run. In particular, as long as the out-of-network cap is above the provider's marginal cost of treating patients, treating out-of-network patients is profitable for the provider. This fact could cause the insurer to suspect that the provider will renege on its threat to turn away patients if negotiations do in fact break down, rendering the provider's threat to turn away patients ineffective.

However, providers negotiate with insurers repeatedly. Providers are likely to recognize that failing to follow through on a threat to turn away an insurer's enrollees would cause that threat to be disbelieved in the future as well, greatly harming its long-run bargaining position. The theoretical literature on these types of bargaining interactions, which is briefly discussed in Appendix A, implies that reputational considerations can easily be enough to induce providers to follow through on these types of threats, making providers' threats credible from the perspective of the insurer.[23]

[23] It seems particularly likely that providers will be able to make their threats credible when the out-of-network cap is set close to the provider's marginal cost of delivering services. In such a scenario, the short-run profits a provider accrues by treating an insurer's enrollees in the absence of a network agreement will be small relative to the potential gains.

As a practical matter, it is clear that providers frequently incur short-run costs in an effort to strengthen their long-run bargaining position. In particular, providers commonly threaten to leave insurers' networks if they are unable to secure acceptable contract terms and follow through on these threats when necessary (e.g., Anderson 2017; Baca 2018; Itkowitz 2017; Rice 2017). Indeed, providers' willingness to go out of network when insurers refuse to offer acceptable contract terms is likely essential to providers' ability to extract high prices from insurers under the status quo.

Social disapproval and similar considerations. A provider might also worry that turning away out-of-network patients would harm its public image or conflict with its mission. However, as just discussed, providers commonly threaten to leave insurers' networks and often follow through on those threats under the status quo, despite the fact that going out of network has the practical effect of exposing the insurer's enrollees to the provider's high charges and severely limiting enrollees' ability to access the provider's services. It is thus difficult to see why declining to serve out-of-network patients would be meaningfully more distasteful to providers than leaving an insurer's network.

Additionally, if social disapproval kept providers from *explicitly* turning away out-of-network patients, providers might be able to find other strategies that would have similar practical effects but were more socially acceptable. For example, an out-of-network provider could simply tell patients that it does not "accept" a particular plan without explaining that patients may be able to access its services under an out-of-network benefit or supporting them in doing so. An aggressive version of this approach might require patients to pay in full before receiving services (or, in cases where the price of the encounter could not be determined in advance, to make a substantial deposit based on the encounter's expected cost). This strategy could be particularly effective for inpatient care. In 2017, the average negotiated price for an inpatient stay in commercial coverage was almost $21,000 (HCCI 2019). Making an upfront payment of this size would likely be a significant barrier to accessing the provider's care for many patients since many families have limited liquid savings (Bhutta and Dettling 2018).

Social disapproval would likely be a more important constraint in some specific circumstances. One important example is out-of-network inpatient care that follows a medical emergency. Once a patient has been stabilized, a hospital is legally permitted under EMTALA to transfer a patient to an in-network facility. Insisting on a transfer in these cases would strengthen the provider's bargaining position in the same way as rejecting elective out-of-network patients. However, these patients may be particularly sympathetic, and providers might be reluctant to take this approach in these cases.

Share of spending that occurs in emergency situations. The preceding discussion implies that providers could credibly threaten to turn away out-of-network patients in most non-emergency situations, but not in emergency situations. I thus use the Medical Expenditure Panel Survey to estimate what share of commercial spending occurs in emergency situations.

In detail, I estimate the share of spending that is on: (1) emergency department care; or (2) inpatient care delivered to a patient admitted through the emergency department. Importantly, this definition *includes* post-stabilization inpatient care delivered to people admitted through the emergency department. [24] Per the discussion above, while EMTALA permits hospitals to decline to deliver this care, it seems unlikely that providers will be able to credibly threaten to do so in practice. If this

[24] On the other hand, I do not include deliveries. While EMTALA bars hospitals from turning away women in labor, the access guarantees under EMTALA do not extend to scheduled deliveries or non-emergency prenatal hospital care, and hospitals have some scope to transfer women who present early in labor to another hospital. Particularly since most women are likely to want to plan to deliver at a hospital that can meet their full range of potential needs, it is most reasonable to treat hospitals as functionally being able to turn away women seeking to deliver at that hospital. In any case, even including all deliveries would increase the estimates reported in Table 4.2 by only around one-quarter.

Table 4.2: Spending on Services Delivered in Emergency Encounters by Commercially Insured Patients, 2014-2018

Type of Emergency Encounter	Emergency Spending as a Percentage of	
	All Health Care Spending	Hospital Spending
No inpatient stay	5	12
With inpatient stay	8	22
All emergency encounters	13	34

Source: Medical Expenditure Panel Survey, Household Component, 2014-2018; author's calculations.

Methodological note: Sample limited to people under age 65 with private coverage in all months in which they are in the sample frame. In the first column, the numerator is facility and physician spending during the specified type of encounter, and the denominator is all health care expenditures. Because of data limitations, emergency room physician spending associated with encounters that result in an inpatient stay may erroneously be categorized as "no inpatient stay" spending. In the second column, the numerator is facility spending during the encounter and the denominator is all inpatient and hospital outpatient spending. Estimated shares were calculated by computing separate estimates for each year 2014 through 2018 and then taking the simple average of those estimates.

assumption is incorrect, then the share of services for which providers could not credibly threaten to turn away out-of-network patients would be smaller than shown here, perhaps considerably so.

Table 4.2 reports that about 13% of all health care spending by non-elderly people with commercial insurance occurs in connection with emergency encounters, suggesting that out-of-network caps can reduce prices for only a modest portion of health care spending.[25] Table 1 does suggest that out-of-network caps could have a somewhat larger effect on prices in the hospital sector, as slightly more than one-third of hospital spending occurs in emergency situations. This is notable since concerns that providers wield inappropriate market power are most acute with respect to the hospital sector.

4.3.2 How Effective is a Cap When Providers Can Reject Patients?

To assess the potential effects of an out-of-network cap in cases where providers *can* credibly threaten to turn away patients in the absence of a network agreement, I now consider how attractive being out of network is for a provider under the status quo. I focus on non-emergency situations since status quo out-of-network outcomes are only relevant to estimating the effects of an out-of-network cap when providers can credibly threaten to turn away out-of-network patients.

Following the discussion in section 4.2.2, I focus on two specific parameters: (1) the share of the volume associated with a particular insurer that the provider retains if it exits the insurer's network; and (2) the ratio of the price the provider receives for out-of-network care to the negotiated price. I consider each parameter in turn and then, consistent with the discussion in section 4.2.2, use them to derive on upper bound on the effect of an out-of-network cap on negotiated prices.

[25] A caveat to this conclusion is that some of hospitals' market power with respect to emergency care might be expressed in the form of higher prices for non-emergency care (e.g., C. Pope 2019). This could occur, for example, because hospitals and insurers often write contracts that specify prices as a constant multiple of Medicare's prices or the hospital's chargemaster across all service types (Cooper et al. 2019). If this is the case *and* hospitals enjoy relatively more market power with respect to services delivered in emergency situations, then the payments *attributed* to services delivered in emergency situations could understate the actual revenue that hospitals are able to extract by virtue of delivering those services, and the estimates in Table 4.2 could understate the scope of the effects of an out-of-network cap. However, it is unclear whether hospitals enjoy more market power in emergency or non-emergency situations. Patients are sometimes unable to choose a hospital in emergency situations, which likely increases hospitals' pricing power over these services (Melnick and Fonkych 2020a). But EMTALA guarantees access to hospitals' emergency services, and hospitals' tools for collecting unpaid bills from patients are imperfect (LeCuyer and Singhal 2007; Mahoney 2015), which may attenuate hospitals' pricing power in this context.

Out-of-network volume retention. A priori, it seems likely that most providers' ability to attract non-emergency out-of-network volume is small. As discussed in section 2.1, commercial plans generally offer much less coverage for out-of-network services than for in-network services (if they offer any out-of-network coverage at all) so patients have strong incentives to seek care in-network.

Unfortunately, there is little research examining how much non-emergency volume a typical in-network provider can retain if it goes out of network.[26] One notable exception is Melnick and Fonkych (2020a), who examine decisions by five California hospitals to cancel all of their commercial network agreements in the mid-2000s.[27] The authors find that these hospitals retained most of their commercial emergency volume. On the other hand, their estimates imply that the hospitals retained at most 8% of their commercial non-emergency inpatient volume.[28]

Out-of-network collections. The evidence on what providers can collect for out-of-network care is better, albeit still imperfect. The best-case scenario from a provider's perspective is that it can collect its full charges from out-of-network patients. The evidence discussed in section 2.1 suggests that both hospitals and physicians set charges that are around twice their negotiated prices, on average. As discussed there, providers likely cannot collect their full charges from out-of-network patients, so the true figure is likely lower, perhaps much lower. Nevertheless, this estimate offers a useful upper bound.

Combining the estimates. The preceding estimates, fragmentary though they may be, suggest that it is reasonable to assume that a provider that leaves an insurer's network under the status quo can expect to retain less than 10% of its volume with that insurer and be paid at most twice what it receives in-network for the volume it retains. Combining these estimates with the bounds presented in Table 4.1 implies that an out-of-network cap could reduce negotiated prices for most non-emergency services by, at most, 11%. Because the parameter values used in this calculation are conservative and the values reported in Table 4.1 are bounds, not point estimates, the true value is most likely lower. It is also important to note that this bound would not be reached unless the cap was set low enough to push all providers to the point of turning away out-of-network patients.

The special case of ancillary physician services. While an out-of-network cap likely has little scope to reduce prices for most non-emergency services, services delivered by ancillary physicians (radiologists, anesthesiologists, pathologists, or assistant surgeons) during a hospitalization may be an exception. As highlighted by recent debates over "surprise billing" (e.g., Adler, Fiedler, Ginsburg, Hall, et al. 2019; Cooper, Scott Morton, and Shekita 2020), patients generally play no role in selecting these physicians, so they are able to retain substantial volume even when out of network.

Consistent with the discussion in in section 4.2.2 and the analysis of Cooper, Scott Morton, and Shekita (2020), this implies that out-of-network caps have much greater potential to reduce in-network prices for these services relative to other non-emergency services. A caveat, however, is that reducing in-

[26] Importantly, several recent studies have estimated out-of-network spending as a share of overall commercial spending (Pelech 2020; Song et al. 2020; Chernew, Dafny, and Pany 2020). These studies conclude that this share is quite small. However, these estimates do not speak directly to the question of interest since commercial networks are relatively broad.

[27] Shepard (2016) estimates the change in utilization of Partners Health Care System by enrollees of a large Commonwealth Care insurer when that insurer dropped Partners from its network. Shepard's estimates are broadly consistent with the Melnick and Fonkych estimates, but they do not disaggregate emergency and non-emergency utilization, and, as Shepard notes, reflect a combination of changes in the insurer's enrollment mix and changes in utilization patterns holding enrollment mix fixed. Only the latter change is of interest here.

[28] In greater detail, Melnick and Fonkych report that commercial inpatient admissions not through the ED accounted for about 50% of commercial inpatient volume before the hospitals cancelled their contracts, but less than 10% after cancellation. They also report that total commercial volume, including both inpatient and outpatient volume, fell to 39% of its pre-cancellation level in the years following contract cancellation. Under the plausible assumption that inpatient volume fell at least as much as total volume, this implies that post-cancellation non-ED inpatient volume was at most 8% (=[0.1*0.39]/0.5) of its pre-cancellation level at these hospitals.

network prices paid for these facility-based services could increase the amount facilities need to pay these physicians in order to ensure adequate staffing. That could, in turn, cause offsetting increases in the prices of facility services that partially or fully offset the reduction in prices for physician services.

Spending on ancillary physician services accounts for a modest, but not trivial, portion of commercial spending. Duffy et al. (2020) estimate that radiology, anesthesiology, and pathology professional services account for 6-7% of commercial plan spending, while Cooper, Nguyen et al. (2020) estimate that the same specialties plus assistant surgery services account for around 9% of plan spending. Importantly, some of this spending occurs in outpatient settings where these physicians' ability to retain out-of-network volume is likely more limited, so these estimates overstate the amount of spending where an out-of-network cap is likely to be an effective tool to reduce prices. Some also occurs in emergency situations and, thus, was already included in the estimates presented in Table 4.2.

4.4 Effect of Placing Both a Cap and a Floor on Out-of-Network Prices

The analysis above focused on policies that would place an upper limit on what providers can collect for out-of-network services but would *not* place a lower limit on what insurers must pay (and how much coverage they must offer) for those services. This focus is consistent with many proposals to broadly regulate out-of-network prices in private insurance markets (e.g., Murray 2013; Berenson et al. 2015; Song 2017; Chernew, Pany, and Frank 2019; Chernew, Dafny, and Pany 2020).

However, many recent state and federal proposals aimed at addressing surprise billing (e.g., Adler, Fiedler, Ginsburg, Hall, et al. 2019; Adler et al. 2019; Adler, Fiedler, Ginsburg, and Linke Young 2019a; 2019b) place a lower limit on how much insurers must pay (and how much coverage they must offer) for out-of-network care in addition to limiting what providers can charge for out-of-network care. Furthermore, as noted earlier, federal law already places a lower limit on what insurers must pay (and how much coverage they must offer) for out-of-network emergency care, so implementing an out-of-network cap would, in effect, bring about this type of "cap and floor" policy for emergency care.

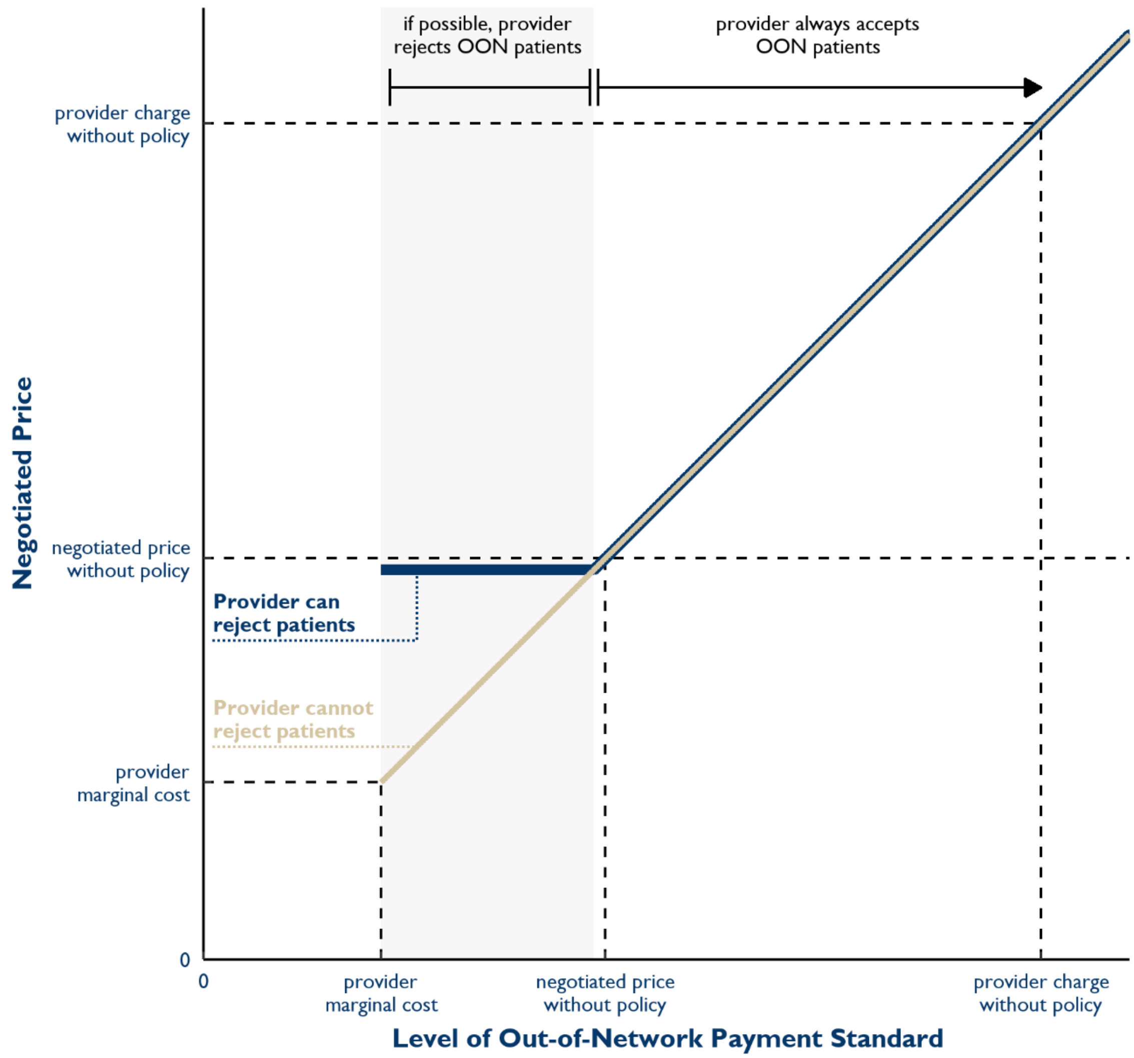
This subsection briefly considers a policy in this vein. Specifically, I consider a policy that would place an upper limit on what providers could collect for out-of-network care, but that would also require insurers to pay no less than that amount and impose no more than typical in-network cost-sharing when enrollees use out-of-network services.[29] Once again, Appendix A presents a formal model of such a policy and the main text summarizes the main conclusions that emerge from that modeling.

In general, this type of "cap and floor" policy is likely to lead to higher negotiated prices than a "cap only" policy. Indeed, a "cap and floor" policy can actually *increase* negotiated prices, rather than reduce them, if the payment standard is high enough. As with a simple out-of-network cap, the effect of the "cap and floor" policy is likely to differ depending on whether the provider can credibly threaten to turn away out-of-network patients, so I consider the two cases separately.

Providers cannot credibly threaten to turn away patients. When providers cannot credibly threaten to turn away out of-network patients, the negotiated price is likely to be very close to the payment standard, as depicted by the gold line in Figure 4.4. The reason is straightforward: without a network agreement, the provider will have to deliver its services at a price equal to the payment standard, and the insurer will have to provide an in-network level of coverage. The provider has no

[29] The analysis that follows assumes that cost-sharing is the primary tool that insurers use to steer enrollees toward in-network providers and, thus, that a "cap and floor" policy largely eliminates providers' ability to influence where enrollees receive care. But insurers have other ways of steering volume. For example, an insurer could encourage contracted primary care physicians to refer laboratory services to a preferred laboratory. There could also be situations where requirements on enrollee cost-sharing would be challenging to enforce. In those cases, the effects of a "cap and floor" policy on negotiated prices would likely fall in between those discussed here and those under a pure out-of-network cap.

Figure 4.4: Negotiated Price Under 'Cap and Floor' Out-of-Network Payment Policy



USC Schaeffer BROOKINGS

reason to agree to a lower price since the provider is already receiving an in-network volume level from the insurer, while the insurer has no reason to agree to a higher price since its enrollees already have access to the provider.[30] Thus, the policy will increase negotiated prices when the payment standard is above the pre-policy negotiated price and decrease negotiated prices otherwise. Comparing to Figure 4.2 also illustrates that negotiated prices are uniformly higher than under a pure out-of-network cap.

Providers can credibly threaten to turn away patients. The effect of the "cap and floor" policy changes when a provider can credibly threaten to turn away patients, as illustrated by the blue line in Figure 4.4. When the payment standard is set low enough, the provider's best option is to turn away the insurer's enrollees in the absence of a network agreement in order to protect its bargaining position, just as under a pure out-of-network cap. Thus, when providers can turn away patients, the scope for the "cap and floor" policy to *reduce* negotiated prices is likely limited, like for a pure out-of-

[30] As discussed in Appendix A, if the payment standard is set very high—above the provider's charges under the status quo—the negotiated price could actually exceed the cap, but this scenario is likely of limited practical relevance.

network cap. On the other hand, for higher payment standards, the negotiated price is likely to be very close to the payment standard for the same reasons as in the case where providers cannot turn away patients. Thus, unlike a pure out-of-network cap, the “cap and floor” policy can actually *increase* negotiated prices if the payment standard is set above the pre-policy negotiated price.

The fact that the “cap and floor” policy would increase negotiated prices if the payment standard exceeded pre-policy negotiated prices, but not substantially reduce them if the payment standard were set lower, means that it would be easy for this type of policy to increase average negotiated prices. Consider, for example, a policy with a payment standard equal to average negotiated prices under the status quo. The “cap” portion of the policy would have little ability to reduce the prices negotiated by providers who are paid above-average prices under the status quo. However, the “floor” portion of the policy would likely allow providers with below-average prices under the status quo to negotiate *higher* prices. On average, therefore, negotiated prices would likely increase. Because, as discussed in section 2.3.2, prices vary widely across providers, this type of effect could be important in practice.

5 Regulating Both In-Network and Out-of-Network Prices

Since an out-of-network cap may have limited scope to reduce the prices of services delivered in non-emergency situations, policymakers might wish to consider policies that would directly regulate both in-network and out-of-network prices. This section considers two potential approaches to doing so, which I refer to as the “comprehensive price cap” and “default contract” approaches.

A comprehensive price cap would directly limit the amounts providers could collect (from either insurers or patients) for delivering health care services, including both in-network and out-of-network services. This is arguably the most commonly discussed approach to regulating in-network prices (e.g., Skinner, Fisher, and Weinstein 2014; Murray and Berenson 2015; Blumberg et al. 2019; Roy 2019).

In this section, I conclude that a comprehensive price cap could reduce negotiated prices for a broad range of services, including non-emergency services, at least on paper. Importantly, however, a comprehensive price cap would reduce prices partly by directly limiting the prices providers and insurers could agree to, rather than by reducing providers’ leverage in network negotiations. In practice, providers might use the leverage that they cannot translate into higher prices to extract other concessions from insurers, which could undermine the cap or have various undesirable effects.

For example, providers could resist contract terms intended to reduce utilization; this was one common concern with prior state efforts to regulate hospital prices (e.g., Pauly and Town 2012; Murray and Berenson 2015). Alternatively, providers might seek to circumvent the cap by demanding insurers pay higher prices for service lines where the cap does not apply or does not bind. Evasion concerns would likely also require policymakers to limit use of alternative payment models, like bundled payments or shared savings contracts, since such contracts could be used to “hide” additional payments from insurers to providers. Policymakers would have options to address these problems, but they would be of uncertain effectiveness and could have undesirable side effects of their own.

In light of the enforcement challenges under a comprehensive price cap, the second part of this section considers another approach to regulating in-network prices that I call the default contract approach.[31] Under this approach, the regulator would publish a model network agreement (the “default contract”) that specified both the prices the insurer paid the provider *and* a minimum level of access the provider would be required to offer to the insurer’s enrollees. Providers would be required to enter a default

[31] Glied and Altman (2017) describe a version of this approach that would apply to a narrow subset of hospital services.

contract with any insurer that requested one, but providers and insurers would also be permitted to negotiate any alternative payment terms they wished.

If the requirement to accept a default contract could be effectively enforced—which would require significant effort from regulators but is likely feasible—then the ability to insist on a default contract would greatly strengthen insurers' hands in network negotiations, allowing insurers to secure prices close to or below the prices specified in the default contract. Moreover, because the approach would directly reduce the provider's leverage in network negotiations—rather than merely limit the provider's ability to use that leverage to secure higher prices—it would avoid the various enforcement challenges under a comprehensive price cap that were described above.

5.1 Comprehensive Price Cap Approaches

I begin by analyzing the comprehensive price cap approach. The first part of this subsection describes the main choices policymakers would need to make in designing a comprehensive price cap. I then analyze how a comprehensive price cap would affect provider prices in an idealized environment, drawing again on the formal model in Appendix A. I then turn to some of the enforcement challenges that could arise under a comprehensive price cap and why these enforcement challenges could cause a real-world comprehensive price cap to fall short of this theoretical ideal.

5.1.1 Design of a Comprehensive Price Cap

A comprehensive price cap would limit what providers can collect for both in-network and out-of-network services. Like an out-of-network cap, a comprehensive price cap would limit the total amount providers can collect for such services from all sources, including the patient and the patient's insurer.

As with an out-of-network cap, policymakers wishing to cap health care prices would need to define what health care services the cap would apply to, which insurance markets it would apply in, and how price limits would be set. Below, I briefly discuss the options policymakers would have along each of these dimensions, and I specify the characteristics of the specific policies I analyze in this subsection:

- **Scope of services included:** A cap could apply to some services but not others. Some recent proposals (e.g., Skinner, Fisher, and Weinstein 2014; Blumberg et al. 2019) cap the prices of all health care services. However, many proposals envision limiting caps solely to hospital services (e.g., Murray and Berenson 2015) or even to a subset of hospital services (e.g., Glied and Altman 2017), often motivated by a desire to confine regulation to settings where providers are believed to wield particularly high levels of market power. Much of the discussion that follows applies regardless of the cap's scope, so I leave the scope unspecified for now. Later, I discuss why enforcing a cap that applied to some services but not others could be challenging.

- **Insurance market segments included:** A comprehensive price cap could be applied broadly or limited to particular insurance markets. Some proposals envision introducing caps only for services covered by individual market plans (e.g., Blumberg et al. 2019) while others envision imposing caps in employer coverage too (e.g., Skinner, Fisher, and Weinstein 2014; Murray and Berenson 2015; Roy 2019). Much of the discussion that follows applies regardless of what markets the cap applies in, so I leave this unspecified for now. Later, I discuss why enforcing a cap that applied in some insurance markets but not others could be challenging.

- **Methodology for setting price limits:** As with an out-of-network cap, policymakers would need to: (1) define the units of care to which price limits applied; and (2) specify a methodology for determining the price limit for each unit of care. As for an out-of-network cap, I assume that a comprehensive price cap would apply at the service level and use service definitions similar to those embodied in Medicare's various fee schedules. One important complication that arises in the context of a comprehensive price cap but not an out-of-network cap is how to determine whether a network agreement that deviates from Medicare's fee-for-service structure complies with the cap; I defer this issue for now, but return to it in section 5.1.3.

Policymakers could also take a variety of approaches to setting price limits for each service. One commonly discussed approach is to set each limit as a multiple of the price traditional Medicare pays for the same service (e.g., Skinner, Fisher, and Weinstein 2014; Murray and Berenson 2015; Blumberg et al. 2019; Roy 2019). Alternatively, limits could be set based on negotiated commercial rates observed before the cap took effect. I leave the methodology for setting price limits largely unspecified, as my analysis applies to a broad range of potential price limits. As in the case of an out-of-network cap, however, I assume that price limits would be set at the level of individual services and that these limits would be set in such a way that neither insurers nor providers can influence the limit through their contracting decisions.

It is worth noting that there are some important structural differences between the price cap approaches considered here and earlier state efforts to regulate the prices of health care services.[32] A first important difference is that these prior efforts generally focused solely on hospital services, whereas the caps considered here could apply more broadly if desired. Second, these regulatory systems generally set different prices for different providers, sometimes based on a review of cost data for each provider, whereas the price cap proposals that are the focus of this paper would set a common price limit for all providers. Third, those systems often placed both a floor and a ceiling on the prices insurers could pay providers, rather than just a ceiling, which meant that those systems had the potential to increase prices rather than just reduce them. Finally, Clemens and Ippolito (2019) emphasize that these systems often were targeted not just at controlling the prices of hospital services, but also at shifting resources toward hospitals with high uncompensated care burdens.

5.1.2 Effects on Negotiated Prices in an Idealized Environment

I now consider how a comprehensive price cap would affect the prices of health care services. To do so, I rely on the same basic model used to analyze an out-of-network cap. As before, the main text presents the main conclusions that that emerge from the model, while the full technical details are presented in Appendix A. To sidestep consideration of the various evasion opportunities that are discussed in section 5.1.3, I begin in an idealized setting. Specifically, I assume that the provider delivers a single type of service and contracts with the insurer in only one insurance market, and I assume there is no ambiguity about whether a particular in-network contract complies with the cap.

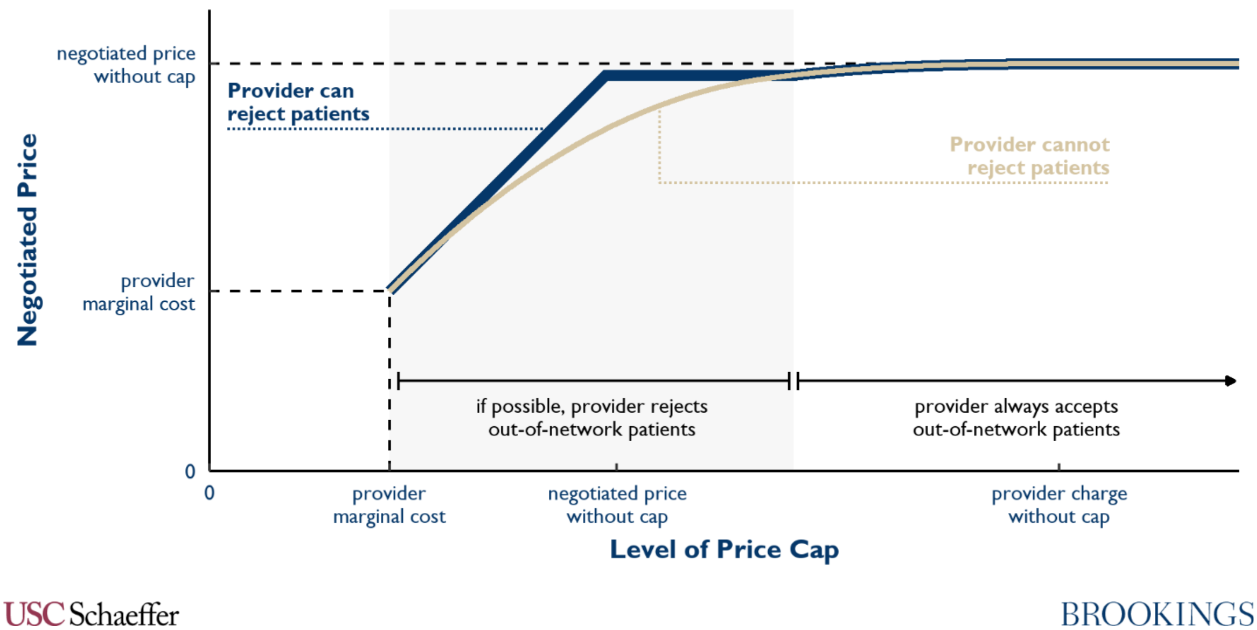
As with an out-of-network cap, the model implies that the effects of a comprehensive price cap would differ depending on whether a provider could credibly threaten to turn away an insurer's enrollees if the provider and the insurer failed to reach a network agreement, so I consider each case in turn.

Providers cannot credibly threaten to turn away patients. In this case, a comprehensive price cap is likely to function very similarly to an out-of-network cap. Like an out-of-network cap, it would allow an insurer's enrollees to access the provider's services at the capped price even without a network agreement, which would in turn allow insurers to insist on prices at or below the cap. The gold line in Figure 5.1 illustrates the relationship between the level of the cap and negotiated prices in this case, which exactly mirrors the relationship under an out-network cap depicted in Figure 4.1.

Providers can credibly threaten to turn away patients. As discussed in section 4.3.1, providers likely can turn away out-of-network patients in most non-emergency situations, and these situations

[32] Most state efforts originated in the 1970s but have since been abandoned. Murray and Berenson (2015) and Clemens and Ippolito (2019) review the history of these systems in much greater detail.

Figure 5.1: Negotiated Price Under an Comprehensive Price Cap



account for the majority of health care spending. In these cases, a provider could keep the out-of-network portion of a comprehensive price cap from compromising its underlying bargaining position by threatening to turn away an insurer's enrollees in the absence of a network agreement. As illustrated in Figure 5.1, providers would elect to turn away patients if the cap were set low enough, limiting how much the out-of-network portion of a comprehensive price cap could reduce negotiated prices.

But importantly—and unlike an out-of-network cap—a comprehensive price cap also *directly* limits the prices that a provider and insurer negotiate. Thus, even though a provider can keep a comprehensive price cap from compromising its underlying bargaining position by threatening to turn away the insurer's enrollees in the absence of a network agreement, a comprehensive price cap set at a low enough level keeps the provider from translating that strong bargaining position into a high price. Thus, by setting a low enough cap, a comprehensive price cap can, at least on paper, allow policymakers to reduce prices as far as they wish, as illustrated in Figure 5.1.

It is important to note that, like an out-of-network cap, a comprehensive price cap would likely reduce patients' ability to access out-of-network care since, consistent with the discussion above, providers would often wish to turn away out-of-network patients in order to protect their bargaining position vis-à-vis insurers. Indeed, the gap between the gold line and the blue line in Figure 5.1 illustrates that the benefit of credibly threatening to turn away patients would often be substantial.[33]

Empirical evidence from prior systems. Before proceeding, I note that this theoretical discussion is broadly consistent with experience under prior state rate setting regimes. Research on experience under those regimes has concluded that they were often successful in constraining the unit prices of health care services (McDonough 1997; Pauly and Town 2012; Murray and Berenson 2015). As discussed below, however, there is more controversy about whether the types of provider responses discussed in the next section kept these systems from reducing overall health care spending.

---

33 Figure 5.1.arguably understates the benefit of being able to make this threat because it does not account for non-price concessions providers may be able to extract when the in-network portion of the cap binds.

5.1.3 Provider Efforts to Circumvent a Price Cap

The preceding analysis shows that, in settings where providers can credibly threaten to turn away an insurer's enrollees in the absence of a network agreement, a comprehensive price cap can reduce negotiated prices by directly limiting providers' ability to translate a strong bargaining position into a high price. However, the leverage that providers could not translate into higher prices would not simply vanish, and providers might seek to use that "excess" leverage to extract concessions that did not technically violate the price cap but did undermine the cap or have other undesirable effects.

Providers might pursue many types of concessions. It is likely not possible to anticipate all of them in advance, but this section examines three types of responses that seem particularly likely. First, providers might seek contract terms that increased utilization of their services. Second, providers might seek to negotiate higher prices for service lines where the cap does not apply or does not bind. Third, if providers and insurers were given flexibility in how payment contracts were structured (e.g., allowed to use alternative payment models), they could seek to use that flexibility to "hide" high prices.

For each evasion strategy, I also discuss how policymakers might seek to prevent these types of responses. In general, I conclude that the options available to policymakers would be imperfect at best. I also note before proceeding that these various evasion strategies would likely be substitutable in practice, in which case blocking some, but not others, might accomplish relatively little.

Increased utilization. One way providers could deploy their excess leverage would be to seek contract terms that encourage utilization of their services, which would increase their profits without running afoul of the cap. These efforts could take a variety of concrete forms. Providers could, for example, seek less stringent prior authorization requirements or reductions in other forms of utilization management. Alternatively, they could resist payment arrangements designed to give them stronger incentives to manage utilization, such as shared savings contracts.

The possibility that capping prices could increase utilization is a longstanding concern. It is a common implication of economic models of provider behavior under administered or regulated pricing (e.g., McGuire (2000)). Moreover, evidence from older state hospital rate setting regimes suggests that these regimes did increase utilization, although there is disagreement about how effectively regulators coped with those pressures and whether higher utilization was large enough to fully offset savings from lower unit prices (McDonough 1997; Pauly and Town 2012; Murray and Berenson 2015).

Policymakers would have some options for preventing increases in utilization, but they would be of uncertain effectiveness and could have other downsides. One approach would be to reduce price caps for providers that have unusually high utilization or who see particularly rapid utilization growth after implementation of the cap (Murray and Berenson 2015). To pursue this approach, policymakers would need to be able to reliably measure utilization performance at the level of individual providers. While not impossible, this has proven challenging in the context of pay-for-performance programs due to variation in case mix, small sample problems, and the fact that any particular provider's performance often depends on the behavior of other providers (e.g., Fiedler et al. 2018; MedPAC 2018).

An alternative approach would be to directly require provider-insurer contracts to include certain types of provisions designed to encourage appropriate utilization. This approach, however, would require regulators to become much more deeply involved in the details of provider-insurer contracts and operations than they are today. That level of involvement is likely neither practical nor desirable.

Price increases in other service lines. Providers might also seek to use their excess leverage to negotiate higher prices for services not subject to the price cap. This would be particularly straightforward for providers that had some service lines for which the price cap was binding and others for which it was not. In these cases, a provider could refuse to sign a network agreement for services where the cap did bind unless the insurer agreed to pay an inflated price for services where the cap did not bind, thereby effectively allowing the provider to circumvent the price cap.

This type of behavior could arise in myriad circumstances, but a few seem particularly important:

- **Hospital-owned physician practices:** Many proposals to implement a comprehensive price cap would constrain the prices of hospital services more than the prices of physician services. For example, the data discussed in section 2.3 suggest that a proposal to cap prices at 175% of Medicare rates would often bind for hospital services but not physician services. Moreover, as noted earlier, some proposals to impose price caps apply exclusively to hospital services or even to just a subset of hospital services (e.g., Glied and Altman 2017; Roy 2019). Thus, a hospital that owned physician practices could use the excess leverage it enjoys with respect to hospital services to extract higher prices for its physician practices.

  Hospital ownership of physician practices is common. Data from Compendium of U.S. Health Systems produced by the Agency for Healthcare Research and Quality (AHRQ) indicate that 72% of non-federal acute care hospitals were part of a health system that included physicians in a broad range of specialties.[34] Moreover, ownership of physician practices is likely even more common among dominant hospitals that would be most constrained by a price cap. It is also likely that hospitals would accelerate their acquisition of physician practices if it became clear that doing so would offer them an opportunity to circumvent a system of price caps.

- **Multihospital systems:** The same AHRQ data indicate that 66% of non-federal acute care hospitals were part of a health system with at least two hospitals in 2018.[35] As discussed in section 2.3, negotiated prices vary widely across hospitals, and it is likely that price caps would sometimes bind for one hospital within a system but not others. For example, in a system with a flagship facility and several less prestigious community hospitals, the price cap might bind for the flagship but not the community hospitals. The system could thus use the excess leverage it holds via the flagship to extract higher prices for its affiliated community hospitals. Related, the ability to use this type of evasion strategy could also make community hospitals more attractive acquisition targets and thereby accelerate their movement into systems.

- **Contracts in multiple insurance markets:** Some proposals (e.g., Blumberg et al. 2019) would apply price caps in the individual health insurance market, but not the group market. However, many individual market insurers also operate in the group market. Indeed, CMS Medical Loss Ratio data show that, in 2018, 66% of individual market enrollment was accounted for by insurers that controlled at least 10% of the small group market in the same state.[36] When negotiating with insurers that operate in both markets, providers could use excess leverage they hold in the individual market to extract group market higher prices. Providers' desire to redeploy their excess leverage in this way could also lead them to refuse to contract with individual market insurers without significant group market business.

[34] The AHRQ data do not distinguish between health systems in which the hospital and affiliated physician practices are under common ownership versus just being jointly managed, so this estimate includes both types of arrangements. In practice, either type of arrangement could likely facilitate evasion of a price cap.

[35] The AHRQ definition of health system only encompasses entities that include a significant number of physician practices, so it would miss hospitals that are part of an entity that owns multiple hospitals but does not own any physician practices. Thus, this estimate may slightly understate the share of hospitals that are actually affiliated with another hospital.

[36] For the purposes of this calculation, issuers were aggregated to the parent company level.

Regulators could seek to prevent this behavior by making it illegal for a provider to condition access to one of its service lines on an insurer's willingness to pay a high price for another service line.[37] This approach could make it harder for providers to explicitly demand this type of concession. However, providers would likely be able to find ways to make these types of demands *implicitly* (e.g., by only signing contracts in instances where insurers offer the desired concession and hoping insurers "get the message"), so this approach might only be partially effective in practice. Another policy response would be for regulators to directly monitor the prices for services where the cap does not apply (or does not bind) and impose penalties if there was evidence of unwarranted increases in prices for those services. However, this strategy could be challenging for regulators to implement since it would frequently be difficult for regulators to distinguish warranted and unwarranted price changes.

Use of alternative contract structures. Another challenge for a comprehensive price cap is how to handle contracts that deviated from the fee-for-service structure used to define the cap. These deviations might take many different forms. For example, if a price cap were specified in terms of Medicare's diagnosis related groups (DRGs), some hospitals and insurers might prefer to use per diem payments, a structure that was common historically (Ginsburg 2010). Others might want to deviate in more fundamental ways, such as by adopting bundled payment or shared savings arrangements that put providers at financial risk for beneficiaries' overall spending and health outcomes; such arrangements encompassed 30% of commercial market spending in 2018 (HCP-LAN 2019).

Allowing alternative contract structures in the context of a comprehensive price cap is not straightforward. Simply exempting these contracts from complying with cap would eviscerate the cap, as it would allow providers to use their leverage to insist on alternative contract structures with very generous payment terms.[38] For example, if the price cap were specified in terms of DRGs, a hospital could insist on being paid under a per diem contract with high per diem amounts.

Faced with these challenges, policymakers would have a few different options, none of them perfect:

- **Ban alternative contract structures:** One option would be to simply require all provider-insurer contracts to conform to the basic structure of the cap. For example, if a hospital price cap were specified in terms of Medicare DRGs, providers and insurers could be required to write contracts using Medicare DRGs. This approach would protect the cap's integrity.

  This approach has the obvious downside that it would forfeit any benefits that new payment structures may create. For example, evidence suggests that bundled payment contracts and shared savings contracts can reduce health care spending, albeit modestly, and it is conceivable that public and private payers will develop more effective models in the future (Barnett et al. 2019; McWilliams et al. 2018; Song et al. 2019). On the other hand, greater standardization in payment structures might reduce administrative burdens for both providers and insurers.

- **Publish a menu of approved alternative contract structures:** An alternative to completely banning alternative contract structures would be to limit providers and insurers to a list of alternative structures pre-approved by the regulator. This approach would also preserve the integrity of the cap but would prevent providers and insurers from developing new contract structures that were not on the approved menu.

---

[37] Policymakers may wish to consider banning these types of "all or nothing" contracts even outside the context of price regulation (Gaynor, Mostashari, and Ginsburg 2017). The Lower Health Care Costs Act of 2019 reported by the Senate Health, Education, Labor, and Pensions Committee included such a ban.

[38] As a historical matter, many states' hospital rate setting systems did exempt managed care contracts and associated capitation arrangements, although such arrangements were still relatively uncommon at the time. Murray and Berenson (2015) and Clemens and Ippolito (2019) discuss problems created by these exemptions.

- **Review alternative contract structures on a case-by-case basis:** A final approach would be to allow providers and insurers broad flexibility to adopt alternative contract structures, provided that they showed that total spending under the contract was expected to be no higher than if the parties signed a contract that mirrored the structure of the price cap.[39] The regulator could enforce this requirement by prospectively reviewing proposed contracts or by requiring providers and insurers to conduct suitable analyses before implementing a contract and then periodically auditing those analyses for reasonableness.

  This approach would also have weaknesses, however. First, it would likely fail to fully preserve the integrity of the cap. Assessing whether spending under a particular alternative contract structure would generate higher or lower spending would often require making assumptions about utilization changes, and the validity of those assumptions would likely be hard to assess, even after the fact. Second, this type of process could still discourage adoption of alternative contract structures by making adopting them more administratively burdensome. Related, in scenarios where compliance was audited after the fact, providers and insurers might be reluctant to take the risk that the regulator would later second-guess their judgements.

5.2 Default Contract Approaches

Motivated by the enforcement challenges that would exist under a comprehensive price cap, I now consider the alternative "default contract" approach. The first part of this section describes the main choices policymakers would need to make in designing a default contract policy. I then argue that, provided that the requirement to accept patients under a default contract could be effectively enforced, this policy would be successful in reducing negotiated prices in a broad array of circumstances but would avoid the various enforcement challenges that arise in the context of a comprehensive price cap. Finally, I consider how policymakers could enforce the access standards under a default contract.

5.2.1 Design of a Default Contract Policy

Under a default contract policy, the regulator would publish a model network agreement (the "default contract") that specified both the prices the insurer paid the provider *and* a minimum level of access the provider would be required to offer to an insurer's enrollees. A provider would be required to enter a default contract with any insurer that requested one, but providers and insurers would also be permitted to negotiate any alternative payment terms they wished. An insurer would be permitted to request a default contract from some providers but not others or, potentially, for some of a provider's service lines but not others. Below, I briefly discuss the options policymakers would have in designing a default contract and specify the characteristics of the particular policy I analyze below.

Many of the design decisions faced by policymakers wishing to implement a default contract policy would closely parallel the decisions that arise under a comprehensive price cap. In particular, policymakers would need to specify what types of providers were obliged to accept a default contract and what insurance markets the requirement applied to. They would also need to specify the payment terms in the default contract. Since the options related to these design decisions closely parallel those under a comprehensive price cap, I do not repeat that discussion here. For the analytic purposes, I assume that these decisions will be made in the same way as under a comprehensive price cap.

But some design decisions are specific to the default contract approach. Specifically, policymakers would need to specify: (1) the patient access standards under the default contract; (2) any exceptions

---

[39] This comparison could account for any changes in utilization caused by the contract. The parties could also, in principle, be permitted to sign contracts with higher spending if they demonstrated that any increase in spending under the proposed contract was justified by improved quality of care.

to the general requirement to accept a default contract; and (3) what obligations insurers would bear under a default contract. I consider each of these in turn:

- **Patient access standards under the default contract:** Most importantly, policymakers would need to define the level of access a provider would be required to offer an insurer's enrollees under a default contract. Broadly speaking, access standards could take two forms.

  First, policymakers could impose a general requirement that providers accept default contract patients on the same terms as some other group of patients, such as patients covered under a negotiated network agreement. As discussed in detail in section 9, institutional providers that wish to participate in Medicare are subject to this type of requirement. Namely, they must agree to accept Medicare patients on the same terms as all other patients they treat.

  Second, policymakers could implement substantive standards that govern specific dimensions of patient access. The standards could address the process by which patients access care. For example, they could bar the provider from collecting more than the patient's cost-sharing amount directly from the patient. Providers could also be required to answer patient inquiries about whether the provider accepts a particular form of insurance coverage the same way regardless of whether the provider has a negotiated agreement with the insurer or a default contract. The access standards could also, in principle, place quantitative limits on how long patients could be required to wait for an appointment, although this type of standard could be hard to tailor to different providers' circumstances and capacity constraints.

  Policymakers could also combine these two approaches and, indeed, a hybrid approach might be policymakers' best option in practice. For the analysis below, I do not specify the details of the access standards under the default contract but instead consider a couple of illustrative scenarios. The benchmark analysis assumes that the default contract would ensure patients a level of access similar to that under a negotiated network agreement. The alternative scenario examines outcomes if policymaker specified weaker standards or could not perfectly enforce a stronger set of access standards. As the subsequent analysis makes clear, the weaker the access standards under the default contract, the less leverage insurers would derive from the option to insist on a default contract, and the higher negotiated prices will tend to be.

- **Exceptions to the general requirement to accept a default contract:** Policymakers could allow providers to decline a default contract in certain cases. For example, a provider could be allowed to turn down a default contract if it faced capacity constraints or if the insurer had failed to meet its obligations under a prior contract. However, the broader the exceptions under the policy, the less the policy would improve insurers' bargaining leverage. In the analysis that follows, I assume any exceptions like these would be relatively narrow.

- **Insurer obligations under a default contract:** Policymakers would also need to decide what requirements to impose on insurers under a default contract. At a minimum, a default contract would likely impose certain procedural requirements on the insurer, including a requirement to pay the provider in a timely fashion and give the provider the information it needed to determine patient cost-sharing and comply with prior authorization requirements.

  The default contract could also, in principle, impose more substantive requirements on the insurer. For example, policymakers could require insurers to choose off a menu of standard cost-sharing structures and prior authorization processes in order to minimize administrative burden on providers. Or policymakers could go further and limit the amount of cost-sharing that could apply to services under a default contract or bar insurers from applying prior authorization requirements to those services. It is important to note, however, that imposing overly stringent requirements on insurers would reduce how much leverage they derived from the option to insist on a default contract and raise negotiated prices. For the analysis below, I assume that any substantive requirements placed on the insurer would be limited in scope.

In practice, it would likely make sense to pair a default contract policy with an out-of-network cap set at a level matching the prices in the default contract. The addition of an out-of-network cap would not affect the analysis presented below (since the provider and insurer are expected to reach a negotiated agreement in equilibrium). But, in the real world, an out-of-network cap would offer enrollees financial protection in idiosyncratic cases in which they received out-of-network care.

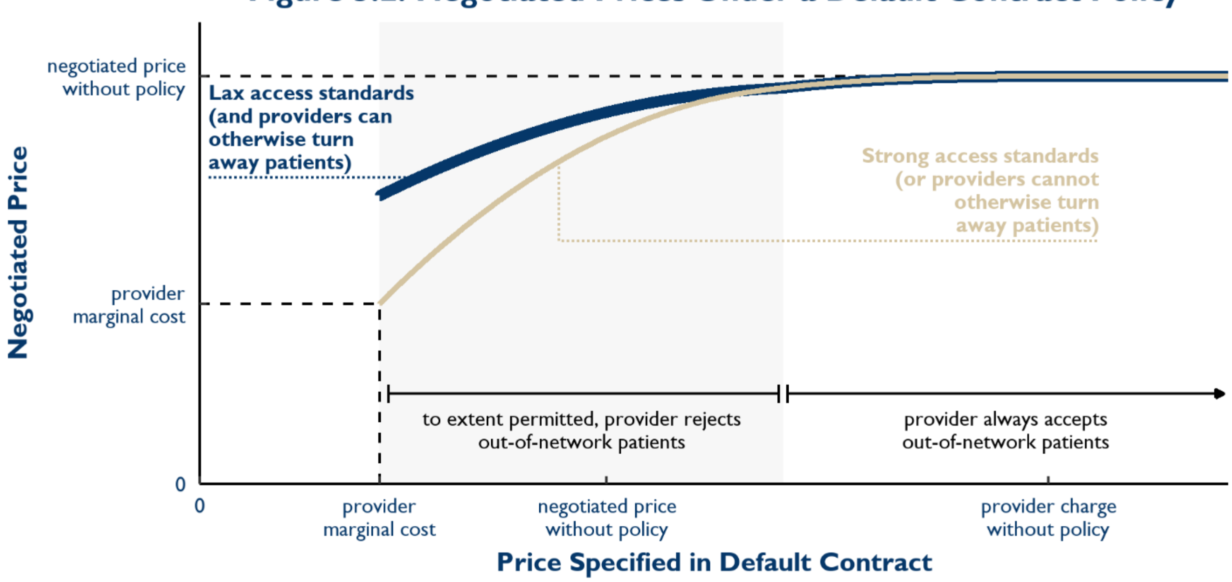
Finally, I note that policymakers could, in principle, permit providers—not just insurers—to request a default contract. That type of policy would function differently from the policy I analyze here. Whereas the default contract policy I consider here could reduce prices but not raise them, price increases would be possible if providers could also request a default contract. That would be particularly true if insurers were required to offer a minimum level of coverage for services delivered under a default contract.

5.2.2 *Effects on Negotiated Prices*

I now consider how a default contract policy would affect the prices providers and insurers negotiate. In doing so, I rely on the same basic model that I have used to analyze the preceding price cap policies. Once again, I present the main conclusions in the main text and full details in Appendix A.

Much like an out-of-network cap, a default contract policy would change the landscape for provider-insurer negotiations by giving the insurer an attractive alternative to a negotiated agreement. Under a default contract policy, the insurer always has the option to break off negotiations and give its patients access to the provider's services under a default contract. If the access standards under the default contract require the provider to offer an in-network level of access (or providers face other barriers to threatening to turn away patients), this option would give the insurer leverage to negotiate prices at or below the prices specified in the default contract. The gold line in Figure 5.2 illustrates how negotiated prices would depend on the level of the prices in the default contract.

Figure 5.2: Negotiated Prices Under a Default Contract Policy



If policymakers set laxer access standards or had trouble enforcing those standards (and the provider faced no other barriers to turning away patients), then the scope for a default contract policy to reduce negotiated prices would be smaller. Once the prices specified in the default contract fell below a critical level, it would be in the provider's interest to restrict access to its services in the absence of a network agreement in order to protect its bargaining position. While even lax access standards would likely keep the provider from turning away all patients in the absence of a network agreement, the ability to restrict access to some degree would still reduce how attractive implementing a default contract is to the insurer. Correspondingly, with lax access standards, a default contract policy would have less scope to reduce negotiated prices, as illustrated by the blue line in Figure 5.2.

Importantly, because the default contract policy would change negotiated prices by strengthening the insurer's underlying bargaining position rather than by directly limiting the provider's ability to translate its strong bargaining position into high negotiated prices, the default contract policy would not create the same enforcement challenges as the comprehensive price cap approach. Because negotiated prices would remain unregulated, providers would have no reason to seek contract terms that increased utilization or to try to use market power in one service line to secure higher prices in another. Nor would policymakers need to place any limits on the use of alternative payment models.

It is also worth noting that the default contract policy would be less likely to reduce access to out-of-network care than an out-of-network cap. While providers would have the same incentives to turn away an insurer's enrollees absent a network agreement, the insurer's ability to insist on implementing a default contract would limit the provider's ability to act on this incentive in practice.

5.2.3 Enforcement Challenges Under a Default Contract Approach

The core enforcement challenge under the default contract approach would be ensuring compliance with the default contract's access standards. While this would require real effort, it would be easier than overcoming the enforcement challenges that would arise under a comprehensive price cap for a couple of reasons. First, enforcement efforts could focus on preventing a single type of behavior—provider attempts to avoid serving default contract patients—rather than the many different problematic behaviors that could arise under a comprehensive price cap. Second, wholesale non-compliance with the access standards under the default contract would be comparatively easy to observe and document via insurer complaints, consumer complaints, or audit studies. Third, it is likely that providers and insurers would generally opt to implement their own contracts rather than rely on the default contract, so the actual volume of enforcement activity would likely be modest.

It is also important to note that, as illustrated in Figure 5.2, the default contract policy could still reduce negotiated prices to some degree even if enforcement of the access standards was imperfect. It follows that policymakers could partially compensate for imperfect enforcement of the default contract's access standards by specifying lower prices in the default contract.

6 Introducing a Public Option

Another commonly discussed approach to expanding regulated or administered pricing is to create a "public option": a publicly operated insurance plan that people could purchase in lieu of a private insurance plan. Introducing a public option was considered during the debate over the ACA, and President-elect Biden's campaign platform included a public option. Many Congressional and think tank proposals also envision introducing a public option (T. Neuman et al. 2019).

Public option proposals vary along many dimensions. In this section, I focus on proposals under which the public option would pay health care providers some percentage of the prices Medicare pays providers, require providers to accept public option patients, and charge a premium sufficient to cover its average claims and non-claims costs. I also briefly discuss certain other public option designs.

Market outcomes with a public option, including the prices providers received, the premiums enrollees paid, and the market share captured by the public option would depend on how private plans—and, particularly, private plans' negotiations with providers—changed in response to creation of a public option. To gain insight on these dynamics, this paper develops a formal model of health insurance markets in the presence of a public option. The main text presents the main insights from that model and the results of simulations using that model. Appendix B presents full details.

In brief, I conclude that, if the public option was much more attractive to consumers than existing private plans, then private plans competing with a public option would end up negotiating provider prices close to the public option's prices. In brief, competition from the public option would limit the premiums private plans can charge while still attracting meaningful enrollment, which would allow insurers to insist on prices that are not too far above the public option's prices when negotiating with providers. At the same time, providers would refuse to accept prices too far below the public option's prices since they would recognize that participating in private plans would cannibalize some of their public option volume. It follows that a public option that paid providers less than existing private plans could both offer consumers a new lower-premium option and reduce the premiums of private plans. This analysis contradicts assumptions made in some prior analyses of public option proposals that introducing a public option would not change the prices private plans could negotiate (Antos and Capretta 2019; FTI Consulting 2019; Koenig et al. 2019; Schaefer and Moffit 2020).

This section also highlights that the premiums charged by private plans and the public option, as well as the market shares captured by the two types of plans, would depend on features other than what they paid providers. Based on available evidence, it appears likely that private plans would have lower utilization, and, in the individual and small group market, would attract healthier enrollees and be more aggressive in recording enrollees' diagnoses for risk adjustment purposes; on the other hand, the public option might have lower non-claims expenses. Private plans' premiums would also presumably incorporate profit margins, whereas the public option's premium would not. In scenarios that reflect assumptions about these factors appropriate to an individual market public option, my simulations show the public option capturing less than half of the market. By contrast, in scenarios that reflect assumptions appropriate to a public option that offers large employers third-party administrator services, my simulations show the public option capturing more than 60% of the market.

This section of the paper proceeds as follows. First, I discuss the main choices policymakers would face in designing a public option and specify the features of the public option proposal I focus on in this paper. Second, I discuss the main factors that would determine market outcomes in the presence of a public option, including the prices that would emerge from provider-insurer negotiations and the plans' performance on various non-price determinants of plan costs. Third, I provide a brief description of the formal model developed in Appendix B, present the results of quantitative simulations using the model, and discuss some of the limitations of the model. Finally, I discuss how my conclusions might change if providers were not required to accept public option patients and, related, if the public option set provider prices through negotiation rather than administratively.

6.1 Design of a Public Option

Policymakers would face many decisions in designing a public option. Thus, I begin by reviewing the several of these choices and specifying the features of the particular proposal I analyze in this paper. In doing so, my focus is on a public option that would be implemented at the federal level. The broad considerations would be similar at the state level, but some of the particulars would differ.

Provider payment rates. Policymakers would need to decide how a public option would pay providers. This analysis focuses on a public option that would set provider payment rates administratively. Administered payment rates could be established in many different ways. They could be set as a percentage of Medicare prices or be based in some way on the prices that commercial plans pay providers today. Most of the analysis of a public option in this paper would apply to a variety of approaches to setting the public option's payment rates, but for the quantitative simulations, I consider a public option that would set prices as a multiple of traditional Medicare's.[40]

While many public option proposals envision setting provider payment rates administratively, a public option could, in principle, negotiate rates with each provider, similar to how private plans determine prices today. In section 6.4, I briefly touch on this type of approach and discuss why relying on these types of negotiations would likely result in the public option paying health care providers prices similar to (or higher than) the prices providers receive under the status quo.

Provider participation requirements. Policymakers would need to decide whether providers would be required to accept public option enrollees. This analysis focuses on scenarios in which providers would be subject to this type of requirement, but I discuss how the analysis might change if providers could decline to treat public option enrollees in section 6.4.

If providers were required to accept public option enrollees, policymakers would need to define what level of access providers were expected to offer public option enrollees and monitor whether that level of access was being offered in practice. Otherwise, providers could notionally "participate" in the public option without actually serving public option patients. Policymakers' options for defining access standards would be essentially identical to those discussed in section 5.2 in connection with the default contract approach to price regulation, so I refer readers back to that section for further discussion.

Eligibility rules. Policymakers would need to decide who could enroll in the public option. Here, I consider a public option that could be purchased by individuals in the individual market and, potentially, by employers on behalf of their employees.[41] Some proposals, often cast as "Medicare buy-ins" would limit eligibility to people above a certain age; I do not consider such proposals here, but they would likely function quite differently from a public option available at all ages.[42]

I make one important assumption about the terms on which large employers could access the public option. Specifically, I assume that large employers would be permitted to hire the public option as a third-party administrator for a self-insured plan (that is, a plan under which the employer bears the cost of enrollee claims), but the public option would not offer insured coverage (that is, coverage under which the insurer bears the cost of enrollee claims) to large employers.

---

[40] Medicare delivers prescription drug coverage through private insurers, so some other approach would be necessary to establish payment rates for prescription drugs. Because this paper is focused on payment for health care services, I do not delve into this question in depth here, but it merits attention in future work.

[41] Even if a public option was not offered directly to employers, employers could give their employees access to an individual market public option by setting up an individual coverage health reimbursement arrangement, which allows employers to pay premiums for individual market plans on their employees' behalf. Depending on the public option's payment rates, this could be an attractive option for many employers, particularly employers with sicker workforces (Linke Young, Levitis, and Fiedler 2018). For the purposes of this analysis, I assume that if policymakers introduced a public option limited to the individual market, they would take action to prevent this type of migration out of the employer market.

[42] Specifically, unlike the proposals considered here, these types of proposals would often give rise to a "bifurcated" equilibrium in which almost all people eligible for the Medicare buy-in opt for the buy-in, while others remain in private plans (Eibner et al. 2019). In this type of equilibrium, private plans would compete with the buy-in to a very limited extent, so introducing a buy-in would likely not change private plans in the same way as a public option.

This approach limits the potential for adverse selection against the public option in the large employer market.[43] Today, large employers either self-insure or purchase insured coverage with experience-rated premiums (that is, premiums that vary based on the employer's risk mix). In either case, employers with sicker workforces pay more to cover their workers. If a public option allowed large employers to purchase insured coverage but did not experience-rate its premiums, then the public option would likely disproportionately attract firms with sicker workforces and have to set very high premiums. It may not be feasible for a government agency to experience-rate premiums, so barring large employers from purchasing insured coverage might be the only way to avoid this problem.

Importantly, employers who hired the public option as a third-party administrator could still purchase stop-loss coverage from a private insurer that would limit their financial exposure, just as many employers who operate self-insured plans do today. Indeed, if employers wished, they could purchase stop-loss coverage that would essentially eliminate their claims risk exposure, effectively allowing the employer to replicate the predictability it would have under an insured plan.[44]

Benefit design and utilization management practices. Policymakers would need to determine what services a public option covered, how cost-sharing under the public option would be structured, and how the public option would manage enrollees' utilization. For this analysis, I assume that the public option would cover the essential health benefit package that individual and small group market insurance plans are required to cover under the ACA. I also assume that the public option would adopt traditional Medicare's utilization management practices, including traditional Medicare's limited use of prior authorization and similar tools (Jacobson and Neuman 2018), consistent with the fact that many public option proposals envision building on Medicare.

Premium setting. Policymakers would need to decide how the public option would set premiums (or for a public option serving as a third-party administrator for a self-insured plan, administration fees). I assume that the public option would set premiums to cover its expected claims and other costs, net of any risk adjustment revenues or payments, which broadly mirrors the approach used to set premiums in Parts A and B of Medicare.[45] Additionally, premiums would vary by age in accordance with the applicable age rating curve and across geographic areas in accordance with differences in claims and administrative expenses. I assume that the public option would set the administration fees it charges self-insured plans to cover a pro rata portion of its administrative costs.

For the purposes of this paper, I assume that the public option's administrative expenses would be considered to include a pro rata portion of the cost of any infrastructure (e.g., data systems) shared between the public option and Medicare. I also assume that the public option would be permitted to take out a "loan" from taxpayers to cover any required start-up or capital expenditures that it could repay (with interest, at the government's borrowing rate) over multiple years.

---

[43] Analogous problems do not arise in the individual or small group market since insurers cannot vary premiums based on health status in those insurance markets.

[44] Generous stop-loss coverage might be more widely available in connection with a public option since employers would have no control over the public option's design or operations. Thus, stop-loss insurers would not need to worry that the employer would respond to a generous stop-loss policy by encouraging its plan administrator to be more lenient in adjudicating claims and thereby drive up how much claims spending the stop-loss insurer was liable for.

[45] An important difference with Medicare Part B is that CMS is required to set Part B premiums so that the Part B trust fund maintains an appropriate contingency reserve. Consequently, if forecast errors cause premiums for a year to fall short of expenses, CMS must set a higher Part B premium in future years to rebuild that contingency reserve. The opposite is true if premiums end up exceeding expenses. The resulting premium volatility is likely undesirable, so I assume that a public option would not use this type of trust fund structure. However, some have raised concerns that a public option would have incentives to set its premiums systematically too low (Church, Heil, and Chen 2020). If the statute establishing a public option clearly required the public option to set its premiums to cover its expenses, it is unclear whether this would be a major problem in practice, but a trust fund structure would be one way of addressing these concerns.

Subsidy applicability. Policymakers would need to decide how the various federal programs that subsidize insurance coverage would apply to the public option. I assume here that all federal subsidies available for the purchase of private insurance plans would also be available to people purchasing the public option. In particular, people who enrolled in the public option through the individual market would receive the same premium tax credit and cost-sharing reductions as private plan enrollees, and public option coverage purchased by an employer would be excluded from its employees' taxable compensation just like employer-provided coverage obtained from a private insurer.

Many proposals that include a public option combine creation of a public option with provisions that would make the ACA's individual market subsidies more generous or expand who is eligible for those subsidies (e.g., by expanding the circumstances in which people offered coverage at work can enroll in subsidized individual market coverage). Those types of subsidy expansions are not intrinsic features of a public option and generally would not meaningfully alter the dynamics of competition between a public option and private plans, so I do not consider them in this paper.

Risk adjustment. Policymakers would need to decide whether and how a public option would participate in the risk adjustment programs that exist in the individual and small group markets (which make payments to insurers with relatively sick enrollees and collect payments from insurers with relatively healthy enrollees). I assume that the public option would be subject to risk adjustment in the same way as private plans participate in those programs today.

Applicability of taxes and fees. Policymakers would also need to decide whether the public option would be subject to various taxes and fees levied on private plans. For the purposes of this analysis, I assume that the public option would be required to pay most federal taxes and fees that apply to private insurers, including the user fee for offering coverage through the Marketplace and the fee that funds the Patient Centered Outcomes Research Institute, as well as most state taxes and fees.[46] However, I assume that the public option would not pay state or federal corporate income taxes.

A note on the role of private insurers in operating a "public option." Before proceeding, I note that the term "public option" has also sometimes been applied to policies under which private insurers would contract with the government to offer plans that incorporated certain features, such as limits on the prices they paid providers, but the government would not directly operate an insurance plan. Washington State is implementing this type of policy in 2021, and Colorado has recently considered a similar policy. Labels aside, these proposals have more in common with the price regulation policies considered in the last section, so I do not consider them further in this section.

Even for a public option primarily operated by a government agency, however, policymakers would need to decide whether to contract out certain functions to private entities. It is likely that a public option would at least contract out most claims processing functions, as is the case under traditional Medicare. But policymakers could consider contracting out a broader array of activities.

For example, policymakers could consider delegating some control over the public option's benefit design, utilization management processes, or risk adjustment diagnosis coding processes to a private contractor. As discussed at length in section 6.2.2, there is evidence that private plans achieve lower utilization and are better at coding diagnoses for risk adjustment purposes than traditional Medicare, so enlisting a private entity to perform these functions might reduce the public option's costs. On the other hand, fees paid to the contractor would at least partially offset any savings the contractor

[46] Congress would likely need to explicitly allow states to collect taxes or fees from a federal public option since states would otherwise face constitutional barriers to doing so. Congress might also wish to limit states' authority to impose taxes or fees on the public option to ensure that a state could not use this power to undermine the public option. In practice, it might be simpler to create a regime in which the public option was not technically subject to state taxes and fees but paid equivalent amounts to state governments in circumstances where certain conditions were met.

achieved. Policymakers would also need to weigh the risk that steps taken by the contractor would discourage utilization of valuable health care, create hassle costs for public option enrollees, or invest resources in socially unproductive diagnosis coding efforts. These concerns would likely be particularly acute if the federal government tried to create strong incentives for the contractor to control the public option's costs by transferring all or part of the public option's claims risk to the contractor.

Policymakers could also delegate premium setting to a private contractor. This could be attractive if policymakers were concerned that government agencies would have trouble predicting the public option's costs and, thus, setting appropriate premiums.[47] If policymakers were to pursue this approach, it would be important to create appropriate incentives for the contractor. One reasonable approach would be to tie the contractor's compensation to how closely the premiums it set matched the public option's realized expenses. Notably, simply making the contractor liable for the public option's expenses and then letting it set (and retain) whatever premium it wished would grant the contractor market power that it could use to set premiums above the public option's expected costs.

6.2 Factors Determining Market Outcomes Under a Public Option

I now turn to analyzing the factors that would shape outcomes under a public option. This subsection discusses these factors in qualitative terms, guided by the formal model in Appendix B. Section 6.3 presents quantitative results from simulations using a calibrated version of that model.

Broadly speaking, outcomes under a public option would be shaped by four main factors:

- what prices private insurers could negotiate with providers in the presence of a public option;
- the performance of the public option and private plans with respect to non-price determinants of plan costs, including their effectiveness in managing utilization, their level of administrative spending, and whether they tended to attract relatively healthy or sick enrollees;
- whether non-premium differences between the public option and private plans, such as differences in benefit design or marketing, caused enrollees to prefer one over the other; and
- differences in how a public option and private plans set premiums.

I discuss each of these factors in turn.

6.2.1 Provider-Insurer Price Negotiations in the Presence of a Public Option

I begin by analyzing how providers and private plans would negotiate prices in the presence of a public option, drawing extensively on the formal model in Appendix B. I focus on cases where the public option is much more attractive to consumers than existing private plans. In such cases, a public option would reshape provider-insurer negotiations in two ways. First, competition from the public option would tightly constrain the premiums private plans could set. Second, providers would recognize that if they did not join private plans' networks, some of their patients would instead enroll in the public option, and they would be paid the public option's prices to care for those patients.

Due to these dynamics, it will be in the mutual interest of a provider-insurer pair to reach agreements under which the insurer set its premium *as if* it were paying the provider a price similar to the public option's price. Setting a higher premium would reduce the parties' joint profits by sacrificing too much

[47] This structure could also facilitate offering insured coverage to large employers since a contractor might be better positioned to develop experience-rated premiums and could be paid on the basis of how accurate its premiums proved to be after the fact. It is unclear, however, that this structure would offer any advantages over just permitting employers who hire the public option as a third-party administrator to obtain stop-loss coverage.

private plan enrollment, while setting a lower premium would do the same by cannibalizing too much of the provider's public option volume. The actual prices insurers pay providers could be lower or higher than the price notionally reflected in the insurer's premium but not too much higher or lower since one of the parties would then prefer no agreement to an agreement at that price.

It is important to note that the analysis presented in this section would generally *not* apply if the public option paid providers more than existing private plans or had non-price cost disadvantages large enough to offset its pricing advantages. Under those circumstances, the public option would set a higher premium than existing private plans and attract little enrollment. Thus, the forces considered here, which arise from competition between private plans and the public option, would be largely irrelevant, and competition among private plans would play the lead role in disciplining both private plans' premiums and the prices private plans pay providers, as under the status quo. Correspondingly, introducing this type of "weak" public option would likely have little effect on market outcomes.[48]

The rest of this section examines these dynamics in much greater detail through the lens of the formal model presented in Appendix B. For simplicity, I focus on a setting with a single private plan. As discussed in the appendix, when the public option is much more attractive to consumers than existing private plans—the scenario I focus on in this section of the paper—this simplifying assumption is likely of limited importance. However, this simplifying assumption would matter greatly in scenarios where the public option is a weak competitor for existing private plans since, as noted above, competition among private plans would then play the primary role in disciplining prices and premiums.

What type of agreements will a provider and the private plan want to reach? To start, I consider the broad incentives facing providers and the private plan. In general, it is reasonable to expect a provider-insurer pair to seek an agreement that maximizes their *joint* profits and then divides those profits between them. Otherwise, either party could propose some alternative agreement that generated higher joint profits and made both parties better off.

The private plan's premium is what ultimately determines the parties' joint profits. The premium determines how many people enroll in the private plan versus the public option and, thus, how much revenue the private plan collects from enrollees, how much revenue the provider collects from the public option, and what costs the provider incurs to deliver care. Thus, a provider-insurer pair should seek an agreement that leads the insurer to set a premium that maximizes their joint profits and then set the price the private plan pays the provider to split those profits in whatever way they wish.

To enable providers and the private plan to reach agreements that have this feature, the formal model developed in Appendix B (and the discussion below) assumes that providers and the private plan will negotiate two-part tariffs, contracts in which the insurer pays the provider a "per service price" for each service the provider delivers plus a lump-sum payment that is independent of volume. The per service price determines the private plan's marginal cost of attracting an additional enrollee and, thus, what premium the private plan wishes to set, while the per service price and the lump-sum payment together determine the "total price" the provider receives from the private plan.

Importantly, while assuming that providers and the private plan use two-part tariffs is convenient for expositional and modeling purposes, other contract structures that may feel more realistic would lead to identical outcomes. For example, the combination of a simple linear price and a commitment by the private plan to deliver a certain amount of volume to the provider would suffice. In practice, even a

[48] There might be exceptions to this conclusion. For example, in cases where the prices providers charge under the status quo are constrained by a concern that setting a higher price would attract unwanted scrutiny from the public or from regulators, introducing a public option that "blessed" high prices could allow a provider to demand higher prices from private plans.

simple linear price (without a volume commitment) may lead to similar outcomes since the analysis below shows that the optimal lump-sum payment is likely to be relatively small.

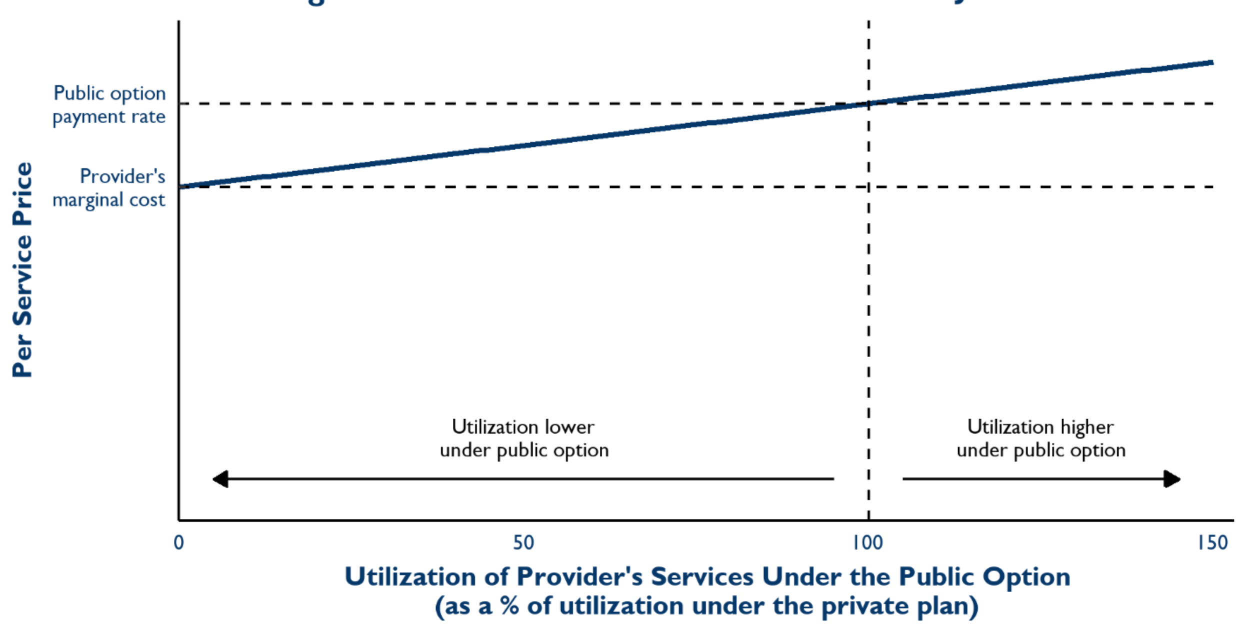
What per service price maximizes joint profits? A provider-insurer pair will maximize its joint profits if the insurer pays the provider a per service price that exactly compensates the provider for the cost it bears when an enrollee switches out of the public option and into the private plan, as shown formally in Appendix B. Intuitively, paying this per service price leads the private plan to appropriately balance the revenue it gains when it lowers its premium to attract more enrollment against the costs that this shift in enrollment imposes on the provider.

The optimal per service price is thus the sum of two amounts: (1) the provider's direct cost of serving the marginal enrollee; and (2) the profits the provider loses from not serving the marginal enrollee under the public option. As shown in Appendix B and illustrated in Figure 6.1, this price is a linear combination of the provider's cost of delivering a service and the public option's payment rate. The weights placed on each amount depends on how the quantity of services an enrollee receives from the provider depends on whether that enrollee is covered by the public option or the private plan.

If the enrollee uses the same quantity of the provider's services when enrolled in either plan, then the optimal per service price exactly equals public option's payment rate. But if the enrollee uses more of the provider's services when enrolled in the public option (e.g., because the public option manages utilization less aggressively), then the optimal per service price is higher than the public option's payment rate; intuitively, when the private plan has lower utilization, compensating the provider for the volume it loses when an enrollee leaves the public option requires a higher price. By contrast, if the enrollee uses less of the provider's services when enrolled in the public option (e.g., because the private plan has a narrower network and directs more of its enrollees' care to the provider), then the optimal per service price is below the public option's payment rate. Indeed, in the simulations in section 6.3, the optimal per service price is modestly below the public option's payment rate.

What total price will the private plan pay providers? The total price the insurer pays the provider—that is, the insurer's total payment per service accounting for both the per service payment

Figure 6.1: Per Service Price that Maximizes Joint Profits



and the lump-sum payment—determines how the profits generated when the insurer sets the optimal premium are divided between the two parties. It is reasonable to assume that the parties will agree on a price at which both parties benefit from a network agreement.[49] Thus, the total price will be between: (1) the minimum price that makes signing a network agreement profitable for the provider; and (2) the maximum price that makes signing a network agreement profitable for the insurer.

I consider the minimum and maximum prices in turn:

- **Minimum price:** The minimum price that makes signing a network agreement profitable for the provider must compensate the provider for: (1) the direct costs the provider incurs to serve the insurer's enrollees; and (2) any profits the provider loses under the public option because a network agreement spurs some enrollees to switch from the public option to the private plan.

  This price will be (weakly) lower than the optimal per service price because only a portion of the private plan's enrollment will consist of people spurred to enroll in the private plan by the provider's presence in the private plan's network. Indeed, in the extreme case where adding the provider to the plan's network causes no change in the private plan's enrollment, the provider will lose no profits under the public option when it joins the private plan's network, so the minimum price will be just the provider's marginal cost. In the more typical case, the minimum price will lie between the provider's marginal cost and the optimal per service price.

- **Maximum price:** The maximum price the insurer can profitably pay is the price that fully absorbs the premium revenue the insurer gains when the provider joins the insurer's network (net of any changes in its non-claims spending and payments to other providers). Naturally, that price will depend on the value enrollees place on access to that specific provider. However, it is shown in Appendix B that the cost of paying *all providers* their respective maximum prices will not exceed the insurer's total premium revenue (net of its non-claims expenses), provided that a reasonable condition on consumers' preferences holds. (The relevant assumption is stated formally in the appendix but, roughly speaking, requires that the value enrollees place on having access to any specific provider shrinks as the insurer's network broadens.[50])

  Because the insurer maximizes its profits, its premium will equal its marginal cost (the cost of paying each provider the optimal per service price, plus any non-claim expenses) plus a markup that depends on the elasticity of demand for the private plan (that is, the sensitivity of enrollment in the private plan to its premium). Empirical evidence, which is discussed further in section 6.3 and Appendix B, suggests that the elasticity of demand for the private plan is likely to be reasonably large in cases where the public option is able to capture significant market share, so the insurer's profit-maximizing markup is likely to be relatively small. It follows that the insurer's total premium revenue cannot be too much larger than its cost of paying each provider the optimal per service price, which implies in turn that, on average, the maximum price cannot be too far above the optimal per service price.

In sum, the minimum price is likely to be modestly below the optimal per service price, while, at least on average, the maximum price is likely to be modestly above that price. It follows that, on average, the negotiated total price cannot be too far from the optimal per service price and, thus, the public option's payment rate.

[49] Specifically, the model in Appendix B adopts the "Nash bargaining" modeling approach discussed in section 4.2, which assumes that the parties will agree on a price at which both gain a meaningful amount from a network agreement.

[50] This assumption is closely related to the diminishing marginal contributions assumption of Collard-Wexler, Gowrinsankaran, and Lee (2019).

Exactly how close the minimum and maximum prices are to the optimal per service price is likely to depend on the public option's equilibrium market share. When the public option has a large market share, it is reasonable to expect demand for the private plan to be more elastic with respect to both the breadth of its network and its premium. This will tend to result in a lower maximum price and a higher minimum price. In practice, the maximum price is likely to be more sensitive to changes in market share because the minimum price is constrained in a relative narrow range between the provider's marginal cost and the optimal per service price. Thus, if the public option captures a larger market share, private plans are likely to pay lower total prices and vice versa.

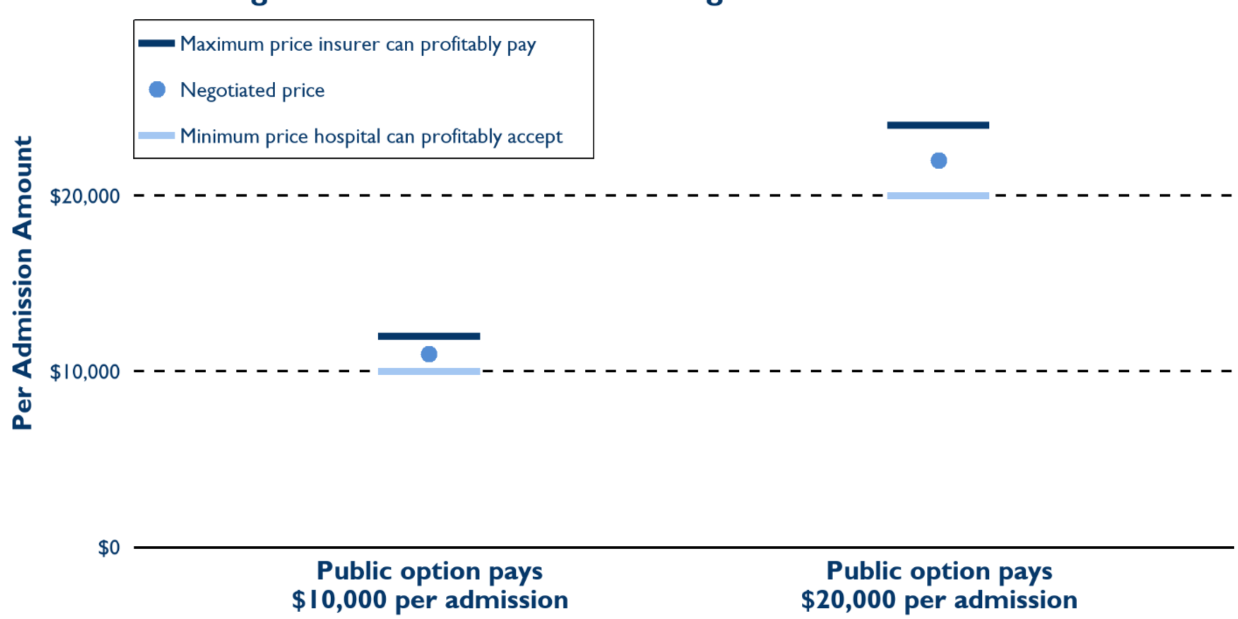
In closing, I note that the preceding discussion implies that introducing a public option could actually put *upward* pressure on prices in cases where the public option pays more than existing private plans, so long as the public option still charged a competitive premium. For example, a public option that paid providers less than existing private plans on average but paid some specific providers more could exert upward pressure on the prices paid to those specific providers.

An illustrative example. A simple numerical example may help make this discussion more concrete. For the purposes of this example only, I consider a simple market that has a single provider (a hospital), a single insurer, and a public option. Consumer demand is such that the private plan's optimal markup is 20% of its marginal cost. For the sake of simplicity, I also assume that the public option and private plan manage utilization identically, and the private plan incurs no non-claims costs.

I first consider a scenario in which the public option pays $10,000 per admission, which is depicted on the left-hand side of Figure 6.2. Because there are no utilization differences between the public option and private plan, the optimal per service price exactly equals the public option's payment rate, so the private plan will set a premium at which it collects $12,000 (=1.2 x $10,000) per admission. Since the private plan attracts no enrollment unless the hospital joins its network, the maximum price that makes a network agreement profitable for the insurer is also $12,000 per admission.

For its part, the hospital will recognize that if it does not participate in the private plan, all of the consumers who are deciding between the public option and the private plan will enroll in the public

Figure 6.2: Determination of Negotiated Price in Private Plan



option, and it will be paid $10,000 per admission for those enrollees. Thus, the minimum price that makes participating in the private plan's network attractive to the hospital is $10,000 per admission. If the hospital and the insurer "split the difference" (consistent with the Nash bargaining assumption in the model), then the hospital and insurer would agree to a price of $11,000 per admission.

Next, I consider a scenario in which the public option pays $20,000 per admission, which is depicted on the right-hand side of Figure 6.2. As above, the optimal per service price exactly equals the public option's payment rate, so the private plan will set a premium at which it collects $24,000 (=1.2 x $20,000) per admission and be willing to pay at most $24,000 per admission. As before, the hospital recognizes that every patient it treats under the private plan is a patient it does not treat under the public option, so it will demand a price of at least $20,000 per admission to join the plan's network. If the hospital and insurer split the difference, then the new negotiated price is $22,000 per admission.

6.2.2 Non-Price Determinants of Plan Costs

Outcomes with a public option would also depend on plans' performance on determinants of plan costs other than provider prices. These include: plans' effectiveness in managing utilization; the level of their non-claims costs (administrative costs, taxes and fees, and the cost of capital); and, in the individual and small group markets, whether the public option and private plans attracted healthier or sicker enrollees or were better or worse at coding diagnoses for risk adjustment purposes.

In this section, I consider how a public option might compare on these dimensions to *both* existing private plans *and* the private plans that might exist after introduction of a public option. Comparing a public option to existing private plans offers insight on how introducing a public option would change premiums relative to the status quo. Comparing a public option to the plans insurers would offer to compete with a public option offers insight on how the premiums of a public option might compare to its competitors and, thus, what market share the public option might capture.

In brief, evidence from Medicare Advantage and elsewhere suggests that a public option would have higher utilization than existing private plans for comparable enrollees, although this utilization disadvantage might be smaller in the employer market than in the individual market. The private plans offered alongside a public option might have higher or lower utilization than existing private plans depending on how they adjusted their plan designs in response to introduction of a public option; I discuss these potential responses by private plans at greater length in section 7. On the other hand, prior experience suggests that a public option would have lower administrative costs and a lower cost of capital than both existing private plans and the private plans offered alongside a public option.

In the individual and small group markets, risk selection and risk adjustment would also be important considerations. Experience from Medicare Advantage suggests that a public option would attract sicker enrollees than competing private plans and be less effective at coding diagnoses for risk adjustment purposes than its private competitors. This would cause the public option to have higher costs than existing private plans, while causing private plans offered alongside a public option to have lower costs than existing plans. The rest of this section discusses these factors in more detail.

Utilization. I first consider how the public option's utilization might compare to existing private plans. My maintained assumption in this paper is that a public option would adopt utilization management practices similar to traditional Medicare, so it is informative to consider the findings of research that compares traditional Medicare to existing private plans.

Private plans—both in the commercial market and in Medicare Advantage—use a variety of strategies to reduce utilization that traditional Medicare does not. Perhaps most importantly, private plans generally have provider networks that exclude at least some providers in the plan's service area. While one motivation for excluding providers is to strengthen insurers' leverage when bargaining with providers (e.g., Ho and Lee 2019), networks can also be used to reduce utilization, such as by steering patients away from high-utilizing providers (e.g., Skopec, Berenson, and Feder 2018). Typical network breadth varies by plan type. Narrow network plans (i.e., plans that exclude many providers) are common in the individual market (Coe, Lamb, and Rivera 2017; Dafny et al. 2017; Polsky, Cidav, and Swanson 2016), and a substantial fraction of Medicare Advantage enrollment is in narrow network plans as well (Jacobson et al. 2016; 2017; Feyman et al. 2019). By contrast, truly narrow networks are relatively uncommon in employer coverage, where only 7% of employers describe their largest plan as having a "somewhat" or "very" narrow network (KFF 2020b).[51]

Private plans also use a range of other utilization controls, such as prior authorization and referral requirements, that are generally not used in traditional Medicare. These types of requirements are the norm in Medicare Advantage and individual market plans (P. Neuman and Jacobson 2018; McKinsey and Company 2020), and exist in many employer plans as well (KFF 2020b).

Research comparing utilization in Medicare Advantage and traditional Medicare suggests that the tighter controls used by Medicare Advantage plans achieve their intended purpose of reducing utilization. Curto et al. (2019) directly compare spending by Medicare Advantage and traditional Medicare enrollees, adjusting for health status differences. In the Curto et al. analyses that adjust for the broadest set of health status differences, the authors estimate that Medicare Advantage enrollees spend 9% less than comparable traditional Medicare enrollees, with the differences concentrated in post-acute and physician spending. Since Medicare Advantage plans generally pay providers prices similar to traditional Medicare's, as discussed in detail in section 9, this difference appears to entirely reflect differences in utilization, not differences in provider prices.

A weakness of the Curto et al. (2019) research design is that they may not be able to fully adjust for differences in health status between traditional Medicare enrollees and Medicare Advantage enrollees. Duggan, Gruber, and Vabson (2018) attempt to avoid the need to adjust for differences in health status by examining how aggregate hospital utilization changed after discrete declines in Medicare Advantage penetration caused by Medicare Advantage plan withdrawals in New York State. The authors conclude that shifting an enrollee from traditional Medicare to Medicare Advantage reduces the number of hospital admissions that an enrollee experiences by 37%.[52]

Evidence suggests that these types of utilization controls can also reduce utilization in the under 65 population. This was the conclusion of a long literature that examined the managed care plans that diffused during the 1980s and 1990s (e.g., Glied 2000), and several more recent papers have reached similar conclusions. Gruber and McKnight (2016) examine an initiative by the state of Massachusetts to move state employees into narrower network plans and find meaningful reductions in utilization, as do Atwood and LoSasso (2016) in a comparison of employers that do and do not offer narrow network plans. Particularly compellingly, Geruso, Layton, and Wallace (2020) examine Medicaid enrollees randomly assigned to Medicaid managed care plans in New York City and find wide variation in spending, apparently reflecting differences in how tightly plans manage utilization.

Of course, as noted above, some private plans outside Medicare Advantage—particularly employer plans—have broad networks and lack other utilization controls as well, so these plans may have smaller

[51] A caveat on cross-market comparisons of network breadth is that fully comparable measures of network breadth are not available. The research cited here on Medicare Advantage and the individual market uses publicly available plan provider directories to estimate what share of providers in a given area are included in a plan's network. But comparable measures are difficult or impossible to construct for employer plans. Nevertheless, the subjective assessments of employers that participate in the KFF survey suggest that employer networks are indeed broader than those in other private plans.

[52] This finding is in some tension with the Curto et al. findings, which show little reduction in hospital utilization. This could reflect shortcomings in one or both research designs or differences between the particular Medicare Advantage plans studied by Duggan, Gruber, and Vabson and the broader universe of Medicare Advantage plans studied by Curto et al.

utilization advantages over traditional Medicare. Indeed, Wallace and Song (2016) compare utilization of imaging services and outpatient procedures among retirees just under age 65 who have employer coverage to retirees just over age 65 who have traditional Medicare, focusing on a sample of large employer plans likely to have broad networks and limited utilization controls. They find no evidence that these employer plans have lower utilization than traditional Medicare.

The evidence discussed above thus suggests that a public option based on traditional Medicare would have higher utilization than existing individual market plans given those plans' narrow networks and tight utilization controls. By contrast, utilization under a public option might be only modestly higher than existing employer market plans given those plans' more limited utilization controls.

I largely defer consideration of how utilization in private plans offered alongside a public option might compare to existing private plans. That would depend on whether and how the introduction of a public option caused private plans to adjust their plan designs, which I discuss in section 7. In brief, however, I conclude that it is plausible that introducing a public option could cause private plans to become either more or less aggressive in managing utilization than they are under the status quo.

Administrative expenses. I next consider how the administrative expenses of a public option might compare to the administrative expenses of private plans—both existing plans and those that would compete with a public option. Data from insurers' Medical Loss Ratio Filings with CMS show that private plans in the individual, small group, and large group markets incurred administrative expenses of $482 per enrollee (10.3% of claims spending) in 2018 (Table 6.1). For comparison, federal administrative spending for Parts A and B of Medicare was $229 per person enrolled in traditional Medicare in that year (4.9% of private market per enrollee claims spending), about half as large.[53]

This Medicare estimate is an imperfect guide to the administrative costs a public option would incur, but it is unclear whether is too high or too low. Because a public option would serve a population that uses fewer health care services, it would likely spend less on claims processing and related activities than traditional Medicare; at least one-third of Part A and B administrative spending is on activities that scale with utilization to some degree.[54] On the other hand, this cost estimate does not include administrative costs associated with offering prescription drug coverage.[55] Enrolling people in a public option might also be more administratively complex than enrolling them in traditional Medicare.

It is less clear why traditional Medicare incurs much lower administrative expenses than private plans. Private plans' more intensive approach to utilization management (discussed above), their greater marketing efforts (discussed below), and their efforts to improve risk selection and diagnosis coding (also discussed below) all likely increase their administrative costs to some degree. Traditional Medicare may also realize some economies of scale not available to private plans.

---

[53] The Medicare estimate was calculated using data for the 2018 calendar year in the 2019 Medicare Trustees report. For Part A, I divide Part A administrative spending by the number of people with Part A coverage from traditional Medicare. I proceed similarly for Part B, except that I exclude a $1.1 billion transfer to the Medicaid program that the Trustees categorize as an administrative expense but that funds some Medicare beneficiaries' Part B premiums. The figure reported in the text is the sum of the resulting Part A and Part B per enrollee amounts. Note that this method erroneously includes costs that the federal government incurs to administer Medicare Advantage, but the resulting upward bias is likely small.

[54] GAO (2015) estimates that the Medicare Administrative Contractors (MACs) that handle claims processing and related functions for traditional Medicare were paid $1.3 billion in fiscal year 2013. The Medicare Trustees report that an additional $1.8 billion was spent in calendar year 2018 on activities aimed at reducing health care fraud and abuse. Extrapolating the MAC figure to calendar year 2018 implies that these two costs represented 38 percent of total federal administrative spending on Part A and B of Medicare in that year. This is a lower bound since various other Medicare administrative costs likely also scale with utilization to some degree.

[55] Because Medicare offers drug coverage through private insurers, it is not possible to use experience under Medicare to gauge the administrative costs that a public option would incur when offering prescription drug coverage.

Table 6.1: Non-Claims Expenses of Private Insurers, 2018

Category of Expenditures	Spending on Category: Per Member Per Year ($)	Spending on Category: As a % of Claims
Administrative expenses		
Claims processing	106	2.3
Direct sales and broker commissions	143	3.1
Other administrative expenses	233	5.0
Total administrative expenses	482	10.3
Taxes and fees		
Federal corporate income tax	57	1.2
ACA health insurance tax	91	1.9
Other federal taxes and fees	39	0.8
State taxes and fees	72	1.5
Memo: Claims spending	4,688	100.0

Source: CMS MLR Public Use File; author's calculations.

Note: Table includes expenses for comprehensive major medical plans offered in the individual, small group, and large group markets. Administrative expenses are reported on section 5 of part 1 of the MLR form. The reported subcategories include the following line items: claims processing expenses (lines 5.1 and 5.2); direct sales and broker expenses (lines 5.3 and 5.4); and other administrative expenses (lines 5.5a, 5.5b, 5.5c, and 5.6). Taxes and fees are reported on section 3 of part 1 of the MLR form. The reported subcategories include the following line items: federal corporate income tax (line 3.1a); ACA health insurance tax (line 3.1c); other federal taxes and fees (lines 3.1b, 3.1d, 3.3a, and 3.3b); and state taxes and fees (lines 3.2a, 3.2b, and 3.2c). Line 3.3b (labeled "Other Federal and State regulatory licenses and fees") is categorized as federal because it consists overwhelmingly of user fees collected by the Health Insurance Marketplace but may include a small amount of state fees. The number of covered life-years is reported in part 1, line 7.4 and claims spending is reported in part 1, line 2.1.

In sum, while further work to estimate the administrative costs of a public option would be worthwhile, experience from Medicare suggests that a public option would likely incur lower administrative costs than existing private plans. By contrast, there is no clear reason to expect the administrative costs of private plans operating alongside a public option to differ from existing private plans.

Taxes and fees. Private plans pay various taxes and fees to federal and state governments, and I have assumed for this analysis that the public option would be subject to these taxes (excepting corporate income taxes, which I discuss separately) in the same way as private plans. Table 6.1 indicates that the amount of such taxes and fees is relatively modest. Excluding federal corporate income taxes and the ACA's health insurance tax (which has been repealed), private insurers in the individual, small group, and large group markets paid taxes and fees of $111 per enrollee (2.4% of claims spending) in 2018.

Cost of capital. Private insurers rely on capital supplied by investors to fund long-term investments and maintain reserves required by regulators, and investors demand compensation for supplying that capital because they forgo the opportunity to invest those funds elsewhere and run the risk of losing their investment. Insurers also pay corporate income tax on the profits they earn to fund compensation paid to investors. The non-tax portion of the cost of capital is not captured in "accounting" measures of costs like those reported in Tables 6.1 and 6.2 (Litow 2006; Zycher 2007).

Table 6.2: Revenues, Costs, and Margins for Insurance Plans Offered in the Small and Large Group Markets, 2014-2018

	Amount	
	Per Member Per Year	As a % of Claims
Premium revenue	5,073	118.8
Claims spending	4,269	100.0
Administrative and health care quality expenses	469	11.0
Taxes and fees		
Federal corporate income tax	57	1.3
All other taxes and fees	161	3.8
Underwriting margin		
Post-tax underwriting margin	117	2.7
Pre-corporate-tax underwriting margin	174	4.1

Source: CMS Medical Loss Ratio Public Use File; author's calculations.

Note: Table reflects experience for comprehensive major medical plans offered in the small and large group markets, as reported on part 1 of the MLR reform. The line items included in each category are as follows: premium revenue (all line items in section 1): claims spending (line 2.1); administrative and health care quality expenses (all line items in sections 5 except items labeled "informational only", plus, for 2014-2016, all items in section 4 or, for 2017 and 2018, line 4.6); federal corporate income tax (line 3.1a); and all other taxes and fees (all other line items in section 3, except items labeled "informational only"). The post-tax underwriting margin is obtained by subtracting claims, administrative and health care quality expenses, and taxes and fees from premium revenue. The pre-corporate-tax underwriting margin is obtained by adding back federal corporate income taxes. The number of covered life-years is reported in part 1, line 7.4.

Directly estimating insurers' tax-inclusive costs of compensating investors is challenging, but these costs can be bounded using data on insurers' underwriting margins (that is, the difference between insurers' premium revenue and their accounting costs, including both their claims and non-claims expenses). In a perfectly competitive market, an insurer's expected pre-corporate-tax underwriting margin will equal the amount of revenue the insurer requires to cover its accounting costs, corporate taxes, and the required return to investors. In reality, insurers appear to hold some market power (e.g., Dafny, Duggan, and Ramanarayanan 2012; Dafny, Gruber, and Ody 2015), so insurers' underwriting margins are likely an upper bound on insurers' tax-inclusive cost of compensating investors.

Data from insurers' medical loss ratio filings with CMS, which are reported in Table 6.2, show that pre-corporate-tax underwriting margins in the small and large group markets were 4.1% of total claims spending over the 2014-2018 period.[56] This suggests that the cost of compensating investors increases insurers' costs by, at most, around 4% of claims spending, and perhaps meaningfully less to the extent that insurers wield market power that allows them to earn "excess" profits.

It is important to note that a public option might incur some capital costs as well. In particular, I have assumed here that a public option would fund long-term investments via loans from the federal

[56] I exclude the individual market from these calculations because it was far from its long-term equilibrium during most of this period as it adapted to policy changes implemented by the ACA. I am unable to separate state corporate income taxes from other state taxes in the MLR data, which likely leads me to slightly understate pre-corporate-tax underwriting margins.

government on which it would be required to pay interest at the government's borrowing rate. The Congressional Budget Office currently projects that interest rate on a 10-year Treasury note will rise to 3.1% over the medium-run (CBO 2020), while a reasonable estimate of the pre-tax return required to compensate an insurer's investors is about 9%. [57] This implies that the public option's cost of capital would be about one-third as large as private plans' (if they had equivalent investment needs).

Risk selection. In the individual and small group markets, an additional consideration is whether the public option and private plans would attract different types of enrollees. If the public option attracted sicker enrollees than private plans, that would increase its costs, while reducing private plans' costs.[58] (Risk selection would not be relevant for a public option offered to large employers if, as I assume here, a public option only sold third-party administrator services to large employers.)

Evidence suggests that a public option, at least a broad-network public option like the one considered here, would attract sicker enrollees than private plans. Research examining Medicare Advantage and the individual market finds that private plans craft provider networks and drug formularies with the goal of attracting healthier enrollees (Geruso, Layton, and Prinz 2019; Kuziemko, Meckel, and Rossin-Slater 2018; Lavetti and Simon 2018; Shepard 2016), and it is likely that they do the same with other aspects of plan design. There is also some evidence that Medicare Advantage insurers target advertising to people in better health (Mehrotra, Grier, and Dudley 2006), although research has reached conflicting conclusions about whether advertising is an effective tool for risk selection in practice (Aizawa and Kim 2018; Shapiro 2020).

The risk adjustment programs that operate in the individual and small group markets could limit the scope for insurers to benefit from this type of risk selection. While risk adjustment likely reduces the benefits private plans could realize through selection, risk adjustment does not capture all dimensions of health status in practice (Brown et al. 2014; Newhouse et al. 2015; Cabral, Geruso, and Mahoney 2018; Curto et al. 2019). Indeed, Curto et al. (2019) estimate that differences in health status between traditional Medicare and Medicare Advantage enrollees reduce Medicare Advantage spending by 25% relative to traditional Medicare and that a differential of 17% remains after adjusting for differences in health status that are captured by the Medicare Advantage risk adjustment system.[59]

Diagnosis coding. A related question is whether private plans are better at documenting enrollees' health conditions for risk adjustment purposes. If so, their greater "coding intensity" will make their enrollees appear sicker in risk adjustment calculations, reducing what they pay (or increasing what they receive) in risk adjustment and allowing them to set lower premiums. Because risk adjustment is budget neutral, this would also put upward pressure on the public option's premium. (These considerations would be relevant for a public option offered in the individual or small group markets, but not one offered to large employers since large employer are not subject to risk adjustment.)

---

[57] Damodaran (2019) reports that the arithmetic average equity premium relative to 10-year Treasury rates over the last 50 years was 4.0%. Combined with CBO's projection of the 10-year Treasury rate, this implies a required equity return of 7.2%. At the current corporate tax rate of 21%, funding that return would require a pre-corporate-tax return of 9.1% (=0.072/0.79).

[58] Indeed, risk selection differences have been a central consideration in some earlier research on the effects of introducing a public option (Barbos and Deng 2015; Miller and Yeo 2019).

[59] Specifically, Curto et al. (2019) report that average per beneficiary month spending in traditional Medicare is $942 (for the specific mix of geographic areas they examine). This estimate falls to $855 after reweighting to match the Medicare Advantage population along dimensions of health status captured in risk adjustment and to $706 after reweighting to account for a broader set of health status differences. In their estimates, the total difference in spending attributable to health status difference is thus 25 percent (= 1 - $706/$942), while the difference after adjusts for factors captured in risk adjustment is 17 percent (=1 - $706/$855). The post-risk adjustment differential may be have shrunk modestly in recent years due to improvements in risk adjustment, particularly implementation of a larger coding intensity adjustment.

Experience in Medicare Advantage offers strong evidence that private plans are indeed better at documenting their enrollees' health conditions than traditional Medicare. Geruso and Layton (2020) estimate that Medicare Advantage plans' greater coding intensity increased their enrollees' risk scores by 6.4% on average during the 2006-2011 period. In Medicare, policymakers have responded to this fact by applying an across-the-board "coding intensity" adjustment to private plans' risk scores that offsets most (though not all) of this coding advantage. In this paper, I generally assume that a public option would participate in the individual and small group market risk adjustment programs on the same terms as private plans and, thus, that an analogous coding intensity adjustment would not be made. But policymakers could adopt the Medicare approach if they wished.

6.2.3 Enrollee Preferences for Public or Private Plans

Market outcomes in the presence of a public option would also depend on whether enrollees tended to prefer the public option over private plans or vice versa at the same premium. Unfortunately, evidence on this question is comparatively thin. Notably, it is hard to draw analogies with Medicare, most importantly because Medicare beneficiaries are enrolled in traditional Medicare by default, which may have a large effect on enrollee decisions but might not occur with a public option.[60]

Nevertheless, this section discusses a few factors that might cause enrollees to prefer one type of plan over the other at the same premium. In general, it is unclear whether these factors would, on net, work in favor of private plans or the public option and what the magnitude of any advantage would be.

Benefit design. Private plans' benefit designs might differ from the public option's in ways that would make them more or less attractive to enrollees. As discussed above, private plans competing with a public option would likely adopt networks that exclude some providers and implement various other utilization controls. These features would likely make private plans somewhat less attractive to enrollees, holding premiums fixed. Indeed, evidence suggests that many beneficiaries will pay more for a broader network, although the magnitude of this difference appears to vary across settings and individuals (Drake 2019; Ericson and Starc 2015b; Gruber and McKnight 2016; Shepard 2016).

On the other hand, private plans might craft benefit designs that consumers would find more attractive in other respects, such as by covering services not covered by the public option or designing cost-sharing in ways that were more appealing to consumers. Private plans may be particularly likely to have this type of advantage over the long run since making major changes to a public option's benefit design might require legislation, as in Medicare, while private plans could likely be nimbler.

The Medicare program offers examples of this latter dynamic. For example, prescription drug coverage was close to universal in employer coverage by the time the Medicare program added a drug benefit in 2006 (KFF and HRET 2006). Medicare Advantage plans also feature modern benefit designs similar to those in commercial plans that, for example, limit enrollees' annual out-of-network pocket spending, whereas traditional Medicare's benefit design has remained largely unchanged for decades despite well-documented shortcomings and many proposals for reform (e.g., MedPAC 2012).[61]

---

[60] Some proposals to automatically enroll people into insurance coverage might make a public option the default for some enrollees (e.g., Linke Young 2019). In those cases, the Medicare experience might be more relevant.

[61] Medicare Advantage plans also offer more generous benefits than traditional Medicare on other dimensions, including lower cost-sharing and dental and vision coverage (KFF 2019). This likely partly reflects plans' efforts to cater to consumer tastes and partly reflects the federal government's generous payment terms for Medicare Advantage plans, some of which accrues to enrollees as richer benefit designs (Duggan, Starc, and Vabson 2016; Cabral, Geruso, and Mahoney 2018).

Marketing effort. Private plans devote significant resources to marketing.[62] Direct sales expenses and broker commissions account for 30% of plans' total administrative spending (3.1% of claims spending), as shown above in Table 6.2. Plans devote additional amounts to advertising, although this spending cannot be separated out from other administrative expenses in the MLR data and is likely small relative to direct sales and broker commissions.[63] While policymakers could, in principle, devote similar resources to marketing a public option, it is questionable whether they would do so in practice.

How many enrollees private plans might be able to attract via marketing is uncertain. Some recent research examining enrollment in the ACA Marketplaces and Medicare Advantage has concluded that mass media advertising does increase plan market shares, although the magnitude of the estimated effects is generally relatively modest (Aizawa and Kim 2018; Shapiro 2020; Aizawa and Kim 2020). To my knowledge, there is no published research examining how the much larger amounts that private insurers spend on direct sales and broker commissions affect enrollment.

Intrinsic preferences for a public option. It is also possible that some enrollees may have intrinsic preference for a publicly operated plan, either for ideological reasons or because they distrust private plans (Commonwealth Fund, New York Times, and Harvard T.H. Chan School of Public Health 2019; KFF 2020a). This may be particularly likely if creation of a public option was politically controversial, as seems likely to be the case in practice. Notably, there is some evidence that political views have affected individual decisions about whether or not to take up Marketplace coverage (Lerman, Sadin, and Trachtman 2017; Sances and Clinton 2019). Like many of the other effects discussed in this section, the potential magnitude of this effect is unclear.

6.2.4 Premium Setting Processes

A final potentially important difference between a public option and private plans is that a public option would set premiums differently than private plans. In particular, private plans generally set premiums to maximize profits, and economic theory implies that the profit-maximizing premium equals the insurer's marginal cost of enrolling an additional person plus a markup that depends on the elasticity of demand for the insurer's plan with respect to its premium, which depends in turn on how much competition the insurer faces. By contrast, I have assumed that a public option would be legally required to set premiums that exactly covered its average per enrollee cost.

If there are few barriers to private plan entry, the difference in how the public option and private plans set premiums may not be particularly consequential in equilibrium. Without barriers to entry, private plans would be expected to continue to enter the market until the premium they could charge exactly matched their average costs (or, equivalently, until private plans' equilibrium markup exactly equaled any difference between their average cost and their marginal cost). Thus, in equilibrium, both private plans and the public option would set premiums that reflected their average costs.

If, however, there are meaningful barriers to entry, which is likely often the case in practice, then these differences may matter in two ways. First—and most obviously—private plans will set higher premiums than the public option even if the two sets of plans have identical cost structures.

[62] This fact features prominently in a prior analysis of a public option from Cebul et al. (2011). Their model emphasizes that private plans' marketing effort may reflect high search costs and that introducing a public option could ameliorate that problem, potentially leading to reductions in socially unproductive marketing effort and reducing inefficient turnover. The mechanisms by which a public option could improve outcomes considered by Cebul et al. are largely not considered here.

[63] Data from Kantar Media indicate that health insurers spent $1.1 billion on advertising in 2015 across all product lines (Liesse 2016). For comparison, the MLR data indicate that insurers' spending on direct sales and broker commissions totaled $10 billion in the individual, small group, and large group markets alone in 2018.

Second, the private plan's premium will depend on its *marginal* cost whereas the public option's premium will depend on its *average* cost. This could be important in at least two contexts:

- **Fixed costs:** A portion of plans' administrative spending consists of fixed costs that do not scale with enrollment. Examples include the cost of establishing payment procedures, credentialing providers, and designing claims processing systems. Fixed costs would be reflected in the public option's premium, but not private plans' premiums. This could reduce private plans' premiums relative to the public option, perhaps partially mitigating the administrative cost advantage a public option seems likely to hold.

- **Risk selection:** In settings with risk selection, an insurer's marginal cost depends on the characteristics of the *marginal* enrollee, not the insurer's *average* enrollee (e.g., Cabral, Geruso, and Mahoney 2018). For a private plan that benefits from advantageous selection, it is natural to expect the plan's marginal enrollee to be sicker than its average enrollee. Consequently, any downward pressure on private plans' premiums due to risk selection may be smaller than suggested by the average risk of the private plan's enrollees. Indeed, it is quite possible for the private plan's marginal enrollee to be sicker than the population average even when the average private plan enrollee is healthier than the population average and, thus, for risk selection to increase the premiums of *both* the public option and private plans. This is precisely what occurs in the simulations presented in the next section.

6.3 Simulations of Market Equilibrium with a Public Option

Building on the preceding discussion, this section uses a calibrated version of the formal model presented in Appendix B to simulate market outcomes in the presence of a public option. While this model makes important simplifications and future work to refine it would be worthwhile, the results nevertheless help to illustrate the major factors that would shape the effects of introducing a public option. I begin this section by briefly describing the model and the main assumptions that underlie it. I then present the simulation results and discuss the model's main limitations.

6.3.1 Model Description and Assumptions

The model used for the simulations is fully described in Appendix B. In brief, however, the model features a single private insurer that competes with a public option. The public option pays providers prices that are fixed in law at 100% of Medicare rates and sets its premium to cover its average costs.[64] By contrast, the private insurer negotiates prices with each provider (specifically, a "two-part tariff," as described in section 6.2.1). Based on the outcome of those negotiations, the insurer sets a premium that maximizes its profits. Enrollees then decide between the public option and the private plan based on the two plans' premiums, networks, and other characteristics. To simplify the analysis, the total number of people enrolling in any form of coverage is fixed; that is, the plans' premiums only affect how many enrollees choose one plan versus the other, not the total number of covered people.[65]

Consistent with the discussion in section 6.2.1, one important model parameter is the sensitivity of enrollees' plan choices to premium differences. To set this parameter, I reviewed studies that estimate the premium elasticity of demand for health plans offered on Massachusetts' pre-ACA individual market (Chan and Gruber 2010; Ericson and Starc 2015a; Jaffe and Shepard 2020) and the ACA

[64] As noted above, Medicare prices do not exist for prescription drugs. The simulations implicitly assume that the prices the public option pays for drugs are the same percentage below the prices existing private plans pay for drugs as the prices the public option pays for other items and services *and* that introduction of a public option would affect the prices that private plans are able to negotiate for drugs in the same way it would affect the prices they negotiate for health care services.

[65] This is unlikely to be important to the main outcomes of interest in this paper. It does mean, however, that this analysis cannot shed light on how introducing a public option would affect overall insurance enrollment.

Marketplaces (Abraham et al. 2017; Domurat 2018; Drake 2019; Saltzman 2019; Tebaldi 2017). Full details are in Appendix B, but this literature suggests that plan choices are highly price sensitive. Averaging across these authors' estimates, I obtain an average elasticity estimate of -7.4, meaning that a 1% increase in a plan's premium reduces enrollment in that plan by approximately 7.4%. I calibrate the model to match this elasticity when the private plan and public option have equal market shares.[66]

I simulate nine scenarios, which vary along three dimensions: (1) the prices that existing private plans pay providers; (2) the prices the public option pays providers; and (3) assumptions about various other characteristics of the public option and private plan. I discuss each dimension in turn.

Prices paid by existing private plans. The first factor that varies across simulation scenarios is the prices that existing private plans pay providers. In some scenarios, I assume that private plans currently pay providers 180% of Medicare prices on average across all services, which reflects an estimate of what employer-sponsored plans currently pay providers on average nationwide based on the studies reviewed in Figure 2.1.[67] In other scenarios, I assume that private plans currently pay providers 125% of Medicare prices on average across all services. These scenarios may offer a better guide to the effects of introducing a public option in the individual market (since individual market plans likely pay providers less than employer plans today) or in geographic areas with lower prices.

Public option payment rates. The second factor that varies across scenarios is the prices the public option pays providers. In one set of scenarios, the public option pays providers prices equal to 100% of Medicare's prices. In the other set of scenarios, the public option pays providers 150% of Medicare prices. As discussed in section 6.2.1 and further in section 6.3.3 below, the model used in this paper is not suitable for analyzing scenarios where the public option pays providers more than existing private plans. Thus, I do not report results for scenarios where the public option pays providers 150% of Medicare prices and existing private plans pay providers 125% of Medicare prices.

Other plan characteristics. The third factor that varies across scenarios is my assumptions about other characteristics of the public option and private plan. These characteristics include: the breadth of the private plan's network, which affects the prices the private plan can negotiate with providers and thus premiums (see section 6.2.1); the plans' performance with respect to non-price determinants of plan costs—specifically, utilization, non-claim expenses, risk selection, and diagnosis coding—which affect claims spending and thus premiums (see section 6.2.2); and enrollee perceptions of the two plans, which affect how many people enroll in each plan at a given set of premiums (see section 6.2.3).

I consider three sets of assumptions: one in which the public option and the private plan are essentially identical; one in which the two plans differ in ways plausible for a public option offered in the individual market; and one in which the two plans differ ins ways plausible for a public option offered in the large employer market. These scenarios help illustrate the consequences of differences in these characteristics and how the effects of introducing a public option in the individual market versus the employer market might differ. These assumptions are summarized in Table 6.3 and described below.

---

[66] In the model (as in many models), the elasticity falls as the private plan's market share rises, reflecting the fact that as the private plan's market share rises, the pool of potential enrollees shrinks relative to the plan's current enrollment.

[67] To arrive at this figure, I first calculate commercial-to-Medicare ratios for each major health care service category by taking an unweighted average of the estimated commercial-to-Medicare ratios surveyed in Figure 2.1. Additionally, I assume that commercial prices for all other non-drug items and services (which consist primarily of laboratory services and durable medical equipment) are comparable to Medicare, which is broadly consistent with available evidence (Trish et al. 2017). Combining these price ratios with estimates of spending by category in 2018 from the Health Care Cost Institute (2020) implies that existing private plans pay 78 percent more than Medicare for non-drug services on a weighted average basis. (As described above, the simulations assume that the differential between what a public option would pay for prescription drugs and what exiting private plans pay for prescription drugs would match the differential for services.)

Table 6.3: Assumptions About Public Option and Private Plan Characteristics

Plan characteristic	Assumptions About Differences Between Public Option and Private Plans		
	Identical plans assumptions	*Individual market assumptions*	*Large employer market assumptions*
Private plan network breadth	Includes all providers	Includes 40% of providers (on a utilization-weighted basis)	Includes 75% of providers (on a utilization-weighted basis)
Utilization	No utilization differences	Relative to existing private plans, public option utilization is 10% higher, private plan utilization is unchanged.	Relative to existing private plans, public option utilization is 5% higher, private plan utilization is unchanged.
Non-claims expenses	Both plans spend amount equivalent to 10.6% of per enrollee claims spending in current private plans	Public option: 7.9% of per enrollee claims spending in existing private plans Private plan: 10.6% of per enrollee claims spending in existing private plans	
Risk selection	No selection differences	Public option experiences adverse selection. See text and Appendix B for additional details.	No selection differences
Diagnosis coding	No coding differences	Private plan enrollees appear 6% sicker than identical public option enrollees in risk adjustment	No coding differences
Enrollee preferences	Enrollees equally likely to select either plan when premiums are equal		Enrollees equally likely to select either plan when public option premium is 5% lower than private plan premium

The details of the three sets of assumptions are as follows:

- **Identical plans assumptions.** These scenarios examine outcomes if the public option and private plan were identical to each other and existing plans except that the public option sets prices administratively (rather than via negotiation) and sets a premium to cover its costs (rather than to maximize profits). This scenario is unrealistic but is a useful benchmark.

  In detail, for these scenarios, I assume that both the public option and the private plan offer broad networks, induce the same level of utilization as existing private plans, code diagnoses identically for risk adjustment purposes, and are equally attractive to enrollees. Additionally, I assume that both plans incur a constant per enrollee non-claims cost equal to 10.6% of the per enrollee claims spending of existing private plans. This assumption is derived from the estimates reported in Tables 6.1 and 6.2, and aims to approximate the *marginal* non-claims expenses incurred by existing private plans, including the cost of compensating investors.[68]

- **Individual market assumptions.** These scenarios incorporate assumptions appropriate to a public option offered in the individual market. In crafting these assumptions, I draw heavily on the evidence from Medicare Advantage reviewed in section 6.2.2 since it is the only existing health insurance market in which enrollees choose between private plans and a publicly operated alternative. In detail, I assume the following:

  - *Private plan network breadth:* I assume that the private plan's network would include 40% of providers in its market (on a utilization-weighted basis). This assumption is broadly consistent with evidence that many Medicare Advantage plans feature moderately narrow networks (Jacobson et al. 2016; 2017). This assumption also implies that the private plan's network would resemble many existing individual market networks (Coe, Lamb, and Rivera 2017; Dafny et al. 2017). As discussed in section 7, introducing a public option would encourage broader private plan networks in some ways and narrower networks in others, so this approach amounts to assuming that these competing forces would roughly offset each other.

  - *Utilization:* I assume that, holding enrollee characteristics fixed, the public option has utilization 10% higher than existing individual market plans, while the private plan's utilization is equal to existing individual market plans. This assumption is based on the Curto et al. (2019) estimate that utilization in traditional Medicare is roughly 10% higher than in Medicare Advantage plans for comparable enrollees.

  - *Non-Claims Expenses:* I assume that the public option would incur per enrollee non-claims expenses equivalent to 7.9% of per enrollee claims spending in existing private plans. This amount reflects the sum of: the estimate of per enrollee administrative spending in traditional Medicare from section 6.2.2; the estimate of taxes and fees other than federal corporate income tax and the ACA health insurance tax from Table 6.1; and an estimate of the cost of compensating taxpayers for loans used to finance

[68] In detail, I begin with the estimate in Table 6.1 that private plans incurred administrative expenses of 10.3% of claims spending in 2018. I then assume that half of private plans' pre-corporate-tax underwriting margins, as estimated in Table 6.2, reflects the cost of compensating investors for supplying capital, yielding total non-claims expenses of 12.3% of private plans' claims spending. I then reduce this amount by one-third as a crude way of excluding fixed costs and increase the result by 2.4 percentage points to account for the taxes reported in Table 6.1 (other than federal corporate taxes and the now repealed ACA health insurance tax), yielding the final estimate of 10.6% of existing private plans' claims spending.

start-up costs and capital investments.[69] By contrast, paralleling the identical plans assumptions, I assume that the private plan would incur per enrollee non-claims expenses equivalent to 10.6% of per enrollee claims spending in existing private plans.

- *Risk selection:* I assume that the public option attracts enrollees who use more health care services (in ways that are not offset by risk adjustment). My approach to modeling risk selection is discussed further in Appendix B, but I calibrate the degree of adverse selection based on the estimates of Curto et al. (2019) from Medicare Advantage. The effects of selection on plans' costs depends on their market shares, but in equilibrium, the public option's enrollees have claims risk 8-11% higher than the population average, while the marginal private plan enrollee has claims risk 2-7% higher than the population average, depending on the particular simulation results considered.

- *Diagnosis coding:* I assume that the private plan's coding efforts would raise its enrollees' risk scores by 6% relative to what they would be if the same individuals were enrolled in the public option. This estimate is roughly consistent with the Geruso and Layton (2020) estimate of upcoding by private plans in Medicare Advantage.

- *Enrollee preferences:* I assume that enrollees would be equally likely to choose the public option or the private plan if they charged the same premium. In essence, I assume that the private plan's narrower network would be offset by its potential advantages in benefit design and marketing discussed in section 6.2.3. I note that the evidence underlying this assumption is much weaker than the others made here.

- **Large employer market assumptions.** These scenarios incorporate assumptions appropriate to a public option offered in the large employer market. With the exception of non-claims expenses, these assumptions differ from those in the individual market scenarios in recognition of the differences between the individual and large employer markets:

  - *Private plan network breadth:* I assume that the private plan's network would include 75% of providers in its market (on a utilization-weighted basis), mirroring the broad networks of existing employer plans (KFF 2020b). As discussed at greater length in section 7, introducing a public option would encourage broader private plan networks in some ways and narrower networks in others, so this approach amounts to assuming that these competing forces would offset each other.

  - *Utilization:* I assume that, for comparable enrollees, utilization under the public option would be 5% higher than existing employer plans, smaller than the 10% differential assumed in the individual market scenario. This difference in assumptions reflects the broader networks and less stringent utilization controls of existing employer plans relative to individual market plans. I assume that utilization under the private plan would be comparable to that under existing employer plans, paralleling my approach in the individual market scenarios and consistent with my assumption that the private plan would offer a network similar to existing employer plans.

[69] In detail, I begin with the estimate discussed in section 6.2.2 that per enrollee administrative spending in traditional Medicare was equivalent to 4.9% of claims spending in commercial plans, to which I add 2.4 percentage points to account for the relevant taxes. I then add an additional 0.7 percentage points, which reflects one-third of the cost private plans incur to compensate investors described in an earlier footnote. This implicitly reflects an assumption that the capital intensity of the public option's operations is similar to the capital intensity of private plans' operations.

- *Risk selection:* Because the public option would offer only third-party administrator services (not insured coverage) to large employers, risk selection would play no role in determining either plan's claims spending, unlike in the individual market scenario.

- *Diagnosis coding:* There is no risk adjustment in the large employer market, so the private plan would derive no benefit from better diagnosis coding.

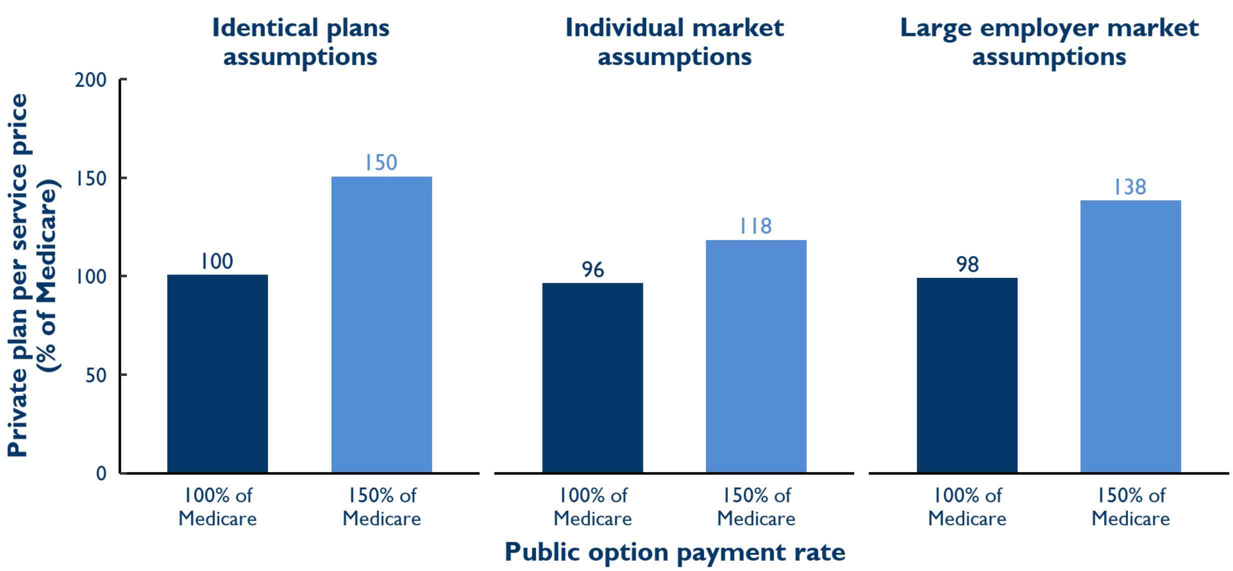
- *Enrollee preferences:* I assume that enrollees would be equally likely to select the private plan and the public option if the public option charged a premium 5% below the private plan's. This reflects an assumption that the private plan would have advantages in benefit design and marketing that would more than offset its modestly narrower network. As with the corresponding assumption for the individual market scenarios, the evidence base for this assumption is comparatively weak.

6.3.2 Simulation Results

Tables 6.4 and 6.5 (which appear at the end of this section) report the full results for each of the nine scenarios specified above. In the rest of this section, I highlight three notable features of these results.

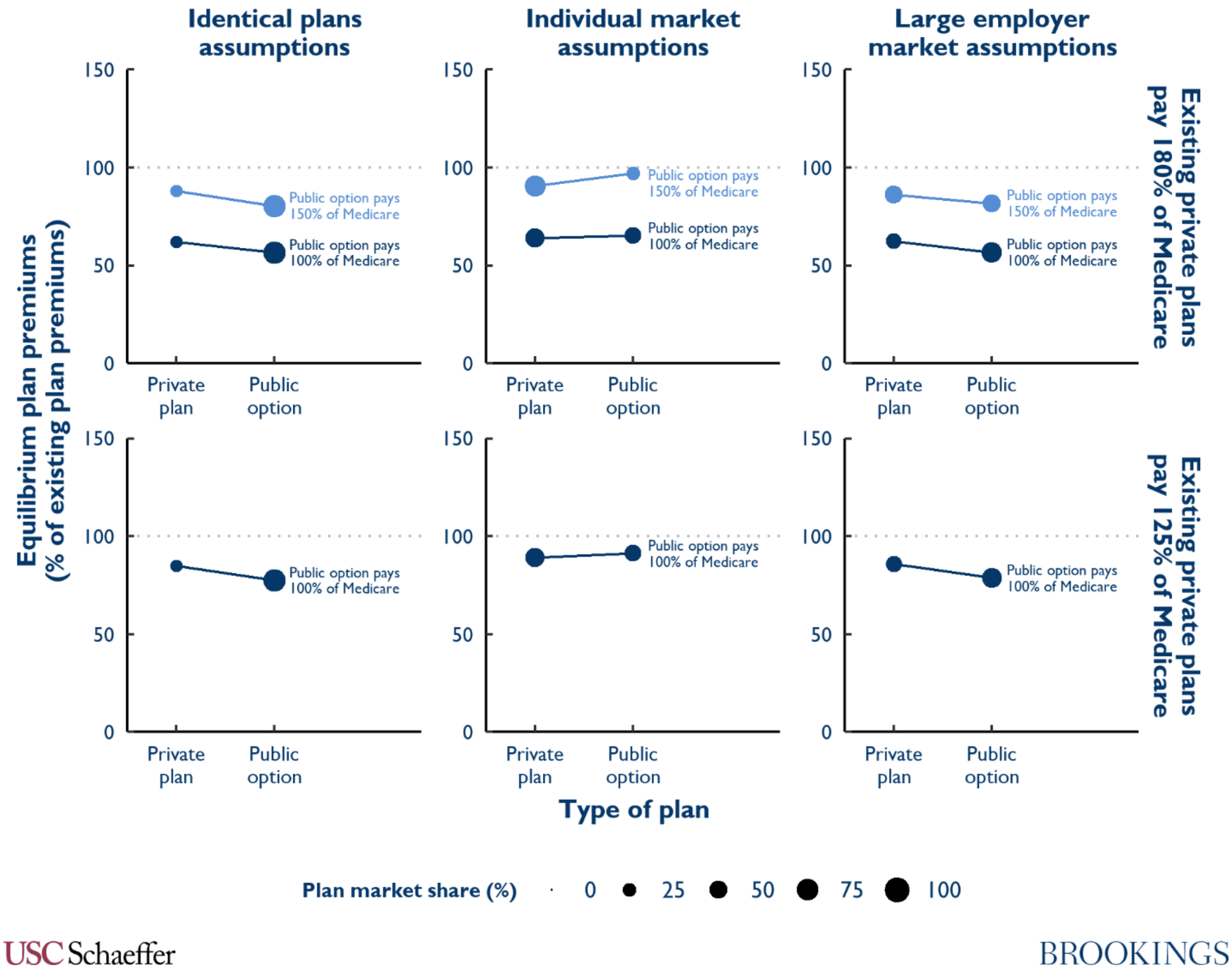
First, as illustrated in Figure 6.3, the per service prices the private plan pays providers are tightly linked to the public option's prices, consistent with the analysis in section 6.2.1. Indeed, when the public option and the private plan have identical utilization profiles, the two plans pay providers identical prices (at the margin). In the individual market and large employer market scenarios, the private plan's per service prices are somewhat lower than the public option's prices, reflecting the fact that the private plan excludes some providers from its network, which pushes the negotiated per service prices downward toward the provider's marginal cost, as discussed in section 6.2.1. This effect is largest in the individual market scenarios (since the private plan's network is narrower) and when the public option pays higher prices (since the public option's prices are farther from providers' marginal costs).

Figure 6.3: Private Plan Per Service Prices



Note: Private plan per service prices are independent of the prices paid by existing private plans.

Figure 6.4: Plan Premiums and Market Shares, by Market Scenario and Prices Paid by Existing Private Plans



Second, in all scenarios I examine, the premium of *both* the public option and the private plan are below the premiums of existing private plans, as illustrated in Figure 6.4. [70] This reflects the fact that I am examining scenarios where the public option pays providers less than existing private plans and, as described in the last paragraph, the private plan pays providers prices weakly lower than the public option's prices (at the margin). Naturally, the decline in the private plan's premium is larger when the public option's prices are farther below the prices paid by existing private plans. (Note that neither Figure 6.4 nor Table 6.5 report results for the case of a public option that pays providers 150% of Medicare rates in a market where existing private plans pay providers 125% of Medicare rates since, as discussed above, the model is likely to perform poorly in that case.)

[70] The tables report premiums as a fraction of the premiums of existing private plans. To calculate these amounts, I compare the simulated premiums to premiums that reflect the prices, utilization patterns, non-claims expenses, and insurer margins under the status quo. I describe my methodology for constructing the status quo premiums in Appendix B. In principle, it would be preferable to use the same model to simulate outcomes both with and without a public option and compare the simulated amounts rather than comparing the simulated amounts with a public option to the constructed status quo premiums. Unfortunately, the model I use in this paper is not suitable for simulating outcomes without a public option.

Third, scenarios that reflect different assumptions about how the public option and private plan compare on dimensions other than what they pay providers generate notably different simulated outcomes, particularly regarding plan market shares, as also illustrated in Figure 6.4. In the identical plans scenarios, the public option's premium is lower than the private plan's premium, reflecting the fact that the private plan's profit maximizing strategy is to set a premium that incorporates a markup. That premium differential, together with the fact that enrollment decisions are highly price sensitive, leads the public option to capture 79% of the market in all scenarios with identical plans.

But the individual market scenarios yield markedly different results. The public option now sets a higher premium than in the identical plans scenarios, reflecting the fact that the public option is now assumed to have higher utilization, attract sicker enrollees, and pay risk adjustment transfers to the private plan, disadvantages that are only slightly offset by lower administrative spending (see Table 6.4 and Table 6.5). The private plan's premium is also higher, but more modestly so, reflecting the net effect of two opposing forces. On the one hand, the private plan's marginal claims cost is now lower, primarily because it is now assumed to have a narrower network and thus pays providers lower per service prices.[71] But the public option's higher premium makes it a weaker competitor for the private plan, so the private plan sets a premium that incorporates a larger markup (a portion of which is, in turn, captured by providers). The net effect of these premium changes is a large shift in enrollment toward the private plan that results in the private plan capturing the majority of the market.

The large employer market scenarios generate results intermediate between the first two set of scenarios. In these scenarios, the public option no longer has the risk selection and diagnosis coding disadvantages it had in the individual market scenarios, and it has a smaller utilization disadvantage, so it charges a much lower premium. The private plan also sets a lower premium than in the individual market scenarios, reflecting the fact that the public option is now a stronger competitor, which leads the private plan to price more aggressively; this effect is partially offset by the fact that the private plan is now assumed to offer a broader network and, thus, negotiates higher per service prices. On net, these premium changes cause enrollment to swing back toward the public option, although the private plan still attracts more enrollment than in the identical plans scenarios (in part because most enrollees are now assumed to slightly prefer the private plan to the public option at the same premium).

[71] Perhaps surprisingly, risk selection actually slightly increases the private plan's marginal cost because the private plan's *marginal* enrollee is now sicker than the population average, even though its average enrollee is healthier.

Table 6.4: Public Option Simulation Results, Existing Private Plans Pay 180% of Medicare Rates

Assumptions about plan characteristics:	Identical plans		Individual market assumptions		Large employer market assumptions	
	Private*	Public	Private*	Public	Private*	Public
Panel A: Public Option Pays 100% of Medicare Rates						
Components of premium (% of premiums of existing private plans)						
Claims spending	48	48	46	57	47	50
Risk adjustment transfers	0	0	-1	2	0	0
Non-claims expenses	9	9	9	7	9	7
Markup	5	0	10	0	6	0
Total premium	62	57	64	65	62	57
Determinants of claims spending						
Risk-standardized utilization (% of status quo)	100	100	100	110	100	105
Enrollee risk (% of population average)	100	100	102	108	100	100
Provider price (% of Medicare)	100	100	96	100	98	100
Equilibrium market shares (%)	21	79	56	44	34	66
Panel B: Public Option Pays 150% of Medicare Rates						
Components of premium (% of premiums of existing private plans)						
Claims spending	71	71	60	87	66	75
Risk adjustment transfers	0	0	-1	3	0	0
Non-claims expenses	9	9	9	7	9	7
Markup	8	0	23	0	11	0
Total premium	88	80	91	97	86	82
Determinants of claims spending						
Risk-standardized utilization (% of status quo)	100	100	100	110	100	105
Enrollee risk (% of population average)	100	100	107	111	100	100
Provider price (% of Medicare)	150	150	118	150	138	150
Equilibrium market shares (%)	21	79	73	27	49	51

* Private plan columns report amounts for the marginal enrollee rather than the average private plan enrollee. In all scenarios, the price the insurer pays providers on the margin may differ from the overall average price the insurer pays providers because the parties negotiate two-part tariffs. In the individual market scenarios, risk selection causes claims spending, the insurer's markup, and enrollee risk to differ between the marginal enrollee and the average enrollee.

Table 6.5: Public Option Simulation Results, Existing Private Plans Pay 125% of Medicare Rates

Assumptions about plan characteristics:	Identical plans		Individual market assumptions		Large employer market assumptions	
	Private*	Public	Private*	Public	Private*	Public
Panel A: Public Option Pays 100% of Medicare Rates						
Components of premium (% of premiums of existing private plans)						
Claims spending	69	69	67	82	67	72
Risk adjustment transfers	0	0	-2	3	0	0
Non-claims expenses	9	9	9	7	9	7
Markup	7	0	15	0	9	0
Total premium	85	78	89	91	86	79
Determinants of claims spending						
Risk-standardized utilization (% of status quo)	100	100	100	110	100	105
Enrollee risk (% of population average)	100	100	103	109	100	100
Provider price (% of Medicare)	100	100	96	100	98	100
Equilibrium market shares (%)	21	79	59	41	37	63
Panel B: Public Option Pays 150% of Medicare Rates						
Components of premium (% of premiums of existing private plans)						
Claims spending	N/A	N/A	N/A	N/A	N/A	N/A
Risk adjustment transfers	N/A	N/A	N/A	N/A	N/A	N/A
Non-claims expenses	N/A	N/A	N/A	N/A	N/A	N/A
Markup	N/A	N/A	N/A	N/A	N/A	N/A
Total premium	N/A	N/A	N/A	N/A	N/A	N/A
Determinants of claims spending						
Risk-standardized utilization (% of status quo)	N/A	N/A	N/A	N/A	N/A	N/A
Enrollee risk (% of population average)	N/A	N/A	N/A	N/A	N/A	N/A
Provider price (% of Medicare)	N/A	N/A	N/A	N/A	N/A	N/A
Equilibrium market shares (%)	N/A	N/A	N/A	N/A	N/A	N/A

* Private plan columns report amounts for the marginal enrollee rather than the average private plan enrollee. In all scenarios, the price the insurer pays providers on the margin may differ from the overall average price the insurer pays providers because the parties negotiate two-part tariffs. In the individual market scenarios, risk selection causes claims spending, the insurer's markup, and enrollee risk to differ between the marginal enrollee and the average enrollee. Panel B is not populated because the model used in this paper is not suitable for simulating scenarios where the public option's premium is likely to exceed the premium of existing private plans.

6.3.3 Limitations

The model used here has a few limitations that should be kept in mind in interpreting the simulation results. First—and likely most important—is that the model includes only a single private insurer, whereas most real-world markets have multiple private insurers. As discussed at length in Appendix B, the additional competitive pressure from the presence of multiple private plans could result in private plans setting somewhat lower premiums (and capturing somewhat more market share) than shown here, although this effect would likely be relatively modest in size since the presence of the public option already constrains the private plan's premium relatively tightly.

Additionally, if there were multiple private plans, then some of a private plan's marginal enrollees would come from other private plans rather than from the public option. As discussed in more detail in Appendix B, this would mean that the profits a provider loses when an enrollee switches into a given plan would depend on the prices the provider receives from other private plans in addition to the public option's prices. As illustrated in Figure 6.3 above, private plans' narrow networks are likely to allow them to negotiate prices (for the marginal services) that are somewhat below the public option's payment rates. This implies that accounting for this dynamic would tend to reduce the per service prices private plans are predicted negotiate, resulting in them setting lower premiums and capturing more market share. The magnitude of this bias is likely relatively small in the scenarios presented here, where per service prices are only slightly below the public option's prices. However, this bias would be much larger in scenarios where the public option paid providers more than existing private plans. Indeed, the model's failure to account for this dynamic is the fundamental reason that the model is a poor guide to outcomes in cases where the public option is a weak competitor for private plans.

Second, as described in detail in Appendix B, under the bargaining protocol used in the model, an insurer can threaten to exclude a provider from its network but cannot threaten to exclude a provider *and* immediately replace it with another provider. The latter type of threat is likely part of the reason that narrow network plans are able to negotiate lower prices (Ho and Lee 2019). The model may therefore modestly overestimate the prices that insurers offering narrow network plans can negotiate and, thus, their premiums. However, the magnitude of this bias is likely modest in most scenarios since negotiated prices in the presence of a public option are at most moderately above providers' marginal cost, which limits the scope for this negotiating tactic to enable further price reductions.

Finally, the variation in results across the identical plans, individual market, and large employer market scenarios illustrates that the results are sensitive to assumptions about utilization, risk selection, non-claims spending, and other factors. While these parameters of the model are calibrated based on the best available empirical evidence, this evidence is imperfect, and uncertainty about these parameters also contributes meaningful uncertainty to the results.

6.4 Effects of Making Provider Participation Voluntary

Most of this section has examined a scenario in which providers would be required to participate in the public option. But policymakers might instead make participation voluntary, and it is worth considering how a public option would function differently under this type of approach.[72]

This section begins by analyzing the benefits and costs providers would realize by opting out of the public option, guided again by the model in Appendix B. In general, it appears plausible that many providers would opt out of the public option, particularly providers that are able to command high prices under the status quo, at least if the public option's payment rates were set close to providers'

[72] There is a question of how the public option would pay for emergency services delivered by non-participating providers in the case where provider participation was voluntary. For simplicity, the discussion that follows essentially ignores the existence of out-of-network care, emergency or otherwise. If providers were required to accept the public option's payment rates for emergency services, then even a voluntary public option would, in effect, remain partially mandatory for providers.

marginal cost of delivering care. However, quantifying the share of providers that would opt out of the public option in practice would require substantial additional analysis.

In light of the likelihood that at least some providers would opt out of a voluntary public option, I then consider how the effects of a public option with a narrow provider network might differ from one with mandatory provider participation. I also briefly consider the effects of a voluntary public option that would negotiate prices with providers, rather than set prices administratively.

6.4.1 Benefits and Costs to Providers of Opting Out of the Public Option

Opting out of the public option would have both benefits and costs for providers. I first consider the financial benefits and costs of opting out of the public option, which would likely play the lead role in providers' decisions. I then briefly consider non-financial factors that might also play a role.

Financial considerations. The main benefit to a provider of opting out of the public option is that it may allow the provider to negotiate higher prices with private plans.[73] In particular, if a provider opted out of the public option, then private plans could offer exclusive access to the provider's services. For this reason, private plans that added that provider to their networks would have a competitive advantage that would allow them to charge higher premiums, attract more enrollment, or both. Private plans would thus be particularly eager to reach a network agreement with these providers, which would, in turn, allow these providers to extract higher prices from insurers.

Opting out of the public option would also have costs for the provider. Most importantly, a provider that opted out of the public option would forgo the profits it could earn by serving public option patients. More subtly, opting out of the public option would weaken a provider's bargaining position vis-à-vis private plans in one respect. In particular, when a provider participates in the public option, it knows that failing to reach an agreement with a private plan will result in some of its patients shifting out of the private plan and into the public option, mitigating its volume losses from the failure to reach agreement. This dynamic modestly increases its leverage with the private plan.[74]

In many respects, the tradeoff a provider faces in deciding whether to participate in the public option is similar to the tradeoffs faced by a provider deciding what price it is willing to accept from a private plan today. However, the public option holds one important advantage over existing private plans that might lead providers to participate in the public option even if it paid less than existing private plans. Specifically, because the public option's prices would be specified in law and not subject to negotiation, the public option would effectively make a "take it or leave it" offer to each provider. Thus, it would be in a provider's interest to participate in the public option at the legislated price even if doing so left it only slightly better off on net. By contrast, a provider would be unlikely to accept a similar offer from a private plan because it could reasonably expect to successfully hold out for a higher price.

Predicting how many providers would actually opt out of a public option is beyond the scope of this paper and is likely to be a difficult modeling problem. But this discussion does provide some insights on the factors that would shape providers' decisions. First, providers whose services consumers value very highly—presumably the same providers that command the highest prices today—would be most likely to opt out of a public option. These providers would have the greatest ability to give private plans a competitive advantage over the public option and thus would have the most to gain by opting out.

---

[73] Providers might also elect to opt out of the public option because they are limited in how many patients they serve and are paid more under the private plan (even if opting out does not change the price they receive from the private plan). Capacity constraints would likely matter in some cases but may be less important over the long run since providers have at least some ability to scale up their operations to accommodate additional demand.

[74] Indeed, because of this effect, it is possible to construct scenarios where opting out of the public option actually *reduces* the revenue a provider can extract from private plans, but these scenarios seem unlikely in practice.

Second, this discussion suggests that a public option that paid lower prices would be more likely to have trouble attracting providers since public option volume would be less lucrative and, thus, less costly to forgo. Indeed, if the public option's payment rate equaled the provider's marginal cost, a provider would lose nothing by opting out of the public option and would very likely do so.

Third, the discussion suggests that a public option would attract more providers if it had features that allowed it to attract more enrollees (e.g., if some people were enrolled in the public option by default or the public option had non-price cost advantages that allowed it to set a low premium) since providers would then forfeit more volume by opting out of the public option. This fact also suggests that different providers' decisions about whether to participate in the public option may be interdependent. Namely, one provider's decision to opt out of the public option could reduce enrollment in the public option, thereby reducing other providers' cost of dropping out of the public option. This raises the possibility of multiple equilibria; that is, the public option's network might stay broad if it started with many providers but stay narrow if it started off with few providers.

Non-financial considerations. Providers' participation decisions would likely be driven primarily by financial considerations, but non-financial considerations could play a role too. Some providers' institutional mission might lead them to accept public option patients even if turning them away would increase profits. Providers might also fear that opting out of the public option would spur negative attention from policymakers or the public. These considerations are similar to those that might shape providers' decisions about whether to reject out-of-network patients under an out-of-network cap. As in that case, providers' willingness to bargain aggressively with private plans under the status quo suggests that these considerations may not play a large role in providers' decision-making.

Moreover, in other cases, providers might believe that opting out of the public option would allow them to extract concessions from policymakers, such as higher payment rates under the public option. This might be most important for a public option created by a state, where an individual provider—such as a dominant hospital system—could single-handedly cripple the public option. A similar problem could emerge at the federal level if legislation creating a public option granted the Executive Branch discretion to increase payment rates in geographic areas with limited provider participation.

6.4.2 Consequences of Limited Provider Participation

If many providers declined to participate in a voluntary public option, it would likely function quite differently than a public option with mandatory provider participation. It is possible that the public option's network could end up being so narrow that it did not offer enrollees meaningful access to care. In this case, enrollees might be wary of enrolling in the public option, causing it to attract little enrollment and to have little effect on the market. (Alternatively, some enrollees might enroll in the public option despite its extremely narrow network, perhaps because they were unaware that few providers participated. Due to this possibility, policymakers might conclude that a public option should be removed from the market if it failed to attract an adequate network of providers.)

Another possibility is that the public option would assemble a narrow, but still viable network. In this case, private plans would likely pay providers more and set higher premiums than in the mandatory participation case since, as discussed above, providers would be most likely to opt out of the public option *precisely* when doing so gave private plans more pricing power. The public option's premium might change too. Having a narrower network might reduce the public option's utilization, consistent with the evidence cited earlier that Medicare Advantage plans' narrower networks are one source of their utilization advantage. In the individual market, a public option that offered a narrow network might also be less likely to experience adverse selection or might even experience advantageous selection (Liu et al. 2020). It is uncertain how enrollment in the public option would change on net since any relative reduction in the public option's premium would be offset by the fact that the public option's narrower network would presumably make it less attractive to consumers.

6.4.3 Setting Prices Through Negotiation, Rather than Administratively

In light of the possibility that a voluntary public option that set prices administratively would struggle to attract providers, policymakers might consider having the public option set payment rates via negotiation. Setting prices via negotiation would likely allow the public option to attract a broader network, but only by paying providers prices comparable to those paid by existing private plans. A public option that negotiated prices could actually negotiate *higher* prices than private plans if it were less willing to use the tools that private plans use to extract lower prices (e.g., narrow networks). It could also be administratively complex since it would require the entity responsible for administering the public option to manage negotiations with many thousands of different health care providers.

Absent an ability to pay providers lower prices, the scope for a public option to offer consumers a lower-premium option would likely be limited. In insurance markets with limited competition and high insurer profit margins, a public option might still be able to reduce premiums by offering a plan that incorporates no profit margin, which might also induce private plans to price more competitively. As discussed earlier, a public option might also have lower non-claims costs than private plans, but this might be offset by disadvantages with respect to utilization, risk selection, and diagnosis coding.

7 Effects on Provider Networks

The analysis presented in the rest of this paper takes the networks offered by private plans as given. In practice, however, a price cap or public option could change the attractiveness of private plans that offer different types of networks and, in turn, the types of networks enrollees select. Network changes would be important in their own right and would also help determine the overall effects of a price cap or public option on provider prices and premiums. While a full analysis of how these policies would affect networks is beyond the scope of this paper, this section briefly considers this question.

In brief, I conclude that policies that reduced the overall level of provider prices—including a price cap or a public option with low enough payment rates—would generally reduce the premium gap between broad and narrow network private plans. This change in relative premiums would tend to push enrollment toward broad network plans. While some non-premium factors might push enrollees in the other direction, it appears most likely that both a price cap and a public option would, on net, cause a shift toward broader network plans on a market-wide basis. In the particular case of a public option, the effect on the network mix of *private plan* enrollment is more ambiguous, as the public option might siphon off many consumers interested in broad network plans.

In practice, shifts toward broader network plans could partially offset the overall reduction in premiums and provider prices caused by a price cap or a public option. However, because these policies would also tend to reduce the gap in premiums and provider prices between broad and narrow network plans, the magnitude of any such offset might be smaller than it would be under the status quo. It might be particularly small for a public option offered in the employer market since most enrollment in the employer market is already in relatively broad network plans (KFF 2020b).

7.1 Effects on Relative Premiums of Broad and Narrow Network Plans

I first consider how these public option and price cap policies might affect the premium gap between broad and narrow network private plans. In general, policies that reduce the overall level of provider prices would reduce this premium gap in two ways:

- **Reduced scope to use narrow networks to negotiate lower prices**. One reason insurers offer narrow network plans is to increase their leverage in negotiations with providers (e.g., Ho and Lee 2019). As discussed above, both price caps and a public option have the potential to greatly reduce the prices private plans negotiate with providers *even in broad network plans*, with the scope and magnitude of those effects depending on the version of the policy considered. By contrast, these policies are likely to do less to reduce the prices providers can negotiate under narrow network plans since negotiated prices generally can fall no lower than providers' marginal cost. Thus, at least under stringent versions of the price cap and public option policies, the price advantage held by narrow network plans is likely to fall, causing the premiums of the two types of plans to converge.

- **Smaller savings from steering enrollees toward low-priced or low-utilization providers.** Another reason insurers offer narrow networks is to steer enrollees toward providers that charge lower prices or encourage less utilization, thereby allowing insurers to offer lower premiums (e.g., Atwood and Lo Sasso 2016; Gruber and McKnight 2016). To the extent that a price cap or public option reduced unit prices, the savings achievable by reducing utilization would shrink. Similarly, a price cap or a public option would likely reduce *variation* in prices across providers, which would tend to shrink the potential savings from steering enrollees toward low-priced providers. It follows that the premium advantage that narrow network plans held over broader network plans would likely shrink.

For a public option offered in the individual or small group markets, there is an additional factor to consider. In particular, sicker enrollees often place a particularly high value on access to particular providers and thus may gravitate toward broad network plans (e.g., Shepard 2016). Risk selection can cause broad network plans to charge high premiums or, in extreme cases, drive them from the market entirely. With a public option, however, a broad network plan would be more likely to remain in the market and attract significant enrollment, which could change risk selection patterns.[75]

One possibility is that with most of the sickest consumers choosing the public option, private plans would be left to compete over a comparatively healthy and homogenous group of enrollees. In this case, changes in risk selection patterns could further narrow the premium differences between broad and narrow network private plans. However, depending on the details of consumer demand, it is conceivable that changes in risk selection could operate in the opposite direction. Additional analysis of changes in risk selection patterns in this context would be worthwhile.

7.2 Overall Effects on Enrollment in Broad and Narrow Network Plans

While changes in the relative premiums of broad and narrow network plans would play an important role in determining how a price cap or public option would change their market shares, non-premium factors would affect enrollee decisions too. For these purposes, I consider the price cap and public option policies separately, as the relevant considerations differ between the two types of policies.

7.2.1 Price Cap Policies

The price cap policies considered in this paper might influence enrollees' choices between broad and narrow network plans through two channels other than their effect on premiums. First, all price cap policies considered in this paper would limit enrollees' financial exposure in cases where they unexpectedly received out-of-network services (e.g., in emergency or "surprise billing" situations), which might make enrollees more willing to enroll in narrow network plans. Second, as discussed in

[75] Consistent with the discussion in section 6, even if the public option experienced serious adverse selection, it might remain viable because the extent to which it constrained the premiums charged by private plans would wane, causing the premiums charged by private plans to rise in parallel.

sections 4 and 5, an out-of-network cap or a comprehensive price cap (but not a default contract policy) would create incentives for providers to turn away out-of-network patients in order to maximize their bargaining leverage with insurers. Enrollees' reduced ability to access out-of-network providers might make them more willing to pay a higher premium to enroll in a broad network plan.

The net effect of these two factors is uncertain. However, it is questionable whether either would be highly salient to enrollees and, thus, have a large effect on enrollment decisions. Thus, in light of the conclusion reached above that the price cap policies would reduce the relative premiums of broad network plans, these policies seem likely to drive enrollment toward broad network plans on net.

7.2.2 Public Option

For a public option, the most important non-premium factor is the presence of the public option itself. A public option (with mandatory provider participation) would offer consumers access to a broad network plan. The analysis in section 6 implies that the public option would attract significant enrollment, which would directly increase enrollment in broad network plans, particularly in the individual market, where narrow network plans dominate today (e.g., Coe, Lamb, and Rivera 2017). Thus, together with the likely reduction in the premium gap between broad and narrow network private plans that was discussed above, it appears likely that introducing a public option would shift *overall* insurance enrollment toward broader network plans.

Effects on the network mix of *private plans* could differ, however. In particular, the analysis in section 6 suggests that the public option would often have modestly lower premiums than a private plan with the same features, so it is plausible that many consumers who have strong preferences for broad network plans would choose to enroll in the public option. Thus, private plans might draw primarily from the pool of consumers who are open to narrower networks. In that case, the share of private plan enrollment accounted for by broad network plans might fall despite the fact that introducing a public option would reduce the premium difference between broad and narrow network private plans.

7.3 Effects on Other Types of Utilization Controls

Before proceeding, I note that much of the analysis in this section would carry over to plan utilization controls other than narrow networks. In particular, price cap and public option policies would likely reduce the premium gap between more and less tightly managed private plans since tighter utilization controls generate smaller reductions in claims spending when the unit prices of care are lower. On the other hand, paralleling the networks analysis, in the case of a public option offered in the individual or small group markets, changes in risk selection patterns could either offset or reinforce this shift in the relative premium of more and less tightly managed plans.

A reduction in the relative premiums of lightly managed plans would tend to push enrollment toward those plans. In the case of a public option, this shift in *overall* enrollment toward more lightly managed plans would likely be reinforced by the fact that the public option itself offered consumers a new lightly managed option. However, paralleling the networks analysis, it is ambiguous how introducing a public option would affect the share of *private plan* enrollment accounted for by lightly managed plans since the public option might siphon off many consumers who value lightly managed plans.

8 Enforcement Approaches

Each of the policy approaches considered in this paper would impose requirements on health care providers. The out-of-network and comprehensive price cap proposals would limit the prices providers can accept under specified circumstances, and a default contract approach to price regulation would require providers to accept a default contract if an insurer requested one. Similarly, the main public option proposal analyzed in this paper would require providers to accept patients covered by the public option. This section discusses two ways these requirements on providers could be enforced.

8.1 Free-Standing Monetary or Other Penalties

The simplest approach would be to impose free-standing monetary or other penalties on providers that were out of compliance with the relevant requirements. At the federal level, fines would be the most natural tool, but state policymakers could consider conditioning provider licensure on compliance with the relevant requirements. This enforcement approach is straightforward and would give policymakers the flexibility to set penalties at whatever level was necessary to ensure compliance.

8.2 Tie to Federal Health Care Coverage and Subsidy Programs

If policymakers did not want to create free-standing penalties of this kind, they could also consider making compliance with these requirements a condition of serving patients with coverage that is provided or subsidized by the federal government. Most directly, policymakers could make compliance with these requirements a condition of participation in Medicare or state Medicaid programs.

However, the federal government also heavily subsidizes private coverage. The federal government implicitly covers around one-third of the cost of employer-sponsored health insurance via the tax exclusion for employer-provided coverage, and it subsidizes individual market coverage via the subsidies available to people purchasing coverage on the Affordable Care Act's Marketplaces. Policymakers thus could also consider barring insurance plans that wish to qualify for the tax exclusion or Marketplace subsidies from covering services delivered by non-compliant providers.[76,77]

For example, in the context of a public option proposal, employer-sponsored plans that received the tax exclusion would be barred from covering services delivered by a hospital that declined to accept public option patients. While this requirement would technically fall on the insurer, insurance plans that were ineligible for these subsidies would be unattractive to consumers. Thus, most insurance enrollment would likely flow to plans that did not cover non-compliant providers, seriously limiting the volume non-compliant providers could attract, thereby pressuring those providers to come into compliance with the public option or price cap. Naturally, this enforcement approach would be more likely to succeed if more forms of federally subsidized coverage were included.

One natural concern with using federal coverage programs or subsidies as an enforcement tool is that some providers might opt out of serving patients under those forms of coverage rather than come into compliance with the requirements imposed by a price cap or public option. Providers' propensity to opt out of subsidized coverage programs would likely depend on a few main factors:

- **Breadth of markets in which the price cap or public option existed.** One important factor would be the markets in which the price cap or public option was implemented. Notably, the individual market covers only around 5% of the population,[78] and, as noted earlier, there is some evidence that provider prices in the individual market are already lower than in the employer market. Consequently, very few providers would likely be willing to forfeit access to, for example, Medicare patients in order to avoid complying with price caps or a public option in the individual market. By contrast, providers might be willing to bear far larger costs to protect their pricing power in the larger and more lucrative employer market.

[76] White and Whaley (2019) proposed a milder variant of this approach as a potential reform to the (now repealed) ACA excise tax on high-cost employer-sponsored plans (commonly known as the "Cadillac tax"). Under their proposal, the Cadillac tax would apply to claims paid at prices in excess of 300 percent of Medicare's prices.

[77] This prohibition could be qualified to some degree. For example, insurers could be permitted to cover services delivered by non-compliant providers in emergency situations.

[78] See, for example, tabulations of the National Health Interview Survey in Fiedler and Linke Young (2019).

- **Stringency of the price cap or public option.** Another important factor is the stringency of the price cap or public option, which determines how much the provider would benefit from circumventing the policy. In particular, per the discussion in sections 4 and 5, providers would likely be willing to give up more to circumvent a price cap set at a lower level or one that applied to both in-network and out-of-network services. Similarly, per the discussion in section 6, the benefits of turning away public option patients would generally be larger if the public option paid lower prices. Notably, providers that can currently command high prices are likely to have more to gain from circumventing a price cap or public option and, thus, would be most willing to opt out of treating patients with federally subsidized coverage.

- **Breadth of the types of federally subsidized coverage at stake.** A final important factor is the breadth of federal coverage and subsidy programs used for enforcement purposes. For example, declining to comply with a price cap or provider participation requirement would be more costly to the provider if doing so required the provider to forgo treating patients covered by Medicare, Medicaid, and subsidized private coverage rather than just Medicare patients. Indeed, it is plausible that very few providers would be willing to completely forgo patients covered under Medicare, Medicaid, and subsidized private coverage since these coverage types account for virtually the entire insured population.

9 Experience from Medicare Advantage

Experience with most of the policy tools considered in this paper is relatively limited in the United States. But the Medicare program is an important exception. In Medicare, private Medicare Advantage (MA) plans compete alongside traditional Medicare, which plays the role of a public option, and providers are subject to an out-of-network cap at traditional Medicare rates when treating MA enrollees.[79] The Medicare program thus offers an interesting empirical setting in which to assess and apply the largely theoretical analysis presented in the rest of this paper.

A well-documented and striking fact is that MA plans pay hospitals and physicians prices very close to traditional Medicare's, not just on average but in almost all cases, a stark contrast with the higher and widely varying prices paid by commercial plans (Berenson et al. 2015; Baker et al. 2016; Trish et al. 2017; Maeda and Nelson 2018; Pelech 2020).[80] In this section, I examine this fact through the lens of the theoretical analysis presented in the rest of this paper. I draw two main conclusions, which offer some support to the theoretical models developed in this paper and some insight into dynamics in MA.

First, because institutional and other factors ensure broad provider participation in traditional Medicare, this paper's analysis of a public option implies that competition from traditional Medicare can largely explain why MA prices are so close to traditional Medicare's. This conclusion echoes prior work that posits a large role for traditional Medicare in disciplining the prices paid by MA plans (e.g.,

[79] See sections 1852(k) and 1866(a)(1)(O) of the Social Security Act, and see 42 CFR § 422.214 for implementing regulations. The Medicare statute and regulations also require that the combination of the plan's payment and the enrollee's cost-sharing for out-of-network covered services total at least the traditional Medicare rate (CMS 2016). However, MA plans are generally not required to cover out-of-network services, and when they do cover out-of-network services, they generally may impose higher cost-sharing on those services. Thus, the MA out-of-network payment policy is closer to a pure out-of-network cap than to a "cap and floor" out-of-network policy like the one analyzed in section 4.4. In any case, the distinction between a pure out-of-network cap and a "cap and floor" policy is of limited importance in this case since the payment standard under the MA policy is set at a low level and the policies are nearly equivalent under those conditions.

[80] This rule does not hold for all provider types. For example, Trish et al. (2017) document that MA plans pay less than traditional Medicare for certain common laboratory services and certain types of common durable medical equipment. Notably, these are both cases where commercial insurers have historically paid less than traditional Medicare.

Berenson et al. 2015; Trish et al. 2017). Second, because there are no apparent barriers keeping providers from turning away out-of-network MA patients in non-emergency situations, it is questionable whether the MA out-of-network cap on its own can explain the prices observed in MA, although it may play a supporting role. By contrast, some prior work assigns the MA out-of-network cap a more central role in shaping outcomes in MA (e.g., Maeda and Nelson 2018; Pelech 2020).

9.1 Background on the MA Policy Environment

Spurred by the analysis in the rest of the paper, I open this section by considering when providers can decline to treat Medicare patients. The analysis of a public option presented in section 6 emphasized that the effects of a public option would depend on whether providers were required to accept public option patients or could opt to serve only private plan patients; applied to Medicare, this insight implies that it is important to understand whether providers can turn away traditional Medicare patients while continuing to treat MA patients. Similarly, the analysis of an out-of-network cap presented in section 4 emphasized that the effects of an out-of-network cap would depend on whether providers can turn away out-of-network patients; applied to the MA setting, this conclusion implies that is important to understand whether providers can turn away out-of-network MA patients.

Importantly, institutional providers who wish to serve Medicare patients must accept Medicare patients on the same terms as they accept patients with other forms of coverage.[81] Specifically, CMS may expel an institutional provider from the program if it "places restrictions on the persons it will accept for treatment and it fails either to exempt Medicare beneficiaries from those restrictions or to apply them to Medicare beneficiaries the same as to all other persons seeking care."

This requirement, together with the requirement that MA plans deliver services through providers who meet the requirements to deliver services under traditional Medicare,[82] plainly bars an institutional provider from turning away traditional Medicare patients while still serving MA patients. And it seems likely that this constraint is binding in practice. I am unaware of any provider that has taken this approach, plausibly because providers fear CMS enforcement action if they did so. Indeed, CMS is likely motivated to prevent providers from declining to serve traditional Medicare patients while continuing to serve MA patients given the threat that this type of behavior would pose to the viability of traditional Medicare. This behavior would also be easy for CMS to detect. As discussed in section 6.4, the main potential advantage to a provider of turning away traditional Medicare patients is to allow MA plans to tout that they offer exclusive access to a provider's services. That advantage can only be realized if the provider is open about its intention to turn away traditional Medicare patients.

On its face, the requirement to accept Medicare and non-Medicare patients on equal terms might also seem to prevent an institutional provider from turning away out-of-network MA patients (unless it opts out of Medicare entirely). However, there are high-profile examples of institutional providers contemplating or actually implementing these types of restrictions, a strong indication that these rules do not prevent this behavior in practice.[83] And, in any case, as discussed in section 4.3.1, providers

[81] The requirement to accept Medicare and non-Medicare patients on the same terms appears at 42 CFR § 489.53(a)(2). Per 42 CFR § 489.1, these requirements apply to "providers of services" as defined in section 1861(u) of the Social Security Act and the categories of institutional "suppliers" listed in 42 CFR § 488.1.

[82] See section 1852(a)(1) of the Social Security Act and 42 CFR § 422.204.

[83] The Mayo Clinic, for example, says that patients covered by certain Medicare Advantage plans "may not be seen" and explicitly states that these patients "cannot be seen on a self-pay basis" (Mayo Clinic 2019). Similarly, in 2019, University of Pittsburgh Medical Center (UPMC) threatened to require Highmark Blue Cross Blue Shield enrollees that wished to access its services on an out-of-network basis to pay in full before receiving care (UPMC 2019). UPMC later retreated from the policy with respect to Highmark's MA plans (though not Highmark's commercial plans). Federal officials expressed some interest in UPMC's policy, but never made any statements about the legality of the policy or gave any public indication they planned to take enforcement action (Gough 2018; Twedt 2019).

may be able to reduce out-of-network patients' ability to access their services in more subtle ways that would not obviously violate Medicare's rules, such as by simply declining to explain that a patient may be able to access its services on an out-of-network basis. It thus appears likely that institutional providers generally can decline to treat out-of-network MA enrollees if they wish, although further research to clarify how providers understand what is permitted would be worthwhile.

It is important to note that, unlike institutional providers, physicians are *not* required to accept Medicare and non-Medicare patients on equal terms. Consequently, physicians do not face legal barriers to turning away either traditional Medicare patients or out-of-network MA enrollees. [84]

9.2 Understanding Pricing Outcomes in Medicare Advantage

With this foundation established, I now examine provider prices in MA through the lens of the theoretical analysis presented in the rest of this paper. I consider the role of competition from traditional Medicare and the presence of the MA out-of-network cap in turn.

Competition from traditional Medicare can largely explain the prices observed in MA. As discussed above, institutional providers are required to accept traditional Medicare patients and, as an empirical matter, access to physician services via traditional Medicare is quite robust (MedPAC 2020a). Thus, traditional Medicare is akin to a public option with mandatory provider participation, and the analysis in this paper implies that the presence of traditional Medicare is likely to constrain the prices paid by MA plans to be close to traditional Medicare's, consistent with what is actually observed.

By contrast, the analysis in this paper suggests that the MA out-of-network cap likely cannot, on its own, explain why MA plans pay providers prices close to traditional Medicare's. As discussed above, in non-emergency situations, neither institutional providers nor physicians face clear legal barriers to turning away out-of-network MA enrollees, and the discussion in section 4.3.1 concluded that other barriers that would be unlikely to prevent providers from turning away out-of-network patients. Thus, consistent with the analysis of an out-of-network cap presented here, the scope for the MA out-of-network cap to reduce negotiated prices in non-emergency situations may be modest.

It is important to note that "modest" is not zero. The discussion in section 4 implies that even when providers can turn away out-of-network patients, the presence of a cap nevertheless reduces negotiated prices to some degree. Thus, in cases where competitive pressure from traditional Medicare leaves the prices negotiated by MA plans somewhat above traditional Medicare's prices, the out-of-network cap may play a supporting role by pushing prices farther toward traditional Medicare's.

Indeed, explaining the fact that MA prices are *uniformly* close to traditional Medicare's prices may require positing some role for the out-of-network cap. Notably, Maeda and Nelson (2018) and Pelech (2018) both present evidence that the prices negotiated by MA plans are essentially unrelated to the market share held by traditional Medicare at the geographic area level. Under some (but not all) theories of what drives variation in traditional Medicare's market share across geographic areas, traditional Medicare would be expected to do less to discipline prices in MA when it holds less of the market.[85] Thus, this finding is (arguably) inconsistent with the presence of traditional Medicare being

[84] An exception is physician practices that have been purchased by a hospital and now operate as part of a hospital outpatient department. These practices would be governed by Medicare's rules for institutional providers.

[85] This would be the case if, for example, variation in traditional Medicare's market share was driven primarily by differences in enrollees' idiosyncratic preferences for MA plans or the generosity of plan benchmarks. But this would not be true under other theories of what drives variation in traditional Medicare's market share. For example, MA plans might tend to achieve higher penetration in markets where enrollees are more attentive to differences in plan premiums. In that case, the equilibrium demand elasticity faced by MA plans—and, thus, traditional Medicare's effectiveness in disciplining the premiums MA plans charge and the prices they pay providers—might not differ across high- and low-penetration markets.

the *sole* factor that allows MA plans to negotiate lower prices than their commercial counterparts. However, this pattern could be consistent with traditional Medicare playing the primary role in driving MA plans' negotiated prices toward traditional Medicare levels, and the out-of-network cap bringing those prices the rest of the way when competition from traditional Medicare alone falls short.[86]

Of course, it is also possible that providers do in fact face barriers to turning away out-of-network MA enrollees. In that case, the MA out-of-network cap would likely be sufficient on its own to drive negotiated prices to traditional Medicare levels. While this is clearly possible, there is reason to doubt this interpretation in the absence of a clear theory about *why* providers are unable to turn away out-of-network MA enrollees. This suggests that, at a minimum, the MA experience offers little reason to be *confident* that an out-of-network cap on its own can substantially reduce prices in non-emergency situations. Moreover, if providers do face barriers to turning away out-of-network MA patients, one likely barrier is the requirement under Medicare's rules that institutional providers accept Medicare and non-Medicare patients on the same terms. This suggests that even if an out-of-network cap is highly effective in reducing prices in MA, that might not generalize to commercial insurance markets, where a similar requirement to accept out-of-network patients clearly does not exist.

9.3 Why Is Physician Participation in Traditional Medicare So Robust?

A lingering question from the analysis above is *why* the vast majority of physicians accept traditional Medicare patients, as discussed in section 2.2. The discussion of a voluntary public option in section 6.4 concluded that it was plausible that many providers would decline to accept the public option in order to increase their leverage vis-à-vis private plans. And per the discussion in this section, physicians (unlike institutional providers) are not legally required to accept traditional Medicare patients on the same terms as MA patients. For a couple of reasons, however, broad physician participation in traditional Medicare may not be that surprising.

First, a purely voluntary public option differs from traditional Medicare in important ways that likely make participating in traditional Medicare much more attractive to physicians. Notably, Medicare rules ensure that traditional Medicare enrollees have access to a very broad network of *institutional* providers, and Medicare beneficiaries are enrolled in traditional Medicare by default. Thus, unlike a purely voluntary public option, traditional Medicare is almost guaranteed to attract substantial market share, meaning that declining to accept traditional Medicare likely requires a physician to forgo substantially more volume than declining to accept a purely voluntary public option.

Second, even in the context of a purely voluntary public option, physicians are likely to realize smaller benefits from opting out of a public option than other types of providers. Consistent with the analysis in section 6.4, the providers who can command the highest prices in the commercial market are likely the providers that have the most to gain by opting out of traditional Medicare. While physicians do command prices above traditional Medicare's on average, the gap is much smaller than for hospital services, as discussed in section 2, so opting out may be correspondingly less attractive.

10 Conclusion

The analysis in this paper shows that an appropriately designed price cap or public option can reduce the prices of health care services. In closing, I consider how policymakers that wished to use one of these tools to reduce health care prices might choose among them. I consider two aspects of this choice:

[86] Notably, in this scenario, it might not be particularly common for providers to even *threaten* to turn away out-of-network patients since the out-of-network cap might not reduce negotiated prices far enough to make it worth doing so.

(1) the choice among the various price cap policies (i.e., an out-of-network cap, a comprehensive price cap, or a default contract policy); and (2) the choice between the price cap policies and a public option.

Before proceeding, I note that I leave to the side the choice between implementing a price cap or public option (or both) and maintaining the status quo. As noted at the outset of this paper, that choice would depend on how the policy tools considered in this paper would affect providers' service offerings and care delivery processes over the long term and, in particular, the quantity and quality of the health care services that providers delivered. But modeling those effects is beyond the scope of this paper.

Choosing among price cap policies. Among the price cap policies considered in this paper, the default contract policy appears most likely to be effective in reducing prices and least likely to create undesirable side-effects. Indeed, it appears questionable (at best) whether an out-of-network price cap would be effective in reducing negotiated prices in non-emergency situations in light of providers' ability to turn away out-of-network patients. Closely related, this policy could cause providers to take steps that would make it harder for patients to access out-of-network services.

A comprehensive price cap would, on paper, have the potential to reduce prices in a greater range of settings. However, it would have the limitation that it would not reduce providers' underlying bargaining leverage but instead just block them from translating that leverage into high prices. That would create a variety of enforcement challenges that could threaten the integrity of the cap. Further, the cap itself (and efforts to enforce it) could also have a variety of undesirable side-effects, including increased utilization, greater consolidation, and less adoption of alternative payment models.

By contrast, a default contract policy would have the ability to reduce prices for all types of health care services without creating the same enforcement challenges or potential undesirable side-effects of the comprehensive price cap approach. Of course, a default contract policy would present its own challenges. Most importantly, an essential feature of a default contract policy is that it would require providers to accept patients under a default contract. Enforcing that requirement would present real, albeit surmountable, challenges. This type of requirement would also surely spur objections from health care providers, although it is not clear that resistance to a default contract policy would be qualitatively different from resistance to other policies that would achieve equivalent price reductions.

Choosing between a price cap and a public option. From a policy perspective, the choice between a price cap and a public option depends on whether policymakers are focused primarily on reducing provider prices or have other goals as well. If policymakers are focused primarily on reducing prices, then either policy could do the job, but a default contract policy has two distinct advantages.

First, a default contract policy is more flexible. It could be targeted to particular types of services (à la Glied and Altman 2017; Roy 2019), whereas a public option would need to set prices for all types of services and, correspondingly, would affect prices for all types of services. Additionally, a default contract policy could be targeted primarily at the highest-priced providers (à la Chernew, Dafny, and Pany 2020) by specifying high prices in the default contract. By contrast, a public option that paid all providers more than existing private plans would be uncompetitive and thus have little or no effect on prices, and a public option that paid lower prices would increase prices received by low-priced providers in addition to reducing the prices received by high-priced providers.

Second, a default contract policy avoids the operational complexity involved in setting up and operating the public option. Closely related, it avoids the risk that a public option would have disadvantages in utilization management, risk selection, or diagnosis coding that would keep it from being a strong competitor for private plans and thereby undermine its ability to reduce provider prices.

However, policymakers may have goals other than reducing provider prices. Notably, many insurance markets are quite concentrated (Fulton 2017), which allows insurers to charge higher premiums (e.g., Dafny, Duggan, and Ramanarayanan 2012; Dafny, Gruber, and Ody 2015).[87] Introducing a public option would place pressure on insurers to set lower premiums. The estimates of insurer profit margins presented in Table 6.2 suggest that the scope to reduce premiums by reducing insurer margins is likely modest, but enhancing competition might also reduce premiums through other channels, such as by driving insurers to manage utilization more aggressively. These considerations offer a rationale for implementing a public option instead of or in addition to some form of price cap.[88]

While this paper focuses on the substantive effects of these policies, policymakers would also need to consider the political feasibility of the alternative policy approaches. Notably, introducing a public option would threaten the interests of health insurers in addition to health care providers and thus could spark broader industry opposition. However, health insurers are deeply distrusted by the public (Commonwealth Fund, New York Times, and Harvard T.H. Chan School of Public Health 2019; KFF 2020a), so a public option that offered consumers a concrete alternative to private insurance plans could have broader public appeal. Perhaps for this reason, data from opinion surveys suggest that public option proposals command broad public support (Kirzinger, Kearney, and Brodie 2020).

Directions for future research. Finally, I discuss a few areas where further research could help clarify the effects of introducing some form of price cap or a public option. First, the dearth of information on what individual market plans (as opposed to commercial plans more broadly) currently pay health care providers makes it challenging to assess the consequences of introducing a price cap or a public option in the individual market. This gap is particularly glaring because many existing proposals to introduce a price cap or a public option would apply solely to the individual market.

Second, this paper's analysis of an out-of-network cap suggests that the effectiveness of an out-of-network cap in non-emergency situations depends on how much volume providers can retain—and at what price—if they go out of network under the status quo. As discussed in section 4.3.2, empirical evidence on this question is sparse, with the notable—but limited—exceptions of Melnick and Fonkych (2020a) and recent research related to surprise billing (e.g., Garmon and Chartock 2017; Cooper et al. 2020; Cooper, Scott Morton, and Shekita 2020). More evidence on this question would be valuable.

Finally, there are areas where additional research could shed more light on the effects of introducing a public option in particular. As illustrated by the simulations in this paper, the effects of introducing a public option depend on, among other things, how utilization under a public option compares to private plans and the extent to which private plans have advantages with respect to risk selection or diagnosis coding. Better evidence on how the intensity of adverse selection against a public option might change as its market share changed would be particularly valuable, as discussed in Appendix B.

Additionally, as discussed in section 6.3, the current model makes the simplifying assumption that a public option competes with a single private plan. While this assumption likely does not affect the main qualitative conclusions of this paper, work to develop richer models that captured competition *among* private plans would allow the model to answer a broader array of questions and increase the accuracy of its quantitative predictions. A model that captured competition among private plans might

[87] In the individual market, the structure of the premium tax credit, specifically the fact that the value of the credit in a geographic area is based on the premiums of the plans offered in that area, may magnify the consequences of limited insurance market competition by making insurers price less aggressively (Jaffe and Shepard 2020). This problem could become more acute if eligibility for the premium tax credit were extended to people above 400% of the federal poverty level, as many have proposed. This problem would also be mitigated by a public option.

[88] There are other policies to address insurer market power, such as direct premium regulation or medical loss ratio requirements. A full analysis of these alternative approaches is beyond the scope of this paper.

be particularly useful in cases where the public option paid providers prices only modestly below those paid by existing private plans or where different private plans offered very different provider networks.

11 References

Abraham, Jean, Coleman Drake, Daniel W. Sacks, and Kosali Simon. 2017. “Demand for Health Insurance Marketplace Plans Was Highly Elastic in 2014–2015.” *Economics Letters* 159 (October): 69–73. https://doi.org/10.1016/j.econlet.2017.07.002.

Abreu, Dilip, and David Pearce. 2007. “Bargaining, Reputation, and Equilibrium Selection in Repeated Games with Contracts.” *Econometrica* 75 (3): 653–710. https://doi.org/10.1111/j.1468-0262.2007.00765.x.

———. 2015. “A Dynamic Reinterpretation of Nash Bargaining with Endogenous Threats.” *Econometrica* 83 (4): 1641–55. https://doi.org/10.3982/ECTA11711.

Adler, Loren, Erin Duffy, Paul B. Ginsburg, Mark Hall, Erin Trish, and Christen Linke Young. 2019. “Rep. Ruiz’s Arbitration Proposal for Surprise Billing (H.R. 3502) Would Lead to Much Higher Costs and Deficits.” *Brookings* (blog). July 16, 2019. https://www.brookings.edu/blog/usc-brookings-schaeffer-on-health-policy/2019/07/16/rep-ruizs-arbitration-proposal-for-surprise-billing-h-r-3502-would-lead-to-much-higher-costs-and-deficits/.

Adler, Loren, Matthew Fiedler, Paul B. Ginsburg, Mark Hall, Erin Trish, Christen Linke Young, and Erin Duffy. 2019. “State Approaches to Mitigating Surprise Out-of-Network Billing.” Brookings Institution. https://www.brookings.edu/research/state-approaches-to-mitigating-surprise-out-of-network-billing/.

Adler, Loren, Matthew Fiedler, Paul B. Ginsburg, and Christen Linke Young. 2019a. “Comments on the No Surprises Act.” https://www.brookings.edu/opinions/comments-on-the-no-surprise-act/.

———. 2019b. “Comments on the Lower Health Care Costs Act of 2019.” https://www.brookings.edu/opinions/comments-on-the-lower-health-care-costs-act-of-2019/.

Aizawa, Naoki, and You Suk Kim. 2018. “Advertising and Risk Selection in Health Insurance Markets.” *American Economic Review* 108 (3): 828–67. https://doi.org/10.1257/aer.20151485.

———. 2020. “Government Advertising in Market-Based Public Programs: Evidence from the Health Insurance Marketplace.” Working Paper 27695. National Bureau of Economic Research. https://doi.org/10.3386/w27695.

America’s Health Insurance Plans, American Hospital Association, Blue Cross Blue Shield Association, and Premera Blue Cross. 2008. “Consumers and Employers Paying Almost $90 Billion Due to Under- Payments to Hospitals and Physicians by Medicare and Medicaid.” https://www.aha.org/system/files/content/00-10/081209jointpr-costshft.pdf.

Anderson, Julie. 2017. “Two Years after Months-Long Dispute Ended, CHI Health, Blue Cross Blue Shield Sign New 3-Year Contract.” *Omaha World-Herald*, June 29, 2017. https://www.omaha.com/livewellnebraska/two-years-after-months-long-dispute-ended-chi-health-blue/article_d65e9f44-5cfb-11e7-8232-0f29d33e2f49.html.

Antos, Joseph, and James C. Capretta. 2019. “The Heavy Hand of the Public Option.” *Real Clear Politics*, June 18, 2019. https://www.realclearpolicy.com/articles/2019/06/18/the_heavy_hand_of_the_public_option_111222.html.

Atwood, Alicia, and Anthony T. Lo Sasso. 2016. “The Effect of Narrow Provider Networks on Health Care Use.” *Journal of Health Economics* 50 (December): 86–98. https://doi.org/10.1016/j.jhealeco.2016.09.007.

Baca, Marie C. 2018. “Heart Institute Ends Contract with Presbyterian Network.” *Albuquerque Journal*, April 19, 2018. https://www.abqjournal.com/1161235/heart-institute-ends-contract-with-presbyterian-network.html.

Bai, Ge, and Gerard F. Anderson. 2017. “Variation in the Ratio of Physician Charges to Medicare Payments by Specialty and Region.” *JAMA* 317 (3): 315–18. https://doi.org/10.1001/jama.2016.16230.

Baker, Laurence C., M. Kate Bundorf, Aileen M. Devlin, and Daniel P. Kessler. 2016. “Medicare Advantage Plans Pay Hospitals Less than Traditional Medicare Pays.” *Health Affairs* 35 (8): 1444–51. https://doi.org/10.1377/hlthaff.2015.1553.

Barbos, Andrei, and Yi Deng. 2015. “The Impact of a Public Option in the U.S. Health Insurance Market.” *Economic Inquiry* 53 (1): 508–21. https://doi.org/10.1111/ecin.12132.

Barnett, Michael L., Andrew Wilcock, J. Michael McWilliams, Arnold M. Epstein, Karen E. Joynt Maddox, E. John Orav, David C. Grabowski, and Ateev Mehrotra. 2019. “Two-Year Evaluation of Mandatory Bundled Payments for Joint Replacement.” *New England Journal of Medicine* 380 (3): 252–62. https://doi.org/10.1056/NEJMsa1809010.

Berenson, Robert A., Jonathan H. Sunshine, David Helms, and Emily Lawton. 2015. “Why Medicare Advantage Plans Pay Hospitals Traditional Medicare Prices.” *Health Affairs* 34 (8): 1289–95. https://doi.org/10.1377/hlthaff.2014.1427.

Bhutta, Neil, and Lisa Dettling. 2018. “Money in the Bank? Assessing Families’ Liquid Savings Using the Survey of Consumer Finances.” FEDS Note. Federal Reserve Board. https://www.federalreserve.gov/econres/notes/feds-notes/assessing-families-liquid-savings-using-the-survey-of-consumer-finances-20181119.htm.

Blumberg, Linda J., John Holahan, Matthew Buettgens, and Stephen Zuckerman. 2019. “The Healthy America Program, an Update and Additional Options.” Urban Institute. https://www.urban.org/research/publication/healthy-america-program-update-and-additional-options.

Blumberg, Linda J., John Holahan, Stacey McMorrow, and Michael Simpson. 2020. “Estimates of the Implications of Public Option and Capped Provider Payment Rate Reforms.” Urban Institute. https://www.urban.org/research/publication/estimates-implications-public-option-and-capped-provider-payment-rate-reforms.

Brown, Jason, Mark Duggan, Ilyana Kuziemko, and William Woolston. 2014. “How Does Risk Selection Respond to Risk Adjustment? New Evidence from the Medicare Advantage Program.” *American Economic Review* 104 (10): 3335–64. https://doi.org/10.1257/aer.104.10.3335.

Cabral, Marika, Michael Geruso, and Neale Mahoney. 2018. “Do Larger Health Insurance Subsidies Benefit Patients or Producers? Evidence from Medicare Advantage.” *American Economic Review* 108 (8): 2048–87. https://doi.org/10.1257/aer.20151362.

Cebul, Randall D., James B. Rebitzer, Lowell J. Taylor, and Mark E. Votruba. 2011. “Unhealthy Insurance Markets: Search Frictions and the Cost and Quality of Health Insurance.” *American Economic Review* 101 (5): 1842–71. https://doi.org/10.1257/aer.101.5.1842.

Centers for Medicare and Medicaid Services. 2016. “Chapter 4 - Benefits and Beneficiary Protections.” In *Medicare Managed Care Manual*. https://www.cms.gov/Regulations-and-Guidance/Guidance/Manuals/Downloads/mc86c04.pdf.

Chan, David, and Jonathan Gruber. 2010. “How Sensitive Are Low Income Families to Health Plan Prices?” *American Economic Review* 100 (2): 292–96. https://doi.org/10.1257/aer.100.2.292.

Chernew, Michael E., Leemore S. Dafny, and Maximilian J. Pany. 2020. “A Proposal to Cap Provider Prices and Price Growth in the Commercial Health-Care Market.” Brookings Institution. https://www.hamiltonproject.org/papers/a_proposal_to_cap_provider_prices_and_price_growth_in_the_commercial_health_care_market.

Chernew, Michael E., Andrew L. Hicks, and Shivani A. Shah. 2020. “Wide State-Level Variation In Commercial Health Care Prices Suggests Uneven Impact Of Price Regulation.” *Health Affairs* 39 (5): 791–99. https://doi.org/10.1377/hlthaff.2019.01377.

Chernew, Michael E., Maximilian J. Pany, and Richard G. Frank. 2019. “The Case for Market-Based Price Caps.” *Health Affairs Blog* (blog). September 3, 2019. https://www.healthaffairs.org/do/10.1377/hblog20190826.369708/full/.

Church, Tom, Daniel L. Heil, and Lanhee J. Chen. 2020. "The Fiscal Effects of the Public Option." https://americashealthcarefuture.org/wp-content/uploads/2020/01/Final-The-Fiscal-Effects-Of-The-Public-Option-1.24.20.pdf.
Clemens, Jeffrey, and Joshua D. Gottlieb. 2016. "In the Shadow of a Giant: Medicare's Influence on Private Physician Payments." *Journal of Political Economy* 125 (1): 1–39. https://doi.org/10.1086/689772.
Clemens, Jeffrey, and Benedic Ippolito. 2019. "Uncompensated Care and the Collapse of Hospital Payment Regulation: An Illustration of the Tinbergen Rule." *Public Finance Review* 47 (6): 1002–41. https://doi.org/10.1177/1091142119871333.
Coe, Erica, Jessica Lamb, and Suzanne Rivera. 2017. "Hospital Networks: Perspective from Four Years of the Individual Market Exchanges." McKinsey and Company. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/hospital-networks-perspective-from-four-years-of-the-individual-market-exchanges.
Coe, Erica, Alex Luterek, and Jim Oatman. 2018. "Insights into the 2019 Individual Exchange Market." McKinsey and Company. https://healthcare.mckinsey.com/insights-2019-individual-exchange-market.
Collard-Wexler, Allan, Gautam Gowrisankaran, and Robin S. Lee. 2019. "'Nash-in-Nash' Bargaining: A Microfoundation for Applied Work." *Journal of Political Economy* 127 (1): 163–95. https://doi.org/10.1086/700729.
Commonwealth Fund, New York Times, and Harvard T.H. Chan School of Public Health. 2019. "Americans' Values and Beliefs about National Health Insurance Reform." https://cdn1.sph.harvard.edu/wp-content/uploads/sites/94/2019/10/CMWF-NYT-Harvard_Final-Report_Oct2019.pdf.
Congressional Budget Office (CBO). 2020. "An Update to the Economic Outlook: 2020 to 2030." Congressional Budget Office. https://www.cbo.gov/publication/56442.
Cooper, Zack, Stuart V. Craig, Martin Gaynor, and John Van Reenen. 2019. "The Price Ain't Right? Hospital Prices and Health Spending on the Privately Insured." *The Quarterly Journal of Economics* 134 (1): 51–107. https://doi.org/10.1093/qje/qjy020.
Cooper, Zack, Hao Nguyen, Nathan Shekita, and Fiona Scott Morton. 2020. "Out-of-Network Billing and Negotiated Payments for Hospital-Based Physicians." *Health Affairs* 39 (1): 24–32. https://doi.org/10.1377/hlthaff.2019.00507.
Cooper, Zack, Fiona Scott Morton, and Nathan Shekita. 2020. "Surprise! Out-of-Network Billing for Emergency Care in the United States." *Journal of Political Economy* 128 (9): 3626–3677. https://doi.org/10.1086/708819.
Curto, Vilsa, Liran Einav, Amy Finkelstein, Jonathan Levin, and Jay Bhattacharya. 2019. "Health Care Spending and Utilization in Public and Private Medicare." *American Economic Journal: Applied Economics* 11 (2): 302–32. https://doi.org/10.1257/app.20170295.
Dafny, Leemore S., Mark Duggan, and Subramaniam Ramanarayanan. 2012. "Paying a Premium on Your Premium? Consolidation in the US Health Insurance Industry." *American Economic Review* 102 (2): 1161–85. https://doi.org/10.1257/aer.102.2.1161.
Dafny, Leemore S., Jonathan Gruber, and Christopher Ody. 2015. "More Insurers Lower Premiums: Evidence from Initial Pricing in the Health Insurance Marketplaces." *American Journal of Health Economics* 1 (1): 53–81. https://doi.org/10.1162/AJHE_a_00003.
Dafny, Leemore S., Igal Hendel, Victoria Marone, and Christopher Ody. 2017. "Narrow Networks On The Health Insurance Marketplaces: Prevalence, Pricing, And The Cost Of Network Breadth." *Health Affairs* 36 (9): 1606–14. https://doi.org/10.1377/hlthaff.2016.1669.
Damodaran, Aswath. 2019. "Equity Risk Premiums (ERP): Determinants, Estimation and Implications – The 2019 Edition." SSRN Scholarly Paper ID 3378246. Rochester, NY: Social Science Research Network. https://papers.ssrn.com/abstract=3378246.
Domurat, Richard. 2018. "Essays on the Economics of Health Insurance Markets." UCLA. https://escholarship.org/uc/item/5xv5x7z8.

Drake, Coleman. 2019. “What Are Consumers Willing to Pay for a Broad Network Health Plan?: Evidence from Covered California.” *Journal of Health Economics* 65 (May): 63–77. https://doi.org/10.1016/j.jhealeco.2018.12.003.
Duffy, Erin L., Bich Ly, Loren Adler, and Erin Trish. 2020. “Policies to Address Surprise Billing Can Affect Health Insurance Premiums.” *American Journal of Managed Care* 26 (9): 401–4. https://doi.org/10.37765/ajmc.2020.88491.
Duggan, Mark, Jonathan Gruber, and Boris Vabson. 2018. “The Consequences of Health Care Privatization: Evidence from Medicare Advantage Exits.” *American Economic Journal: Economic Policy* 10 (1): 153–86. https://doi.org/10.1257/pol.20160068.
Duggan, Mark, Amanda Starc, and Boris Vabson. 2016. “Who Benefits When the Government Pays More? Pass-through in the Medicare Advantage Program.” *Journal of Public Economics* 141 (September): 50–67. https://doi.org/10.1016/j.jpubeco.2016.07.003.
Dunn, Abe, and Adam Hale Shapiro. 2014. “Do Physicians Possess Market Power?” *The Journal of Law and Economics* 57 (1): 159–93. https://doi.org/10.1086/674407.
Eibner, Christine, Raffaele Vardavas, Sarah A. Nowak, Jodi L. Liu, and Preethi Rao. 2019. “Medicare for 50-to-64-Year-Olds: Assessing the Effects of Allowing Older Adults to Buy Into the Medicare Program.” RAND Corporation. https://www.rand.org/pubs/research_reports/RR4246.html.
Einav, Liran, Amy Finkelstein, and Mark R. Cullen. 2010. “Estimating Welfare in Insurance Markets Using Variation in Prices.” *The Quarterly Journal of Economics* 125 (3): 877–921. https://doi.org/10.1162/qjec.2010.125.3.877.
Ericson, Keith Marzilli, and Amanda Starc. 2015a. “Pricing Regulation and Imperfect Competition on the Massachusetts Health Insurance Exchange.” *The Review of Economics and Statistics* 97 (3): 667–82. https://doi.org/10.1162/REST_a_00514.
———. 2015b. “Measuring Consumer Valuation of Limited Provider Networks.” *American Economic Review* 105 (5): 115–19. https://doi.org/10.1257/aer.p20151082.
Feyman, Yevgeniy, José F. Figueroa, Daniel E. Polsky, Michael Adelberg, and Austin Frakt. 2019. “Primary Care Physician Networks In Medicare Advantage.” *Health Affairs* 38 (4): 537–44. https://doi.org/10.1377/hlthaff.2018.05501.
Fiedler, Matthew. 2017. “Taking Stock of Insurer Financial Performance in the Individual Health Insurance Market through 2017.” Brookings Institution. https://www.brookings.edu/wp-content/uploads/2017/10/individualmarketprofitability.pdf.
Fiedler, Matthew, Tim Gronniger, Paul B. Ginsburg, Loren Adler, Kavita Patel, and Margaret Darling. 2018. “Congress Should Replace Medicare’s Merit-Based Incentive Payment System.” *Health Affairs Blog* (blog). February 26, 2018. https://www.healthaffairs.org/do/10.1377/hblog20180222.35120/full/.
Froeb, Luke M., Vlad Mares, and Steven Tschantz. 2019. “Nash-in-Shapley: Bilateral Bargaining with Recursive Threat Points.” SSRN Scholarly Paper ID 3304179. Rochester, NY: Social Science Research Network. https://doi.org/10.2139/ssrn.3304179.
FTI Consulting. 2019. “Assessing the Impact of a Public Option on Market Stability and Consumer Choice.” https://americashealthcarefuture.org/wp-content/uploads/2019/11/FTI-Public-Option-Issue-Brief-FINAL.pdf.
Fulton, Brent D. 2017. “Health Care Market Concentration Trends In The United States: Evidence And Policy Responses.” *Health Affairs* 36 (9): 1530–38. https://doi.org/10.1377/hlthaff.2017.0556.
Garmon, Christopher, and Benjamin Chartock. 2017. “One In Five Inpatient Emergency Department Cases May Lead To Surprise Bills.” *Health Affairs* 36 (1): 177–81. https://doi.org/10.1377/hlthaff.2016.0970.
Garthwaite, Craig, Christopher Ody, and Amanda Starc. 2020. “Endogenous Quality Investments in the U.S. Hospital Market.” Working Paper. National Bureau of Economic Research. https://doi.org/10.3386/w27440.
Gaynor, Martin. 2020. “What to Do about Health-Care Markets? Policies to Make Health-Care Markets Work.” Brookings Institution.

https://www.hamiltonproject.org/papers/what_to_do_about_health_care_markets_policies_to_make_health_care_markets_work.
Gaynor, Martin, Farzad Mostashari, and Paul B. Ginsburg. 2017. "Making Health Care Markets Work: Competition Policy for Health Care." Brookings Institution. https://www.brookings.edu/wp-content/uploads/2017/04/gaynor-et-al-final-report-v11.pdf.
Gaynor, Martin, and Robert J. Town. 2011. "Competition in Health Care Markets." In *Handbook of Health Economics*, edited by Mark Pauly, Thomas G. Mcguire, and Pedro P. Barros, 2:499–637. Handbook of Health Economics. Elsevier. https://doi.org/10.1016/B978-0-444-53592-4.00009-8.
Geruso, Michael, and Timothy Layton. 2020. "Upcoding: Evidence from Medicare on Squishy Risk Adjustment." *Journal of Political Economy* 128 (3): 984–1026. https://doi.org/10.1086/704756.
Geruso, Michael, Timothy J Layton, and Jacob Wallace. 2020. "Are All Managed Care Plans Created Equal? Evidence from Random Plan Assignment in Medicaid." Working Paper 27762. National Bureau of Economic Research. https://doi.org/10.3386/w27762.
Geruso, Michael, Timothy Layton, and Daniel Prinz. 2019. "Screening in Contract Design: Evidence from the ACA Health Insurance Exchanges." *American Economic Journal: Economic Policy* 11 (2): 64–107. https://doi.org/10.1257/pol.20170014.
Ginsburg, Paul B. 2010. "Wide Variation in Hospital and Physician Payment Rates Evidence of Provider Market Power." Center for Studying Health System Change. http://www.hschange.org/CONTENT/1162/#ib2.
Glied, Sherry A. 2000. "Managed Care." In *Handbook of Health Economics*, edited by Anthony J. Culyer and Joseph P. Newhouse, 1:707–53. Handbook of Health Economics. Elsevier. https://doi.org/10.1016/S1574-0064(00)80172-9.
Glied, Sherry A., and Stuart H. Altman. 2017. "Beyond Antitrust: Health Care and Health Insurance Market Trends and the Future of Competition." *Health Affairs* 36 (9): 1572–77. https://doi.org/10.1377/hlthaff.2017.0555.
Gough, Paul J. 2018. "Feds Looking into Highmark-UPMC Battle over Medicare Advantage Reimbursements." *Pittsburgh Business Times*, October 12, 2018. https://www.bizjournals.com/pittsburgh/news/2018/10/12/feds-looking-into-highmark-upmc-battle-over.html.
Government Accountability Office. 2015. "Medicare Administrative Contractors: CMS Should Consider Whether Alternative Approaches Could Enhance Contractor Performance." United States Government Accountability Office. https://www.gao.gov/products/GAO-15-372.
Gowrisankaran, Gautam, Aviv Nevo, and Robert Town. 2015. "Mergers When Prices Are Negotiated: Evidence from the Hospital Industry." *American Economic Review* 105 (1): 172–203. https://doi.org/10.1257/aer.20130223.
Gruber, Jonathan, and Robin McKnight. 2016. "Controlling Health Care Costs through Limited Network Insurance Plans: Evidence from Massachusetts State Employees." *American Economic Journal: Economic Policy* 8 (2): 219–50. https://doi.org/10.1257/pol.20140335.
Health Care Cost Institute (HCCI). 2019. "2017 Health Care Cost and Utilization Report." Health Care Cost Institute. https://healthcostinstitute.org/research/annual-reports/entry/2017-health-care-cost-and-utilization-report.
———. 2020. "2018 Health Care Cost and Utilization Report." Health Care Cost Institute. https://healthcostinstitute.org/images/pdfs/HCCI_2018_Health_Care_Cost_and_Utilization_Report.pdf.
Health Care Payment Learning & Action Network (HCP-LAN). 2019. "Measuring Progress: Adoption of Alternative Payment Models in Commercial, Medicaid, Medicare Advantage, and Traditional Medicare Programs." Health Care Payment Learning & Action Network. http://hcp-lan.org/workproducts/apm-methodology-2019.pdf.
Hempstead, Katherine. 2018. "Marketplace Pulse: Percent of Plans with out of Network Benefits." Robert Wood Johnson Foundation.

https://www.rwjf.org/en/library/research/2018/10/percent-of-plans-with-out-of-network-benefits.html.
Ho, Kate, and Robin S. Lee. 2017. "Insurer Competition in Health Care Markets." *Econometrica* 85 (2): 379–417. https://doi.org/10.3982/ECTA13570.
———. 2019. "Equilibrium Provider Networks: Bargaining and Exclusion in Health Care Markets." *American Economic Review* 109 (2): 473–522. https://doi.org/10.1257/aer.20171288.
Holahan, John, Linda J. Blumberg, Erik Wengle, and Caroline Elmendorf. 2019. "What's behind 2018 and 2019 Marketplace Insurer Participation and Pricing Decisions?" Urban Institute. https://www.urban.org/research/publication/whats-behind-2018-and-2019-marketplace-insurer-participation-and-pricing-decisions.
Itkowitz, Colby. 2017. "One Medical Says It Will Drop CareFirst BlueCross BlueShield Insurance, Catching Many by Surprise." *Washington Post*, October 6, 2017, sec. Local. https://www.washingtonpost.com/local/one-medical-says-it-will-drop-carefirst-insurance-catching-many-by-surprise/2017/10/06/79ad0504-aa0a-11e7-850e-2bdd1236be5d_story.html.
Jacobson, Gretchen, and Tricia Neuman. 2018. "Prior Authorization in Medicare Advantage Plans: How Often Is It Used?" Kaiser Family Foundation. https://www.kff.org/medicare/issue-brief/prior-authorization-in-medicare-advantage-plans-how-often-is-it-used/.
Jacobson, Gretchen, Matthew Rae, Tricia Neuman, Kendal Orgera, and Cristina Boccuti. 2017. "Medicare Advantage: How Robust Are Plans' Physician Networks?" Kaiser Family Foundation. https://www.kff.org/medicare/report/medicare-advantage-how-robust-are-plans-physician-networks/.
Jacobson, Gretchen, Ariel Trilling, Tricia Neuman, Anthony Damico, and Marsha Gold. 2016. "Medicare Advantage Hospital Networks: How Much Do They Vary?" Kaiser Family Foundation. https://www.kff.org/medicare/report/medicare-advantage-hospital-networks-how-much-do-they-vary/.
Jaffe, Sonia, and Mark Shepard. 2020. "Price-Linked Subsidies and Imperfect Competition in Health Insurance." *American Economic Journal: Economic Policy* 12 (3): 279–311. https://doi.org/10.1257/pol.20180198.
Kaiser Family Foundation (KFF). 2019. "Medicare Advantage." Kaiser Family Foundation. https://www.kff.org/medicare/fact-sheet/medicare-advantage/.
———. 2020a. "Public's Views of Doctors, Nurses, Insurance Companies, and Drug Companies Survey." Kaiser Family Foundation. https://www.kff.org/health-costs/poll-finding/views-of-doctors/.
———. 2020b. "2020 Employer Health Benefits Survey." Kaiser Family Foundation. https://www.kff.org/health-costs/report/2020-employer-health-benefits-survey/.
Kaiser Family Foundation (KFF), and Health Research and Educational Trust (HRET). 2006. "2005 Employer Health Benefits Survey." Kaiser Family Foundation. https://www.kff.org/wp-content/uploads/2012/09/2005ehbs.pdf.
Kirzinger, Ashley, Audrey Kearney, and Mollyann Brodie. 2020. "KFF Health Tracking Poll – February 2020: Health Care in the 2020 Election." Kaiser Family Foundation. https://www.kff.org/health-reform/poll-finding/kff-health-tracking-poll-february-2020/.
Koch, Thomas, and Shawn W. Ulrick. 2017. "Price Effects of a Merger: Evidence from a Physicians' Market." Federal Trade Commission Working Paper. Social Science Research Network. https://papers.ssrn.com/abstract=3026344.
Koenig, Lane, Asha Saavos, Samuel Soltoff, Berna Demiralp, and Jing Xu. 2019. "The Impact of Medicare-X Choice on Coverage Healthcare Use, and Hospitals." KNG Consulting, LLC. https://www.aha.org/system/files/2019-03/the-impact-of-medicare-X-choice-final-report-2019.pdf.
Kuziemko, Ilyana, Katherine Meckel, and Maya Rossin-Slater. 2018. "Does Managed Care Widen Infant Health Disparities? Evidence from Texas Medicaid." *American Economic Journal: Economic Policy* 10 (3): 255–83. https://doi.org/10.1257/pol.20150262.

Lavetti, Kurt, and Kosali Simon. 2018. “Strategic Formulary Design in Medicare Part D Plans.” *American Economic Journal: Economic Policy* 10 (3): 154–92. https://doi.org/10.1257/pol.20160248.
LeCuyer, Nick, and Shubham Singhal. 2007. “Overhauling the US Healthcare Payment System.” McKinsey and Company. https://healthcare.mckinsey.com/overhauling-us-healthcare-payment-system.
Lerman, Amy E., Meredith L. Sadin, and Samuel Trachtman. 2017. “Policy Uptake as Political Behavior: Evidence from the Affordable Care Act.” *American Political Science Review* 111 (4): 755–70. https://doi.org/10.1017/S0003055417000272.
Liesse, Julie. 2016. “Healthcare Marketing.” Advertising Age. https://cdn2.hubspot.net/hubfs/2247255/KM/PDF/Kantar%20Media%20Forms/KantarMedia_AdAge_HCwhitepaper_102016.pdf.
Linke Young, Christen. 2019. “Three Ways to Make Health Insurance Auto-Enrollment Work.” Brookings Institution. https://www.brookings.edu/wp-content/uploads/2019/06/Yonu_Autoenrollment_6.19.19.pdf.
Linke Young, Christen, and Matthew Fiedler. 2019. “What Would the 2020 Candidates’ Proposals Mean for Health Care Coverage?” *Brookings* (blog). October 15, 2019. https://www.brookings.edu/policy2020/votervital/what-would-the-2020-candidates-proposals-mean-for-health-care-coverage/.
Linke Young, Christen, Jason Levitis, and Matthew Fiedler. 2018. “Evaluating the Administration’s Health Reimbursement Arrangement Proposal.” Brookings Institution. https://www.brookings.edu/research/evaluating-the-administrations-health-reimbursement-arrangement-proposal/.
Litow, Mark E. 2006. “Medicare versus Private Health Insurance: The Cost of Administration.” Milliman. https://www.cahi.org/cahi_contents/resources/pdf/CAHIMedicareTechnicalPaper.pdf.
Liu, Jodi L., Asa Wilks, Sarah A. Nowak, Preethi Rao, and Christine Eibner. 2020. “Public Options for Individual Health Insurance: Assessing the Effects of Four Public Option Alternatives.” RAND Corporation. https://www.rand.org/pubs/research_reports/RR3153.html.
Maeda, Jared Lane K., and Lyle Nelson. 2018. “How Do the Hospital Prices Paid by Medicare Advantage Plans and Commercial Plans Compare with Medicare Fee-for-Service Prices?” *INQUIRY: The Journal of Health Care Organization, Provision, and Financing* 55 (January): 1–8. https://doi.org/10.1177/0046958018779654.
Mahoney, Neale. 2015. “Bankruptcy as Implicit Health Insurance.” *American Economic Review* 105 (2): 710–46. https://doi.org/10.1257/aer.20131408.
Mayo Clinic. 2019. “More about Medicare.” December 31, 2019. https://www.mayoclinic.org/patient-visitor-guide/billing-insurance/insurance/accepted-insurance/medicare/more-on-medicare.
McDonough, John E. 1997. “Tracking The Demise Of State Hospital Rate Setting.” *Health Affairs* 16 (1): 142–49. https://doi.org/10.1377/hlthaff.16.1.142.
McGuire, Thomas G. 2000. “Physician Agency.” In *Handbook of Health Economics*, edited by Anthony J. Culyer and Joseph P. Newhouse, 1:461–536. Handbook of Health Economics. Elsevier. https://doi.org/10.1016/S1574-0064(00)80168-7.
McKinsey and Company. 2020. “Insights into the 2020 Individual Market--Increased Consumer Choice and Decreased Premiums.” McKinsey and Company. https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/insights-into-the-2020-individual-market.
McWilliams, J. Michael, Laura A. Hatfield, Bruce E. Landon, Pasha Hamed, and Michael E. Chernew. 2018. “Medicare Spending after 3 Years of the Medicare Shared Savings Program.” *New England Journal of Medicine* 379 (12): 1139–49. https://doi.org/10.1056/NEJMsa1803388.
Medicaid and CHIP Payment and Access Commission (MACPAC). 2017. “Medicaid Hospital Payment - A Comparison across States and to Medicare.” Medicaid and CHIP Payment and

Access Commission. https://www.macpac.gov/wp-content/uploads/2017/04/Medicaid-Hospital-Payment-A-Comparison-across-States-and-to-Medicare.pdf.
———. n.d. “Provider Payment under Fee for Service.” Accessed August 5, 2020. https://www.macpac.gov/subtopic/provider-payment/.
Medicare Payment Advisory Commission (MedPAC). 2012. “Medicare and the Health Care Delivery System.” Medicare Payment Advisory Commission. http://medpac.gov/docs/default-source/reports/jun12_entirereport.pdf?sfvrsn=0.
———. 2016. “Medicare Payment Policy.” Medicare Payment Advisory Commission. http://www.medpac.gov/docs/default-source/reports/march-2016-report-to-the-congress-medicare-payment-policy.pdf.
———. 2018. “Medicare Payment Policy.” Medicare Payment Advisory Commission. http://www.medpac.gov/docs/default-source/reports/mar18_medpac_entirereport_sec_rev_0518.pdf?sfvrsn=0.
———. 2019a. “Clinical Laboratory Services Payment System.” Payment Basics. Medicare Payment Advisory Commission. http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_19_clinical_lab_final_sec.pdf?sfvrsn=0.
———. 2019b. “Durable Medical Equipment Payment System.” Payment Basics. Medicare Payment Advisory Commission. http://www.medpac.gov/docs/default-source/payment-basics/medpac_payment_basics_19_dme_final_sec.pdf?sfvrsn=0.
———. 2020a. “Medicare Payment Policy.” Medicare Payment Advisory Commission. http://www.medpac.gov/docs/default-source/reports/mar20_entirereport_sec.pdf?sfvrsn=0.
———. 2020b. “Payment Basics.” Payment Basics. August 2020. http://www.medpac.gov/-documents-/payment-basics.
Mehrotra, Ateev, Sonya Grier, and R. Adams Dudley. 2006. “The Relationship Between Health Plan Advertising And Market Incentives: Evidence Of Risk-Selective Behavior.” *Health Affairs* 25 (3): 759–65. https://doi.org/10.1377/hlthaff.25.3.759.
Melnick, Glenn, and Katya Fonkych. 2020a. “An Empirical Analysis of Hospital ED Pricing Power.” *AJMC* 26 (3). https://www.ajmc.com/journals/issue/2020/2020-vol26-n3/an-empirical-analysis-of-hospital-ed-pricing-power.
———. 2020b. “Regulating Out-Of-Network Hospital Emergency Prices: Problem And Potential Benchmarks.” *Health Affairs Blog* (blog). March 23, 2020. https://www.healthaffairs.org/do/10.1377/hblog20200320.866552/full/.
Miller, Daniel P., and Jungwon Yeo. 2019. “The Consequences of a Public Health Insurance Option: Evidence from Medicare Part D.” *American Journal of Health Economics* 5 (2): 191–226. https://doi.org/10.1162/ajhe_a_00119.
Murray, Robert. 2013. “Hospital Charges and the Need for a Maximum Price Obligation Rule for Emergency Department & Out-of-Network Care.” *Health Affairs Blog* (blog). May 16, 2013. https://www.healthaffairs.org/do/10.1377/hblog20130516.031255/full/.
Murray, Robert, and Robert A Berenson. 2015. “Hospital Rate Setting Revisited: Dumb Price Fixing or a Smart Solution to Provider Pricing Power and Delivery System Reform?” Urban Institute. https://www.urban.org/sites/default/files/publication/73841/2000516-Hospital-Rate-Setting-Revisited.pdf.
Nash, John. 1953. “Two-Person Cooperative Games.” *Econometrica* 21 (1): 128–40. https://doi.org/10.2307/1906951.
Neuman, Patricia, and Gretchen A. Jacobson. 2018. “Medicare Advantage Checkup.” *New England Journal of Medicine* 379 (22): 2163–72. https://doi.org/10.1056/NEJMhpr1804089.
Neuman, Tricia, Karen Pollitz, Jennifer Tolbert, Robin Rudowitz, and Wyatt Koma. 2019. “10 Key Questions on Public Option Proposals.” Kaiser Family Foundation. https://www.kff.org/health-reform/issue-brief/10-key-questions-on-public-option-proposals/.

Newhouse, Joseph P., Mary Price, John Hsu, J. Michael McWilliams, and Thomas G. McGuire. 2015. "How Much Favorable Selection Is Left in Medicare Advantage?" *American Journal of Health Economics* 1 (1): 1–26. https://doi.org/10.1162/AJHE_a_00001.
Osborne, Martin J., and Ariel Rubinstein. 1994. *A Course in Game Theory*. Twelfth edition. Cambridge, Mass: The MIT Press.
Pauly, Mark, and Robert Town. 2012. "Maryland Exceptionalism? All-Payers Regulation and Health Care System Efficiency." *Journal of Health Politics, Policy and Law* 37 (4): 697–707. https://doi.org/10.1215/03616878-1597502.
Pelech, Daria M. 2018. "An Analysis of Private-Sector Prices for Physicians' Services." Working Paper. Congressional Budget Office. https://www.cbo.gov/publication/53441.
———. 2020. "Prices for Physicians' Services in Medicare Advantage and Commercial Plans." *Medical Care Research and Review* 77 (3): 236–48. https://doi.org/10.1177/1077558718780604.
Pelech, Daria M., and Tamara Hayford. 2019. "Medicare Advantage and Commercial Prices for Mental Health Services." *Health Affairs* 38 (2): 262–67. https://doi.org/10.1377/hlthaff.2018.05226.
Polsky, Daniel, Zuleyha Cidav, and Ashley Swanson. 2016. "Marketplace Plans With Narrow Physician Networks Feature Lower Monthly Premiums Than Plans With Larger Networks." *Health Affairs* 35 (10): 1842–48. https://doi.org/10.1377/hlthaff.2016.0693.
Pope, Chris. 2019. "End Hospitals' Right to a Blank Check for Emergency Care." *Economics21* (blog). May 3, 2019. https://economics21.org/end-hospital-emergency-medical-billing-blank-check.
Pope, Devin G. 2009. "Reacting to Rankings: Evidence from 'America's Best Hospitals.'" *Journal of Health Economics* 28 (6): 1154–65. https://doi.org/10.1016/j.jhealeco.2009.08.006.
Prager, Elena, and Nicholas Tilipman. 2020. "Regulating Out-of-Network Hospital Payments: Disagreement Payoffs, Negotiated Prices, and Access." https://sites.google.com/view/eprager/research.
Rice, Sabriya. 2017. "Tenet Healthcare Hospitals Will Be Back In-Network for Humana by October." *Dallas Morning News*, May 2, 2017. https://www.dallasnews.com/business/health-care/2017/05/02/tenet-healthcare-hospitals-will-be-back-in-network-for-humana-by-october/.
Roy, Avik. 2019. "Improving Hospital Competition: A Key to Affordable Health Care." Foundation for Research on Equal Opportunity. https://freopp.org/improving-hospital-competition-a-key-to-affordable-medicine-343e9b5c70f.
Rubinstein, Ariel. 1982. "Perfect Equilibrium in a Bargaining Model." *Econometrica* 50 (1): 97–109. https://doi.org/10.2307/1912531.
Saltzman, Evan. 2019. "Demand for Health Insurance: Evidence from the California and Washington ACA Exchanges." *Journal of Health Economics* 63 (January): 197–222. https://doi.org/10.1016/j.jhealeco.2018.11.004.
Sances, Michael W., and Joshua D. Clinton. 2019. "Who Participated in the ACA? Gains in Insurance Coverage by Political Partisanship." *Journal of Health Politics, Policy and Law* 44 (3): 349–79. https://doi.org/10.1215/03616878-7366988.
Schaefer, Nina Owcharenko, and Robert E. Moffit. 2020. "The Public Option: Single Payer on the Installment Plan." Heritage Foundation. https://www.heritage.org/sites/default/files/2020-02/BG3462_0.pdf.
Shapiro, Bradley T. 2020. "Advertising in Health Insurance Markets." *Marketing Science* 39 (3): 587–611. https://doi.org/10.1287/mksc.2018.1086.
Shepard, Mark. 2016. "Hospital Network Competition and Adverse Selection: Evidence from the Massachusetts Health Insurance Exchange." Working Paper. Cambridge, MA: National Bureau of Economic Research. https://doi.org/10.3386/w22600.
Skinner, Jonathan, Elliott Fisher, and James Weinstein. 2014. "The 125 Percent Solution: Fixing Variations in Health Care Prices." *Health Affairs Blog* (blog). August 26, 2014. https://www.healthaffairs.org/do/10.1377/hblog20140826.041002/full/.

Skopec, Laura, Robert A. Berenson, and Judith Feder. 2018. “Why Do Medicare Advantage Plans Have Narrow Networks?” Urban Institute. https://www.urban.org/sites/default/files/publication/99414/why_do_medicare_advantage_plans_have_narrow_networks.pdf.
Song, Zirui. 2017. “Using Medicare Prices — Toward Equity and Affordability in the ACA Marketplace.” *New England Journal of Medicine* 377 (24): 2309–11. https://doi.org/10.1056/NEJMp1710020.
Song, Zirui, Yunan Ji, Dana G. Safran, and Michael E. Chernew. 2019. “Health Care Spending, Utilization, and Quality 8 Years into Global Payment.” *New England Journal of Medicine* 381 (3): 252–63. https://doi.org/10.1056/NEJMsa1813621.
Song, Zirui, William Johnson, Kevin Kennedy, Jean Fuglesten Biniek, and Jacob Wallace. 2020. “Out-Of-Network Spending Mostly Declined In Privately Insured Populations With A Few Notable Exceptions From 2008 To 2016.” *Health Affairs* 39 (6): 1032–41. https://doi.org/10.1377/hlthaff.2019.01776.
Tebaldi, Pietro. 2017. “Estimating Equilibrium in Health Insurance Exchanges: Price Competition and Subsidy Design under the ACA.” SSRN Scholarly Paper ID 3020103. Rochester, NY: Social Science Research Network. https://papers.ssrn.com/abstract=3020103.
Tirole, Jean. 1988. *The Theory of Industrial Organization*. The MIT Press.
Trish, Erin, Paul Ginsburg, Laura Gascue, and Geoffrey Joyce. 2017. “Physician Reimbursement in Medicare Advantage Compared with Traditional Medicare and Commercial Health Insurance.” *JAMA Internal Medicine* 177 (9): 1287–95. https://doi.org/10.1001/jamainternmed.2017.2679.
Twedt, Steve. 2019. “Feds May Be Taking Another Look at UPMC Pre-Payment Policy.” *Pittsburgh Post-Gazette*, June 4, 2019. https://www.post-gazette.com/business/healthcare-business/2019/06/04/UPMC-Highmark-Health-and-Human-Services-Azar-Casey-prepayment-network-Medicare-Advantage/stories/201906040142.
University of Pittsburgh Medical Center (UPMC). 2019. “Frequently Asked Questions for Highmark Medicare Advantage Enrolles Who Wish to Access UPMC Services on an Out-of-Network Basis after June 30, 2019.” https://www.upmc.com/-/media/upmc/patients-families/choice-is-vital/medicareadvancepay.pdf.
Wallace, Jacob, and Zirui Song. 2016. “Traditional Medicare versus Private Insurance: How Spending, Volume, and Price Change at Age Sixty-Five.” *Health Affairs* 35 (5): 864–72. https://doi.org/10.1377/hlthaff.2015.1195.
Whaley, Christopher M., Brian Briscombe, Rose Kerber, Brenna O’Neill, and Aaron Kofner. 2020. “Nationwide Evaluation of Health Care Prices Paid by Private Health Plans: Findings from Round 3 of an Employer-Led Transparency Initiative.” RAND Corporation. https://www.rand.org/pubs/research_reports/RR4394.html.
White, Chapin. 2013. “Contrary To Cost-Shift Theory, Lower Medicare Hospital Payment Rates For Inpatient Care Lead To Lower Private Payment Rates.” *Health Affairs* 32 (5): 935–43. https://doi.org/10.1377/hlthaff.2012.0332.
White, Chapin, and Christopher M. Whaley. 2019. “Prices Paid to Hospitals by Private Health Plans Are High Relative to Medicare and Vary Widely: Findings from an Employer-Led Transparency Initiative.” RAND Corporation. https://www.rand.org/pubs/research_reports/RR3033.html.
Yu, Xiaowei, and Keith Waehrer. 2018. “Recursive Nash-in-Nash Bargaining Solution.” SSRN Scholarly Paper ID 3319517. Rochester, NY: Social Science Research Network. https://doi.org/10.2139/ssrn.3319517.
Zuckerman, Stephen, Laura Skopec, and Marni Epstein. 2017. “Medicaid Physician Fees after the ACA Primary Care Fee Bump.” Urban Institute. https://www.urban.org/sites/default/files/publication/88836/2001180-medicaid-physician-fees-after-the-aca-primary-care-fee-bump_0.pdf.
Zycher, Benjamin. 2007. “Comparing Public and Private Health Insurance: Would a Single-Payer System Save Enough to Cover the Uninsured?” Manhattan Institute.

https://www.manhattan-institute.org/html/comparing-public-and-private-health-insurance-would-single-payer-system-save-enough-cover.

Appendix A Model of Capping Provider Prices

This appendix presents a model of provider-insurer bargaining that formalizes most of the discussion of price cap policies that was presented in the main text. The model examines a setting in which a single insurer bargains with a single provider over whether the provider will see the insurer's patients and, if so, what price the insurer will pay and what coverage the insurer will offer for the provider's services. The outcome of provider-insurer negotiations is determined by Nash bargaining, following considerable recent literature on provider-insurer bargaining (e.g., Gowrisankaran, Nevo, and Town 2015; Clemens and Gottlieb 2016; Ho and Lee 2017; Cooper, Scott Morton, and Shekita 2020).

Many of the price cap policies considered here affect negotiated prices primarily or entirely by changing what happens if the provider and insurer fail to reach a network agreement. Some other recent work on provider-insurer bargaining in commercial insurance markets has also emphasized the importance of disagreement outcomes (e.g., Cooper, Scott Morton, and Shekita 2020; Prager and Tilipman 2020), and research examining the prices private insurers negotiate in Medicare Advantage has emphasized similar themes (Berenson et al. 2015; Baker et al. 2016; Trish et al. 2017; Maeda and Nelson 2018; Pelech 2020). To that end, I examine two approaches to modeling disagreement outcomes: in the first, I assume that reputational considerations allow the parties to credibly commit to disagreement outcomes, while in the second I assume that commitment is not possible.

The remainder of this appendix proceeds as follows. I first specify the model primitives, the Nash bargaining framework, and the two approaches I use to model disagreement outcomes. I then analyze, in turn, an out-of-network cap, an out-of-network "cap and floor" policy, a comprehensive price cap, and a default contract policy. The final section describes how the figures in the main text were produced. Proofs and other technical details related to this appendix are in Appendix D.

A.1 Model Setup

This section establishes the modeling framework for the rest of this appendix. I specify, in turn, the model primitives, the Nash bargaining framework that governs provider-insurer negotiations, and the process that determines outcomes in the absence of an agreement. I then briefly characterize the solution to the Nash bargaining problem when negotiated prices are unconstrained, as well as equilibrium outcomes under the status quo without any form of price cap.

A.1.1 Model Primitives

I consider a setting in which a single insurer bargains with a single provider.[89] The provider sets the price $p \in \mathbb{R}$ it charges for its services and the fraction $a \in [0,1]$ of the insurer's patients it accepts. The insurer determines the terms under which it will cover care the provider delivers to its enrollees, which I represent by some coverage level $l \in [0,1]$. Setting $l = 1$ should be understood to correspond to providing complete coverage, while $l = 0$ corresponds to providing no coverage at all. The coverage level l may be understood to encompass all relevant aspects of plan design, including cost-sharing requirements, prior authorization requirements, and referral requirements.

I do not explicitly model the insurance market. Rather, following the approach of Gowrisankaran, Nevo, and Town (2015), I assume that each insurer's enrollment is exogenously fixed (and normalized to one) and assume that longer-term competitive pressures ensure that insurers act as good agents for their enrollees. This assumption allows me to focus the analysis on the bargaining process between the insurer and provider and likely has little effect on the main conclusions that emerge from the model.

[89] My main conclusions would likely generalize to a model with multiple insurers bargaining with multiple providers, but doing so would add considerable complexity, likely in exchange for little additional insight.

The insurer therefore seeks to maximize the value its enrollees realize from receiving health care net of the cost of that care, which enrollees bear as premiums. That is, the insurer's objective function is:

$$W(p,l,a) = a\left[V\big(Q(p,l)\big) - pQ(p,l)\right],$$

where $Q(p,l)$ is per enrollee consumption of health care services, determined as a function of the insurer's coverage decision l and the provider's price p (if the provider serves the insurer's patients), and $V(Q)$ is the value the insurer's enrollees derive from a given volume of the provider's services.

The provider's objective function is simply its profits:

$$\pi(p,l,a) = aQ(p,l)\,[p-c],$$

where c is the provider's marginal cost of delivering an additional service.

To facilitate the analysis that follows, I make the following assumptions:

- **Assumption A1 (Demand):** The function Q is twice continuously differentiable, with $Q_l(p,l) > 0$, and $Q_{pl}(p,l) \geq 0$ for all $p \in \mathbb{R}$ and $l \in [0,1]$. For all $p \in \mathbb{R}$, $Q_p(p,l) < 0$ if $l < 1$ and $Q_p(p,1) = 0$.

- **Assumption A2 (Value of services):** The function V is twice continuously differentiable, with $V'(Q) > 0$ and $V''(Q) < 0$. Additionally, $V'(0) > c$, and V is normalized so $V(0) = 0$.

- **Assumption A3 (Importance of coverage):** The insurer's ability to affect demand for the provider's service is sufficiently strong that $V'(Q(p,1)) < c < V'(Q(p,0))$ for all $p \in \mathbb{R}$.

- **Assumption A4 (Technical conditions):** For all values of $p \in \mathbb{R}$,

$$\frac{d}{dp}\left[V'\big(Q(p,l)\big)\right] \equiv V''(Q(p,l))Q_p(p,l) \leq 1,$$

  with the inequality strict for $l > 0$. Additionally, for any $l < 1$, there exists some $\epsilon > 0$, such that

$$\frac{d}{dp}\left[-\frac{Q(p,l)}{Q_p(p,l)}\right] \equiv -1 + Q_{pp}(p,l)\frac{Q(p,l)}{Q_p(p,l)^2} < 1 - V''(Q(p,l))Q_p(p,l) - \epsilon$$

  for all $p \in \mathbb{R}$.

The assumptions are largely intuitive, but a few comments are warranted. The requirement in Assumption A2 that $V'(0) > c$ ensures that it is optimal for the provider to deliver some care to the insurer's enrollees. Assumption A3 ensures that it is always possible to reach the "efficient" utilization level, which simplifies the analysis, but could be relaxed while preserving the main conclusions.

Assumption A4 ensures that the parties' payoff functions are reasonably well-behaved. The first part requires that the value enrollees place on the marginal service rises no more than one-for-one with the price. In essence, this assumption imposes a limited degree of consistency between enrollees' demand behavior (captured in Q) and their underlying valuation of services (captured in V).

The second part of the assumption limits how quickly the magnitude of the inverse semi-elasticity of demand rises as prices rise. Equivalently, it limits how quickly the sensitivity of enrollees' demand for care to the provider's price falls off as the price rises. This ensures that the provider faces a meaningful demand constraint and does not wish to set an infinite price absent a negotiated agreement.

Notably, the second part of assumption A4 rules out the possibility that some enrollees' decisions are completely insensitive to prices, so this assumption may be unrealistic in emergency situations or in settings where "surprise billing" is common. But adapting the model to these cases would likely be straightforward. Even in these cases, prices are still constrained by other factors, including challenges in collecting from enrollees (or insurers) and fears that setting too high a price will trigger social disapproval. If Assumption A4 were relaxed and these types of factors were incorporated, the analysis that follows would likely proceed with minimal changes to the qualitative conclusions.

A.1.2 Nash Bargaining Framework

I assume that providers and insurers bargain over network agreements (p, l, a), which specify the fraction of the insurer's patients that will have access to the provider's services (a), the price the insurer will pay for those services (p), and the coverage the insurer will offer for those services (l). I assume that negotiated outcomes are determined by Nash bargaining, which, as discussed earlier in the main text, has become a workhorse approach to modeling provider-insurer network negotiations.

Under Nash bargaining, the negotiated network agreement solves the maximization problem:

$$(p^*, l^*, a^*) = \underset{\substack{p \in \mathcal{P} \\ l \in [0,1] \\ a \in [0,1]}}{\operatorname{argmax}} \left[W(p, l, a) - \widetilde{W}\right]^{\theta} \times [\pi(p, l, a) - \tilde{\pi}]^{1-\theta}, \tag{A1}$$

where $\widetilde{W}$ and $\tilde{\pi}$ are, respectively, the insurer and provider's payoffs if they fail to reach agreement, the set $\mathcal{P} \subset \mathbb{R}$ is a closed set of permissible negotiated prices (which depends on the policy scenario under consideration), and $\theta \in (0,1)$ is the insurer's bargaining weight. A higher value of θ leads to better outcomes for the insurer, while a lower value of θ leads to better outcomes for the provider. The parameter θ is commonly interpreted as reflecting the parties' bargaining "skill" or relative patience.

As I demonstrate below, the Nash bargaining problem (A1) has a unique solution in all of the scenarios considered in this appendix. Thus, for future reference, I let $p^*(\widetilde{W}, \tilde{\pi}, \mathcal{P})$, $l^*(\widetilde{W}, \tilde{\pi}, \mathcal{P})$, and $a^*(\widetilde{W}, \tilde{\pi}, \mathcal{P})$ denote the solution to (A1) for disagreement payoffs $\widetilde{W}$ and $\tilde{\pi}$ and a set of permissible prices $\mathcal{P}$.

The characteristics of this solution depend in important ways on the form of the set $\mathcal{P}$, so I defer a full characterization of the solution until later in this appendix. However, it is immediately apparent that the disagreement payoffs $\widetilde{W}$ and $\tilde{\pi}$ will play a major role in determining the negotiated outcome. In particular, it is easy to see that increasing $\widetilde{W}$ will, all else equal, weakly increase $W(p^*, l^*, a^*)$ and weakly reduce $\pi(p^*, l^*, a^*)$. An increase in $\tilde{\pi}$ has the opposite effect. Given the importance of the disagreement payoffs in determining negotiated outcomes, I now discuss how they are determined.

A.1.3 Modeling the Disagreement Payoffs

I assume that the disagreement payoffs reflect the actions the parties expect to be taken in the absence of a network agreement. Formally, the provider's disagreement actions consist of selecting a fraction $\tilde{a}$ of the insurer's patients to accept that lies in some closed set $\tilde{\mathcal{A}} \subset [0,1]$, and a price $\tilde{p}$ in some closed set $\tilde{\mathcal{P}} \subset \mathbb{R}$, which I call the provider's "charge."[90] The insurer's disagreement action is to select out-of-

[90] As discussed in the main text and above, providers are typically not able to collect their full charges for out-of-network care. I abstract from that fact in this appendix but, as noted above, incorporating this feature of the real world would not change the model's qualitative conclusions.

network coverage terms $\tilde{l}$ in some closed set $\tilde{\mathcal{L}} \subset [0,1]$. The sets $\tilde{\mathcal{A}}$, $\tilde{\mathcal{P}}$, and $\tilde{\mathcal{L}}$ vary in what follows depending on the policies in place and whether providers can feasibly reject patients.

Given these disagreement actions, the parties' disagreement payoffs are then $\widetilde{W} = W(\tilde{p}, \tilde{l}, \tilde{a})$ and $\tilde{\pi} = \pi(\tilde{p}, \tilde{l}, \tilde{a})$. As long as $\tilde{\mathcal{P}} \subset \mathcal{P}$, as will always be the case here, this model for the disagreement payoffs ensures that the Nash bargaining problem (A1) always has at least one solution.[91]

I model determination of the disagreement actions $(\tilde{p}, \tilde{l}, \tilde{a})$ in two ways. Under the first approach, the parties can credibly commit to the actions they will take if negotiations break down. Under the second approach, commitment is not possible. As will become clear, these two approaches have markedly different implications for how the price cap policies will affect negotiated prices.

With commitment. Under this approach, the parties simultaneously announce their disagreement actions prior to bargaining. Because commitment is possible, the parties expect those actions to be implemented if negotiations do in fact break down. The parties thus choose disagreement actions to maximize their respective bargained payoffs, $W(p^*, l^*, a^*)$ and $\pi(p^*, l^*, a^*)$. I seek a pure strategy Nash equilibrium of the resulting game, and I show later that all such equilibria lead to the same disagreement payoffs. This is the "Nash bargaining with variable threats" model of Nash (1953).

It is important to note that, consistent with the discussion following equation (A1), each party will generally benefit not only from improving its own disagreement payoff, but also from worsening the other party's disagreement payoff. Indeed, a party will often choose disagreement actions that would harm its own interests if implemented, provided that those actions would harm the other party even more. This implies that the parties will often threaten to take actions that they would wish to renege on if given the opportunity to do so. Thus, the parties' ability to commit actually matters.

True binding commitments are not possible in practice. However, insurers and providers do interact repeatedly, and it will generally be to each party's advantage to develop a reputation for following through on its threats. Indeed, Abreu and Pearce (2007; 2015) argue that these types of reputational effects make the Nash bargaining with variable threats outcome the most plausible outcome in a broad class of bargaining games with repeated interactions. Moreover, as discussed in the main text, providers and insurers routinely make (and follow through on) similar threats under the status quo, suggesting that the assumption that the parties can commit is empirically reasonable.

Without commitment. Nevertheless, I also consider a second approach in which commitment is not possible. Under this approach, I assume that each party will simultaneously announce disagreement actions if negotiations do in fact break down and, correspondingly, that each party will select actions that maximize its disagreement payoff (*not* its bargained payoff). As in the case with commitment, I seek a pure strategy Nash equilibrium of this game. I show later that, in cases where there are multiple equilibria, all generate the same disagreement payoffs.

A.1.4 Bargained Agreements When Negotiated Prices are Unregulated

I now characterize the solution to the bargaining problem (A1) when negotiated prices are unregulated; that is, when $\mathcal{P} = \mathbb{R}$. This case encompasses not just scenarios without a price cap, but also scenarios with an out-of-network cap, a "cap and floor" out-of-network policy, and a default contract policy, so

[91] In particular, consider the set Ω of payoff tuples (W', π') that satisfy $W' \geq \widetilde{W}$ and $\pi' \geq \tilde{\pi}$, as well as $W' = W(p, l, a)$ and $\pi' = \pi(p, l, a)$ for some permissible network agreement (p, l, a). The fact that $\widetilde{W} = W(\tilde{p}, \tilde{l}, \tilde{a})$ and $\tilde{\pi} = \pi(\tilde{p}, \tilde{l}, \tilde{a})$ ensures that Ω is non-empty. It is also easily seen that Ω is compact. The continuity of the maximand in (A1) then implies that (A1) has at least one solution. I return to uniqueness later.

results for this case will be relevant throughout most of this appendix. I address the case of a comprehensive price cap, which does directly constrain negotiated prices, in section A.5.

As shown formally in Appendix D, the unique bargained outcome has $a^* = 1$ and p^* and l^* satisfying

$$V'(Q) = c \tag{A2}$$

$$p^* Q = cQ + (1-\theta)[V(Q) - cQ] + \theta\tilde{\pi} - (1-\theta)\widetilde{W}, \tag{A3}$$

where the dependence of Q on p^* and l^* is suppressed to streamline notation.

These conditions have intuitive interpretations. The combination of $a^* = 1$ and equation (A2) shows that the provider and insurer strike an "efficient" bargain in the sense that the provider delivers all services for which the marginal benefit to the enrollee (weakly) exceeds the provider's marginal cost.[92] Notably, the parties are predicted to agree on this outcome regardless of the disagreement outcomes. This is intuitive: the parties are always best served by maximizing their joint surplus and then setting a price that allocates that surplus between them in accordance with the strength of their bargaining positions. Note that because V is strictly concave, there is a unique quantity Q^* such that $V'(Q^*) = c$.

Equation (A3) shows that the provider's revenue is the sum of three things: the provider's costs; a share $1-\theta$ of the surplus generated by the care delivered under an agreement; and, crucially, a term $\theta\tilde{\pi} - (1-\theta)\widetilde{W}$ that depends on the payoffs each party would achieve if negotiations broke down. The form of this final term shows that the provider can secure a more favorable agreement by *either* increasing its disagreement profits *or* reducing the insurer's disagreement payoff; the reverse is true for the insurer. This fact will prove important in the discussion that follows.

Because the quantity of services delivered under a negotiated agreement is independent of the disagreement payoffs *and* the disagreement payoffs enter (A3) in a simple linear way when negotiated prices are unregulated, it is possible to nest the two models for determining disagreement actions inside a single unified model of the "disagreement game." This nested form will be convenient below. In particular, the disagreement actions $(\tilde{p}, \tilde{l}, \tilde{a})$ can be taken to be the Nash equilibrium outcomes from a simultaneous move game in which the provider's and the insurer's respective payoffs are given by:

$$d^P(\tilde{p}, \tilde{l}, \tilde{a}) \equiv [1 - \gamma(1-\theta)]\pi(\tilde{p}, \tilde{l}, \tilde{a}) - \gamma(1-\theta)W(\tilde{p}, \tilde{l}, \tilde{a}) \tag{A4}$$

$$d^I(\tilde{p}, \tilde{l}, \tilde{a}) \equiv -\gamma\theta\pi(\tilde{p}, \tilde{l}, \tilde{a}) + [1 - \gamma\theta]W(\tilde{p}, \tilde{l}, \tilde{a}) \tag{A5}$$

where $\gamma \in \{0,1\}$. It is easy to verify that, when $\gamma = 1$, this game will generate the same disagreement actions as the approach with commitment outlined above. Similarly, when $\gamma = 0$, it will generate the same disagreement actions as the approach without commitment outlined above.

A.1.5 Equilibrium Outcomes in the Absence of a Price Cap

To provide a baseline for the remainder of the analysis, I now characterize outcomes in the absence of any form of price cap (in formal terms, when $\mathcal{P} = \tilde{\mathcal{P}} = \mathbb{R}$ and $\tilde{\mathcal{L}} = [0,1]$). I consider outcomes both when the provider is barred from rejecting patients absent an agreement (in formal terms, when $\tilde{\mathcal{A}} = \{1\}$) and when the provider can reject patients (in formal terms, when $\tilde{\mathcal{A}} = [0,1]$).

[92] The provider and insurer are able to strike an efficient bargain because the insurer's payoff depends on its choice of coverage terms l solely through its effect on the utilization Q. In reality, changing cost-sharing, prior authorization, and other requirements could have direct effects on enrollees' well-being. A model capturing this possibility would be harder to analyze but would likely lead to qualitatively similar conclusions.

Proposition A1 characterizes these outcomes. The proof is in Appendix D, but I discuss the intuition behind the proposition below. For future reference, I let $\tilde{p}_{\text{nocap}}$ and $\tilde{l}_{\text{nocap}}$ denote the equilibrium disagreement charge and coverage terms, respectively, (which the proposition shows do not depend on whether the provider can reject patients), and let p^*_{nocap} denote the corresponding negotiated price.

Proposition A1. The game without a price cap has a unique pure strategy equilibrium, and the equilibrium does not depend on whether the provider can reject patients absent an agreement. In that equilibrium, the provider always accepts out-of-network patients (that is, $\tilde{a} = 1$), $Q(\tilde{p}_{\text{nocap}}, \tilde{l}_{\text{nocap}}) < Q^*$, and $p^*_{\text{nocap}} < \tilde{p}_{\text{nocap}}$. When the parties can commit to their disagreement actions, $\tilde{l}_{\text{nocap}} = 0$.

One important conclusion is that, without a price cap, the provider never wishes to reject patients absent an agreement. When the provider cannot commit to disagreement actions, this follows from the fact that the provider chooses its disagreement actions to maximize its short-run profit. The provider's best response obviously must have $\tilde{p} > c$, which in turn implies that its best response cannot have $\tilde{a} < 1$ since the alternative of $\tilde{a} = 1$ would generate strictly higher profits.

When the provider can commit to its disagreement actions, it chooses disagreement actions to maximize $d^P(\tilde{p}, \tilde{l}, \tilde{a})$, which depends positively on its profits and negatively on the insurer's payoff. Setting a sufficiently high charge $\tilde{p}$ ensures that $d^P(\tilde{p}, \tilde{l}, 1)$ is strictly positive, which implies that the provider's best response must result in $d^P(\tilde{p}, \tilde{l}, \tilde{a})$ *being positive*. This implies that playing $\tilde{a} = 0$ cannot be a best response. Similarly, the provider cannot play $\tilde{a} < 1$ since the alternative of $\tilde{a} = 1$ would generate a strictly larger payoff. Note, however, that the unattractiveness of turning away the insurer's patients hinges on the provider's ability to set a high enough price absent an agreement. Indeed, as shown below, the provider's preferred action can change if its charge is capped.

Another notable finding is that $Q(\tilde{p}_{\text{nocap}}, \tilde{l}_{\text{nocap}}) < Q^*$. That is, absent an agreement between the insurer and the provider, the quantity of care is constrained below its efficient level. To see why this is the case, it is useful to examine the parties' incentives in choosing disagreement actions $\tilde{p}$ and $\tilde{l}$. Differentiating the functions d^P and d^I defined in (A4) and (A5) yields:

$$\frac{d}{d\tilde{p}} d^P(\tilde{p}, \tilde{l}, 1) = \tilde{Q} + \tilde{Q}_p\left[\tilde{p} - c - \gamma(1-\theta)\{V'(\tilde{Q}) - c\}\right] \tag{A6}$$

$$\frac{d}{d\tilde{l}} d^I(\tilde{p}, \tilde{l}, 1) = -\tilde{Q}_l\left[\tilde{p} + \gamma\theta\{V'(\tilde{Q}) - c\} - V'(\tilde{Q})\right], \tag{A7}$$

where I have defined $\tilde{Q} \equiv Q(\tilde{p}, \tilde{l})$, $\tilde{Q}_p \equiv Q_p(\tilde{p}, \tilde{l})$, and $\tilde{Q}_l \equiv Q_l(\tilde{p}, \tilde{l})$ to simplify notation.

When considering the disagreement game without commitment (that is, the case where $\gamma = 0$), the provider's first-order condition is the standard first-order condition for a monopolist, and the provider correspondingly sets a disagreement price above its marginal cost. The insurers sets its out-of-network coverage terms to equate the charge $\tilde{p}$ and the marginal value of care $V'(\tilde{Q})$, so the provider's high price leads the insurer to set coverage terms that cause its enrollees to underconsume the provider's care.

These dynamics are much stronger with commitment (that is, the case where $\gamma = 1$). Examining (A6) shows that the provider acts as if its marginal cost is $c + (1-\theta)\{V'(\tilde{Q}) - c\}$, rather than just c. This additional term is positive in equilibrium, so the provider sets a charge $\tilde{p}$ above the ordinary profit-maximizing charge. Intuitively, this additional term arises because the provider can increase the negotiated price either by increasing its disagreement payoff or by *reducing* the insurer's disagreement payoff. Increasing its charge beyond the ordinary profit maximizing level has no first-order effect on its profits, but does harm the insurer, so it improves the provider's bargaining position overall.

Similarly, examining (A7) shows that the insurer acts as if is charged a price $\tilde{p} + \theta\{V'(\tilde{Q}) - c\}$, rather than just $\tilde{p}$. Thus, it sets stingier out-of-network coverage terms than it otherwise would. Paralleling the logic for the provider, the insurer is willing to do this because reducing coverage slightly below the level that would ordinarily maximize its enrollees' well-being has no first-order effect on the insurer's payoff, but does reduce the provider's profits and thus improves the insurer's bargaining position overall. The proposition demonstrates that, in the case with commitment, the feedback between the provider's desire to set a high price and the insurer's desire to set stingy coverage terms is so strong that the insurer ends up setting $\tilde{l}_{\text{nocap}} = 0$ in equilibrium. That is, in equilibrium, the insurer provides no out-of-network coverage for the provider's services.

A.2 Effects of an Out-of-Network Cap

With the basic modeling framework established, I now consider how introducing an out-of-network cap would affect the outcome of provider-insurer negotiations. For these purposes, I model an out-of-network price cap as an upper limit $\bar{p} \geq c$ on the charge $\tilde{p}$ the provider can set in the absence of a network agreement. The set of charges the provider can choose from in the absence of a network agreement is thus $\tilde{\mathcal{P}} = [0, \bar{p}]$. Importantly, this policy leaves negotiated prices unrestricted, so the set of permissible negotiated prices is $\mathcal{P} = \mathbb{R}$. Similarly, an out-of-network cap policy does not regulate the level of coverage insurers offer for out-of-network services, so $\tilde{\mathcal{L}} = [0,1]$.

The rest of this section considers how an out-of-network cap affects negotiated outcomes in scenarios where providers either can or cannot reject out-of-network patients. In brief, I show that an out-of-network cap can have large effects on negotiated prices when providers cannot reject out-of-network patients but may have considerably smaller effects when providers can reject patients.

A.2.1 Outcomes When Providers Cannot Reject Patients

I begin by considering how an out-of-network cap would affect negotiated prices when the provider cannot reject patients absent an agreement (that is, when $\tilde{\mathcal{A}} = \{1\}$). Proposition A2 characterizes outcomes in this case. Again, I defer the proof to Appendix D but discuss the intuition here.

For reference here and later in the appendix, I let $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$ denote the equilibrium disagreement charge and coverage terms for an out-of-network cap $\bar{p}$, respectively, and let $p^*_{\text{out}}(\bar{p})$ denote the corresponding negotiated price. In Proposition A2 and the ensuing discussion, I largely (though not entirely) suppress the dependence of these amounts on $\bar{p}$ in order to streamline notation.

Proposition A2. The game with an out-of-network cap $\bar{p} \geq c$ in which the provider cannot reject patients has a unique pure strategy Nash equilibrium. The equilibrium has the following properties:

(i) The provider's disagreement charge $\tilde{p}_{\text{out}}$ has $\tilde{p}_{\text{out}} = \bar{p}$ for $\bar{p} \in [c, \tilde{p}_{\text{nocap}})$ and $\tilde{p}_{\text{out}} = \tilde{p}_{\text{nocap}}$ for $\bar{p} \geq \tilde{p}_{\text{nocap}}$. The insurer's disagreement coverage terms $\tilde{l}_{\text{out}}$ satisfy $\tilde{l}_{\text{out}} \geq \tilde{l}_{\text{nocap}}$, with strict inequality for sufficiently small values of $\bar{p}$ and equality for $\bar{p} \geq \tilde{p}_{\text{nocap}}$. Further, $Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}) > Q(\tilde{p}_{\text{nocap}}, \tilde{l}_{\text{nocap}})$ for $\bar{p} < \tilde{p}_{\text{nocap}}$ and $Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}) = Q^*$ for $\bar{p} = c$.

(ii) The negotiated price p^*_{out} satisfies $p^*_{\text{out}} \leq \bar{p}$ for all $\bar{p}$, with equality only for $\bar{p} = c$, and $p^*_{\text{out}} = p^*_{\text{nocap}}$ for $\bar{p} \geq \tilde{p}_{\text{nocap}}$. Further, p^*_{out} is a continuous function of $\bar{p}$, and p^*_{out} is differentiable as a function of $\bar{p}$ except possibly at one or two values of $\bar{p}$, with $(p^*_{\text{out}})'(\bar{p}) \leq Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}) / Q^* \leq 1$ and the second inequality strict unless $\bar{p} = c$. Additionally:

a. When the parties cannot commit to disagreement actions, there exists some $\tilde{p}' > p^*_{\text{nocap}}$ such that the negotiated price p^*_{out} satisfies $p^*_{\text{out}} < p^*_{\text{nocap}}$ if $\bar{p} < \tilde{p}'$.

b. When the parties can commit to disagreement actions, the negotiated price p^*_{out} is strictly increasing in $\bar{p}$ and satisfies $p^*_{\text{out}} < p^*_{\text{nocap}}$ for all $\bar{p} < \tilde{p}_{\text{nocap}}$. Further, $(p^*_{\text{out}})'(\tilde{p}_{\text{nocap}}) = 0$.

The introduction of an out-of-network cap makes failing to reach agreement with the provider far more attractive for the insurer. As described in part (i) of Proposition A2, once the out-of-network cap $\bar{p}$ falls below $\tilde{p}_{\text{nocap}}$, the provider is constrained to instead set a charge $\tilde{p}_{\text{out}} = \bar{p}$. For a sufficiently low out-of-network cap, the constrained charge makes it attractive for the insurer to increase the generosity of its out-of-network coverage (that is, to set $\tilde{l}_{\text{out}} > \tilde{l}_{\text{nocap}}$), giving its enrollees a level of access to the provider's services closer to what they would have under a network agreement. Indeed, for an out-of-network cap equal to the provider's marginal cost, the insurer sets coverage terms that lead to the insurer's enrollees receiving the efficient volume of services Q^* even without an agreement.

Part (ii) of Proposition A2 shows that, as a result of the above, the insurer can now negotiate a price p^*_{out} no higher than the out-of-network cap $\bar{p}$. Notably, this implies that a stringent enough out-of-network cap can achieve any negotiated price weakly above the provider's marginal cost.

Importantly, the introduction of an out-of-network cap can exert some downward pressure on negotiated prices even if set above the pre-policy negotiated price p^*_{nocap}. Indeed, when commitment is possible, any out-of-network cap below $\tilde{p}_{\text{nocap}}$ reduces negotiated prices. When commitment is not possible, introducing an out-of-network cap set only slightly below $\tilde{p}_{\text{nocap}}$ can theoretically increase negotiated prices, but an out-of-network cap close enough to p^*_{nocap} still reduces negotiated prices.[93]

Intuitively, even a relatively loose out-of-network cap can have some effect because its presence makes failing to reach a network agreement marginally more attractive for the insurer and, thus, marginally increases the insurer's willingness to hold out for a better deal. The effect of a loose cap will generally, however, be relatively small. Indeed, part (ii).b of Proposition A2 shows that, when the parties can commit to disagreement actions, $(p^*_{\text{out}})'(\tilde{p}_{\text{nocap}}) = 0$, which indicates that imposing a cap slightly below the provider's pre-policy charge will reduce negotiated prices by a negligible amount. This reflects the fact that the provider chose $\tilde{p}_{\text{nocap}}$ to maximize its bargaining leverage, so forcing the provider to set a slightly lower charge has no first-order effect on its bargaining position. More generally, the bound $(p^*_{\text{out}})'(\bar{p}) \leq Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}) \,/\, Q^*$ demonstrates that tightening the cap will only have a meaningful effect on negotiated prices if the cap is set at a level that induces the insurer to set coverage terms that result in a significant volume of services being delivered in the absence of a network agreement.

A.2.2 Outcomes When Providers Can Reject Patients

I now examine how the effects of an out-of-network cap change when providers can reject out-of-network patients (that is, when $\tilde{\mathcal{A}} = [0,1]$). The effect of an out-of-network cap now depends on whether a provider can commit to its disagreement actions and, thus, credibly threaten to turn away

93 The reason an out-of-network cap slightly below $\tilde{p}_{\text{nocap}}$ can increase negotiated prices when commitment is not possible is somewhat subtle. The cap effectively allows the provider to commit to setting a charge $\tilde{p}_{\text{out}}$ below its unilateral profit-maximizing charge. That commitment induces the insurer to offer more generous out-of-network coverage. The resulting increase in volume generates a first-order increase in the provider's disagreement payoff more than sufficient to offset the second-order reduction in its payoff from the lower price. Under some circumstances, the increase in the provider's disagreement payoff can be large enough to offset the corresponding improvement in the insurer's disagreement payoff and thus strengthen the provider's bargaining position on net. The expressions for $(p^*_{\text{out}})'$ that are derived in the proof of Proposition A2 show that this is most likely to be the case when θ is very close to one.

the insurer's patients absent a network agreement. Proposition A3 characterizes the outcomes in this case. I defer the proof to Appendix D but discuss the intuition behind the proposition below.[94]

Proposition A3. The game with an out-of-network cap $\bar{p} > c$ in which the provider can reject patients has a pure strategy Nash equilibrium, and all pure strategy Nash equilibria result in the same negotiated price. The equilibrium disagreement actions and negotiated prices satisfy the following:

(i) If the parties cannot commit to disagreement actions, then there is a unique equilibrium. In that equilibrium, the provider accepts all patients absent an agreement (that is, $\tilde{a} = 1$), the disagreement price and coverage terms are $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$, respectively, and the negotiated price is $p^*_{\text{out}}(\bar{p})$.

(ii) If the parties can commit to disagreement actions, then there exists a critical level of the out-of-network cap $\bar{p}_{\text{reject}} > p^*(0,0,\mathbb{R})$ that satisfies $p^*_{\text{out}}(\bar{p}_{\text{reject}}) = p^*(0,0,\mathbb{R})$ for which:

a. If $\bar{p} \geq \bar{p}_{\text{reject}}$, the negotiated price is $p^*_{\text{out}}(\bar{p})$. Furthermore, for $\bar{p} > \bar{p}_{\text{reject}}$, the provider accepts all patients absent an agreement (that is, $\tilde{a} = 1$), and the equilibrium disagreement price and coverage terms are $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$, respectively.

b. If $\bar{p} < \bar{p}_{\text{reject}}$, the provider rejects all patients absent an agreement (that is, $\tilde{a} = 0$), and the negotiated price is $p^*(0,0,\mathbb{R})$. Furthermore,

$$p^*_{\text{nocap}} - p^*(0,0,\mathbb{R}) < \frac{\tilde{\mathrm{Q}}_{\text{nocap}} \ / \ Q^*}{1 - \tilde{\mathrm{Q}}_{\text{nocap}} \ / \ Q^*} \left[\tilde{p}_{\text{nocap}} - p^*_{\text{nocap}}\right],$$

where $\tilde{\mathrm{Q}}_{\text{nocap}} \equiv Q(\tilde{p}_{\text{nocap}}, \tilde{l}_{\text{nocap}}) \ / \ Q^*$.

The proposition demonstrates that, when providers can turn away patients absent an agreement, the effects of an out-of-network cap depend crucially on whether the parties can commit to their disagreement actions. If commitment is not possible, then an out-of-network cap can substantially reduce negotiated prices in the model. The intuition is straightforward: if negotiations break down, the provider can always earn positive profits by accepting the insurer's patients and setting some charge $\tilde{p} \in (c, \bar{p}]$, which is better than rejecting the insurer's patients and earning a profit of zero. Thus, without commitment, the provider will never reject the insurer's patients, and the introduction of an out-of-network cap will shift the bargaining landscape sharply in the insurer's favor. Indeed, without commitment, outcomes are identical regardless of whether the provider can reject patients.

But if commitment is possible, then the scope for an out-of-network cap to reduce negotiated prices may be relatively modest when the provider can turn away out-of-network patients. By threatening to turn away the provider's patients, the provider can create a disagreement outcome in which the provider delivers no care to the insurer's enrollees and both parties earn disagreement payoffs of zero. Thus, the provider can guarantee itself a price no lower than $p^*(0,0,\mathbb{R})$.

Rejecting patients will not be attractive for an out-of-network cap set modestly below $\tilde{p}_{\text{nocap}}$. Indeed, whereas $d^P(\tilde{p}, \tilde{l}, 0) = 0$ for all $\tilde{p}$ and $\tilde{l}$, Proposition A1 shows that $d^P(\tilde{p}_{\text{nocap}}, \tilde{l}_{\text{nocap}}, 1) > 0$, reflecting the fact that the profits the provider earns by accepting patients and charging $\tilde{p}_{\text{nocap}}$ outweighs the value

[94] In stating Proposition A3, I exclude the edge case where $\bar{p} = c$, which gives rise to additional equilibria when commitment is not possible. In this case, the provider's profit in the disagreement game is zero whether or not it accepts the insurer's patients. As a result, there is an equilibrium with $\tilde{a} = 1$, which has the properties described, as well as a continuum of equilibria with $\tilde{a} < 1$ that generate a continuum of negotiated prices.

the insurer derives from its enrollees having some access to the provider's services. But as the cap falls, the provider's out-of-network profits fall relative to the insurer's out-of-network payoff, and the provider is ultimately best served by turning away patients absent an agreement.

The maximum potential reduction in the negotiated price that is achievable with an out-of-network cap, $p^*_{\text{nocap}} - p^*(0,0,\mathbb{R})$, depends on how attractive it was to be out-of-network under the status quo. Part (ii)b of Proposition A3 shows that the maximum potential price reduction is higher the more volume the provider could retain absent an agreement under the status quo (that is, the larger is $\tilde{Q}_{\text{nocap}} \,/\, Q^*$) and the higher the price the provider an collect absent an agreement under the status quo (that is, the larger is $\tilde{p}_{\text{nocap}} - p^*_{\text{nocap}}$). The calibration presented in the main text suggests that this amount is likely to be small in most instances, although evidence on this point is imperfect.

A.3 Effects of a "Cap and Floor" Out-of-Network Policy

I now consider a variant on the out-of-network cap policy that would both place an upper limit $\bar{p}$ on the price that the provider can charge for out of-network care (that is, impose $\tilde{\mathcal{P}} = (-\infty, \bar{p}]$) *and* a lower limit $\underline{l}$ on the out-of-network coverage the provider can offer (that is, impose $\tilde{\mathcal{L}} = [\underline{l}, 1]$). The latter portion of this policy can be understood as a lower limit on what the insurer must pay for the enrollee's care, hence the "cap and floor" label. In keeping with the fact that the aim of these types of policies is typically to make being out-of-network invisible to enrollees, I consider policies with $Q(\bar{p}, \underline{l}) = Q^*$. In this section, I formally describe outcomes under this policy in Proposition A4 and then discuss the intuition behind them. The proof of the proposition is in Appendix D.

Proposition A4. The provider-insurer bargaining game with an out-of-network cap $\bar{p} > c$ and coverage standard $\underline{l}$ such that $Q(\bar{p}, \underline{l}) = Q^*$ has a pure strategy Nash equilibrium, and all pure strategy Nash equilibria result in the same negotiated price. The following properties hold:

(i) If the provider cannot reject patients or the parties cannot commit to disagreement actions, there is a unique equilibrium. In equilibrium, the provider accepts all patients absent an agreement (that is, $\tilde{a} = 1$), and the insurer sets disagreement coverage terms $\underline{l}$. If $\bar{p} \leq \tilde{p}_{\text{nocap}}$, the provider sets a charge $\bar{p}$, and the negotiated price is $\bar{p}$. If $\bar{p} > \tilde{p}_{\text{nocap}}$, the provider sets a charge weakly greater than $\tilde{p}_{\text{nocap}}$, and the negotiated price is weakly greater than $\bar{p}$.

(ii) If the provider can reject patients and the parties can commit to disagreement actions, then:

   a. If $\bar{p} \geq p^*(0,0,\mathbb{R})$, the negotiated price is identical to the negotiated price in (i) above. For $\bar{p} > p^*(0,0,\mathbb{R})$, the provider accepts all patients absent an agreement (that is, $\tilde{a} = 1$), and the parties' disagreement actions are also the same as in (i).

   b. If $\bar{p} < p^*(0,0,\mathbb{R})$, the provider rejects all patients absent an agreement (that is, $\tilde{a} = 0$), and the negotiated price is $p^*(0,0,\mathbb{R})$.

Part (i) of the proposition shows that when the provider cannot reject patients or cannot credibly commit to doing so, the "cap and floor" policy will generally lead to a negotiated price equal to the payment standard $\bar{p}$. This result is intuitive. In the absence of a network agreement, the provider will have to deliver its services at a price equal to the payment standard, but the insurer will have to offer an in-network level of coverage for those services, causing the provider to deliver a volume of services Q^* even absent a network agreement. The provider thus has nothing to gain from a network agreement at a price below the payment standard, while the insurer has nothing to gain from a network agreement at a higher price, so the equilibrium negotiated price exactly equals the payment standard.[95]

Part (ii) shows that when the provider can turn away patients and can commit to disagreement actions, a "cap and floor" policy will lead to a negotiated price equal to the payment standard if the payment standard is set relatively high, but not if the payment standard is set relatively low. In particular, for a stringent enough payment standard, it will always be in the provider's interest to threaten to turn away patients absent an agreement, resulting in a price $p^*(0,0,\mathbb{R})$, just like under an out-of-network cap.

Comparing the results to Propositions A2 and A3 indicates that a "cap and floor" policy will generally result in higher prices than an out-of-network cap set at an equivalent level. Importantly, the "cap and floor" policy actually has the potential to *increase* prices when the payment standard $\bar{p}$ is set above the status quo level of negotiated prices, whereas an out-of-network cap always reduces prices. Even in circumstances where a "cap and floor" policy does reduce prices, it is likely to reduce prices by less than a cap alone. It is also similarly limited in its ability to reduce the negotiated price when the provider can credibly threaten to reject the insurer's patients absent a network agreement.

A.4 Effects of a Comprehensive Price Cap

I now consider the effects of a comprehensive price cap, which I model here as an upper limit $\bar{p} > c$ on *both* the charge the provider can set in the absence of a network agreement *and* the negotiated price. That is, I model a comprehensive price cap as the case with $\mathcal{P} = \tilde{\mathcal{P}} = (-\infty, \bar{p}]$. (For convenience, I will use $\bar{\mathcal{P}}$ as a shorthand for the set $(-\infty, \bar{p}]$ in this section and in Appendix D.) This policy does not restrict the level of out-of-network coverage insurers can offer; that is, $\tilde{\mathcal{L}} = [0,1]$.

To analyze this case, I first characterize the solution to the Nash bargaining problem (A1) when negotiated prices are capped (that is, when $\mathcal{P} = \bar{\mathcal{P}}$). Based on that analysis, I then characterize the equilibrium disagreement actions and resulting contract terms. In brief, I show that a comprehensive price cap functions similarly to an out-of-network cap when providers either are not allowed to turn away out-of-network patients or cannot credibly threaten to do so. By contrast, when providers can credibly threaten to turn way out-of-network patients, a comprehensive price cap has much greater potential to reduce prices, but also has the potential to increase utilization.

A.4.1 Bargaining When Negotiated Prices are Capped

The solution of the Nash bargaining problem (A1) when negotiated prices are capped is more complicated than the solution when negotiated prices are uncapped. I characterize outcomes informally here and present full mathematical details of the solution in Appendix D.

When the disagreement payoffs place the provider in a bargaining position weak enough that $p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R}) \leq \bar{p}$, the cap on negotiated prices does not bind at this stage of play. Thus, the provider and insurer reach the same negotiated agreement as when negotiated prices were uncapped. In particular, the negotiated price is still $p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R})$, the provider accepts all of the insurer's enrollees, and the negotiated coverage terms are set so the provider delivers the efficient quantity of services Q^*.

When the provider's bargaining position is stronger and $p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R}) > \bar{p}$, the cap on the negotiated price binds and the solution to (A1) changes accordingly. Most intuitively, the negotiated price now

[95] There is an exception to this logic for a payment standard set above the pre-policy level of charges $\tilde{p}_{\text{nocap}}$. For a payment standard far enough above $\tilde{p}_{\text{nocap}}$, the provider may wish to set its charge *below* $\bar{p}$. In this case, the insurer will still be required to provide a coverage level $\underline{l}$, resulting in a disagreement quantity above the efficient quantity Q^*. This creates the scope for an unorthodox network agreement between the provider and insurer in which the provider agrees to a *reduction* in volume in exchange for raising the price above $\bar{p}$.

equals the cap; that is, $p^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}) = \bar{p}$. However, the quantity of services delivered changes too. In particular, the parties negotiate coverage terms such that this quantity strictly exceeds the efficient quantity Q^*. Intuitively, the provider can no longer use its bargaining leverage to extract a higher price, so it instead uses that leverage to extract higher volume (which is profitable since $\bar{p} > c$). The one thing that does not change is that the negotiated agreement still has $a^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}) = 1$.

A.4.2 Equilibrium Outcomes Under a Comprehensive Price Cap

Building on the preceding discussion, I now characterize the equilibrium disagreement actions and negotiated contract terms under a comprehensive price cap. Proposition A5 characterizes outcomes in the case. I defer the proof to Appendix D but discuss the intuition behind the proposition below. For convenience, I let $Q_{\text{comp}}(\bar{p})$ denote the equilibrium quantity of services for a cap of $\bar{p}$.

In stating and proving the portion of Proposition A5 that pertains to cases where the parties can commit to disagreement actions and the provider can reject patients, I assume that a provider that chooses to reject some patients in the absence of an agreement must reject all of them (that is, I assume $\tilde{\mathcal{A}} = \{0,1\}$). This differs from what I assume in the rest of this appendix, but it simplifies the proof of Proposition A5 and does not affect the main qualitative conclusions.[96]

Proposition A5. The provider-insurer bargaining game with a comprehensive price cap $\bar{p} > c$ has a pure strategy Nash equilibrium, and all pure strategy Nash equilibria result in the same negotiated price. The equilibrium disagreement actions and negotiated contract terms satisfy the following:

(i) If the provider cannot reject patients absent an agreement or the parties cannot commit to disagreement actions, there is a unique equilibrium. In equilibrium, the provider accepts all patients (that is, $\tilde{a} = 1$), the disagreement price and coverage terms are $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$, respectively, the negotiated price is $p^*_{\text{out}}(\bar{p})$, and $Q_{\text{comp}}(\bar{p}) = Q^*$.

(ii) If the parties can commit to disagreement actions and the provider must either accept all patients or reject all patients absent an agreement, then there exists a critical value $\bar{p}_{\text{reject}} > p^*(0,0,\mathbb{R})$ that satisfies $p^*_{\text{out}}(\bar{p}_{\text{reject}}) = p^*(0,0,\mathbb{R})$ for which:

   a. If $\bar{p} \geq \bar{p}_{\text{reject}}$, the negotiated price is $p^*_{\text{out}}(\bar{p})$ and $Q_{\text{comp}}(\bar{p}) = Q^*$. For $\bar{p} > \bar{p}_{\text{reject}}$, the provider accepts all patients absent an agreement (that is, $\tilde{a} = 1$), and the equilibrium disagreement price and coverage terms are $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$.

   b. If $\bar{p}_{\text{reject}} > \bar{p} \geq p^*(0,0,\mathbb{R})$, the provider rejects all patients absent an agreement (that is, $\tilde{a} = 0$). The negotiated price is $p^*(0,0,\mathbb{R})$ and $Q_{\text{comp}}(\bar{p}) = Q^*$.

   c. If $\bar{p} < p^*(0,0,\mathbb{R})$, the provider rejects all patients absent an agreement (that is, $\tilde{a} = 0$). The negotiated price is $\bar{p}$. Additionally, $Q_{\text{comp}}(\bar{p}) > Q^*$ with $Q_{\text{comp}}(\bar{p}) \to Q^*$ as $\bar{p} \to p^*(0,0,\mathbb{R})$, and Q_{comp} is strictly decreasing in $\bar{p}$ if $l^*(0,0,\bar{\mathcal{P}}) < 1$.

[96] In particular, I have been unable to rule out the possibility that the provider might wish to reject some patients and accept others in this scenario. Even if this can occur, the qualitative message of Proposition A5 would not change. Any equilibrium in which the provider accepts some patients must be weakly better for the provider than a scenario in which it rejects all of the insurer's patients, so the provider must be at least as successful in protecting its bargaining position in these equilibria as in the equilibrium described in Proposition A5. It follows that a cap with $\bar{p} < p^*(0,0,\mathbb{R})$ would still result in a negotiated price of $\bar{p}$. However, it might lead to a higher quantity than when the provider must make an "all or nothing" choice.

Part (i) of the proposition demonstrates that in the circumstances in which an out-of-network cap could be effective in reducing prices—situations where the provider either is not allowed to turn away patients or cannot credibly commit to doing so—a comprehensive price cap would function identically.

This outcome is intuitive. As shown in Propositions A2 and A3, an out-of-network price of $\bar{p}$ results in a negotiated price strictly below $\bar{p}$ in these cases. As a result, the portion of the comprehensive price cap that applies to negotiated prices does not bind. Thus, consistent with the analysis of the Nash bargaining problem (A1) above, neither disagreement actions nor negotiated outcomes change.

But part (ii) of the proposition shows that, when the provider can credibly threaten to turn away patients, a comprehensive price cap has much greater scope to reduce negotiated prices than an out-of-network cap. As discussed above, a provider can limit the damage an out-of-network cap does to its bargaining position by threatening to turn away out-of-network patients, thereby ensuring itself a negotiated price no lower than $p^*(0,0,\mathbb{R})$. But because a comprehensive price cap directly constrains negotiated prices, it can push prices below $p^*(0,0,\mathbb{R})$. Indeed, part (ii)c of the proposition shows that a comprehensive price cap can push negotiated prices as low as a regulator wishes.

However, the proposition also shows that setting a price cap $\bar{p} < p^*(0,0,\mathbb{R})$ causes the parties to negotiate coverage terms that increase utilization above the efficient quantity Q^*. The magnitude of the increase in utilization rises as $\bar{p}$ falls until $l^*(0,0,\mathcal{P})$ reaches one. The intuition behind this result was discussed in the preceding section. When the provider is barred from using its bargaining leverage to secure a higher price, it instead uses that leverage to extract more volume.

A.5 Effects of a Default Contract Policy

I now consider the effects of a default contract policy. As described in the main text, a default contract policy would allow the insurer to demand a contract with the provider in the absence of a negotiated agreement. That contract, the "default contract," would specify some maximum price and some minimum level of access to the provider's services that the provider must maintain.

I model this as a policy that: (1) places an upper limit $\bar{p}$ on the price the provider can charge in the absence of an agreement (that is, imposes $\tilde{\mathcal{P}} = (-\infty, \bar{p}]$); and (2) places a lower limit $\underline{a}$ on the fraction of the insurer's enrollees the provider must accept absent an agreement (that is, imposes $\tilde{\mathcal{A}} = [\underline{a}, 1]$) when providers could otherwise reject patients. Proposition A6 formally characterizes outcomes under this policy. I defer the proof to Appendix D but discuss the intuition below.

Proposition A6. The provider-insurer bargaining game with a default contract policy that specifies a contract price $\bar{p} > c$ and an access standard $\underline{a} > 0$ has a pure strategy Nash equilibrium, and all pure strategy Nash equilibria result in the same negotiated price. The following properties hold:

(i) If the provider cannot reject patients or the parties cannot commit to disagreement actions, there is a unique equilibrium. The equilibrium disagreement price and coverage terms are $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$, respectively, and the negotiated price is $p^*_{\text{out}}(\bar{p})$.

(ii) If the provider can reject patients absent an agreement, subject to the access standard under the default contract, and the parties can commit to disagreement actions, then there exists a critical value $\bar{p}_{\text{reject}} > p^*(0,0,\mathbb{R})$ that satisfies $p^*_{\text{out}}(\bar{p}_{\text{reject}}) = p^*(0,0,\mathbb{R})$ for which:

   a. If $\bar{p} > \bar{p}_{\text{reject}}$, the provider accepts all patients absent an agreement (that is, $\tilde{a} = 1$), the equilibrium disagreement price and coverage terms are $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$, respectively, and the negotiated price is $p^*_{\text{out}}(\bar{p})$.

b. If $\bar{p} < \bar{p}_{\text{reject}}$, the provider rejects as many patients as permitted absent an agreement (that is, $\tilde{a} = \underline{a}$). The equilibrium disagreement price and coverage terms are $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$, respectively, and the negotiated price is $\underline{a}p^*_{\text{out}}(\bar{p}) + (1 - \underline{a})p^*(0,0,\mathbb{R})$.

Part (i) of the proposition demonstrates that when the provider either cannot turn away patients or cannot credibly commit to doing so, a default contract policy functions identically to an out-of-network cap. This is intuitive. The only difference between an out-of-network cap and the default contract policy is the access standards imposed by the default contract policy. But, in the cases considered in part (i) of the proposition, the provider either cannot or does not wish to turn away the insurer's patients absent a network agreement, so the default contract's access standards are superfluous.

But part (ii) of the proposition shows that a default contract policy has much more scope than an out-of-network cap to reduce prices in circumstances where the provider can credibly threaten to turn away patients. In particular, as discussed in connection with Proposition A3, a provider can limit how much an out-of-network cap worsens its bargaining position by threatening to turn away the insurers' patients in the absence of a network agreement. The access standards in the default contract directly limit the provider's ability to take that approach and, thus, allow policymakers to achieve much larger reductions in negotiated prices than are possible under an out-of-network cap.

Naturally, the magnitude of the price reductions achievable with a default contract policy depends on the stringency of the access standard. If the access standard requires the provider to accept all of the insurer's patients absent an agreement (that is, $\underline{a} = 1$), then the default contract policy drives prices all the way to $p^*_{\text{out}}(\bar{p})$, the negotiated price generated by an out-of-network cap when providers are unable to turn away patients absent an agreement. By contrast, if $\underline{a} < 1$, then prices end up somewhere between $p^*_{\text{out}}(\bar{p})$ and $p^*(0,0,\mathbb{R})$, the price that would arise if the provider could turn away patients.

Notably, unlike a comprehensive price cap, the default contract policy's greater scope to reduce negotiated prices is not accompanied by higher utilization. Indeed, because negotiated prices are unconstrained, the negotiated outcomes still lead the provider to deliver a quantity Q^* in equilibrium. Intuitively, the difference relative to a comprehensive price cap is that the default contract policy reduces prices by weakening the provider's underlying bargaining position rather than by blocking the provider from translating a strong bargaining position into a high negotiated price. Thus, the provider is not left with "leftover" leverage to use to extract contract terms that encourage higher utilization.

A.6 Functional Forms Used to Create Figures

Several figures in sections 4 and 5 in the main text use a calibrated version of the model presented in this appendix to illustrate the negotiated prices that would emerge under various price cap policies. This subsection briefly specifies the particular functional forms used in creating the figures.

Specifically, I normalize the provider's marginal cost so that $c = 1$, use a Nash bargaining parameter $\theta = 0.5$, and consider a scenario where the negotiating parties can commit to disagreement actions. I assume that demand for the provider's services is given by $Q(p,l) = \exp[-0.7(1-l)p]$, while the insurer's value of the provider's services is $V(Q) = 5.8Q - 3.0Q^2$. I solve the model numerically.[97] When examining the default contract policy, I examine a scenario with $\underline{a} = 1$, which corresponds to a stringent access standard with perfect enforcement, and a scenario with $\underline{a} = 0.5$, corresponding to a weaker access standard or an access standard that is imperfectly enforced.

[97] When both p and l are very low, these primitives do not satisfy Assumption A4. Because setting a price this low is never in the provider's interest, this fact is irrelevant for this analysis.

The parameter values above were chosen so that, in a scenario without a price cap, provider charges, negotiated prices, and provider marginal cost bear roughly the same relationship to one another as is observed in the hospital sector today. In any case, as the rest of this appendix makes clear, the main qualitative relationships highlighted in the figures displayed in the main text would be the same under a relatively broad range of alternative functional form assumptions.

Appendix B Model of a Public Option

This appendix presents a model of health insurance markets in the presence of a public option that formalizes much of the discussion of the effects of introducing a public option in the main text. The model examines a setting in which a single private insurer competes with a public option. In the model, the public option pays providers prices that are fixed in law and sets its premium to cover its average costs. By contrast, the private insurer negotiates prices (specifically, a "two-part tariff") with each provider via a "Nash-in-Nash" bargaining protocol that is common in work on provider-insurer bargaining (e.g., Gowrisankaran, Nevo, and Town 2015; Ho and Lee 2017). Based on the outcome of those negotiations, the insurer sets a premium that maximizes its profits. Enrollees then decide between the public option and the private plan based on the two plans' premiums and networks.

Importantly, my goal here is to understand how competition *between* the private plan and the public option would shape market outcomes. That objective, together with the tractability of a model with a single private plan, drives my decision to focus on a model with a single private plan. However, this modeling choice means that the model cannot capture the consequences of competition *among* private plans. This is likely of relatively limited importance in cases where the public option is much more attractive to consumers than existing private plans, but it does mean that this model is not suitable for examining market outcomes without a public option or with a public option that is a weak competitor for private plans. I discuss these limitations in much greater detail below.

The remainder of this appendix proceeds as follows. I first specify the model primitives and the model's timing assumptions. To build intuition, I then analyze outcomes in a simplified model with a single provider before analyzing the full model with multiple providers. I then extend the model to incorporate risk selection and risk adjustment before describing how I use the model to produce the simulation results presented in the main text. Finally, I discuss how the conclusions of the model might change if it included more than one private insurer or if providers were not required to participate in the public option. Proofs of the propositions stated in this appendix are provided in Appendix E.

B.1 Model Setup

I begin by specifying the model primitives and the model's timing assumptions.

B.1.1 Model Primitives

I consider a model with two plans: a private plan offered by an insurer and a public option operated by the government. The subscript i indexes plans, with $i = \text{pri}$ referring to the private plan and $i = \text{pub}$ referring to the public option. I define $\mathcal{I} \equiv \{\text{pri}, \text{pub}\}$ and use $-i$ to refer to the plan other than plan i.

Both insurers negotiate with a common set of providers $\mathcal{H}$, indexed by h. The set of providers that accepts patients enrolled in plan i, which I refer to as the network of plan i, is denoted $\mathcal{A}_i$. The list of both plans' networks is denoted $\boldsymbol{\mathcal{A}} \equiv \{\mathcal{A}_i\}_{i \in \mathcal{I}}$. I use $\mathcal{A}^{\setminus \mathcal{B}}$ to denote the network $\mathcal{A}$ with the set of providers $\mathcal{B} \subset \mathcal{A}$ removed and $\boldsymbol{\mathcal{A}}^{\setminus i, \mathcal{B}}$ to denote the network list $\boldsymbol{\mathcal{A}}$ with the set of providers $\mathcal{B}$ removed from network $\mathcal{A}_i$. Frequently, it will be useful to deal with sets $\mathcal{B}$ that consists of a single element h, in which case I will abuse this notation by using $\mathcal{A}^{\setminus h}$ to denote the network $\mathcal{A}$ with provider h removed and using $\boldsymbol{\mathcal{A}}^{\setminus \boldsymbol{i}, \boldsymbol{h}}$ to denote the network list $\boldsymbol{\mathcal{A}}$ with provider h removed from network $\mathcal{A}_i$.

The quantity of services that provider h delivers to enrollees of plan i is given by a function $Q_i^h(\mathcal{A}_i)$, which depends solely on the insurer's network. No out-of-network services are delivered, so $Q_i^h(\mathcal{A}_i) = 0$ if $h \notin \mathcal{A}_i$. Allowing utilization to depend on the plan type i allows public and private plans to differ in ways that may induce different levels of utilization. However, because utilization does not depend on the characteristics of plan enrollees, this formulation rules out the possibility that the public and private plan may attract enrollees with different health status, a point I return to in section B.4.

The public option's operations are specified in law. Specifically, the public option pays any provider h a price $\bar{p}_h \geq c_h$ per service, where c_h is the marginal cost provider h incurs to deliver an additional service. For most of this appendix, I assume that all providers are required to join the public option's network, so $\mathcal{A}_{\text{pub}} = \mathcal{H}$, although at the end of this appendix I briefly consider the case where provider participation is voluntary. The public option also incurs non-claims costs of f_{pub} for each person it enrolls, and it is required to set a premium r_{pub} that exactly covers its costs. That is,

$$r_{\text{pub}}^*(\mathcal{A}_{\text{pub}}) = f_{\text{pub}} + \sum_{h \in \mathcal{A}_{\text{pub}}} \bar{p}_h Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}})\,.$$

For its part, the insurer chooses the private plan's network $\mathcal{A}_{\text{pri}}$ and negotiates contract terms (p_h, t_h) with each provider $h \in \mathcal{A}_{\text{pri}}$, where p_h is the amount the private plan pays per service delivered by provider h and t_h is a lump-sum transfer from the insurer to provider h. For convenience, I use $\boldsymbol{p} \equiv \{p_h\}_{h\in\mathcal{H}}$ to denote the vector of per service prices and $\boldsymbol{t} \equiv \{t_h\}_{h\in\mathcal{H}}$ to denote the corresponding vector of lump-sum transfers, where I adopt the convention that entries for providers $h \notin \mathcal{A}_{\text{pri}}$ are taken to be zero.[98] The private plan incurs non-claims costs f_{pri} and sets a premium r_{pri}. The process for determining the private plan's network, provider prices, and premium is described in the next section.

Each provider h aims to maximize its profits, which depend on enrollment in both the private and public option and the prices paid for services delivered under the two plans:

$$\pi_h^P(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{t}) = D_{\text{pri}}(\boldsymbol{r}, \boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})[p_h - c_h] + D_{\text{pub}}(\boldsymbol{r}, \boldsymbol{\mathcal{A}}) Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}})[\bar{p}_h - c_h] + t_h.$$

The insurer similarly aims to maximize its profits, which are given by

$$\pi^I(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{t}) = D_{\text{pri}}(\boldsymbol{r}, \boldsymbol{\mathcal{A}}) \left[r_{\text{pri}} - f_{\text{pri}} - \sum_{h \in \mathcal{A}_{\text{pri}}} p_h Q_{\text{pri}}^h\big(\mathcal{A}_{\text{pri}}\big) \right] - \sum_{h \in \mathcal{A}_{\text{pri}}} t_h.$$

I also define both entities' "gross profit" functions, that is, profits before considering lump-sum transfers, which are given, respectively, by $\tilde{\pi}_h^P(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}) \equiv \pi_h^P(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{0})$ and $\tilde{\pi}^I(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}) \equiv \pi^I(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{0})$.

B.1.2 Structure of Participation Decisions, Price Negotiations, and Enrollment

I assume that networks, provider prices, premiums, and plan enrollment are determined as follows:

(1) If providers are permitted to choose whether to participate in the public option, each provider h decides whether it wants to be included in the public option's network $\mathcal{A}_{\text{pub}}$.

(2) The government sets the public option premium r_{pub}.

[98] This convention streamlines notation in practice since it will often be useful to refer to the prices negotiated under a network $\mathcal{A}_{\text{pri}}$ in the context of a private plan that is actually offering some narrower network $\mathcal{B}_{\text{pri}} \subset \mathcal{A}_{\text{pri}}$.

(3) The insurer decides whether to seek to offer a plan with an exogenously specified network $\mathcal{A}_{\text{pri}}$.

(4) The insurer negotiates contract terms (p_h, t_h) with each provider $h \in \mathcal{A}_{\text{pri}}$ via simultaneous Nash bargaining.

(5) The insurer sets the private plan premium r_{pri}.

(6) Enrollees select plans based on the premium vector $\boldsymbol{r} \equiv \{r_i\}_{i \in \mathcal{I}}$ and network list $\boldsymbol{\mathcal{A}} \equiv \{\mathcal{A}_i\}_{i \in \mathcal{I}}$, with enrollment in each plan $i \in \mathcal{I}$ given by a demand function $D_i(\boldsymbol{r}, \boldsymbol{\mathcal{A}})$.

I make two notes on this protocol before proceeding. First, I follow much of the existing literature on provider-insurer bargaining in assuming that the private plan's network $\mathcal{A}_{\text{pri}}$ is exogenous. The private plan's choice is likely to be a relatively complex one, requiring insurers to consider both what would maximize the insurer's leverage vis-à-vis providers (e.g., Ho and Lee 2019) and, in markets where risk selection is relevant, whether different networks would attract different enrollee mixes (e.g., Shepard 2016). Endogenizing that choice would be a useful direction for future work. Section 7 in the main text offers a qualitative discussion of how introducing a public option might change insurers' network choices and concludes that the effect of a public option on network breadth is ambiguous *a priori*.

Second, the simultaneous Nash bargaining process envisioned in stage 4 involves each bilateral provider-insurer negotiation being resolved by Nash bargaining, taking the outcome of the insurer's negotiations with other providers as given. This "Nash equilibrium in Nash bargains" or "Nash-in-Nash" approach has become the workhorse of the literature on provider-insurer bargaining (e.g., Gowrisankaran, Nevo, and Town 2015; Ho and Lee 2017).[99] I note that while insurer threats to exclude a provider from its network are central to the bargaining process in a Nash-in-Nash framework, the standard Nash-in-Nash framework does not allow the insurer to threaten to exclude one provider *and* replace it with another provider, which can allow insurers to extract lower prices under narrow network plans (Ho and Lee 2019). The prices that emerge from this model may therefore be somewhat too high, although the importance of this factor may be less important in the presence of a public option than under the status quo because the scope to secure lower prices may be modest.

B.1.3 Assumptions Regarding Model Primitives

I assume that the primitives defined above have several relatively straightforward properties, which I will assume hold throughout the rest of the analysis.

Assumption B1 (Demand increases in network breadth). For each $i \in \mathcal{I}$, any network lists $\boldsymbol{\mathcal{A}}$ and $\boldsymbol{\mathcal{B}}$ with $\mathcal{A}_i \subset \mathcal{B}_i$, $\mathcal{A}_i \neq \mathcal{B}_i$, and $\mathcal{A}_{-i} = \mathcal{B}_{-i}$, and any premium vector $\boldsymbol{r}$, the function D_i satisfies $D_i(\boldsymbol{r}, \boldsymbol{\mathcal{B}}) > D_i(\boldsymbol{r}, \boldsymbol{\mathcal{A}})$. Furthermore, $D_i(\boldsymbol{r}, \boldsymbol{\mathcal{A}}) = 0$ if $\mathcal{A}_i = \emptyset$.

Assumption B2 (Demand declines in premium). The function $D_i(\boldsymbol{r}, \boldsymbol{\mathcal{A}})$ is continuously differentiable in $\boldsymbol{r}$ for each $i \in \mathcal{I}$ and any network list $\boldsymbol{\mathcal{A}}$. Furthermore, whenever $\mathcal{A}_j \neq \emptyset$ for each $j \in \mathcal{I}$, D_i is strictly decreasing in r_i and strictly increasing in r_{-i}, and there is a unique r_i that maximizes $D_i(\{r_i, r_{-i}\}, \boldsymbol{\mathcal{A}})[r_i - c]$ for any premium r_{-i} and constant $c \geq 0$.

Assumption B3 (Fixed insurance market size). For any premium vector $\boldsymbol{r}$ and network list $\boldsymbol{\mathcal{A}}$ such that $\mathcal{A}_i \neq \emptyset$ for at least one $i \in \mathcal{I}$, $D_{\text{pub}}(\boldsymbol{r}, \boldsymbol{\mathcal{A}}) + D_{\text{pri}}(\boldsymbol{r}, \boldsymbol{\mathcal{A}}) = 1$.

[99] Collard-Wexler, Gowrinsankaran, and Lee (2019) show that the Nash-in-Nash outcomes can be understood as the equilibrium outcome of an extension of the Rubinstein (1982) alternating offers bargaining game.

These assumptions are generally straightforward and intuitive, but a few comments are warranted. First, Assumptions B1 and B2 imply that any plan with a non-empty network attracts at least some enrollees. This assumption is mostly made for convenience to eliminate various tedious complexities created by zero-enrollment plans and could be relaxed without affecting the main results. Second, the assumption of fixed overall insurance enrollment (Assumption B3) greatly simplifies the analysis but is inessential to the main qualitative conclusions of this analysis.

B.2 Model with a Single Provider

To build intuition, it is useful to begin with the case with a single provider (and where that provider must participate in the public option's network). I work backwards through the stages of play described in section B.1.2. The final stage of play—enrollee plan selection—is determined entirely by the demand function, so I begin with insurer premium setting, then characterize the prices negotiated between the provider and the insurer, and finally verify that it is in fact in the insurer's interest to offer a plan. Throughout, I assume that the private plan's network includes the single provider.

B.2.1 Insurer Premium Setting

The insurer sets premiums to maximize its profits given the payment terms it negotiates with the provider. The first-order condition for the insurer's profit maximization problem implicitly defines the insurer's profit-maximizing premium $r^*_{\text{pri}}(p)$:[100]

$$r^*_{\text{pri}}(p) = f_{\text{pri}} + pQ_{\text{pri}} + \frac{D_{\text{pri}}\left(r^*_{\text{pri}}(p)\right)}{-\frac{\partial D_{\text{pri}}}{\partial r_{\text{pri}}}\left(r^*_{\text{pri}}(p)\right)}, \tag{B1}$$

where, in order to streamline notation, I have suppressed the plan networks and public option premium where they appear as function arguments, as well as the h indices. I will continue to suppress these function arguments and subscripts throughout the analysis of the single-provider case.

Equation (B1) has a standard and intuitive form. The first two terms on the right-hand side are the marginal cost the insurer incurs by attracting an additional enrollee. The third term is a standard markup term equal to the (negative of the) inverse semi-elasticity of demand for the private plan. As shown in the next section, the degree of pricing power held by the insurer has major implications for provider-insurer negotiations. Importantly, r^*_{pri} does *not* depend on the lump-sum transfer t.

B.2.2 Provider-Insurer Price Negotiations

I now analyze provider-insurer negotiations over the per service price p and the lump-sum transfer t. I first characterize the set of contracts that maximize the parties' joint profits since many bargaining protocols, including the Nash bargaining protocol examined here, will lead to contracts of this form. I then characterize the particular joint-profit-maximizing contract that emerges from Nash bargaining, which determines how the resulting profits are shared between the two parties.

Contract terms that maximize joint profits. The parties' joint profits for a contract (p, t) are:

$$\pi^I\left(r^*_{\text{pri}}(p), p, t\right) + \pi^P\left(r^*_{\text{pri}}(p), p, t\right) = D_{\text{pri}}\left(r^*_{\text{pri}}(p)\right)\left[r^*_{\text{pri}}(p) - f_{\text{pri}} - cQ_{\text{pri}}\right] + D_{\text{pub}}\left(r^*_{\text{pri}}(p)\right)[\bar{p} - c]Q_{\text{pub}}.$$

Notably, the contract terms (p, t) influence the parties' joint profits solely through their effect on the insurer's optimal premium $r^*_{\text{pri}}(p)$, so whether any particular contract terms maximize joint profits depends solely on whether the per service price p induces the insurer to set the "right" premium.

[100] Assumption B2 ensures that the insurer's first-order condition has a unique solution.

Differentiating joint profits with respect to p, substituting in for $r_{\text{pri}}^*(p)$ using the premium setting condition (B1), and setting the result equal to zero implies that the per service price that maximizes the parties' joint profits, which I denote by p^J, satisfies the following condition:

$$p^J Q_{\text{pri}} = cQ_{\text{pri}} + [\bar{p} - c]Q_{\text{pub}}. \tag{B2}$$

This price leads the insurer to set a premium that maximizes joint profits because it ensures that the insurer's marginal claims cost exactly equals the cost that higher enrollment in the private plan imposes on the provider. The two terms on the right-hand-side of equation (B2) correspond to the two components of that cost: (1) the cost of delivering services to the marginal enrollee, cQ_{pri}; and (2) the profits that the marginal enrollee would have generated if covered by the public option, $[\bar{p} - c]Q_{\text{pub}}$.

Equation (B2) has implications for the outcomes under *any* bargaining protocol that leads the parties to maximize their joint profits. Notably, the price the insurer pays for the marginal service—and thus the premium the insurer sets—is an increasing function of the public option's payment rate $\bar{p}$. Furthermore, this price will often be similar to the public option's payment rate. If the public option and the private plan have identical utilization profiles, then equation (B2) implies that $p^J = \bar{p}$. If the private plan has lower utilization, then p^J will actually be higher than $\bar{p}$ (because the compensation the provider requires for the profits it loses under the public option must now be spread over fewer services). Conversely, if the private plan has higher utilization, then p^J will be below $\bar{p}$.

Outcome of Nash bargaining. I now characterize the contract terms that emerge from Nash bargaining. Under Nash bargaining, the parties split the total gain from trade generated by a network agreement. The insurer attracts no enrollment without a network agreement, so its gains from an agreement with terms (p, t) are simply its profits with an agreement: $\pi^I(p, t)$. The provider, on the other hand, can count on the full population enrolling in the public option absent a network agreement, so its gains from reaching from an agreement with terms (p, t) are $\pi^P(p, t) - Q_{\text{pub}}[\bar{p} - c]$.

The Nash bargained contract terms p^* and t^* thus solve the following maximization problem:

$$(p^*, t^*) = \underset{p,t}{\operatorname{argmax}}\, [\pi^I(p, t)]^\theta \left[\pi^P(p, t) - Q_{\text{pub}}[\bar{p} - c]\right]^{1-\theta},$$

where $\theta \in (0,1)$ is the insurer's bargaining weight. It is easy to see that the negotiated per service price satisfies $p^* = p^J$; if it did not, switching to p^J and making a suitable adjustment to the lump-sum transfers t could increase both parties' profits and thus increase the objective function. The lump-sum transfer t^* then splits those profits in accordance with the parties' respective bargaining weights.

The first-order condition of the Nash bargaining problem with respect to t can be used to show that the insurer's total per enrollee payment to the provider, including the lump-sum transfer, is given by

$$p^* Q_{\text{pri}} + \frac{t^*}{D_{\text{pri}}\left(r_{\text{pri}}^*(p^*)\right)} = \theta \underbrace{[p^J Q_{\text{pri}}]}_{\substack{\text{minimum amount provider} \\ \text{can profitably accept}}} + (1-\theta) \underbrace{\left[p^J Q_{\text{pri}} + \frac{\tilde{\pi}^I(r_{\text{pri}}^*(p^J), p^J)}{D_{\text{pri}}\left(r_{\text{pri}}^*(p^J)\right)}\right]}_{\substack{\text{maximum amount insurer} \\ \text{can profitably pay}}}. \tag{B3}$$

The per enrollee payment from the insurer to the provider is the weighted average of the two labeled amounts, each of which has an intuitive interpretation. The first is the minimum payment required to compensate the provider for its costs of delivering care and the profits it loses when enrollment shifts out of the public option into the private plan. The second is the maximum payment at which forming a network agreement with the provider remains profitable for the insurer.

Equation (B3) implies that the private plan's average per enrollee claims spending is unlikely to be substantially below the public option's spending and will be substantially above it only if the private plan holds substantial pricing power. The lower bound follows because the first labeled term in equation (B3), $p^J Q_{\text{pri}}$, is likely to be similar to $\bar{p}Q_{\text{pub}}$, consistent with the discussion above. The upper bound follows because the second labeled term in equation (B3) will only be substantially larger than $p^J Q_{\text{pri}}$ if the insurer's gross profits are large. Inspecting the insurer's premium-setting condition, equation (B1), shows that this will only be the case if the price elasticity of demand for the private plan is small and the insurer can command a substantial markup. The upper bound also implies that it will be profitable for the insurer to offer a plan even in the presence of a public option.

Importance of the availability of a two-part tariff. The ability of the insurer and provider to negotiate a two-part tariff allows them to set a per service price that maximizes their joint profits and then use the lump-sum transfer to allocate those profits between them. If the insurer and provider were instead required to negotiate a simple linear contract, this would create a classic double marginalization problem, which would lead the private plan to set a higher premium and result in commensurately lower enrollment in the private plan.[101] On the other hand, a two-part-tariff is not the only contract structure that could avoid double marginalization. For example, allowing the insurer to commit to steering a certain level of volume to the provider would produce equivalent outcomes.

B.2.3 Insurer Plan Offer Decision

Equation (B3) makes clear that, if the insurer offers a plan, it will always earn positive profits. Since the insurer earns zero profits if it does not offer a plan, it will always offer a plan.

B.3 Model with Multiple Providers

I now consider the case with multiple providers. I proceed under the assumption that $\mathcal{A}_{\text{pub}}$ is non-empty, consistent with my general focus on the case where all providers are required to participate in the public option, so $\mathcal{A}_{\text{pub}} = \mathcal{H}$. As before, I proceed through the stages of play in reverse order. The final stage of play—enrollee plan selection—is determined entirely by the demand function, so I begin with private insurer premium setting, then discuss provider-insurer price negotiations, and then discuss the private insurer's decision about whether to offer a plan.

B.3.1 Insurer Premium Setting

As before, the insurer sets premiums to maximize profits given the payment terms negotiated with providers in the preceding stage. The first-order condition for the insurer's profit maximization problem implicitly defines the insurer's profit-maximizing premium r^*_{pri} as a function of the public option premium r_{pub}, the network lists $\boldsymbol{\mathcal{A}}$, and the negotiated per service price vector $\boldsymbol{p}$:[102]

$$r^*_{\text{pri}}(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}) = f_{\text{pri}} + \sum_{h \in \mathcal{A}_{\text{pri}}} p_h Q^h_{\text{pri}}(\mathcal{A}_{\text{pri}}) + \frac{D_{\text{pri}}\left(\left\{r^*_{\text{pri}}(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), r_{\text{pub}}\right\}, \boldsymbol{\mathcal{A}}\right)}{-\dfrac{\partial D_{\text{pri}}}{\partial r_{\text{pri}}}\left(\left\{r^*_{\text{pri}}(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), r_{\text{pub}}\right\}, \boldsymbol{\mathcal{A}}\right)}. \tag{B4}$$

Equation (B4) is essentially identical to equation (B1) derived in the single-provider case, except that the insurer's marginal claims costs are now captured by a summation over all providers $h \in \mathcal{A}_{\text{pri}}$. As before, under the maintained Assumptions B1-B3, it is easy to show that r^*_{pri} is increasing in each p_h. Once again, the plan's optimal premium is not a function of the lump-sum transfer vector $\boldsymbol{t}$.

[101] Tirole (1988) provides a textbook discussion of double marginalization and contract structures that avoid it.

[102] Assumption B2 ensures that the insurer's first-order condition has a unique solution.

B.3.2 Provider-Insurer Price Negotiations

I now analyze provider-insurer negotiations over the per service prices $\boldsymbol{p}$ and the lump-sum transfers $\boldsymbol{t}$. As in the single-provider case, I first characterize the set of contracts that maximize the bilateral profits earned by any given provider-insurer pair since many bargaining protocols, including the Nash bargaining protocol examined here, will lead to contracts of this form. I then characterize the particular contracts that emerge from Nash bargaining, which determine how profits are shared.

Contract terms that maximize joint profits. If the insurer negotiates contract terms $\boldsymbol{p}$ and $\boldsymbol{t}$ with the providers in $\mathcal{A}_{\text{pri}}$, then the joint profits earned by the insurer and a provider $h \in \mathcal{A}_{\text{pri}}$ are:

$$\pi^I\big(\boldsymbol{r}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{t}\big) + \pi_h^P\big(\boldsymbol{r}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{t}\big)$$

$$= D_{\text{pri}}\big(\boldsymbol{r}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), \boldsymbol{\mathcal{A}}\big)\big[r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}) - f_{\text{pri}} - c_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})\big] - \sum_{l \in \mathcal{A}_{\text{pri}}^{\setminus h}} t_l$$

$$+ D_{\text{pub}}\big(\boldsymbol{r}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), \boldsymbol{\mathcal{A}}\big)[\bar{p}_h - c_h] Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}}),$$

where I have defined $\boldsymbol{r}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}) \equiv \{r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), r_{\text{pub}}\}$ to streamline notation. Observe that, as in the single-provider case, the parties' joint profits depend on the contract terms negotiated by the insurer and provider h solely through the effect that p_h has on the insurer's premium r_{pri}^*.

Now, let p_h^J denote the per service price that maximizes the joint profits of the insurer and provider h, holding the prices the insurer negotiates with other providers constant. Differentiating with respect to p_h, substituting in for $r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p})$ using the premium setting condition (B4), and setting the result equal to zero implies that p_h^J depends only on the network list $\boldsymbol{\mathcal{A}}$ and satisfies:

$$p_h^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) = c_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) + [\bar{p}_h - c_h] Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}}). \tag{B5}$$

Paralleling the single-provider case, a per service price of $p_h^J(\boldsymbol{\mathcal{A}})$ leads the insurer to set a premium that maximizes joint profits because it ensures that the insurer's marginal claims cost exactly equals the cost that higher enrollment in the private plan imposes on the provider, including both its direct costs of serving the private plan's enrollees and any lost profits under the public option.[103]

Equation (B5) has important implications for the outcomes under any bargaining protocol that leads each insurer-provider pair to maximize its joint profits, conclusions that also parallel the single-provider case. As before, the price the insurer pays for the marginal service—and thus the premium it sets—is an increasing function of the public option's payment rate $\bar{p}_h$. Furthermore, $p_h^J(\boldsymbol{\mathcal{A}})$ will often be similar to the public option's payment rate. In particular, if the public option and the private plan have identical utilization profiles, then $p_h^J = \bar{p}_h$. If the private plan has higher (lower) utilization with respect to a particular provider, then p_h^J will be lower (higher) than the public option's price $\bar{p}_h$.

In the case with multiple providers, one important reason public option and private plan enrollees may use different amounts of a particular provider's services is differences in networks. If the private plan's network is narrower than the public option's, then much of the additional private plan volume a provider receives when an enrollee switches out of the public option will come from providers that are in the public option's network but not the private plan's. Thus, it will often be the case that $Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) >$

[103] Notably, if every provider-insurer pair sets a per service price $p_h^J(\boldsymbol{\mathcal{A}})$, then the insurer will actually set a premium that maximizes the joint profits of the insurer and *all* of the providers $h \in \mathcal{A}_{\text{pri}}$ taken as a group.

$Q^h_{\text{pub}}(\mathcal{A}_{\text{pub}})$ for each $h \in \mathcal{A}_{\text{pri}}$. Consistent with the analysis above, this will tend to push p^J_h below $\bar{p}_h$ and downward toward the provider's marginal cost c_h. The opposite will occur in the (perhaps less relevant) case where the public option's network is narrower than the private plan's network.

Before characterizing the Nash-in-Nash contract terms, I pause to state a property of a network $\mathcal{A}_{\text{pri}}$ that ensures that, for each provider in $\mathcal{A}_{\text{pri}}$, the insurer and provider earn higher joint profits by striking a network agreement than by declining to strike a network agreement, as demonstrated formally in Lemma E1 in Appendix E. This ensures, in turn, that Nash-in-Nash contract terms exists.

Definition. A private plan network $\mathcal{A}_{\text{pri}}$ is **viable** with respect to a public option premium r_{pub} and network $\mathcal{A}_{\text{pub}}$ if for each provider $h \in \mathcal{A}_{\text{pri}}$

$$D_{\text{pri}}\left(\left\{r^{-h} + \delta_h, r_{\text{pub}}\right\}, \boldsymbol{\mathcal{A}}\right) \geq D_{\text{pri}}\left(\left\{r^{-h}, r_{\text{pub}}\right\}, \boldsymbol{\mathcal{A}}^{\backslash \text{pri},\boldsymbol{h}}\right),$$

where $\boldsymbol{\mathcal{A}} \equiv \left\{\mathcal{A}_{\text{pri}}, \mathcal{A}_{\text{pub}}\right\}$, $r^{-h} \equiv r^*_{\text{pri}}\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}^{\backslash \text{pri},\boldsymbol{h}}, \boldsymbol{p}^{\boldsymbol{J}}(\boldsymbol{\mathcal{A}})\right)$, and

$$\delta_h \equiv p^J_h(\boldsymbol{\mathcal{A}}) Q^h_{\text{pri}}\left(\mathcal{A}_{\text{pri}}\right) - \sum_{l \in \mathcal{A}^{\backslash h}_{\text{pri}}} p^J_l(\boldsymbol{\mathcal{A}}) \left[Q^l_{\text{pri}}\left(\mathcal{A}^{\backslash h}_{\text{pri}}\right) - Q^l_{\text{pri}}\left(\mathcal{A}_{\text{pri}}\right)\right].$$

In essence, a network is viable if the marginal private plan enrollee is willing to pay an additional premium of at least δ_h to gain access to each provider $h \in \mathcal{A}_{\text{pri}}$, where δ_h is the insurer's incremental claims spending from adding provider h to its network if the insurer paid all providers prices $\boldsymbol{p}^{\boldsymbol{J}}(\boldsymbol{\mathcal{A}})$.

In practice, the class of viable networks is likely to be relatively large. A consumer's only alternative path to accessing a given provider's services is to enroll in the public option (and even this path only exists when the provider is included in the public option's network). But the public option's premium reflects prices $\bar{\boldsymbol{p}}$ that, as discussed above, will generally be similar to the prices $\boldsymbol{p}^{\boldsymbol{J}}(\boldsymbol{\mathcal{A}})$. This suggests that the amount δ_h will often not be prohibitive, particularly for consumers with an idiosyncratic preference for the private plan. Nevertheless, some networks, such as networks including providers that deliver services that generate little value for enrollees, may not be viable. Indeed, excluding such providers may be one way a private plan could add value relative to the public option.

Nash-in-Nash contract terms. I now characterize the contract terms that emerge from a Nash-in-Nash bargaining process. To do so, it is useful to define the amounts that the insurer and provider h gain from forming a network agreement, holding the terms the insurer has reached with the other providers constant. Specifically, the *gross* gains from trade for the insurer and the provider (that is, the gains to each party before considering lump-sum transfers) are given by, for each $h \in \mathcal{A}_{\text{pri}}$,

$$GFT^I_h\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right) \equiv \tilde{\pi}^I\left(\boldsymbol{r}^*\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right), \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right) - \tilde{\pi}^I\left(\boldsymbol{r}^*\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}^{\backslash \text{pri},\boldsymbol{h}}, \boldsymbol{p}\right), \boldsymbol{\mathcal{A}}^{\backslash \text{pri},\boldsymbol{h}}, \boldsymbol{p}\right)$$

$$GFT^P_h\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right) \equiv \tilde{\pi}^P_h\left(\boldsymbol{r}^*\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right), \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right) - \tilde{\pi}^P_h\left(\boldsymbol{r}^*\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}^{\backslash \text{pri},\boldsymbol{h}}, \boldsymbol{p}\right), \boldsymbol{\mathcal{A}}^{\backslash \text{pri},\boldsymbol{h}}, \boldsymbol{p}\right).$$

The net gains from trade for the insurer and provider (that is, the gains after incorporating the lump-sum transfers) are $GFT^I_h\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right) - t_h$ and $GFT^P_h\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}\right) + t_h$, respectively.

The Nash-in-Nash per service prices $\boldsymbol{p}^*$ and lump-sum transfers $\boldsymbol{t}^*$ maximize each bilateral Nash product, taking contract terms with other providers as given. That is, for all $h \in \mathcal{A}_{\text{pri}}$,

$$(p^*_h, t^*_h) = \underset{p_h, t_h}{\operatorname{argmax}} \left[GFT^I_h\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \{p_h, \boldsymbol{p}^*_{-\boldsymbol{h}}\}\right) - t_h\right]^{\theta} \left[GFT^P_h\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \{p_h, \boldsymbol{p}^*_{-\boldsymbol{h}}\}\right) + t_h\right]^{1-\theta}, \qquad \text{(B6)}$$

where $\boldsymbol{p}^*_{-\boldsymbol{h}}$ denotes the vector $\boldsymbol{p}^*$ with the entry for provider h removed and $\theta \in (0,1)$ denotes the insurer's bargaining weight. I have suppressed the dependence of $\boldsymbol{p}^*$ and $\boldsymbol{t}^*$ on the public option's premium r_{pub} and the network list $\boldsymbol{\mathcal{A}}$ in order to streamline notation.

Proposition E1 in Appendix E derives the unique solution of the system (B6) for any network $\mathcal{A}_{\text{pri}}$ that is viable with respect to the public option's premium r_{pub} and network $\mathcal{A}_{\text{pub}}$. The bargained per service price with provider h depends only on the network list $\boldsymbol{\mathcal{A}}$ and satisfies $p_h^*(\boldsymbol{\mathcal{A}}) = p_h^J(\boldsymbol{\mathcal{A}})$, paralleling the single-provider case. This is intuitive, as if the per service price did not maximize the parties' bilateral profits, both parties could strictly increase their gains from trade by instead adopting a per service price $p_h^J(\boldsymbol{\mathcal{A}})$ and adjusting the lump-sum transfer appropriately. As in the single-provider case, the lump-sum transfers $t_h^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}})$ depend on both the network list $\boldsymbol{\mathcal{A}}$ and the premium r_{pub}, and it splits the bilateral surplus under the parties' agreement in accordance with their bargaining weights.

Using the first-order condition for t_h, it is straightforward to show that the insurer's total per enrollee payment to provider h, including the lump-sum transfer, is

$$
\begin{aligned}
&p_h^*(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) + \frac{t_h^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}})}{D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}})} \\
&\qquad = \theta \underbrace{\left[p_h^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) - [\bar{p}_h - c_h] Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}}) \frac{D_{\text{pri}}^{-h}(r_{\text{pub}}, \boldsymbol{\mathcal{A}})}{D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}})} \right]}_{\text{minimum payment provider can profitably accept}} \\
&\qquad\qquad + (1-\theta) \underbrace{\left[p_h^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) + \frac{GFT_h^I(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}^J(\boldsymbol{\mathcal{A}}))}{D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}})} \right]}_{\text{maximum amount insurer can profitably pay}}, \qquad \text{(B7)}
\end{aligned}
$$

where I have made the following definitions to streamline notation:

$$D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \equiv D_{\text{pri}}\left(\boldsymbol{r}^*\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}^J(\boldsymbol{\mathcal{A}})\right), \boldsymbol{\mathcal{A}}\right)$$

$$D_{\text{pri}}^{-h}(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \equiv D_{\text{pri}}\left(\boldsymbol{r}^*\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}^{\backslash\text{pri},\boldsymbol{h}}, \boldsymbol{p}^J(\boldsymbol{\mathcal{A}})\right), \boldsymbol{\mathcal{A}}^{\backslash\text{pri},\boldsymbol{h}}\right) \ \forall h \in \mathcal{A}_{\text{pri}}.$$

Paralleling the single-provider case, equation (B7) implies that the per enrollee payment from the insurer to provider h is a weighted average of the two labeled amounts: the minimum payment required to compensate the provider for its costs of delivering care plus the profits it loses when enrollment shifts out of the public option into the private plan; and the maximum payment at which forming a network agreement with the provider remains profitable for the insurer.

Equation (B7) implies that the presence of the public option constrains the private plan's average per enrollee claims spending from both above and below, as it did in the single-provider case. However, the fact that the private plan will now attract some enrollment even if a particular provider declines to join its network changes both the lower and upper bounds in important ways.

The lower bound on the per enrollee payment, which corresponds to the first labeled amount in equation (B7), is now looser than the corresponding bound in equation (B3). Relative to equation (B3), this term is now reduced by an amount $[\bar{p}_h - c_h] Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}})\, D_{\text{pri}}^{-h}(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \,/\, D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}})$, reflecting the fact that enrollees who switch from the public option into the private plan when provider h joins the insurer's network are now only a subset of the private plan's enrollees. Correspondingly, the lower bound now falls somewhere between the provider's direct cost $c_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})$ and the marginal per enrollee payment $p_h^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})$. It follows that the lower bound on the insurer's per enrollee payments to the provider may now be well below the public option's per enrollee payments to the provider. Indeed, if the provider's presence in the insurer's network has little effect on private plan enrollment, the lower bound will simply be the provider's cost $c_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})$.

The upper bound, which arises from the second bracketed term in equation (B7), also changes. This bound now depends on the *change* in the insurer's gross profits when provider h joins the plan's network, $GFT_h^I(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}^*(\boldsymbol{\mathcal{A}}))$. By contrast, the insurer's full profit appeared in equation (B3) since the insurer earned zero profits without an agreement.

This change in the upper bound makes it harder to analyze. To make progress, I make the following assumption about consumer demand, which roughly parallels the diminishing marginal contribution assumption of Collard-Wexler, Gowrinsankaran, and Lee (2019):

Assumption B4 (Diminishing returns to network breadth). For any network lists $\boldsymbol{\mathcal{A}} = \{\boldsymbol{\mathcal{A}}_{\text{pri}}, \boldsymbol{\mathcal{C}}\}$ and $\boldsymbol{\mathcal{B}} = \{\boldsymbol{\mathcal{B}}_{\text{pri}}, \boldsymbol{\mathcal{C}}\}$ with $\mathcal{B}_{\text{pri}} \subset \mathcal{A}_{\text{pri}}$, $\mathcal{B}_{\text{pri}} \neq \emptyset$, and $\mathcal{C} \neq \emptyset$ and for any $h \in \mathcal{B}_{\text{pri}}$:

$$\underbrace{D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{B}}) p_h^J(\boldsymbol{\mathcal{B}}) Q_{\text{pri}}^h(\mathcal{B}_{\text{pri}}) + GFT_h^I\left(r_{\text{pub}}, \boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{B}})\right)}_{\substack{\text{insurer's incremental revenue from adding provider } h \text{ to achieve network } \mathcal{B}_{\text{pri}},\\ \text{net of non-claims costs and payments to other providers}}}$$

$$\geq \underbrace{D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) p_h^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) + GFT_h^I\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right)}_{\substack{\text{insurer's incremental revenue from adding provider } h \text{ to achieve network } \mathcal{A}_{\text{pri}},\\ \text{net of non-claims costs and payments to other providers}}}$$

$$- \underbrace{p_h^J(\boldsymbol{\mathcal{A}})\left[D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) - D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{B}}) Q_{\text{pri}}^h(\mathcal{B}_{\text{pri}})\right]}_{\text{volume change term}}.$$

Assumption B4 says that if the insurer shifts from a narrower network $\mathcal{B}_{\text{pri}}$ to a broader network $\mathcal{A}_{\text{pri}}$, then the incremental revenue the insurer can extract from enrollees when it adds provider h to its network, net of what it pays other providers and its non-claims spending, either shrinks sufficiently or does not increase too much (depending on the sign of the "volume change term"). This assumption is likely to be satisfied if enrollees view competing providers as substitutes, in which case enrollees' willingness to pay for any particular provider is likely to fall as the insurer's network broadens.

Proposition E2 in Appendix E demonstrates that, if Assumption B4 holds, then

$$\sum_{h \in \mathcal{A}_{\text{pri}}} GFT_h^I\left(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right) \leq \tilde{\pi}_*^I(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \tag{B8}$$

where $\tilde{\pi}_*^I(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \equiv \pi^I(\boldsymbol{r}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})), \boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}}))$ is the insurer's gross profit when the public option charges a premium r_{pub}, the network list is $\boldsymbol{\mathcal{A}}$, and the insurer pays per service prices $\boldsymbol{p^J}(\boldsymbol{\mathcal{A}})$. Thus, if Assumption B4 holds, then the insurer's total payments to all providers can be substantially larger than the sum of the per enrollee payments $\sum_h p_h^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}(\mathcal{A}_{\text{pri}})$ only if the insurer's gross profits are large, which equation (B4) implies will be the case only if the insurer faces a low elasticity of demand. If equation (B8) holds, it also follows that it will be profitable for the insurer to offer a plan.

While Assumption B4 has intuitive appeal, it is unlikely to hold exactly in practice. In particular, while it is plausible that enrollees generally view competing providers as substitutes, they may view providers of different types (e.g., physicians versus hospitals) as complements. Network adequacy requirements that require insurers to have at least one provider of each type in their networks could also, in effect, make different providers complements, at least in very narrow networks.

With substantial complementarities, Assumption B4 could fail and the bound stated in equation (B8) might no longer hold. Consider, for example, the case of an insurer in a geographic area with two "must have" providers without which it cannot attract any enrollment. In this case, the insurer's gains from trade from adding each individual provider to its network would be its *full* gross profit, so the sum of the gains from trade terms on the left-hand-side of equation (B8) would be *twice* the insurer's gross profit. In such cases, the insurer's payments to providers could exceed its revenues, making it unwilling to offer a plan. Of course, complementarities would need to be large for this to occur in practice. Indeed, equation (B7) illustrates that, if the insurer's bargaining weight θ is substantially greater than zero, then the bound in equation (B8) would need to be violated by a substantial margin in order for the negotiated lump-sum transfer to cause the insurer to incur losses.

For essentially the reasons discussed above, Collard-Wexler, Gowrinsankaran, and Lee (2019) suggest that the Nash-in-Nash bargaining solution might not be reasonable in contexts where there are substantial complementarities on at least one side of the market. Some recent work has examined modifications of the Nash-in-Nash bargaining solution that might produce more reasonable predictions in such settings (Yu and Waehrer 2018; Froeb, Mares, and Tschantz 2019). Applied to the present setting, these alternative bargaining solutions have the appealing (and intuitive) feature that they would always result in the insurer realizing positive profits. Exploring alternative bargaining solutions is a useful direction for future work.[104]

Importantly, however, the quantitative simulations presented in the main text depend only on the premium the private plan sets. Thus, those results will be the same under *any* bargaining protocol that leads each insurer-provider pair to strike agreements that maximize their bilateral profits, a category that includes the alternative bargaining solutions referenced above and many others as well.

Importance of the availability of a two-part tariff. As in the single-provider case, the ability of each insurer-provider pair to negotiate a two-part tariff is what allows them to maximize bilateral profits and then split those profits between them however they wish. If they were restricted to use simple linear contracts, a double marginalization problem would again arise.

But the consequences of double marginalization are less clear cut with multiple providers. In the single-provider case, equations (B2) and (B3) show that the insurer's total per enrollee payment always exceeds its marginal per enrollee payment, implying that restricting the parties to a simple linear contract would increase the insurer's premium and reduce enrollment in the private plan. But with multiple providers, equations (B5) and (B7) show that the insurer's total per enrollee payment to the provider may actually be less than or equal to its marginal per enrollee payment, particularly if the insurer's bargaining weight is high. Thus, with multiple providers, restricting the parties to linear contracts could either increase the private plan's premium (and correspondingly reduce enrollment) or reduce the private plan's premium (and correspondingly increase enrollment).

B.3.3 Insurer Plan Offer Decision

The discussion in the preceding section showed that, under Assumption B4, the insurer earns positive net profits for any non-empty network $\mathcal{A}_{\text{pri}}$, so it is always in the insurer's interest to offer a plan.

[104] One shortcoming of these specific alternative bargaining solutions is that it is not immediately clear whether they are well-defined in this setting. In particular, the monotonicity condition that Yu and Waehrer (2018) use to ensure existence of their bargaining solution may not be plausible here.

B.4 Incorporating Risk Selection and Risk Adjustment

The discussion so far implicitly assumes that all potential enrollees have similar health status and, thus, similar demand for health care services. Formally, this is reflected in the assumption that the utilization amounts $Q_i^h(\mathcal{A}_i)$ depend only on each plan's network $\mathcal{A}_i$. Correspondingly, the preceding discussion also does not consider the potential effects of a risk adjustment program designed to transfer funds from plans that attracted healthier enrollees to plans that attracted sicker enrollees.

However, as discussed in the main text, experience from the Medicare program suggests that a public option offered in the individual or small group markets would attract sicker enrollees than competing private plans. Furthermore, that experience suggests that these differences would not be completely neutralized by the risk adjustment programs that operate in those markets, both because some dimensions of health status would not be captured by risk adjustment and because private plans would code their diagnoses more aggressively than the public option, making their enrollees appear sicker.

In this subsection, therefore, I extend the model analyzed above to incorporate risk adjustment and risk selection, albeit in a stylized way in order to preserve tractability:

- **Risk adjustment and coding intensity.** I assume that policymakers operate a risk adjustment program that collects data on the characteristics of enrollees in each plan and transfers funds from the plan whose enrollees appear healthier to the plan whose appear sicker. In detail, I assume that each plan reports an average risk score s_i based on some set of observable enrollee characteristics. Each plan i receives a per enrollee risk adjustment transfer $s_i - s^0$, where s^0 is an exogenous target risk score.[105] When simulating the model, I assume that the government sets s^0 so that risk adjustment is budget neutral in equilibrium.[106] That is, $s_{\text{pri}}D_{\text{pri}}^* + s_{\text{pub}}D_{\text{pub}}^* = s^0$, where D_{pri}^* and D_{pub}^* denote equilibrium enrollment in the two plans.

  Following the model in Geruso and Layton (2020), I assume that the risk adjustment system eliminates plans' incentives to select on the enrollee characteristics captured in risk adjustment, so there is no sorting on these characteristics in equilibrium, regardless of what premiums or networks the plans offer.[107] However, because the private plan is more aggressive in coding diagnoses, it is nevertheless the case that $s_{\text{pri}} > s_{\text{pub}}$. I assume that the private plan and public option view the risk scores s_{pri} and s_{pub} as exogenous.

- **Residual risk selection.** While I assume that there is no sorting across plans on the enrollee characteristics captured in risk adjustment, I do allow for sorting on other dimensions of health status. To model this selection, I proceed in the spirit of Einav, Finkelstein, and Cullen (2010). I assume that each individual in the population of potential enrollees has a type v uniformly distributed on [0,1] that characterizes the person's propensity to enroll in the private plan. In particular, for any premium vector $\boldsymbol{r}$ and network list $\boldsymbol{\mathcal{A}}$, people with $v \leq D_{\text{pri}}(\boldsymbol{r}, \boldsymbol{\mathcal{A}})$ enroll in the private plan and people with $v > D_{\text{pri}}(\boldsymbol{r}, \boldsymbol{\mathcal{A}})$ enroll in the public option.

[105] I assume that risk scores are measured in dollars to avoid introducing a superfluous conversion factor.

[106] In reality, risk adjustment programs in the individual and small group markets set s^0 *after the end of the year* to match the actual average risk score reported by participating plans. This design ensures that risk adjustment is always budget neutral in practice. Incorporating this feature of reality would complicate the analysis since plans and providers would need to account for how their decisions would change the target risk score. It is doubtful, however, that this simplification has much effect on the results.

[107] Curto et al. (2019) report that there is some sorting on characteristics included in risk adjustment in Medicare Advantage, but find that it is modest in size, suggesting that this is a reasonable assumption.

I assume that a person of type v has a relative utilization factor $m(v)$, which is normalized so that $\int_0^1 m(v)dv = 1$ and which satisfies $m'(v) \geq 0$, consistent with the expectation that the public option experiences adverse selection. A person of type v who is enrolled in plan i with a network $\mathcal{A}_i$ uses a quantity of services $Q_i^h(\mathcal{A}_i)m(v)$ from provider h, where the quantity $Q_i^h(\mathcal{A}_i)$ now corresponds to the average per enrollee utilization of services delivered by provider h if the entire population were enrolled in plan i under network $\mathcal{A}_i$.

For convenience, I also define

$$M_{\text{pri}}(v) = \frac{1}{v}\int_0^v m(u)du \quad \text{and} \quad M_{\text{pub}}(v) = \frac{1}{1-v}\int_v^1 m(u)du,$$

which are the average relative utilization factors for the private plan and public option, respectively, when a fraction v of the population enrolls in the private plan. It follows that per enrollee utilization of provider h's services by enrollees of plan i when that plan has a network $\mathcal{A}_i$ and enrollment in the private plan is v is then given by $Q_i^h(\mathcal{A}_i)M_i(v)$.

Given these definitions, the provider and insurer's profit functions now take the form:

$$\pi_h^P(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{t}) = D_{\text{pri}} Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) M_{\text{pri}}(D_{\text{pri}})[p_h - c_h] + D_{\text{pub}} Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}}) M_{\text{pub}}(D_{\text{pri}})[\bar{p}_h - c_h] + t_h$$

$$\pi^I(\boldsymbol{r}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}, \boldsymbol{t}) = D_{\text{pri}}\left[r_{\text{pri}} - f_{\text{pri}} + (s_{\text{pri}} - s^0) - \sum_{h \in \mathcal{A}_{\text{pri}}} p_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) M_{\text{pri}}(D_{\text{pri}})\right] - \sum_{h \in \mathcal{A}_{\text{pri}}} t_h,$$

where I have suppressed the arguments of D_{pri} and D_{pub} to streamline notation.

Similarly, the first-order condition of the insurer's profit maximization problem becomes

$$\begin{aligned} r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}) = f_{\text{pri}} - [s_{\text{pri}} - s^0] + m\left(D_{\text{pri}}(\{r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), r_{\text{pub}}\}, \boldsymbol{\mathcal{A}})\right) \sum_{h \in \mathcal{A}_{\text{pri}}} p_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}}) \\ + \frac{D_{\text{pri}}(\{r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), r_{\text{pub}}\}, \boldsymbol{\mathcal{A}})}{-\frac{\partial D_{\text{pri}}}{\partial r_{\text{pri}}}(\{r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), r_{\text{pub}}\}, \boldsymbol{\mathcal{A}})}. \end{aligned} \tag{B9}$$

This equation differs from the corresponding condition without risk selection and risk adjustment (equation (B4)) in two important ways. First, the provider's marginal cost now incorporates the risk adjustment transfer $s_{\text{pri}} - s^0$ it receives on the marginal enrollee. Second, due to the presence of the term $m(D_{\text{pri}}(\{r_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p}), r_{\text{pub}}\}, \boldsymbol{\mathcal{A}}))$, the private plan's marginal cost now depends on what type of enrollee is on the margin between the private plan and the public option.

For private plan networks that meet a suitably modified version of the definition of "viable" given above, reasoning parallel to that used to derive equations (B5) and (B6) can be used to show that the per service prices are unchanged, while the insurer's total per enrollee payment to provider h, including the lump-sum transfer, now takes the slightly modified form:

$$p_h^*(\boldsymbol{\mathcal{A}})Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})M_{\text{pri}}\left(D_{\text{pri}}^*(r_{\text{pub}},\boldsymbol{\mathcal{A}})\right)+\frac{t_h^*(r_{\text{pub}},\boldsymbol{\mathcal{A}})}{D_{\text{pri}}^*(r_{\text{pub}},\boldsymbol{\mathcal{A}})}$$

$$=\theta\underbrace{\left[p_h^J(\boldsymbol{\mathcal{A}})Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})M_{\text{pri}}\left(D_{\text{pri}}^*(r_{\text{pub}},\boldsymbol{\mathcal{A}})\right)-[\bar{p}_h-c_h]Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}})M_{\text{pri}}\left(D_{\text{pri}}^{-h}(r_{\text{pub}},\boldsymbol{\mathcal{A}})\right)\frac{D_{\text{pri}}^{-h}(r_{\text{pub}},\boldsymbol{\mathcal{A}})}{D_{\text{pri}}^*(r_{\text{pub}},\boldsymbol{\mathcal{A}})}\right]}_{\text{minimum payment provider can profitably accept}}$$

$$+\ (1-\theta)\underbrace{\left[p_h^J(\boldsymbol{\mathcal{A}})Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})M_{\text{pri}}\left(D_{\text{pri}}^*(r_{\text{pub}},\boldsymbol{\mathcal{A}})\right)+\frac{GFT_h^I(r_{\text{pub}},\boldsymbol{\mathcal{A}},\boldsymbol{p^J}(\boldsymbol{\mathcal{A}}))}{D_{\text{pri}}^*(r_{\text{pub}},\boldsymbol{\mathcal{A}})}\right]}_{\text{maximum amount insurer can profitably pay}}.\quad \text{(B10)}$$

For its part, the public option still must set a premium that covers its average costs. It is easily shown that the public option thus sets a premium $r_{\text{pub}}^*(\mathcal{A}_{\text{pub}})$ that satisfies the following condition:

$$r_{\text{pub}}^*(\mathcal{A}_{\text{pub}})=\ f_{\text{pub}}-(s_{\text{pub}}-s^0)$$
$$+M_{\text{pub}}\left(D_{\text{pri}}^*\left(r_{\text{pub}}^*(\mathcal{A}_{\text{pub}}),\{\mathcal{A}_{\text{pri}}^*(r_{\text{pub}}^*(\mathcal{A}_{\text{pub}}),\mathcal{A}_{\text{pub}}),\mathcal{A}_{\text{pub}}\}\right)\right)\sum_{h\in\mathcal{A}_{\text{pub}}}\bar{p}_hQ_{\text{pub}}^h,\ \text{(B11)}$$

where I have omitted the network arguments of the utilization functions to streamline notation. It is easy to see that $r_{\text{pub}}^*(\mathcal{A}_{\text{pub}})$ is higher than the premium the public option would have set in the absence of selection or upcoding by the private plan. How much higher depends on the degree of selection.

B.5 Simulating Outcomes When Provider Participation is Mandatory

This section calibrates the model developed above and uses the calibrated model to simulate insurance market outcomes and provider payment rates in the presence of a public option. For the purposes of these simulations, I assume that providers are required to join the public option's network, so $\mathcal{A}_{\text{pub}}=\mathcal{H}$. The results of these simulations are reported in section 6.3.2 in the main text.

This section proceeds as follows. I first establish some useful notation and state two assumptions useful for calibration. I then show how the model can be solved numerically given these assumptions and a set of relevant parameters. Next, I explain how I map the assumptions stated in section 6.3.1 and summarized in Table 6.3 to the parameters needed for calibration. The final part of the section explains how I compare results from the calibrated model to the premiums of existing private plans.

B.5.1 Notation

It is useful to work with versions of the plan premiums that are normalized by the public option's per enrollee claims cost of covering the full population when it uses a set of base payment rates $\bar{\boldsymbol{p}}^{\mathbf{0}}\equiv\{\bar{p}_h^0\}_{h\in\mathcal{H}}$, taken here to be traditional Medicare's payment rates. To that end, I define for each plan i:

$$\hat{r}_i\equiv\frac{r_i}{\sum_{h\in\mathcal{H}}\bar{p}_h^0Q_{\text{pub}}^h(\mathcal{H})}.$$

I also use normalized versions of each plan's administrative spending and risk scores, which I denote by $\hat{f}_i$ and $\hat{s}_i$, respectively, for each plan i, as well as a normalized version of the target risk score, $\hat{s}^0$.

Demand for the private plan given the normalized premiums and private plan network $\mathcal{A}_{\text{pri}}$ is

$$\widehat{D}_{\text{pri}}(\hat{r}_{\text{pri}},\hat{r}_{\text{pub}},\mathcal{A}_{\text{pri}})\equiv D_{\text{pri}}\left(\left\{\hat{r}_{\text{pri}}\cdot\left[\sum_{h\in\mathcal{H}}\bar{p}_h^0Q_{\text{pub}}^h(\mathcal{H})\right],\hat{r}_{\text{pub}}\cdot\left[\sum_{h\in\mathcal{H}}\bar{p}_h^0Q_{\text{pub}}^h(\mathcal{H})\right]\right\},\{\mathcal{A}_{\text{pri}},\mathcal{H}\}\right).$$

Similarly, the private plan's demand elasticity as a function of the normalized premiums is denoted $\hat{\epsilon}(\hat{r}_{\text{pri}}, \hat{r}_{\text{pub}})$. For convenience, I additionally make the definition $\widehat{D}_{\text{pub}}(\hat{r}_{\text{pri}}, \hat{r}_{\text{pub}}) \equiv 1 - \widehat{D}_{\text{pri}}(\hat{r}_{\text{pri}}, \hat{r}_{\text{pub}})$.

For future reference, it is also useful to define the following two quantities:

$$\hat{Q}_{\text{pri}} \equiv \frac{\sum_{h \in \mathcal{A}_{\text{pri}}} \bar{p}_h^0 Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})}{\sum_{h \in \mathcal{H}} \bar{p}_h^0 Q_{\text{pub}}^h(\mathcal{H})} \quad \text{and} \quad \hat{a}_{\text{pri}} \equiv \frac{\sum_{h \in \mathcal{A}_{\text{pri}}} \bar{p}_h^0 Q_{\text{pub}}^h(\mathcal{H})}{\sum_{h \in \mathcal{H}} \bar{p}_h^0 Q_{\text{pub}}^h(\mathcal{H})}.$$

The first quantity, $\hat{Q}_{\text{pri}}$, is private plan utilization expressed as a fraction of public option utilization (weighing different providers' utilization using the base payment rates). If the plans have identical utilization, then $\hat{Q}_{\text{pri}}$ will equal one, while if the private plan manages utilization more aggressively, then $\hat{Q}_{\text{pri}}$ will be less than one. The second quantity, $\hat{a}_{\text{pri}}$, is the share of the public option's utilization that occurs at providers included in the private plan's network (weighting different providers' utilization using the base payment rates) and is essentially a measure of the private plan's network breadth. If $\mathcal{A}_{\text{pri}} = \mathcal{H}$, then $\hat{a}_{\text{pri}}$ will be one, while in practice it will generally be less than one.

B.5.2 Calibration Assumptions

For calibration purposes, I assume that the weighted average gap between providers' marginal cost of delivering services and the base set of payment rates for those services is the same under both plans' utilization profiles. That is, I assume there exists an amount $\hat{c}$ that satisfies the following condition:

$$\hat{c} = \frac{\sum_{h \in \mathcal{H}} c_h Q_{\text{pub}}^h(\mathcal{H})}{\sum_{h \in \mathcal{H}} \bar{p}_h^0 Q_{\text{pub}}^h(\mathcal{H})} = \frac{\sum_{h \in \mathcal{A}_{\text{pri}}} c_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})}{\sum_{h \in \mathcal{A}_{\text{pri}}} \bar{p}_h^0 Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})}.$$

Note that a sufficient (but not necessary) condition for a suitable $\hat{c}$ to exist is for the base payment rate vector $\bar{\boldsymbol{p}}^{\mathbf{0}}$ to be a scalar multiple of the cost vector $\boldsymbol{c}$.

Similarly, I assume that the weighted average gap between the public option's payment rates $\bar{\boldsymbol{p}}$ and the base payment rates $\bar{\boldsymbol{p}}^{\mathbf{0}}$ is the same for both profiles. That is, there exists an amount $\hat{\bar{p}}$ such that

$$\hat{\bar{p}} = \frac{\sum_{h \in \mathcal{H}} \bar{p}_h Q_{\text{pub}}^h(\mathcal{H})}{\sum_{h \in \mathcal{H}} \bar{p}_h^0 Q_{\text{pub}}^h(\mathcal{H})} = \frac{\sum_{h \in \mathcal{A}_{\text{pri}}} \bar{p}_h Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})}{\sum_{h \in \mathcal{A}_{\text{pri}}} \bar{p}_h^0 Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})}.$$

Similar to the preceding paragraph, a sufficient (but not necessary) condition for a suitable $\hat{\bar{p}}$ to exist is that the vector of payment rates $\bar{\boldsymbol{p}}$ is a scalar multiple of the base payment rate vector $\bar{\boldsymbol{p}}^{\mathbf{0}}$

B.5.3 Solution Method

The model can be solved in three steps.

Step 1. The first step is to determine the normalized premium $\hat{r}_{\text{pri}}^*(\hat{r}_{\text{pub}}, \hat{s}^0)$ the private plan sets when the public option sets a normalized premium $\hat{r}_{\text{pub}}$ and the government has set a normalized target risk score of $\hat{s}^0$. The private plan's premium-setting condition equation (B9), together with the per service prices from equation (B5), imply that

$$\hat{r}_{\text{pri}}^*(\hat{r}_{\text{pub}}, \hat{s}^0) = \left[\frac{1}{1 + \hat{\epsilon}\left(\hat{r}_{\text{pri}}^*(\hat{r}_{\text{pub}}, \hat{s}^0), \hat{r}_{\text{pub}}\right)^{-1}}\right] \times$$
$$\left[\hat{f}_{\text{pri}} - \{\hat{s}_{\text{pri}} - \hat{s}^0\} + \{\hat{c}\hat{Q}_{\text{pri}} + \hat{a}_{\text{pri}}[\hat{\bar{p}} - \hat{c}]\} m\left(\widehat{D}_{\text{pri}}\left(\hat{r}_{\text{pri}}^*(\hat{r}_{\text{pub}}, \hat{s}^0), \hat{r}_{\text{pub}}\right)\right)\right].$$

This equation is easy to solve numerically for $\hat{r}^*_{\text{pri}}(\hat{r}_{\text{pub}}, \hat{s}^0)$ at any $\hat{r}_{\text{pub}}$ and $\hat{s}^0$ given the various other parameters that appear in the equation, the demand function $\widehat{D}_{\text{pri}}$, and the elasticity function $\hat{\epsilon}$.

Step 2. The second step is to find the normalized public option premium $\hat{r}^*_{\text{pub}}$ that satisfies the public option's breakeven constraint, given the normalized target risk score $\hat{s}^0$ and the premium the private plan is expected to set in response to the public option's premium. From equation (B11), I obtain

$$\hat{r}^*_{\text{pub}}(\hat{s}^0) = \hat{f}_{\text{pub}} - \{\hat{s}_{\text{pub}} - \hat{s}^0\} + \hat{\bar{p}} M_{\text{pub}}\left(\widehat{D}_{\text{pri}}\left(\hat{r}^*_{\text{pri}}\left(\hat{r}^*_{\text{pub}}(\hat{s}^0), \hat{s}^0\right), \hat{r}^*_{\text{pub}}(\hat{s}^0)\right)\right).$$

As above, this equation is easy to solve numerically for $\hat{r}^*_{\text{pub}}(\hat{s}^0)$ at any $\hat{s}^0$ given the various parameters, the function $\widehat{D}_{\text{pri}}$, and the ability to compute $\hat{r}^*_{\text{pri}}(\hat{r}_{\text{pub}}, \hat{s}^0)$ at any point.

Step 3. As noted above, I assume that the government sets the target risk score so that risk adjustment is budget neutral. Thus, the final step is to find the normalized target risk score $\hat{s}^0$ that satisfies

$$\hat{s}_{\text{pri}}\widehat{D}_{\text{pri}}\left(\hat{r}^*_{\text{pri}}\left(\hat{r}^*_{\text{pub}}(\hat{s}^0), \hat{s}^0\right), \hat{r}^*_{\text{pub}}(\hat{s}^0)\right) + \hat{s}_{\text{pub}}\widehat{D}_{\text{pub}}\left(\hat{r}^*_{\text{pri}}\left(\hat{r}^*_{\text{pub}}(\hat{s}^0), \hat{s}^0\right), \hat{r}^*_{\text{pub}}(\hat{s}^0)\right) = \hat{s}^0.$$

This equation is also easily solved numerically given the parameters, the functions $\widehat{D}_i$, and the ability to calculate $\hat{r}^*_{\text{pri}}$ and $\hat{r}^*_{\text{pub}}$ at any point. The resulting solution for $\hat{s}^0$ can then be used to compute the corresponding equilibrium (normalized) premium $\hat{r}^*_i$ and enrollment $\widehat{D}_i$ for each plan i.

B.5.4 Parameter Calibration

This section specifies how model parameters are set for the various simulation scenarios in Table 6.4.

Marginal cost parameter. The marginal cost parameter $\hat{c}$ captures how Medicare's payment rates compare to providers' marginal costs, on average. I set a common value of $\hat{c}$ across all simulation scenarios. Based on hospitals' cost reports to CMS, MedPAC (2020a) estimates that Medicare payment rates exceeded hospitals' marginal costs by approximately 8% in 2018; MedPAC estimated higher margins for the other categories of providers for which data are available (dialysis facilities, skilled nursing facilities, home health agencies, rehabilitation hospitals, and long-term care hospitals). Unfortunately, comparable estimates are not available for physicians, although MedPAC does present survey evidence indicating that the vast majority of physicians are accepting new Medicare patients, which strongly suggests that Medicare rates generally exceed physicians' marginal cost.

I thus set $\hat{c}$ based on the MedPAC estimates for hospitals, so $\hat{c} = 1/1.08$. The simulation results are only modestly sensitive to varying $\hat{c}$. To see why, note that equation (B5) shows that the per service prices negotiated between providers and the private insurer depend on the provider's marginal cost only to the extent that: (a) utilization differs between public and private plan enrollees; and (b) the public option's payment rates are above providers' marginal cost. In most of the scenarios considered here, both of those differences are assumed to be relatively modest.

Demand parameters. I assume that demand for the private plan takes a logit form:

$$D_{\text{pri}}(\{r_{\text{pri}}, r_{\text{pub}}\}, \{\mathcal{A}_{\text{pri}}, \mathcal{H}\}) = \frac{\exp[\alpha + \beta \ln(r_{\text{pri}} / r_{\text{pub}})]}{1 + \exp[\alpha + \beta \ln(r_{\text{pri}} / r_{\text{pub}})]},$$

This demand specification implies that the functions $\widehat{D}_{\text{pri}}$ and $\hat{\epsilon}$ defined above take the following forms:

$$\widehat{D}_{\text{pri}}(\hat{r}_{\text{pri}}, \hat{r}_{\text{pub}}) = \frac{\exp[\alpha + \beta \ln(\hat{r}_{\text{pri}} / \hat{r}_{\text{pub}})]}{1 + \exp[\alpha + \beta \ln(\hat{r}_{\text{pri}} / \hat{r}_{\text{pub}})]}$$

$$\hat{\epsilon}(\hat{r}_{\text{pri}}, \hat{r}_{\text{pub}}) = \beta\left[1 - \widehat{D}_{\text{pri}}(\hat{r}_{\text{pri}}, \hat{r}_{\text{pub}})\right].$$

The parameter β captures how sensitive enrollees' choices are to premiums. As described in the main text, I set β so that the elasticity of demand with respect to premiums achieves a target elasticity of ϵ_0 when $\widehat{D}_{\text{pri}}(\hat{r}_{\text{pri}}, \hat{r}_{\text{pub}}) = 0.5$. From the equations above, this implies setting $\beta = 2\epsilon_0$.

As discussed in the main text, I set the target elasticity ϵ_0 by reviewing the existing literature that examines the sensitivity of enrollees' plan choice to premiums for health plans offered on Massachusetts' pre-ACA individual market (Chan and Gruber 2010; Ericson and Starc 2015a; Jaffe and Shepard 2020) and the ACA Marketplaces (Abraham et al. 2017; Domurat 2018; Drake 2019; Saltzman 2019; Tebaldi 2017). The price elasticities from each individual paper are summarized in Table B.1, and the table notes describe how elasticities were extracted from each of these studies. Averaging across the estimates in these papers, I obtain an own-premium elasticity of -7.4.

The parameter α captures whether enrollees have a systematic preference for the private plan relative to the public option, apart from premium differences. For each simulation scenario, the main text specifies that systematic preference as the change in the private plan's premium that causes an equivalent change in enrollment. Letting Δ_α denote that premium change, it follows that $\alpha = \Delta_\alpha \beta$.

Table B.1: Review of Own-Premium Demand Elasticities

Study	Estimated Elasticity
Massachusetts Connector	
Chan and Gruber (2010)	-5.9*
Ericson and Starc (2015a)	-7.5*
Jaffe and Shepard (2020)	-9.3
ACA Marketplaces	
Abraham et al. (2017)	-4.6
Domurat (2018)	-16.1*
Drake (2019)	-4.8
Saltzman (2019)	-8.2†
Tebaldi (2017)	-2.8‡
Overall Average	-7.4

* These authors report semi-elasticities, which I convert to elasticities by multiplying by the relevant average premium. Chan and Gruber (2010) do not themselves report an average premium, but a comparable premium for that market and year is available from Jaffe and Shepard (2020). Ericson and Starc (2015a) report different semi-elasticities for different age groups, which I use to compute a weighted average semi-elasticity before multiplying by the average premium.

† Saltzman (2019) reports separate elasticity estimate for California (-9.1) and Washington State (-7.2). The elasticity estimate reported in the table is the simple average of these two estimates.

‡ Tebaldi (2017) does not report a summary elasticity estimate, so I infer an elasticity from the equilibrium markup reported in his policy simulations. I use simulations in which the ACA subsidies are replaced by a flat voucher; this ensures that the elasticity does not reflect effects along the lines of Jaffe and Shepard (2020), which could depress the implied elasticity.

Private plan utilization. The utilization parameter $\hat{Q}_{\text{pri}}$ reflects how much an enrollee's utilization depends on whether the enrollee is covered by the private plan or the public option. For each scenario, the main text specifies utilization under both the private plan and the public option as a fraction of utilization under existing private plans. I take these utilization differentials to be specified with respect to the base payment rates. That is, if $\Delta_{Q,i}$ is the specified utilization differential for plan i, then

$$\Delta_{Q,i} \equiv \frac{\sum_{h\in\mathcal{H}} \bar{p}_h^0\, Q_i^h(\mathcal{A}_i)}{\sum_{h\in\mathcal{H}} \bar{p}_h^0 Q_{\text{cur}}^h} - 1,$$

where Q_{cur}^h is the risk-standardized per enrollee quantity of provider h's services used in existing private plans. The corresponding private plan utilization parameter is $\hat{Q}_{\text{pri}} = \left(1 + \Delta_{Q,\text{pri}}\right) / \left(1 + \Delta_{Q,\text{pub}}\right)$.

Private plan network breadth. The parameter $\hat{a}_{\text{pri}}$ captures the breadth of the private plan's network relative to the public option's network on a utilization-weighted basis. The value this parameter takes in each simulation scenario is specified directly in the main text.

Non-claims costs. The parameters $\hat{f}_{\text{i}}$ are the normalized non-claims costs of each plan i. For each scenario, the main text specifies each plan's non-claims costs as a percentage of existing private plans' claims spending. That is, letting τ_i be the percentages specified for each plan i,

$$f_i = \tau_i \sum_{h\in\mathcal{H}} p_h^{\text{cur}} Q_{\text{cur}}^h,$$

where p_h^{cur} is the current (average) price paid for the services of provider h under existing private plans and Q_{cur}^h has the same definition as above. It then follows that $\hat{f}_i = \tau_i \hat{p}_{\text{cur}} / \left(1 + \Delta_{Q,\text{pub}}\right)$, where

$$\hat{p}_{\text{cur}} \equiv \frac{\sum_{h\in\mathcal{H}} p_h^{\text{cur}} Q_{\text{cur}}^h}{\sum_{h\in\mathcal{H}} \bar{p}_h^0 Q_{\text{cur}}^h}$$

is the weighted average ratio of prices paid in current private plans to the base payment rates, which is also specified directly in the main text for each of the scenarios considered.

Risk selection function. The function $m(v)$ captures how enrollees' propensity to use services varies with their propensity to enroll in the private plan. In scenarios where there is no adverse selection against the public option, I take $m(v) = M_{\text{pub}}(v) = M_{\text{pri}}(v) = 1$.

By contrast, in the individual market scenario, I assume that m takes the form:

$$m(v) = 1 + \gamma\left(v - \frac{1}{2}\right).$$

It is straightforward to show that this implies that the functions M_{pri} and M_{pub} take the form

$$M_{\text{pri}}(v) = 1 + \frac{\gamma}{2}(v-1) \text{ and } M_{\text{pub}}(v) = 1 + \frac{\gamma}{2}v.$$

This scenario assumes that the degree of adverse selection against the public option would match the degree of selection against traditional Medicare in the context of the Medicare program. Thus, I use evidence from the Medicare program presented by Curto et al. (2019) to calibrate the parameter γ.

In particular, as discussed in the main text, the Curto et al. estimates imply that health status differences not accounted for in risk adjustment reduce the utilization of Medicare Advantage enrollees by 17% relative to traditional Medicare. This estimate likely reflects *both* true health status differences along dimensions not captured in risk adjustment and greater coding intensity in Medicare Advantage plans. I therefore take 14% as a rough estimate of the portion of this differential that reflects true health status differences.[108] Data on county-level MA penetration from CMS indicate that Medicare Advantage plans enrolled 30% of all eligible Medicare beneficiaries in the states and year studied by Curto et al. I thus set γ so that $M_{\text{pri}}(0.3)/M_{\text{pub}}(0.3) = 1 - 0.14$.

The results are modestly sensitive to the functional form of m. Unfortunately, I am unaware of evidence that can offer guidance on the correct functional form for m. As a theoretical matter, if adverse selection against the public option arose primarily because a small number of enrollees who have high costs (after risk adjustment) always select the public option, then m would be convex. On the other hand, if selection arose because private plans were particularly good at attracting enrollees who are much healthier than they look in risk adjustment, then m could be concave. In reality, of course, m might be neither convex nor concave and take some more complicated shape.

Coding intensity parameters. The parameters $\hat{s}_i$ are the normalized risk scores for the two plans. I assume that risk scores are scaled so that the public option's risk score equals the claims spending it would incur if it enrolled the whole market, which implies that $\hat{s}_{\text{pub}} = \hat{\bar{p}}$. For each scenario, the main text specifies the percentage Δ_{code} by which the private plan's coding efforts raise its risk scores relative to the public option's. The private plan's normalized risk score is then given by $\hat{s}_{\text{pri}} = (1 + \Delta_{\text{code}})\hat{\bar{p}}$.

B.5.5 *Expressing Results in Terms of Existing Private Plan Premiums*

The premiums reported in section 6.3.2 are expressed as a percentage of the premiums charged by existing private plans, but those premiums cannot be simulated within the model. Rather, I calculate (normalized) premiums for existing private plans from the assumptions described in the main text about how the public option's prices and utilization compare to existing private plans, as well as auxiliary assumptions about the non-claims costs and underwriting margins in existing private plans.

In particular, using the notation defined earlier in this section, normalized claims spending under existing private plans is given by $\hat{p}_{\text{cur}} \,/\, \left(1 + \Delta_{Q,\text{pub}}\right)$. Existing plans' normalized premiums are then

$$\hat{r}_{\text{cur}} \equiv (1 + \mu_{\text{cur}}) \frac{\hat{p}_{\text{cur}}}{1 + \Delta_{Q,\text{pub}}}$$

where μ_{cur} is the gross margin earned by existing private plans, expressed as a share of claims spending, with an adjustment to exclude premium revenue collected to offset the ACA's health insurance tax. Drawing on the estimates in Tables 6.1 and 6.2, I take $\mu_{\text{cur}} = 0.167$.[109]

B.6 Limitations of a Model with a Single Private Insurer

For the sake of tractability, I examine a model with a single private insurer. However, most real-world insurance markets feature multiple private insurers, so it is worth briefly considering where a single-insurer model is likely to go awry in predicting outcomes under a public option.

In brief, there are two important dynamics that a single-insurer model cannot capture. First, the model cannot capture the role of competition among private plans (as opposed to between the private plan

[108] Curto et al. apply a 3.41% coding intensity adjustment to the risk scores used in their analysis (consistent with the coding intensity adjustment applied by CMS in the year the authors study) and, thus, remove a portion of coding intensity effects. The estimates of Geruso and Layton (2020) imply that Medicare Advantage plans' coding intensity efforts increase their risk scores by 6.4% on average, suggesting that another 3 percentage points in coding intensity remains to be accounted for.

[109] In detail, I obtain this estimate by summing two quantities: (1) all line items reported in Table 6.1, excluding federal corporate taxes and the ACA's health insurance tax, which yields an estimate of 12.7% of claims spending; and (2) the average pre-corporate-tax underwriting margin of 4.1% of claims spending reported in Table 6.2.

and the public option) in disciplining private plans' premiums. Second, the model cannot capture how shifts in enrollment *among* private plans (as opposed to between private plans and the public option) may affect providers' bargaining behavior. Together, these limitations make the model unsuitable for simulating outcomes without a public option or where the public option is a weak competitor for private plans, either because it has large non-price cost disadvantages or pays high prices.

B.6.1 Role of Insurer-Insurer Competition in Disciplining Premiums

In my model, the sole factor that disciplines the premium set by the single private plan is the risk of losing enrollment to the public option. Competition among private insurers plays no role. [110]

The omission of insurer-insurer competition is likely unimportant in most scenarios examined in this paper. Because the public option offers a broad network and has at most moderate non-price cost disadvantages relative to the private plan, the public option attracts substantial enrollment in equilibrium, so the private plan faces a sizeable demand elasticity. The private plan thus sets a moderate markup in equilibrium, and there is limited scope for additional competition to reduce it.

However, there are scenarios where omitting insurer-insurer competition would be problematic. Most obviously, the model cannot be used to simulate outcomes without a public option. In that case, the single private plan would face completely inelastic demand, set infinite premiums, and pay providers infinite prices. This absurd prediction directly reflects the lack of insurer-insurer competition.

The model's predictions will be similarly suspect in the case of a "weak" public option that captures little equilibrium market share since the demand elasticity faced by the private plan will again become unrealistically small. In the model, this can occur when the public option has large non-price cost disadvantages (e.g., due to severe adverse selection). It could also be the case if providers were not required to participate in the public option and the public option's network ended up being very narrow, making it unappealing to enrollees. One implication of this latter fact is that the present model is not suitable for modeling scenarios where public option participation is voluntary for providers, although it can provide some limited insights on this question as discussed in section B.7.

B.6.2 Effects on Provider Profits from Shifts of Enrollment Among Private Plans

As discussed above, the prices the private plan pays providers for the marginal service are set so that the additional revenue a provider receives when the private plan attracts an additional enrollee exactly offsets the costs that shift imposes on the provider. With a single private plan, any shift in enrollment into the private plan must come entirely from the public option, so the optimal per service price is the price that covers the provider's cost of serving the marginal enrollee plus the profits the insurer loses under the public option. With multiple private plans, the marginal enrollees would be a mixture of public option enrollees and enrollees in other private plans, so the lost profits would be a mixture of lost profits under the public option and other private plans.

If the public option and private plans paid the same prices, then this distinction would be irrelevant. In general, however, many private plan networks exclude at least some providers, which in the model allows them to negotiate prices for the marginal service that are somewhat lower than the public option's. This tendency would likely be even stronger in a model that accounted for insurers' ability to threaten to drop a provider from its network and replace it with a competitor (e.g., Ho and Lee 2019). For this reason, accounting for the fact that some of a private plan's marginal enrollees come from

[110] Another omitted factor is that (contra Assumption B3) some people would elect to go uninsured if premiums got very high, which would discipline the private plan's premium to some degree. However, estimates of extensive margin insurance enrollment elasticities are modest, so this is likely a secondary consideration relative to the effects of competition from other plans. See, for example, Fiedler (2017) for a brief recent review of this literature.

other private plans rather than the public option would likely lead providers and private plans to negotiate lower prices for the marginal service than the single-insurer model predicts.[111]

The reduction in the prices private plans pay at the margin would lead them to set lower premiums, which would cut into the public option's market share. The public option's reduced market share would cause the public option to account for even fewer of the private plan's marginal enrollees, further reducing the importance of the public option's price in determining the prices providers and private plans negotiate for the marginal service, while also reducing the extent to which the presence of the public option disciplined private plans' premiums. On balance, these dynamics seem likely to drive private plans' premiums and negotiated prices toward the premiums and negotiated prices that prevailed without a public option.

The implications of this fact depend on whether the public option pays more or less than existing private plans. In cases where the public option paid providers more than existing plans, the first-order effect of accounting for the presence of multiple private plans would be *reinforced* by the follow-on effects associated with the public option's declining market share. Thus, premiums and prices would plausibly be driven all the way back to the outcomes that prevailed without the public option. By contrast, the present model predicts that the provider prices and premium of the private plan would end up close to the public option's. Thus, the present model is not suitable for simulating cases where the public option pays providers more than existing plans.

On the other hand, in cases where the public option paid providers less than existing private plans, the first-order effect of accounting for the presence of multiple private plans would be *offset* by the follow-on effects associated with the decline in the public option's market share. Thus, any biases are likely to be relatively modest in cases where the public option pays providers less than existing plans.

B.6.3 Would Nash-in-Nash Bargaining Still be a Reasonable Assumption?

Finally, I note that accommodating multiple private plans would likely require changes to the model's bargaining structure. The Nash-in-Nash bargaining framework used here assumes that each provider-insurer negotiation takes all other contracts as given. However, in a setting with multiple insurers, providers would likely recognize that agreeing to a lower per service price with one insurer would weaken its bargaining position with other insurers, both by reducing the premium those insurers can profitably charge and by reducing how much compensation it can demand when enrollment shifts out of the first insurer's plan.[112] In general, an appropriate change in the bargaining protocol to capture this dynamic would likely lead to higher prices and premiums, offsetting at least a portion of the downward pressure on prices and premiums from introducing multiple insurers.

B.7 Provider Public Option Participation Decisions

This paper focuses on public option proposals that would require providers to accept public option patients. However, as discussed in the main text, policymakers might also consider proposals under which providers could choose not to participate in the public option.

As I discussed above, the model used here is likely to perform poorly when the public option has a very narrow network. In this case, the public option will be a weak competitor for the private plan, leading

[111] This might only be true if the different private plans offer different networks, but that is the usual case.

[112] Indeed, if this model were applied to the status quo without a public option, all per service prices would equal the provider's marginal cost, leading insurers to set premiums far too low to support the overall average provider prices that are actually observed. This problem with the Nash-in-Nash framework is not as glaring in the model of Ho and Lee (2017) since they limit provider-insurer pairs to negotiate linear contracts, rather than allowing payers and providers to negotiate two-part-tariffs as I do here. This results in providers' market power being reflected in insurers' payments to providers at the margin, which leads to more reasonable results in that setting.

the single private plan to set an unrealistically high premium. It follows that this model is not suitable for a full analysis of providers' decisions about whether to participate in the public option.

However, the model can provide some insight on whether it is plausible that the public option could attract a broad network if provider participation were voluntary.[113] Specifically, I examine whether, starting from some reasonably broad public option network $\mathcal{A}_{\text{pub}}$, it will be in the interest of the providers contained in $\mathcal{A}_{\text{pub}}$ to remain in the public option's network. If the answer is yes for all or almost all providers, then it is plausible that the public option could assemble a broad provider network. If not, then it is plausible that the public option's network will end up being relatively narrow.

To streamline notation in what follows, I define the function $w(\mathcal{A}_{\text{pub}}) \equiv (r^*_{\text{pub}}(\mathcal{A}_{\text{pub}}), \{\mathcal{A}_{\text{pub}}, \mathcal{A}_{\text{pri}}\})$, which maps the public option's network $\mathcal{A}$ to its premium and the network list. The provider's profits when the public option has network $\mathcal{A}$ can then be written as

$$\pi_h^{P*}(\mathcal{A}_{\text{pub}}) = \pi_h^P\left(\boldsymbol{r}^*\left(w(\mathcal{A}_{\text{pub}}), \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right), \boldsymbol{p^J}(\boldsymbol{\mathcal{A}}), \boldsymbol{t}^*\left(w(\mathcal{A}_{\text{pub}})\right)\right).$$

The net benefit to a provider $h \in \mathcal{A}_{\text{pub}}$ of withdrawing from the public option's network is then:

$$\begin{aligned}
&\pi_h^{P*}\left(\mathcal{A}_{\text{pub}}^{\setminus h}\right) - \pi_h^{P*}(\mathcal{A}_{\text{pub}}) \\
&= \underbrace{D^*_{\text{pri}}\left(w(\mathcal{A}_{\text{pub}}^{\setminus h})\right) Q^h_{\text{pri}}(\mathcal{A}_{\text{pri}})\left[p_h^J(\boldsymbol{\mathcal{A}}^{\setminus \text{pub},\boldsymbol{h}}) - c_h\right] + t_h^*\left(w\left(\mathcal{A}_{\text{pub}}^{\setminus h}\right)\right)}_{\text{profits from private plan when NOT in public option}} \\
&\qquad - \underbrace{\left[D^*_{\text{pri}}\left(w(\mathcal{A}_{\text{pub}})\right) Q^h_{\text{pri}}(\mathcal{A}_{\text{pri}})\left[p_h^J(\boldsymbol{\mathcal{A}}) - c_h\right] + t_h^*\left(w(\mathcal{A}_{\text{pub}})\right)\right]}_{\text{profits from private plan when in public option}} \\
&\qquad - \underbrace{D^*_{\text{pub}}\left(w(\mathcal{A}_{\text{pub}})\right) Q^h_{\text{pub}}(\mathcal{A}_{\text{pub}})[\bar{p}_h - c_h]}_{\text{profits from public option volume}}, \quad \text{(B12)}
\end{aligned}$$

where $D^*_{\text{pub}}(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \equiv 1 - D^*_{\text{pri}}(r_{\text{pub}}, \boldsymbol{\mathcal{A}})$ is the public option's enrollment for a premium r_{pub} and network list $\boldsymbol{\mathcal{A}}$. The provider's choice thus depends on whether exiting the public option increases its profits on its private plan business by enough to offset the lost public option volume.

It is easy to see that a provider $h \notin \mathcal{A}_{\text{pri}}$ will never want to opt out of the public option since it loses profits under the public option but gains nothing under the private plan. In applying this conclusion to a real-world setting with multiple private plans, it is most reasonable to think of it as applying only to providers that participate in *no* private plans. Such providers are likely relatively rare, although there may be some in the individual market, where provider networks are often narrow due to both strategic (e.g., Ho and Lee 2019) and selection-related (e.g., Shepard 2016) considerations.

To consider the case of providers $h \in \mathcal{A}_{\text{pri}}$, I make two additional definitions. The first is the insurer's gross profits if it drops provider h from its network but continues to pay the per service prices $\boldsymbol{p^J}(\boldsymbol{\mathcal{A}})$:

$$\tilde{\pi}^I_{-h}(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \equiv \tilde{\pi}^I\left(\boldsymbol{r}^*\left(w(\mathcal{A}_{\text{pub}}), \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right), \boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right)$$

---

[113] For the purposes of this discussion, I use the version of the model without the extensions to incorporate risk selection and risk adjustment that were introduced in section B.4.

The second is the insurer's gross profits if it paid provider h a per service price of c_h instead of $p_h^J(r_{\text{pub}}, \boldsymbol{\mathcal{A}})$:

$$\hat{\pi}_h^I(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) \equiv \tilde{\pi}_*^I(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) + D_{\text{pri}}^*(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) Q_{\text{pri}}^h(\mathcal{A}_{\text{pri}})[p_h^J(r_{\text{pub}}, \boldsymbol{\mathcal{A}}) - c_h].$$

Using these definitions, equation (B5), equation (B7), and the fact that $Q_{\text{pub}}^h\left(\mathcal{A}_{\text{pub}}^{\setminus h}\right) = 0$, it follows that:

$$\begin{aligned}
&\pi_h^{P*}\left(\mathcal{A}_{\text{pub}}^{\setminus h}\right) - \pi_h^{P*}(\mathcal{A}_{\text{pub}}) \\
&\quad = (1-\theta)\left[\underbrace{\left\{\hat{\pi}_h^I\left(w\left(\mathcal{A}_{\text{pub}}^{\setminus h}\right)\right) - \tilde{\pi}_{-h}^I\left(w\left(\mathcal{A}_{\text{pub}}^{\setminus h}\right)\right)\right\} - \left\{\hat{\pi}_h^I\left(w(\mathcal{A}_{\text{pub}})\right) - \tilde{\pi}_{-h}^I\left(w(\mathcal{A}_{\text{pub}})\right)\right\}}_{\text{change in insurer's incremental gross profits from agreement, if provider } h \text{ paid at cost}}\right] \\
&\qquad - \underbrace{[\bar{p}_h - c_h] Q_{\text{pub}}^h(\mathcal{A}_{\text{pub}})\left[D_{\text{pub}}^*\left(w(\mathcal{A}_{\text{pub}})\right) + \theta \Delta D_{\text{pri}}^h\left(w(\mathcal{A}_{\text{pub}})\right)\right]}_{\text{public option volume and leverage effect}}, \quad \text{(B13)}
\end{aligned}$$

The first term on the right-hand side of equation (B13) captures the main potential benefit to a provider of opting out of the public option: making itself more valuable to the private plan. Offering access to provider h is likely to be particularly valuable to the private plan when the private plan is the *only* way to access provider h's services, so this term is likely to be positive and potentially large. That, in turn, is likely to make the private plan more eager to reach an agreement with provider h, allowing the provider to extract some a portion $1-\theta$ of that additional revenue as higher payments.

But opting out also has costs for a provider, as reflected in the second term of equation (B13). Most directly, the provider loses volume it previously received under the public option, reflected by the D_{pub}^* term. There is also a respect in which opting out of the public option weakens the provider's bargaining leverage. In particular, when provider h and the private plan fail to reach a network agreement, some of the insurer's enrollment is likely to shift to the public option. When provider h is participating in the public option, failing to reach agreement with the private plan thus generates an offsetting increase in volume under the public option, making it easier for the provider to insist on better contract terms. But when provider h opts out of the public option, this effect vanishes.

Which of these two effects will be larger is not clear *a priori*. The first effect will be more likely to dominate if patients place a particularly high value on access to provider h or if the public option pays prices close to providers' marginal cost, while the second effect will tend to dominate otherwise. This is thus fundamentally an empirical question, although as discussed in the main text it seems plausible that opting out will be attractive for providers able to attract the highest prices today. That, in turn, will tend to cause enrollment in the public option to fall, likely reducing the magnitude of the second term and making it more likely additional providers will opt out.

Appendix C Nash Bargaining Lemmas

Lemmas C1 and C2 characterize the solution to transferrable-utility Nash bargaining problems. Essentially identical results are widely available in the literature (e.g., Osborne and Rubenstein 1994; Mas-Collel and Whinston 1995). I state them here for convenient reference in the subsequent proofs.

Lemma C1. Consider constants g_1, g_2 with $g_1 + g_2 \geq 0$ and $\theta \in (0,1)$. The following holds:

$$t^* \equiv \underset{t\in\mathbb{R}}{\operatorname{argmax}}\, (g_1 - t)^\theta (g_2 + t)^{1-\theta} = (1-\theta)g_1 - \theta g_2.$$

Further, the maximand $f(t) \equiv (g_1 - t)^\theta (g_2 + t)^{1-\theta}$ is strictly quasi-concave on the interval $[-g_1, g_2]$.

Proof. The function f is well-defined on the interval $[-g_1, g_2]$, which is non-empty since $g_1 + g_2 \geq 0$.

If $g_1 + g_2 = 0$, then the interval $[-g_1, g_2]$ consists of a single point. Strict quasi-concavity follows trivially. Additionally, $t^* = -g_1 = g_2$, which trivially implies $t^* = (1-\theta)g_1 - \theta g_2$.

Now suppose $g_1 + g_2 > 0$. Observe that for $t \in (-g_1, g_2)$

$$\frac{df}{dt}(t) = f(t)\left[-\frac{\theta}{g_1 - t} + \frac{1-\theta}{g_2 + t}\right].$$

Since $f(t) > 0$ on this interval, it is easily verified that this derivative has a unique zero at $t^* = (1-\theta)g_1 - \theta g_2$, is strictly positive for $t < t^*$, and is strictly negative for $t > t^*$. Since $f(-g_1) = f(g_2) = 0$, it follows that $f(t)$ is strictly quasi-concave on $[-g_1, g_2]$ and t^* is the unique maximum.□

Lemma C2. Consider functions $g_1(x)$ and $g_2(x)$ on some set $\mathcal{X}$, and suppose that $g_1(x) + g_2(x)$ attains a unique maximum $\hat{x} \in \mathcal{X}$. The maximization problem

$$(x^*, t^*) \equiv \underset{x\in\mathcal{X}, t\in\mathbb{R}}{\operatorname{argmax}}\, (g_1(x) - t)^\theta (g_2(x) + t)^{1-\theta}$$

has a well-defined solution if and only if $g_1(\hat{x}) + g_2(\hat{x}) \geq 0$. If a solution exists, then $x^* = \hat{x}$ and

$$t^* = (1-\theta)g_1(\hat{x}) - \theta g_2(\hat{x}).$$

Proof. For convenience, I define $f(x,t) \equiv (g_1(x) - t)^\theta (g_2(x) + t)^{1-\theta}$.

I show first that if this maximization problem has a solution (x^*, t^*), then $g_1(\hat{x}) + g_2(\hat{x}) \geq 0$. In particular, $f(x^*, t^*)$ must be well-defined, so $g_1(x^*) - t^* \geq 0$ and $g_2(x^*) + t^* \geq 0$. It follows that

$$g_1(\hat{x}) + g_2(\hat{x}) \geq g_1(x^*) + g_2(x^*) = [g_1(x^*) - t^*] + [g_2(x^*) + t^*] \geq 0.$$

Now, I suppose that $g_1(\hat{x}) + g_2(\hat{x}) \geq 0$ and show that $(\hat{x}, \hat{t})$ with $\hat{t} \equiv (1-\theta)g_1(\hat{x}) - \theta g_2(\hat{x})$ is the unique solution to the maximization problem. In particular, let $(x', t') \neq (\hat{x}, \hat{t})$ be any other tuple for which the maximand $f(x', t')$ is well-defined.

If $x' = \hat{x}$, then it follows from Lemma C1 that $f(\hat{x}, \hat{t}) \geq f(\hat{x}, t')$, with strict inequality unless $t' = \hat{t}$. If $x' \neq \hat{x}$, then define $\delta \equiv [g_1(\hat{x}) + g_2(\hat{x})] - [g_1(x') + g_2(x')]$ and $t'' \equiv t' - g_1(x') + g_1(\hat{x}) - \delta / 2$. Then,

$$g_1(\hat{x}) - t'' = g_1(x') - t' + \delta/2 \quad \text{and} \quad g_2(\hat{x}) + t'' = g_2(x') + t' + \delta / 2.$$

The definition of $\hat{x}$ implies that $\delta > 0$, so it follows immediately that $f(\hat{x}, t'') > f(x', t')$. Furthermore, Lemma C1 implies that $f(\hat{x}, \hat{t}) \geq f(\hat{x}, t'')$, so $f(\hat{x}, \hat{t}) > f(x', t')$.□

Appendix D Price Cap Proofs

This appendix collects arguments, lemmas, and proofs relevant to the analysis in Appendix A. The first subsection characterizes the solution to the Nash bargaining problem (A1) for various assumptions about the set of permissible negotiated prices $\mathcal{P}$. The second subsection then states lemmas used in the proofs of Propositions A1-A6, and the final subsection provides proofs of the propositions.

D.1 Solution of Nash Bargaining Problem

This section characterizes the solution to the Nash bargaining problem (A1) under two different policy regimes. I first consider the case where negotiated prices are unregulated (that is, $\mathcal{P} = \mathbb{R}$) and the consider the case with a comprehensive price cap (that is, $\mathcal{P} = \tilde{\mathcal{P}} = (-\infty, \bar{p}]$). Throughout this subsection, I assume that the disagreement payoffs take the form $\widetilde{W} = W(\tilde{p}, \tilde{l}, \tilde{a})$ and $\tilde{\pi} = \pi(\tilde{p}, \tilde{l}, \tilde{a})$ for some profile of disagreement actions with $\tilde{p} \in \tilde{\mathcal{P}}$, $\tilde{l} \in \tilde{\mathcal{L}}$, and $\tilde{a} \in \tilde{\mathcal{A}}$. As shown in Appendix A, this ensures that the bargaining problem (A1) has at least one solution for all $\mathcal{P}$ and $\tilde{\mathcal{P}}$ considered here.

D.1.1 Solution When Negotiated Prices Are Unregulated

I first show that when $\mathcal{P} = \mathbb{R}$, the Nash bargaining problem (A1) has a unique solution, and that solution satisfies $a^* = 1$ as well as equations (A2) and (A3). To that end, it is convenient to consider the following transformed version of the maximization problem (A1):

$$\left(\hat{Q}, \hat{t}, \hat{a}\right) = \underset{\substack{Q \in [0,\infty) \\ t \in \mathbb{R} \\ a \in [0,1]}}{\operatorname{argmax}} \left[aV(Q) - t - \widetilde{W}\right]^{\theta} [-acQ + t - \tilde{\pi}]^{1-\theta}. \tag{D1}$$

By comparison to (A1), It is clear that if (D1) has a unique solution and there exists a unique $(\hat{p}, \hat{l})$ such that $Q(\hat{p}, \hat{l}) = \hat{Q}$ and $\hat{a}\hat{p}\hat{Q} = \hat{t}$, then $(\hat{p}, \hat{l}, \hat{a})$ is the unique solution to (A1).

To that end, define $h(Q, a) \equiv a[V(Q) - cQ] - \widetilde{W} - \tilde{\pi}$, the sum of the parties' payoffs in the transformed problem (D1). It is clear that the function h is uniquely maximized when $a = 1$ and $Q = Q^*$, the efficient quantity defined in Appendix A. Furthermore, by assumption it follows that

$$\widetilde{W} + \tilde{\pi} = \tilde{a}\left[V\left(Q(\tilde{p}, \tilde{l})\right) - cQ(\tilde{p}, \tilde{l})\right],$$

from which it follows immediately that $h(Q^*, 1) \geq 0$. The problem (D1) thus satisfies the conditions of Lemma C2, so (D1) has a unique solution: $\hat{a} = 1$, $\hat{Q} = Q^*$ and $\hat{t} = (1-\theta)\left[V(Q^*) - \widetilde{W}\right] - \theta\,[-cQ^* - \tilde{\pi}]$.

To complete the proof, set $\hat{p} = \hat{t}/Q^*$ and choose $\hat{l}$ so that $Q(\hat{p}, \hat{l}) = Q^*$, which is possible by Assumption A3. These are clearly the unique values $(\hat{p}, \hat{l})$ such that $Q(\hat{p}, \hat{l}) = \hat{Q}$ and $\hat{a}\hat{p}\hat{Q} = \hat{t}$. It follows that $(\hat{p}, \hat{l}, 1)$ solves (A1). Simple algebra verifies that $(\hat{p}, \hat{l})$ satisfies equations (A2) and (A3).

D.1.2 Solution Under a Comprehensive Price Cap

I now characterize the solution to (A1) under a comprehensive price cap (that is, when $\mathcal{P} = \tilde{\mathcal{P}} = \bar{\mathcal{P}}$).

To start, note that if $\bar{p} \geq p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R})$, then the constraint on negotiated prices does not bind. Thus, the unique solution to the unconstrained problem is also the unique solution when $\mathcal{P} = \bar{\mathcal{P}}$.

Thus, I focus on the case with $\bar{p} < p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R})$. I show the following: (a) the problem (A1) has a unique solution; (b) $a^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}) = 1$; (c) $p^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}) = \bar{p}$; and (d) $Q(p^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}), l^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}})) > Q^*$.

To this end, it is convenient to consider a slightly different transformed maximization problem:

$$\left(\hat{Q}, \hat{p}, \hat{a}\right) = \underset{\substack{Q \in [0,\bar{Q}] \\ p \in (-\infty, \bar{p}] \\ a \in [0,1]}}{\operatorname{argmax}} \left[a\{V(Q) - pQ\} - \widetilde{W}\right]^{\theta} [a\{p - c\}Q - \tilde{\pi}]^{1-\theta}, \tag{D2}$$

where $\bar{Q}$ is the quantity such that $Q(p, 1) = \bar{Q}$ for all p, which Assumption A1 ensures exists. By comparison to (A1), it is clear that if (D2) has a unique solution and there exists a unique $\hat{l}$ such that $Q\left(\hat{p}, \hat{l}\right) = \hat{Q}$, then $(\hat{p}, \hat{l}, \hat{a})$ is the unique solution to (A1). For future reference, I define $\widehat{W}(Q, p, a) \equiv a[V(Q) - pQ]$ and $\hat{\pi}(Q, p, a) \equiv a[p - c]Q$, and I let h denote the maximand in (D2).

To see that (D2) has a solution, let Ω be the set of payoff tuples (W', π') for which $W' \geq \widetilde{W}$ and $\pi' \geq \tilde{\pi}$ and for which $W' = \widehat{W}(Q, p, a)$ and $\pi' = \hat{\pi}(Q, p, a)$ for some vector (Q, p, a) that meets the constraints in (D2). The fact that $\widetilde{W} = W(\tilde{p}, \tilde{l}, \tilde{a})$ and $\tilde{\pi} = \pi(\tilde{p}, \tilde{l}, \tilde{a})$ ensures that Ω is non-empty. It is also easily seen that Ω is compact. The continuity of the maximand in (D2) then implies that (D2) has a solution.

I now characterize an arbitrary solution $(\hat{Q}, \hat{p}, \hat{a})$ of (D2). I show it has several properties:

- $\boldsymbol{\hat{a} > 0}$ **and** $\boldsymbol{\hat{Q} > 0}$: If $\hat{a} = 0$ or $\hat{Q} = 0$, then $\widehat{W}\left(\hat{Q}, \hat{p}, \hat{a}\right) = \hat{\pi}\left(\hat{Q}, \hat{p}, \hat{a}\right) = 0$. But taking $a' = 1$, $Q' = Q^*$, and $p' = (\min\{\bar{p}, V(Q^*) / Q^*\} + c) / 2$, yields $\widehat{W}(Q', p', a') > 0$ and $\hat{\pi}(Q', p', a') > 0$. This implies that $h(Q', p', a') > h\left(\hat{Q}, \hat{p}, \hat{a}\right)$, contradicting the fact that $(\hat{Q}, \hat{p}, \hat{a})$ solves (D2).

- $\boldsymbol{\hat{a} = 1}$**:** Suppose to the contrary that $\hat{a} < 1$ and consider two cases. If $\hat{p} < \bar{p}$, define $Q' = \hat{a}\hat{Q}$ and $p' = \hat{p} + \epsilon$ for an arbitrary $\epsilon > 0$. Then, for small enough ϵ, it follows that $p' < \bar{p}$,

$$\hat{\pi}(Q', p', 1) = \hat{\pi}\left(\hat{Q}, \hat{p}, \hat{a}\right) + \epsilon\hat{a}\hat{Q} > \hat{\pi}\left(\hat{Q}, \hat{p}, \hat{a}\right) \text{ and}$$

$$\widehat{W}(Q', p', 1) = \widehat{W}\left(\hat{Q}, \hat{p}, \hat{a}\right) + V\left(\hat{a}\hat{Q}\right) - \hat{a}V\left(\hat{Q}\right) - \epsilon\hat{a}\hat{Q} > \widehat{W}\left(\hat{Q}, \hat{p}, \hat{a}\right),$$

  where the second inequality uses the concavity of V, which contradicts the fact that $(\hat{Q}, \hat{p}, \hat{a})$ solves (D2). Likewise, if $\hat{p} = \bar{p}$, define $Q' = (1 + \epsilon)\hat{a}\hat{Q}$ for an arbitrary $\epsilon > 0$. Then, for small enough ϵ, it follows that $Q' \in [0, \bar{Q}]$,

$$\hat{\pi}(Q', \hat{p}, 1) = (1 + \epsilon)\hat{\pi}\left(\hat{Q}, \hat{p}, \hat{a}\right) > \hat{\pi}\left(\hat{Q}, \hat{p}, \hat{a}\right), \text{ and}$$

$$\widehat{W}(Q', \hat{p}, 1) = \widehat{W}\left(\hat{Q}, \hat{p}, \hat{a}\right) + V(Q') - \hat{a}V\left(\hat{Q}\right) - \epsilon\hat{p}\hat{a}\hat{Q} > \widehat{W}\left(\hat{Q}, \hat{p}, \hat{a}\right),$$

  where the second inequality again follows from the fact that the function V is concave. This pair of inequalities also contradicts the fact that $(\hat{Q}, \hat{p}, \hat{a})$ solves (D2).

- $\boldsymbol{\hat{p} = \bar{p}}$**:** Suppose to the contrary that $\hat{p} < \bar{p}$. Then, define for an arbitrary $\epsilon > 0$

$$Q' = \hat{Q} + \epsilon\left[Q^* - \hat{Q}\right] \text{ and } p' = c + [\hat{p} - c]\frac{\hat{Q}}{Q'} + \frac{1}{2Q'}\left\{[V(Q') - cQ'] - \left[V\left(\hat{Q}\right) - c\hat{Q}\right]\right\}.$$

  and observe that

$$\hat{\pi}(Q', p', \hat{a}) - \hat{\pi}\left(\hat{Q}, \hat{p}, \hat{a}\right) = \widehat{W}(Q', p', \hat{a}) - \widehat{W}\left(\hat{Q}, \hat{p}, \hat{a}\right) = \frac{1}{2}\hat{a}\left\{[V(Q') - cQ'] - \left[V\left(\hat{Q}\right) - c\hat{Q}\right]\right\}.$$

  It is clear that $p' < \bar{p}$ for sufficiently small ϵ, so the fact that $(\hat{Q}, \hat{p}, \hat{a})$ solves (D2) implies that the right-hand-side of the above equation must be precisely zero, which requires $\hat{Q} = Q^*$.

  It thus must be that $(Q^*, \hat{p}, 1)$ solves (D2). The fact that $\hat{p} < \bar{p}$ implies that $\widehat{W}(\hat{Q}, \hat{p}, \hat{a}) - \widetilde{W}$ and $\hat{\pi}(\hat{Q}, \hat{p}, \hat{a}) - \tilde{\pi}$ must either be both positive or both zero. In the former case,

$$\frac{d \ln h}{dp}(Q^*,\hat{p},1) = -\theta\left[\frac{Q^*}{V(Q)^* - \hat{p}Q^* - \widetilde{W}}\right] + (1-\theta)\left[\frac{Q^*}{(\hat{p}-c)Q^* - \tilde{\pi}}\right] = 0.$$

This implies that $\hat{p} = p^*(\widetilde{W},\tilde{\pi},\mathbb{R})$ and, thus, $\bar{p} > p^*(\widetilde{W},\tilde{\pi},\mathbb{R})$, contradicting the assumption that $\bar{p} < p^*(\widetilde{W},\tilde{\pi},\mathbb{R}_+)$. A similar contradiction arises if $\widehat{W}(Q^*,\hat{p},1) - \widetilde{W} = \hat{\pi}(Q^*,\hat{p},1) - \tilde{\pi} = 0$.

- $\boldsymbol{\hat{Q} > Q^*}$**:** Suppose to the contrary that $\hat{Q} < Q^*$. Define a price $p' = c + (\hat{p}-c)(\hat{Q}/Q^*) + \epsilon$ for an arbitrary $\epsilon > 0$. Then, for small enough ϵ, $p' < \bar{p}$,

  $$\hat{\pi}(Q^*,p',\hat{a}) = \hat{\pi}(\hat{Q},\hat{p},\hat{a}) + \epsilon\hat{a}Q^* > \hat{\pi}(\hat{Q},\hat{p},\hat{a}), \text{ and}$$

  $$\widehat{W}(Q^*,p',\hat{a}) = \widehat{W}(\hat{Q},\hat{p},\hat{a}) + \hat{a}\left[(V(Q^*) - cQ^*) - \left(V(\hat{Q}) - c\hat{Q}\right)\right] - \epsilon\hat{a}Q^* > \widehat{W}(\hat{Q},\hat{p},\hat{a}),$$

  where final inequality uses the fact that Q^* maximizes $V(Q) - cQ$. This implies that $h(Q^*,p',\hat{a}) > h(\hat{Q},\hat{p},\hat{a})$, contradicting the fact that $(\hat{Q},\hat{p},\hat{a})$ solves (D2).

  Next, I suppose that $\hat{Q} = Q^*$, so that $(Q^*,\bar{p},1)$ solves (D2). It is easy to verify that $\widehat{W}_Q(Q^*,\bar{p},1) = c - \bar{p} = -\hat{\pi}_Q(Q^*,\bar{p},1) \neq 0$, which in turn implies that either $\widehat{W}(Q^*,\bar{p},1) - \widetilde{W}$ and $\hat{\pi}(Q^*,\bar{p},1) - \tilde{\pi}$ are both strictly positive or both precisely zero. In the former case, it follows that

  $$\frac{d \ln h}{dQ}(Q^*,\bar{p},1) = -\theta\left[\frac{\bar{p}-c}{V(Q^*) - \bar{p}Q^* - \widetilde{W}}\right] + (1-\theta)\left[\frac{\bar{p}-c}{(\bar{p}-c)Q^* - \tilde{\pi}}\right] = 0.$$

  This implies that $\bar{p} = p^*(\widetilde{W},\tilde{\pi},\mathbb{R})$, contradicting the assumption that $\bar{p} < p^*(\widetilde{W},\tilde{\pi},\mathbb{R})$. A similar contradiction arises if $\widehat{W}(Q^*,\bar{p},1) - \widetilde{W} = \hat{\pi}(Q^*,\bar{p},1) - \tilde{\pi} = 0$.

The arguments above imply that (D2) has at least one solution and all solutions have the form $(\hat{Q},\bar{p},1)$ with $\hat{Q} > Q^*$. I now show that there is exactly one such solution. In particular, suppose that $(\hat{Q}',\bar{p},1)$ and $(\hat{Q}'',\bar{p},1)$ were distinct solutions. Define $\hat{Q}''' = \alpha\hat{Q}' + (1-\alpha)\hat{Q}''$ for some $\alpha \in (0,1)$. Then,

$$\hat{\pi}(\hat{Q}''',\bar{p},1) = \alpha\hat{\pi}(\hat{Q}',\bar{p},1) + (1-\alpha)\hat{\pi}(\hat{Q}'',\bar{p},1), \text{ and}$$

$$\widehat{W}(\hat{Q}''',\bar{p},1) > \alpha\widehat{W}(\hat{Q}',\bar{p},1) + (1-\alpha)\widehat{W}(\hat{Q}'',\bar{p},1),$$

where the inequality follows from the concavity of V. Next, using the standard result that $g(x,y) = x^\theta y^{1-\theta}$ is weakly increasing in both arguments and strictly quasi-concave, observe that

$$\begin{aligned}
h(\hat{Q}''',\bar{p},1) &= g\left(\hat{\pi}(\hat{Q}''',\bar{p},1),\widehat{W}(\hat{Q}''',\bar{p},1)\right) \\
&\geq g\left(\alpha\hat{\pi}(\hat{Q}',\bar{p},1) + (1-\alpha)\hat{\pi}(\hat{Q}'',\bar{p},1), \alpha\widehat{W}(\hat{Q}',\bar{p},1) + (1-\alpha)\widehat{W}(\hat{Q}'',\bar{p},1)\right) \\
&> g\left(\hat{\pi}(\hat{Q}',\bar{p},1),\widehat{W}(\hat{Q}',\bar{p},1)\right) = h(\hat{Q}',\bar{p},1),
\end{aligned}$$

which contradicts the assumption that $(\hat{Q}',\bar{p},1)$ and $(\hat{Q}'',\bar{p},1)$ solve (D2).

To complete the proof, I show that there is a unique $\hat{l} \in [0,1]$ such that $Q(\bar{p},\hat{l}) = \hat{Q}$. To see this, note that there exists l' such that $Q(\bar{p},l') = Q^*$ by Assumption A3 and recall that $Q(\bar{p},1) = \bar{Q}$ by definition. Since $\hat{Q} \in (Q^*,\bar{Q}]$ and $Q(\bar{p},l)$ is continuous and monotonic as a function of l, a suitable $\hat{l}$ must exist.

D.2 Lemmas for Proofs of Propositions

To prove the propositions in Appendix A, I begin by characterizing the insurer and provider's best response functions when the provider's charge is unregulated and the provider cannot reject patients. Formally, the provider's best response function in this case is $r^P(\tilde{l}) \equiv \text{argmax}_{p\in\mathbb{R}}\, d^P(p,\tilde{l},1)$, while the insurer's best response function is $r^I(\tilde{p}) \equiv \text{argmax}_{l\in[0,1]}\, d^I(\tilde{p},l,1)$.

To that end, I prove three lemmas. Lemma D1 characterizes the "quasi-markup" term $h(\tilde{p},\tilde{l};\beta) \equiv \tilde{p} - \beta c - (1-\beta)V'(Q(\tilde{p},\tilde{l}))$, which appears in both the insurer and the provider's first-order condition:

$$\frac{d}{d\tilde{p}}d^P(\tilde{p},\tilde{l},1) = \tilde{Q} + \tilde{Q}_p\left[\tilde{p} - (1-\gamma(1-\theta))c - \gamma(1-\theta)V'\left(\tilde{Q}\right)\right] = \tilde{Q} + \tilde{Q}_p h\left(\tilde{p},\tilde{l};1-\gamma(1-\theta)\right) \quad \text{(D3)}$$

$$\frac{d}{d\tilde{l}}d^I(\tilde{p},\tilde{l},1) = -\tilde{Q}_l\left[\tilde{p} - \gamma\theta c - (1-\gamma\theta)V'\left(\tilde{Q}\right)\right] = -\tilde{Q}_l h\left(\tilde{p},\tilde{l};\gamma\theta\right). \quad \text{(D4)}$$

Lemma D2 and Lemma D3 then use Lemma D1 to characterize the two best response functions.

Lemma D1 (Properties of the Quasi-Markup). The following hold:

(i) For any $\beta \in [0,1]$, h is continuous and increasing in $\tilde{l}$ and $\tilde{p}$. Additionally, for $\beta \in (0,1]$, h is strictly increasing in $\tilde{p}$, and, for $\beta \in [0,1)$, h is strictly increasing in $\tilde{l}$.

(ii) For any $\tilde{l} \in [0,1]$ and $\beta \in [0,1]$, there is a unique interval $[\tilde{p}',\tilde{p}'']$ such that $h\left(\tilde{p},\tilde{l};\beta\right) = 0$ for any $\tilde{p} \in [\tilde{p}',\tilde{p}'']$. Furthermore, $\tilde{p}' > 0$.

Proof. Starting with (i), continuity follows from Assumptions A1 and A2.

To see that h is increasing in $\tilde{p}$ (strictly so for $\beta > 0$), observe that

$$\frac{d}{d\tilde{p}}\left[\tilde{p} - \beta c - (1-\beta)V'(Q(\tilde{p},\tilde{l}))\right] = 1 - (1-\beta)V''(Q(\tilde{p},\tilde{l}))Q_p(\tilde{p},\tilde{l})$$

and apply the fact that $V''\left(Q(p,l)\right)Q_p(p,l) \leq 1$ by Assumption A4.

Similarly, to see that h is increasing in $\tilde{l}$ (strictly so for $\beta < 1$), note that

$$\frac{d}{d\tilde{l}}\left[\tilde{p} - \beta c - (1-\beta)V'(Q(\tilde{p},\tilde{l}))\right] = -(1-\beta)V''(Q(\tilde{p},\tilde{l}))Q_l(\tilde{p},\tilde{l}).$$

The conclusion then follows from the fact that V is strictly concave and $Q_l > 0$.

To see (ii), observe that $h(0,\tilde{l};\beta) < 0$ for any $\tilde{l} \in [0,1]$, and note that $h(\tilde{p},\tilde{l};\beta) \to \infty$ as $\tilde{p} \to \infty$ since, by Assumption A2, V' is bounded above. Since h is continuous and increasing in $\tilde{p}$, the existence of the desired interval follows.□

Lemma D2 (Insurer's Best Response). The following hold:

(i) $d^I(\tilde{p},\tilde{l},1)$ is strictly quasi-concave in $\tilde{l}$;

(ii) r^I is well-defined and continuous; and

(iii) there exist $\tilde{p}_0 > c$ and $\tilde{p}_1 < c$ such that: $r^I(\tilde{p}) = 1$ for $\tilde{p} \in (-\infty,\tilde{p}_1]$; $r^I(\tilde{p}) \in (0,1)$ and r^I is strictly decreasing for $\tilde{p} \in (\tilde{p}_1,\tilde{p}_0)$; and $r^I(\tilde{p}) = 0$ for $\tilde{p} \in [\tilde{p}_0,\infty)$.

Proof. To show that $d^I(\tilde{p},\tilde{l},1)$ is strictly quasi-concave in $\tilde{l}$, it suffices to show that $d^I_{\tilde{l}}(\tilde{p},\tilde{l},1)$ is zero at no more than one point and, if such a zero exists, is positive below that point and negative above that point. Examining (D4), this follows immediately from the fact that $Q_l > 0$ and the fact that the quasi-markup $\tilde{p} - \gamma\theta c - (1-\gamma\theta)V'(\tilde{Q})$ is strictly increasing in $\tilde{l}$ by Lemma D1. Since d^I is strictly quasi-concave in $\tilde{l}$, the function r^I is well-defined. Additionally, because r^I is a well-defined function and d^I is continuous, the maximum theorem implies that r^I is continuous.

Turning to (iii), choose $\tilde{p}_1$ to be the largest value such that $h(\tilde{p}_1, 1; \gamma\theta) = 0$, and $\tilde{p}_0$ to be the smallest value such that that $h(\tilde{p}_0, 0; \gamma\theta) = 0$; these values must exist by part (ii) of Lemma D1. The fact that $\tilde{p}_1 < c$ follows from the fact that $V'(Q(\tilde{p},1)) < c$ for all $\tilde{p}$ by Assumption A3. Similarly, the fact that $\tilde{p}_0 > c$ follows from the fact that $V'(Q(\tilde{p},0)) > c$ for all $\tilde{p}$.

Examining (D4) and using the fact that h is increasing in $\tilde{p}$ and strictly increasing $\tilde{l}$, it follows that $d^I_{\tilde{l}}(\tilde{p},\tilde{l},1) > 0$ for all $\tilde{l} \in [0,1)$ if $\tilde{p} \in [0,\tilde{p}_1]$, which implies $r^I(\tilde{p}) = 1$ for $\tilde{p} \in [0,\tilde{p}_1]$. Similarly, it follows that $d^I_{\tilde{l}}(\tilde{p},\tilde{l},1) < 0$ for all $\tilde{l} \in (0,1]$ if $\tilde{p} \in [\tilde{p}_0,\infty)$, which implies that $r^I(\tilde{p}) = 0$ for $\tilde{p} \in [\tilde{p}_0,\infty)$.

Essentially the same logic implies that $r^I(\tilde{p}) \in (0,1)$ for $\tilde{p} \in (\tilde{p}_1,\tilde{p}_0)$. To see that r^I is strictly decreasing on this interval, I use the implicit function theorem to show that

$$\frac{dr^I}{d\tilde{p}} = \frac{1-(1-\gamma\theta)V''(Q)Q_p}{Q_l(1-\gamma\theta)V''(Q)},$$

where I have suppressed function arguments to streamline notation. It is clear from the assumptions that the numerator is positive and that the denominator is negative, so $r^I_{\tilde{p}} < 0$ follows.□

Lemma D3 (Provider's Best Response). For $\tilde{l} \in [0,1)$, the following hold:

(i) $d^P(\tilde{p},\tilde{l},1)$ is strictly quasi-concave in $\tilde{p}$;

(ii) r^P is well-defined, continuous, and strictly increasing, and it satisfies $r^P(\tilde{l}) > c$, $d^P(r^P(\tilde{l}),\tilde{l},1) > 0$, and $r^P(\tilde{l}) \to \infty$ as $\tilde{l} \to 1$.

Additionally, $d^P(\tilde{p},1,1)$ is strictly increasing in $\tilde{p}$ and $d^P(\tilde{p},1,1) \to \infty$ as $\tilde{p} \to \infty$.

Proof. To start, I consider $\tilde{l} \in [0,1)$. I rewrite (D3) as

$$d^P_{\tilde{p}}(\tilde{p},\tilde{l},1) = \tilde{Q}_p\left[\tilde{Q}/\tilde{Q}_p + \tilde{p} - \left(1-\gamma(1-\theta)\right)c - \gamma(1-\theta)V'\left(\tilde{Q}\right)\right]$$

Differentiating the expression in brackets on the right-hand side and applying Assumption A4 implies that this expression is strictly increasing in $\tilde{p}$ with a slope bounded below by some $\epsilon > 0$. This implies that d^P is strictly quasi-concave in $\tilde{p}$, and, together with the fact that the expression in brackets is negative for $\tilde{p} = 0$, also implies that $d^P_{\tilde{p}}(\tilde{p},\tilde{l},1)$ has a unique zero, which must occur at a positive price $\tilde{p}$. Thus, the function r^P is well-defined with $r^P(\tilde{l}) > 0$ for all $\tilde{l} \in [0,1)$. Because r^P is single-valued and d^P is continuous, the maximum theorem implies that r^P is continuous.

To show that r^P is strictly increasing, I use the implicit function theorem to show

$$\frac{dr^P}{d\tilde{l}} = \frac{-Q_l\left[1-\gamma(1-\theta)V''(Q)Q_p\right] + Q_{pl}\dfrac{Q}{Q_p}}{Q_p\left[1 - Q_{pp}\dfrac{Q}{Q_p^2} + 1 - \gamma(1-\theta)V''(Q)Q_p\right]},$$

where I have suppressed function arguments to streamline notation. It is straightforward to use the assumptions to verify that both the numerator and denominator are negative, so $r_{\tilde{l}}^{P} > 0$ as desired.

Next, observe from (D3) that since $V'(Q(\tilde{p},0)) > c$ for all $\tilde{p}$ by Assumption A3, it must be the case that $d_{\tilde{p}}^{P}(c,0,1) \geq Q(c,0) > 0$. This implies in turn that $r^{P}(0) > c$, which when combined with the fact that r^{P} is strictly increasing in $\tilde{l}$ implies that $r^{P}(\tilde{l}) > c$ for all $\tilde{l} \in [0,1)$.

To see that $d^{P}(r^{P}(\tilde{l}),\tilde{l},1) > 0$, observe that for any $\tilde{l}$

$$d^{P}(\tilde{p},\tilde{l},1) \equiv Q(\tilde{p},\tilde{l})\left[\tilde{p} - \{1-\gamma(1-\theta)\}c - \gamma(1-\theta)\frac{V(Q(\tilde{p},\tilde{l}))}{Q(\tilde{p},\tilde{l})}\right]$$
$$\geq Q(\tilde{p},\tilde{l})[\tilde{p} - \{1-\gamma(1-\theta)\}c - \gamma(1-\theta)V'(0)].$$

The right-hand side of the equation above is strictly positive for $\tilde{p} > \{1-\gamma(1-\theta)\}c + \gamma(1-\theta)V'(0)$. Since $d^{P}(r^{P}(\tilde{l}),\tilde{l},1) \geq d^{P}(\tilde{p},\tilde{l},1)$ for all $\tilde{p}$ and all $\tilde{l} < 1$, it follows that $d^{P}(r^{P}(\tilde{l}),\tilde{l},1) > 0$.

Turning to the case with $\tilde{l} = 1$, note that for all $\tilde{p}$

$$d^{P}(\tilde{p},1,1) = \tilde{p}\bar{Q} - \{1-\gamma(1-\theta)\}c\bar{Q} - \gamma(1-\theta)V(\bar{Q}),$$

where $\bar{Q}$ is the unique quantity of services delivered for $\tilde{l} = 1$ (and any price $\tilde{p}$). It then follows immediately that $d^{P}(\tilde{p},1,1)$ is strictly increasing and that $d^{P}(\tilde{p},1,1) \to \infty$ as $\tilde{p} \to \infty$.

Finally, to show that $r^{P}(\tilde{l}) \to \infty$ as $\tilde{l} \to 1$, I fix a price $\tilde{p}'$ and show that there exists $\delta > 0$ such that $r^{P}(\tilde{l}) > \tilde{p}'$whenever $\tilde{l} \in (1-\delta,1)$. To that end, choose some $\tilde{p}''$ such that $d^{P}(\tilde{p}'',1,1) > \tilde{p}'\bar{Q}$, which is possible since $d^{P}(\tilde{p},1,1) \to \infty$ as $\tilde{p} \to \infty$, and choose $\delta > 0$ so that $d^{P}(\tilde{p}'',\tilde{l},1) > \tilde{p}'\bar{Q}$ whenever $\tilde{l} \in (1-\delta,1)$, which is possible because d^{P} is continuous. To complete the proof, note that for any $\tilde{l} > 1-\delta$

$$r^{P}(\tilde{l}) > \frac{d^{P}(r^{P}(\tilde{l}),\tilde{l},1)}{\bar{Q}} \geq \frac{d^{P}(\tilde{p}'',\tilde{l},1)}{\bar{Q}} > \tilde{p}',$$

where the first inequality follows from simple algebra, the second inequality follows because $r^{P}(\tilde{l})$ is a best response, and the final inequality follows by construction.□

D.3 Proofs of Propositions

I now prove Propositions A1-A6. The proofs rely heavily on the properties of the best response functions r^{I} and r^{P} that were established in Lemma D2 and Lemma D3. To streamline the prose, I sometimes omit explicit references to these lemmas where not necessary for clarity.

Proof of Proposition A1. I begin with the case where the provider cannot reject patients absent an agreement (that is, when $\tilde{\mathcal{A}} = \{1\}$). I first establish existence and uniqueness.

To demonstrate existence, define the function $k(\tilde{p}) = \tilde{p} - r^{P}(r^{I}(\tilde{p}))$. It follows easily from the facts established in Lemmas D2 and D3 that this function is well-defined and continuous for any $\tilde{p} \geq c$. Now, $k(c) = c - r^{P}(r^{I}(c)) < 0$ since $r^{I}(c) < 1$ and $r^{P}(\tilde{l}) > c$ for all $\tilde{l} \in [0,1)$. Additionally, for $\tilde{p}' = \max\{r^{P}(0),\tilde{p}_0\}$, where $\tilde{p}_0$ is some price such that $r^{I}(\tilde{p}_0) = 0$, it must be the case that $k(\tilde{p}') = \max\{r^{P}(0),\tilde{p}_0\} - r^{P}(0) \geq 0$. It follows that there must exist some $\tilde{p} \in (c,\tilde{p}']$ such that $k(\tilde{p}) = 0$. Clearly, $(\tilde{p}, r^{I}(\tilde{p}))$ is an equilibrium. This equilibrium must be unique because r^{I} is decreasing in $\tilde{p}$, r^{P} is increasing in $\tilde{l}$ for $\tilde{l} \in [0,1)$, and $r^{P}(\tilde{l}) \to \infty$ as $\tilde{l} \to 1$. Note that $\tilde{p} > c$ and, thus, $r^{I}(\tilde{p}) < 1$.

For the remainder of the proof, I let $(\tilde{p},\tilde{l})$ denote the equilibrium strategies.

I first show that $Q(\tilde{p},\tilde{l}) < Q^*$. Since V is strictly concave and $V'(Q^*) = c$, it suffices to show that $V'(Q(\tilde{p},\tilde{l})) > c$. If $\tilde{l} = 0$, then $V'(Q(\tilde{p},\tilde{l})) > c$ follows directly from Assumption A3. If $\tilde{l} \in (0,1)$, then $d^I_{\tilde{l}}(\tilde{p},\tilde{l},1) = 0$, so (D4) together with the fact that $\tilde{p} > c$ implies that $V'(Q(\tilde{p},\tilde{l})) > c$, as desired.

I now pause to show that $\tilde{p} > \theta c + (1-\theta)V'(Q(\tilde{p},\tilde{l}))$. Since $\tilde{p}$ is a best response, $d^P_{\tilde{p}}(\tilde{p},\tilde{l},1) = 0$, so (D3) implies that $h(\tilde{p},\tilde{l};1-\gamma(1-\theta)) > 0$. Similarly, since $\tilde{l}$ is a best response and $\tilde{l} < 1$, $d^I_{\tilde{l}}(\tilde{p},\tilde{l},1) \leq 0$, equation (D4) implies that $h(\tilde{p},\tilde{l};\gamma\theta) \geq 0$. Combining these two inequalities demonstrates that

$$\tilde{p} - \theta c - (1-\theta)V'(Q(\tilde{p},\tilde{l})) = \theta h(\tilde{p},\tilde{l};1-\gamma(1-\theta)) + (1-\theta)h(\tilde{p},\tilde{l};\gamma\theta) > 0,$$

from which the desired inequality follows.

Now, to see that $p^*_{\text{nocap}} < \tilde{p}$, observe that

$$\begin{aligned} p^*_{\text{nocap}}Q^* &= \tilde{p}Q(\tilde{p},\tilde{l}) + \theta c\left[Q^* - Q(\tilde{p},\tilde{l})\right] + (1-\theta)\left[V(Q^*) - V(Q(\tilde{p},\tilde{l}))\right] \\ &< \tilde{p}Q(\tilde{p},\tilde{l}) + \left[\theta c + (1-\theta)V'(Q(\tilde{p},\tilde{l}))\right]\left[Q^* - Q(\tilde{p},\tilde{l})\right] \quad (*) \end{aligned}$$

where the equality follows from (A3) and the inequality follows since $Q(\tilde{p},\tilde{l}) < Q^*$ and V is strictly concave. Combining $\tilde{p} > \theta c + (1-\theta)V'(Q(\tilde{p},\tilde{l}))$ with equation $(*)$ yields the result.

To see that $\tilde{l} = 0$ when the parties can commit to disagreement actions (that is, $\gamma = 1$), substitute the inequality $\tilde{p} > \theta c + (1-\theta)V'(Q(\tilde{p},\tilde{l}))$ into (D4). This implies $d^I_{\tilde{l}}(\tilde{p},\tilde{l},1) < 0$, and the result follows.

Finally, I return to the case where the provider can reject patients absent an agreement (that is, when $\mathcal{A} = [0,1]$). Lemma D3 implies that $d^P(r^P(\tilde{l}),\tilde{l},1) > 0$ for any $\tilde{l}$. Since $d^P(p,l,a) = ad^P(p,l,1)$, it follows that strategies with $\tilde{a} < 1$ may be ignored. Thus, the equilibrium when the provider can reject patients must be identical to the equilibrium when it cannot reject patients.□

Proof of Proposition A2. To begin, I define the provider's best response function with an out-of-network cap: $\bar{r}^P(\tilde{l};\bar{p}) = \text{argmax}_{p\in(-\infty,\bar{p}]}\, d^P(p,\tilde{l},1)$. The properties of $r^P(\tilde{l})$ from Lemma D3 imply that $\bar{r}^P(\tilde{l};\bar{p}) = \min\{r^P(\tilde{l}),\bar{p}\}$ and that $\bar{r}^P$ is a continuous and increasing function of $\tilde{l}$.

I now establish existence and uniqueness. To demonstrate existence, define the function $k(\tilde{p}) \equiv \tilde{p} - \bar{r}^P(r^I(\tilde{p}))$. Lemmas D2 and D3 imply that this function is well-defined and continuous for $\tilde{p} \geq c$. Now, observe that $k(c) = c - \bar{r}^P(r^I(c)) \leq 0$ since $\bar{r}^P(\tilde{l}) \geq c$ for all $\tilde{l}$. Additionally, $k(\bar{p}) \geq \bar{p} - \bar{p} = 0$. It follows that there exists some $\tilde{p} \in [c,\bar{p}]$ such that $k(\tilde{p}) = 0$. Clearly, $(\tilde{p}, r^I(\tilde{p}))$ is an equilibrium. This equilibrium must be unique because r^I is decreasing in $\tilde{p}$ and $\bar{r}^P$ is increasing in $\tilde{l}$.

Turning to part (i) of the proposition, when $\bar{p} \geq \tilde{p}_{\text{nocap}}$, it is clear that the unique equilibrium of the game without an out-of-network cap is still the unique equilibrium. It follows immediately that the equilibrium strategies have the stated properties.

When $\bar{p} < \tilde{p}_{\text{nocap}}$, the fact that r^I is decreasing implies that $\tilde{l}_{\text{out}} = r^I(\tilde{p}_{\text{out}}) \geq r^I(\bar{p}) \geq r^I(\tilde{p}_{\text{nocap}}) = \tilde{l}_{\text{nocap}}$. This inequality is strict if $\bar{p} < \tilde{p}_0$, where $\tilde{p}_0 > c$ is the lowest price with $r^I(\tilde{p}_0) = 0$, since r^I is strictly decreasing for $\tilde{p} \in [c,\tilde{p}_0]$ by Lemma D2. Likewise, since r^P is increasing, it must also be the case that $r^P(\tilde{l}_{\text{out}}) \geq r^P(\tilde{l}_{\text{nocap}}) = \tilde{p}_{\text{nocap}} > \bar{p}$, so $\tilde{p}_{\text{out}} = \bar{r}^P(\tilde{l}_{\text{out}};\bar{p}) = \min\{r^P(\tilde{l}_{\text{out}}),\bar{p}\} = \bar{p}$.

The fact that $Q(\tilde{p}_{\text{out}},\tilde{l}_{\text{out}}) > Q(\tilde{p}_{\text{nocap}},\tilde{l}_{\text{nocap}})$ for $\bar{p} < \tilde{p}_{\text{nocap}}$ follows immediately from the features of the equilibrium strategies and the properties of Q stated in Assumption A1. To see that $Q(\tilde{p}_{\text{out}},\tilde{l}_{\text{out}}) = Q^*$

for $\bar{p} = c$, note that Lemma D2 implies that $\tilde{l}_{\text{out}} = r^I(c) \in (0,1)$, so $d_l^I(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}, 1) = 0$. From (D4), this implies $V'(Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}})) = c$, which implies in turn that $Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}) = Q^*$.

I now turn to part (ii) and characterize p_{out}^*. Note first that the equilibrium strategies are obviously continuous functions of $\bar{p}$, and, by (A3) and the continuity of the underlying model primitives, p_{out}^* is a continuous function of the equilibrium strategies. It follows that p_{out}^* is a continuous function of $\bar{p}$.

I next establish some useful facts for two subcases that will be used repeatedly below:

- $\bar{p} \geq \tilde{p}_{\text{nocap}}$: In this case, the fact that the equilibrium strategies are unchanged from the case without a cap implies that $p_{\text{out}}^*(\bar{p}) = p_{\text{nocap}}^*$ and $(p_{\text{out}}^*)'(\bar{p}) = 0$.

- $\bar{p} < \tilde{p}_{\text{nocap}}$: In this case, equation (A3) and the form of the equilibrium strategies imply that

  $$p_{\text{out}}^*(\bar{p})Q^* = \theta c Q^* + (1-\theta)V(Q^*) + [\bar{p} - \theta c]Q(\bar{p}, r^I(\bar{p})) - (1-\theta)V(Q(\bar{p}, r^I(\bar{p}))). \tag{†}$$

  Note that in the specific case when $\bar{p} = c$, substituting $Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}) = Q^*$ into (†) yields $p_{\text{out}}^*(c) = c$. Furthermore, differentiating (†) with respect to $\bar{p}$ yields

  $$(p_{\text{out}}^*)'(\bar{p})Q^* = Q + \left[Q_p + \frac{dr^I}{d\tilde{p}} Q_l\right][\bar{p} - \theta c - (1-\theta)V'(Q)], \tag{‡}$$

  where I have suppressed function arguments to streamline notation.

I next more fully characterize $(p_{\text{out}}^*)'$. The facts established above imply that p_{out}^* is differentiable except possibly for $\bar{p} \in \{\tilde{p}_0, \tilde{p}_{\text{nocap}}\}$. (In those instances, I treat $(p_{\text{out}}^*)'(\bar{p})$ as being the corresponding right derivative.) I proceed by considering three distinct subcases:

- Case 1 ($\gamma = 0$ and $\tilde{l}_{\text{nocap}} > 0$): In this case, I show that

  $$(p_{\text{out}}^*)'(\bar{p}) = \begin{cases} \dfrac{1}{Q^*}\left[Q(\bar{p}, r^I(\bar{p})) + \theta \dfrac{\bar{p} - c}{V''(Q(\bar{p}, r^I(\bar{p})))}\right] & \text{if } \bar{p} \in [c, \tilde{p}_{\text{nocap}}) \\ 0 & \text{if } \bar{p} \in [\tilde{p}_{\text{nocap}}, \infty) \end{cases}.$$

  Since $\tilde{l}_{\text{nocap}} > 0$, Lemma D2 implies $r^I(\bar{p}) \in (0,1)$ for any $\bar{p} \in [c, \tilde{p}_{\text{nocap}})$. Thus, $d_l^I(\bar{p}, r^I(\bar{p}), 1) = 0$, so (A7) implies $V'(Q(\bar{p}, r^I(\bar{p}))) = \bar{p}$. Similarly, the expression for $dr^I \,/\, d\tilde{p}$ derived in the proof of Lemma D2 for this case implies that, when $\bar{p} \in [c, \tilde{p}_{\text{nocap}})$,

  $$Q_p + \frac{dr^I}{d\tilde{p}} Q_l = Q_P + \left[\frac{1 - V''(Q)Q_p}{Q_l V''(Q)}\right] Q_l = \frac{1}{V''(Q)},$$

  where I have again suppressed function arguments. Substituting into (‡) yields the desired expression for $(p_{\text{out}}^*)'(\bar{p})$ for these values of $\bar{p}$. The case where $\bar{p} \geq \tilde{p}_{\text{nocap}}$ was handled above.

- Case 2 ($\gamma = 0$ and $\tilde{l}_{\text{nocap}} = 0$): In this case, I show that

  $$(p_{\text{out}}^*)'(\bar{p}) = \begin{cases} \dfrac{1}{Q^*}\left[Q(\bar{p}, r^I(\bar{p})) + \theta \dfrac{\bar{p} - c}{V''(Q(\bar{p}, r^I(\bar{p})))}\right] & \text{if } \bar{p} \in [c, \tilde{p}_0) \\ \dfrac{1}{Q^*}\left[Q(\bar{p}, 0) + Q_p(\bar{p}, 0)\{\bar{p} - \theta c - (1-\theta)V'(Q(\bar{p}, 0))\}\right] & \text{if } \bar{p} \in [\tilde{p}_0, \tilde{p}_{\text{nocap}}) \\ 0 & \text{if } \bar{p} \in [\tilde{p}_{\text{nocap}}, \infty) \end{cases}.$$

Note that $\tilde{l}_{\text{nocap}} = 0$, implies that $\tilde{p}_0 < \tilde{p}_{\text{nocap}}$ since r^I is decreasing. To characterize $(p^*_{\text{out}})'(\bar{p})$ for $\bar{p} \in [c, \tilde{p}_0)$, the same arguments used for Case 1 apply. For $\bar{p} \in [\tilde{p}_0, \tilde{p}_{\text{nocap}})$, note that $r^I(\bar{p}) = 0$, so $dr^I/d\tilde{p} = 0$, and apply (‡) again. The case with $\bar{p} \geq \tilde{p}_{\text{nocap}}$ was handled above.

- Case 3 ($\gamma = 1$): In this case, I show that

$$(p^*_{\text{out}})'(\bar{p}) = \begin{cases} Q(\bar{p}, r^I(\bar{p}))/Q^* & \text{if } \bar{p} \in [c, \tilde{p}_0) \\ \dfrac{1}{Q^*}\big[Q(\bar{p}, 0) + Q_p(\bar{p}, 0)\{\bar{p} - \theta c - (1 - \theta)V'(Q(\bar{p}, 0))\}\big] & \text{if } \bar{p} \in [\tilde{p}_0, \tilde{p}_{\text{nocap}}) \\ 0 & \text{if } \bar{p} \in [\tilde{p}_{\text{nocap}}, \infty) \end{cases}.$$

For $\bar{p} \in [c, \tilde{p}_0)$, Lemma D2 implies $r^I(\bar{p}) \in (0,1)$, so $d^I_{\tilde{l}}(\bar{p}, r^I(\bar{p}), 1) = 0$, which, together with (D4), implies $\bar{p} - \theta c - (1 - \theta)V'(Q) = 0$. Substituting into (‡) yields the result. For $\bar{p} \in [\tilde{p}_0, \tilde{p}_{\text{nocap}})$, note that $r^I(\bar{p}) = 0$, so $dr^I/d\tilde{p} = 0$, and apply (‡) once again. The case where $\bar{p} \geq \tilde{p}_{\text{nocap}}$ was handled above.

Now, note that since $Q(c, r^I(c)) = Q^*$ and r^I is a decreasing function, it follows that $Q(\bar{p}, r^I(\bar{p})) < Q^*$ for any $\bar{p} > c$. It is then straightforward (albeit tedious) to use the various expressions for $(p^*_{\text{out}})'(\bar{p})$ derived above to show that $(p^*_{\text{out}})'(\bar{p}) \leq Q(\tilde{p}_{\text{out}}, \tilde{l}_{\text{out}}) \,/\, Q^* \leq 1$, with the second equality strict unless $\bar{p} = c$. To complete the main part of (ii), note that these bounds on $(p^*_{\text{out}})'(\bar{p})$, together with the continuity of p^*_{out} and the fact that $p^*_{\text{out}}(c) = c$, imply that $p^*_{\text{out}} \leq \bar{p}$ for all $\bar{p}$ and $p^*_{\text{out}} < \bar{p}$ for $\bar{p} > c$.

Turning to (ii).(a), it suffices to note that $(p^*_{\text{out}})'(\bar{p}) < 1$ for any $\bar{p} > c$. This fact, together with the continuity of p^*_{out} and the fact that $p^*_{\text{out}}(c) = c$, implies that $p^*_{\text{cap}}(p^*_{\text{nocap}}) < p^*_{\text{nocap}}$, so a suitable $\tilde{p}'$ exists.

Finally, for (ii).(b), I show that $(p^*_{\text{out}})'(\bar{p}) > 0$ for $\bar{p} < \tilde{p}_{\text{nocap}}$. When $\bar{p} \in [c, \tilde{p}_0)$, this follows immediately from the expressions derived in Case 3 above. When $\bar{p} \in [\tilde{p}_0, \tilde{p}_{\text{nocap}})$, note that $(p^*_{\text{out}})'(\bar{p}) = d^P_{\tilde{p}}(\bar{p}, 0,1) \,/\, Q^*$ and observe that $d^P_{\tilde{p}}(\bar{p}, 0,1) > 0$ since the equilibrium of the uncapped game is $(\tilde{p}_{\text{nocap}}, 0)$. Because p^*_{out} is strictly increasing for $\bar{p} < \tilde{p}_{\text{nocap}}$ and $p^*_{\text{out}}(\tilde{p}_{\text{nocap}}) = p^*_{\text{nocap}}$, it also follows that $p^*_{\text{out}} < p^*_{\text{nocap}}$ for any $\bar{p} < \tilde{p}_{\text{nocap}}$. Parallel logic implies that $(p^*_{\text{out}})'(\tilde{p}_{\text{nocap}}) = 0$.□

Proof of Proposition A3. I start with part (i). When the parties cannot commit to disagreement actions (so $\gamma = 0$), note that $d^P(\bar{p}, \tilde{l}, 1) > 0$ for any $\tilde{l}$ since $\bar{p} > c$ by assumption. Since $d^P(p, l, a) = ad^P(p, l, 1)$, strategies with $\tilde{a} < 1$ can never be a best response and may be ignored. It then follows immediately from Proposition A2 that $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}),1)$ is the unique equilibrium of the current game and the negotiated price is $p^*_{\text{out}}(\bar{p})$.

I now turn to part (ii), in which the parties can commit to disagreement actions (so $\gamma = 1$).

I first show that there is a unique out-of-network cap $\bar{p} > p^*(0,0,\mathbb{R})$ such that $p^*_{\text{out}}(\bar{p}) = p^*(0,0,\mathbb{R})$. Proposition A2, together with equation (A3), show that $p^*_{\text{out}}(c) = c < p^*(0,0,\mathbb{R})$. For $\bar{p} = \tilde{p}_{\text{nocap}}$, equation (A3) and the properties of the equilibrium strategies derived in Proposition A2 imply that

$$p^*_{\text{out}}(\bar{p}) = p^*(0,0,\mathbb{R}) + [1/Q^*]d^P(r^P(0), 0,1) > p^*(0,0,\mathbb{R}),$$

where the inequality follows since $d^P(r^P(0),0,1) > 0$ by Lemma D3. The fact that p^*_{out} is continuous and strictly increasing on $[c, \tilde{p}_{\text{nocap}}]$ implies that a suitable $\bar{p}$ exists, which I denote $\bar{p}_{\text{reject}}$. The fact that $\bar{p}_{\text{reject}} > p^*_{\text{out}}(\bar{p}_{\text{reject}}) = p^*(0,0,\mathbb{R})$ follows immediately from Proposition A2.

Now, note that equation (A3) implies that $d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) = [p^*_{\text{out}}(\bar{p}) - p^*(0,0,\mathbb{R})]Q^*$, which implies in turn that $d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) > 0$ when $\bar{p} > \bar{p}_{\text{reject}}$ and $d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) < 0$ when $\bar{p} < \bar{p}_{\text{reject}}$. It is thus natural to consider three subcases: $\bar{p} > \bar{p}_{\text{reject}}$, $\bar{p} < \bar{p}_{\text{reject}}$, and $\bar{p} = \bar{p}_{\text{reject}}$.

First, consider $\bar{p} > \bar{p}_{\text{reject}}$. Observe that, for any $\tilde{l}$,

$$d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}, 1) = -d^I(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}, 1) \geq -d^I(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) = d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) > 0.$$

where the first inequality follows since $\tilde{l}_{\text{out}}$ is the insurer's best response, and the second inequality was established above when $\bar{p} > \bar{p}_{\text{reject}}$. Since $d^P(p, l, a) = ad^P(p, l, 1)$, it follows that strategies with $\tilde{a} < 1$ can never be a best response and may be ignored. It then follows from Proposition A2 that $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1)$ is the unique equilibrium of the current game and the negotiated price is $p^*_{\text{out}}(\bar{p})$.

Next, consider $\bar{p} < \bar{p}_{\text{reject}}$. Since $d^P(p, l, a) = ad^P(p, l, 1)$ and $d^I(p, l, a) = ad^I(p, l, a)$, Proposition A2 implies that any equilibrium with $\tilde{a} > 0$ must have the form $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), \tilde{a})$; however, since it was shown above that $d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) < 0$, the provider's best response to $\tilde{l}_{\text{out}}(\bar{p})$ must have $\tilde{a} = 0$, so this cannot be an equilibrium. It is easy to check that $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 0)$ is an equilibrium and leads to a negotiated price $p^*(0,0,\mathbb{R})$. There are other equilibria with $\tilde{a} = 0$, but since all have disagreement payoffs $\widetilde{W} = \tilde{\pi} = 0$, examining (A1) shows that they all produce the same negotiated outcomes.

To derive the bound on $p^*_{\text{nocap}} - p^*(0,0,\mathbb{R})$, it is convenient to define a function $g(Q) = \theta c Q + (1-\theta)V(Q)$. Using equation (A3), it is easy to see that

$$p^*_{\text{nocap}} - p^*(0,0,\mathbb{R}) = \frac{1}{Q^*}\left[\tilde{p}_{\text{nocap}}\tilde{Q}_{\text{nocap}} - g\big(\tilde{Q}_{\text{nocap}}\big)\right], \tag{$*$}$$

Next, note that equation (A3) also implies that

$$p^*_{\text{nocap}}Q^* - \tilde{p}_{\text{nocap}}\tilde{Q}_{\text{nocap}} = g(Q^*) - g\big(\tilde{Q}_{\text{nocap}}\big).$$

Since g is strictly concave and $g(0) = 0$, the preceding equation then implies that

$$g\big(\tilde{Q}_{\text{nocap}}\big) > g'\big(\tilde{Q}_{\text{nocap}}\big)\tilde{Q}_{\text{nocap}} > \frac{g(Q^*) - g\big(\tilde{Q}_{\text{nocap}}\big)}{Q^* - \tilde{Q}_{\text{nocap}}}\tilde{Q}_{\text{nocap}} = \frac{p^*_{\text{nocap}}Q^* - \tilde{p}_{\text{nocap}}\tilde{Q}_{\text{nocap}}}{Q^* - \tilde{Q}_{\text{nocap}}}\tilde{Q}_{\text{nocap}}.$$

Combining this inequality with equation $(*)$ then yields the result:

$$p^*_{\text{nocap}} - p^*(0,0,\mathbb{R}) < \frac{1}{Q^*}\left[\tilde{p}_{\text{nocap}}\tilde{Q}_{\text{nocap}} - \frac{p^*_{\text{nocap}}Q^* - \tilde{p}_{\text{nocap}}\tilde{Q}_{\text{nocap}}}{Q^* - \tilde{Q}_{\text{nocap}}}\tilde{Q}_{\text{nocap}}\right] = \frac{s}{1-s}\left[\tilde{p}_{\text{nocap}} - p^*_{\text{nocap}}\right].$$

Finally, when $\bar{p} = \bar{p}_{\text{reject}}$ it is easy to use arguments similar to those above to show that $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1)$ is an equilibrium and that there also exist equilibria with $\tilde{a} < 1$. It is easy to show that any such equilibria lead to a negotiated price $p^*(0,0,\mathbb{R})$.□

Proof of Proposition A4. I start with part (i). Note that the same arguments used in the proof of Proposition A3 establish that the provider will never wish to turn away patients when commitment is not possible, so I restrict attention to cases where the provider is required to set $\tilde{a} = 1$.

To begin, I define best response functions in this game. The provider's best response function is $\bar{r}^P(\tilde{l}; \bar{p}) = \operatorname{argmax}_{p \in [0,\bar{p}]} d^P(p, \tilde{l}, 1)$, and Lemma D3 implies that $\bar{r}^P(\tilde{l}; \bar{p}) = \min\{r^P(\tilde{l}), \bar{p}\}$. The insurer's best response function is $\underline{r}^I(\tilde{p}; \underline{l}) = \operatorname{argmax}_{l \in [\underline{l},1]} d^I(\tilde{p}, l, 1)$, and Lemma D2 implies that $\underline{r}^I =$

$\max\{r^I(\tilde{p}), \underline{l}\}$. The facts established in Lemmas D2 and D3 imply that both functions are continuous, $\bar{r}^P$ is weakly increasing, and $\underline{r}^I$ is weakly decreasing. Existence and uniqueness then follow from an argument essentially identical to the corresponding argument in Proposition A2.

Now, let $(\tilde{p}, \tilde{l})$ denote the equilibrium disagreement strategies and p^* the resulting negotiated price.

I first show $\tilde{l} = \underline{l}$. Note first that since $\tilde{p} \leq \bar{p}$, $\tilde{l} \geq \underline{l}$, and Q is decreasing in p and increasing in l, it follows that $Q(\tilde{p}, \tilde{l}) \geq Q(\bar{p}, \underline{l}) = Q^*$, which implies in turn that $V'(Q(\tilde{p}, \tilde{l})) \leq c$. Additionally, $\tilde{p} = \bar{r}^P(\tilde{l}) > c$ by Lemma D3. Equation (D4) then implies that $d_{\tilde{l}}^I(\tilde{p}, \tilde{l}, 1) < 0$, which requires $\tilde{l} = \underline{l}$ since $\tilde{l}$ is the insurer's best response.

To characterize $\tilde{p}$, I separately consider cases with $\bar{p} \leq \tilde{p}_{\text{nocap}}$ and $\bar{p} > \tilde{p}_{\text{nocap}}$:

- $\bar{p} \leq \tilde{p}_{\text{nocap}}$: Since $\underline{r}^I$ is decreasing, it follows that
$$\tilde{l} = \underline{r}^I(\tilde{p}) \geq \underline{r}^I(\bar{p}) \geq \underline{r}^I(\tilde{p}_{\text{nocap}}) \geq \tilde{l}_{\text{nocap}}.$$
Since $\bar{r}^P$ is increasing, it follows in turn that
$$\tilde{p} = \bar{r}^P\big(\tilde{l}\big) \geq \bar{r}^P\big(\tilde{l}_{\text{nocap}}\big) = \min\{r^P(\tilde{l}_{\text{nocap}}), \bar{p}\} = \min\{\tilde{p}_{\text{nocap}}, \bar{p}\} = \bar{p},$$
so $\tilde{p} = \bar{p}$. Recalling that $Q(\bar{p}, \underline{l}) = Q^*$ and substituting into (A3) then yields $p^* = \bar{p}$.

- $\bar{p} > \tilde{p}_{\text{nocap}}$: Proposition A1 demonstrated that $Q(\tilde{p}_{\text{nocap}}, \tilde{l}_{\text{nocap}}) < Q^* = Q(\bar{p}, \underline{l})$. Since Q is strictly decreasing in p and strictly increasing in l, this fact together with $\bar{p} > \tilde{p}_{\text{nocap}}$ implies $\underline{l} > \tilde{l}_{\text{nocap}}$. Since $\bar{r}^P$ is increasing, this implies in turn that $\tilde{p} = \bar{r}^P(\tilde{l}) = \bar{r}^P(\underline{l}) \geq \bar{r}^P(\tilde{l}_{\text{nocap}}) \geq \tilde{p}_{\text{nocap}}$.

  Next, using the shorthand $\tilde{Q} \equiv Q(\tilde{p}, \tilde{l})$, note that
$$\begin{aligned}\theta\pi\big(\tilde{p}, \tilde{l}, 1\big) - (1-\theta)W\big(\tilde{p}, \tilde{l}, 1\big) &= d^P(\tilde{p}, \underline{l}, 1) - (1-\gamma)(1-\theta)\big[V(\tilde{Q}) - c\tilde{Q}\big] \\ &\geq d^P(\bar{p}, \underline{l}, 1) - (1-\gamma)(1-\theta)\big[V(\tilde{Q}) - c\tilde{Q}\big] \\ &\geq d^P(\bar{p}, \underline{l}, 1) - (1-\gamma)(1-\theta)[V(Q^*) - cQ^*] \\ &= \bar{p}Q^* - cQ^* - (1-\theta)[V(Q^*) - cQ^*],\end{aligned}$$
where the first inequality follows because $\tilde{p}$ is a best response and the second because Q^* maximizes $V(Q) - cQ$. Combining this inequality with (A3) yields $p^* \geq \bar{p}$, as desired.

Turning to part (ii), I note that this portion of the proposition can be proved using arguments that are almost identical to the arguments used to prove part (ii) of Proposition A3, so I omit the proof.□

Proof of Proposition A5. I begin by stating for convenient reference two facts that were noted in Appendix A and proven in section D.1.2 regarding the solution to (A1) when $\mathcal{P} = \bar{\mathcal{P}}$:

- *Fact 1:* If $\widetilde{W}$ and $\tilde{\pi}$ are disagreement payoffs for which $p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R}) \leq \bar{p}$, then: (i) $p^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}) = p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R})$; (ii) $l^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}) = l^*(\widetilde{W}, \tilde{\pi}, \mathbb{R})$; and (iii) $Q(p^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}), l^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}})) = Q^*$.

- *Fact 2:* If $\widetilde{W}$ and $\tilde{\pi}$ are disagreement payoffs for which $p^*(\widetilde{W}, \tilde{\pi}, \mathbb{R}) > \bar{p}$, then: (i) $p^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}) = \bar{p}$; and (ii) $Q(p^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}}), l^*(\widetilde{W}, \tilde{\pi}, \bar{\mathcal{P}})) > Q^*$.

Next, I establish two additional facts that, taken together, demonstrate that the parties' rankings of alternative profiles of disagreement payoffs when $\mathcal{P} = \bar{\mathcal{P}}$ are tightly related to the parties' ranking when negotiated prices are unconstrained (that is, when $\mathcal{P} = \mathbb{R}$). In particular:

- *Fact 3:* If $(\widetilde{W},\tilde{\pi})$ and $(\widetilde{W}',\tilde{\pi}')$ are pairs of disagreement payoffs for which $p^*(\widetilde{W}',\tilde{\pi}',\mathbb{R}) \leq p^*(\widetilde{W},\tilde{\pi},\mathbb{R}) \leq \bar{p}$, then:
$$\pi\left(p^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),l^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),1\right) \geq \pi\left(p^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),l^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),1\right); \text{and}$$
$$W\left(p^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),l^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),1\right) \leq W\left(p^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),l^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),1\right).$$
If $p^*(\widetilde{W}',\tilde{\pi}',\mathbb{R}) < p^*(\widetilde{W},\tilde{\pi},\mathbb{R})$, then the concluding inequalities are both strict.

- *Fact 4:* If $\widetilde{W}$ and $\tilde{\pi}$ are disagreement payoffs for which $p^*(\widetilde{W},\tilde{\pi},\mathbb{R}) > \bar{p}$, and $\widetilde{W}'$ and $\tilde{\pi}'$ are disagreement payoffs for which $p^*(\widetilde{W}',\tilde{\pi}',\mathbb{R}) \leq \bar{p}$, then:
$$\pi\left(p^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),l^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),1\right) > [\bar{p}-c]Q^* \geq \pi\left(p^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),l^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),1\right); \text{and}$$
$$W\left(p^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),l^*(\widetilde{W},\tilde{\pi},\bar{\mathcal{P}}),1\right) < V(Q^*) - \bar{p}Q^* \leq W\left(p^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),l^*(\widetilde{W}',\tilde{\pi}',\bar{\mathcal{P}}),1\right).$$

Fact 3 follows immediately from Fact 1. In Fact 4, the first inequality in each conclusory statement follows from Fact 2, while the second inequality follows from Fact 1.

I now prove part (i) of the proposition. Consider two sub-cases:

- *Parties cannot commit to disagreement actions:* In this case, the parties choose disagreement actions to maximize their disagreement payoffs without regard to the effect on their negotiated payoffs. The form of the Nash bargaining problem (A1) is thus irrelevant to the choice of disagreement actions, so the equilibrium disagreement actions under a comprehensive price cap of $\bar{p}$ are identical to those under an out-of-network cap of $\bar{p}$: $\tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l}_{\text{out}}(\bar{p})$. Propositions A2 and A4 imply that $p^*_{\text{out}}(\bar{p}) \leq \bar{p}$, so Fact 1 implies that negotiated contract terms for a comprehensive price cap of $\bar{p}$ are the same as under an out-of-network cap of $\bar{p}$.

- *Parties can commit to disagreement actions and the provider cannot reject patients:* I again proceed by verifying that the change in set of permissible negotiated prices from $\mathcal{P} = \mathbb{R}$ to $\mathcal{P} = \bar{\mathcal{P}}$ does not change the equilibrium disagreement actions. That is harder in this case because the parties choose disagreement actions to maximize their payoffs in the Nash bargaining problem (A1). For convenience, I let $(\tilde{p},\tilde{l})$ denote $(\tilde{p}_{\text{out}}(\bar{p}),\tilde{l}_{\text{out}}(\bar{p}))$, the equilibrium strategies with an out-of-network cap of $\bar{p}$, and let $\widetilde{W}$ and $\tilde{\pi}$ denote the corresponding disagreement payoffs. Recall that Proposition A2 implies $p^*(\widetilde{W},\tilde{\pi},\mathbb{R}) = p^*_{\text{out}}(\bar{p}) \leq \bar{p}$.

  I first show that $(\tilde{p},\tilde{l})$ is still an equilibrium of the disagreement game. Suppose the provider deviated and played $\tilde{p}'$, and let $\widetilde{W}'$ and $\tilde{\pi}'$ be the resulting disagreement payoffs. This strategy must have $p^*(\widetilde{W}',\tilde{\pi}',\mathbb{R}) \leq p^*(\widetilde{W},\tilde{\pi},\mathbb{R})$ since $\tilde{p}$ was a best response under an out-of-network cap. Since $p^*(\widetilde{W},\tilde{\pi},\mathbb{R}) \leq \bar{p}$, Fact 3 implies that the provider still weakly prefers $\tilde{p}$ to $\tilde{p}'$ under a comprehensive price cap, so $\tilde{p}$ is still the provider's best response.

  Similarly, suppose the insurer deviated and played $\tilde{l}'$, and again let $\widetilde{W}'$ and $\tilde{\pi}'$ be the resulting disagreement payoffs. This strategy must have $p^*(\widetilde{W}',\tilde{\pi}',\mathbb{R}) \geq p^*(\widetilde{W},\tilde{\pi},\mathbb{R})$ since $\tilde{l}$ was a best response under an out-of-network cap. Now, consider two cases. If $p^*(\widetilde{W}',\tilde{\pi}',\mathbb{R}) \leq \bar{p}$, then Fact 3 implies that the insurer still prefers $\tilde{l}$ to $\tilde{l}'$ under a comprehensive price cap, so $\tilde{l}$ is still a best response for the provider. If $p^*(\widetilde{W}',\tilde{\pi}',\mathbb{R}) > \bar{p}$, the same conclusion follows from Fact 4.

Now, consider any strategy profile $(\tilde{p}', \tilde{l}')$ that was not an equilibrium under an out-of-network cap, and let $\widetilde{W}'$ and $\tilde{\pi}'$ be the corresponding disagreement payoffs. I show that $(\tilde{p}', \tilde{l}')$ is still not an equilibrium. To do so, I consider two cases.

First, suppose $p^*(\widetilde{W}', \tilde{\pi}', \mathbb{R}) > \bar{p}$. In this case, choose a strategy $\tilde{l}''$ so $Q(\tilde{p}', \tilde{l}'') = Q^*$, which is possible by Assumption A3. Letting $\widetilde{W}''$ and $\tilde{\pi}''$ be the corresponding disagreement payoffs, (A3) implies that $p^*(\widetilde{W}'', \tilde{\pi}'', \mathbb{R}) = \tilde{p}' \leq \bar{p} < p^*(\widetilde{W}', \tilde{\pi}', \mathbb{R})$. Fact 4 then implies that the insurer strictly prefers $\tilde{l}''$ to $\tilde{l}'$ under a comprehensive price cap, so $(\tilde{p}', \tilde{l}')$ is not an equilibrium.

Second, suppose $p^*(\widetilde{W}', \tilde{\pi}', \mathbb{R}) \leq \bar{p}$. In this case, note that since $(\tilde{p}', \tilde{l}')$ was not an equilibrium under an out-of-network cap, the provider or the insurer must have had a strategy that produced a strictly higher negotiated payoff.

If the provider had such a strategy, let $\tilde{p}''$ be that strategy, and let $\widetilde{W}''$ and $\tilde{\pi}''$ be the resulting disagreement payoffs. Clearly, $p^*(\widetilde{W}'', \tilde{\pi}'', \mathbb{R}) > p^*(\widetilde{W}', \tilde{\pi}', \mathbb{R})$. If $p^*(\widetilde{W}'', \tilde{\pi}'', \mathbb{R}) \leq \bar{p}$, Fact 3 implies the provider still strictly prefers $\tilde{p}''$ to $\tilde{p}'$ under a comprehensive price cap, so $(\tilde{p}', \tilde{l}')$ is not an equilibrium. The same conclusion follows from Fact 4 if $p^*(\widetilde{W}'', \tilde{\pi}'', \mathbb{R}) > \bar{p}$.

Similarly, if the insurer had such a strategy, let $\tilde{l}''$ be that strategy, and let $\widetilde{W}''$ and $\tilde{\pi}''$ be the resulting disagreement payoffs. Clearly, $p^*(\widetilde{W}'', \tilde{\pi}'', \mathbb{R}) < p^*(\widetilde{W}', \tilde{\pi}', \mathbb{R})$, so Fact 3 implies that the insurer still strictly prefers $\tilde{l}''$ to $\tilde{l}'$, and $(\tilde{p}', \tilde{l}')$ cannot be an equilibrium.

I now turn to part (ii), which concerns the case where the provider can reject patients and the parties can commit to disagreement actions. Because the introduction of a constraint on negotiated prices in the Nash bargaining problem (A1) is irrelevant when $\bar{p} \geq p^*(0,0,\mathbb{R})$, the proofs of subparts (a) and (b) almost exactly parallel the proof of the corresponding statements in Proposition A3 related to an out-of-network cap. The exception is that the proof now builds upon the facts regarding the disagreement actions when providers cannot reject patients that were established in part (i) of this proposition, rather than the corresponding facts established in Proposition A2 for an out-of-network cap.

I thus omit the proof of subparts (a) and (b) and focus on subpart (c), which considers $\bar{p} < p^*(0,0,\mathbb{R})$. To that end, note that part (i) of this proposition implies that the only potential equilibrium with $\tilde{a} = 1$ is $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1)$. Proposition A2 showed that the corresponding negotiated price when $\mathcal{P} = \mathbb{R}$ is $p^*_{\text{out}}(\bar{p}) < \bar{p} < p^*(0,0,\mathbb{R})$. Fact 4 then implies that $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1)$ is not an equilibrium. It is, however, easy to see that $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 0)$ is an equilibrium; there are many other equilibria with $\tilde{a} = 0$, but since all have $\widetilde{W} = \tilde{\pi} = 0$, all lead to the same negotiated outcomes.

I now characterize those negotiated outcomes. By Fact 2, the negotiated price under a comprehensive price cap $\bar{p} < p^*(0,0,\mathbb{R})$, is $p^*(0,0,\bar{\mathcal{P}}) = \bar{p}$. Additionally, $Q_{\text{comp}}(\bar{p}) = Q(\bar{p}, l^*(0,0,\bar{\mathcal{P}})) > Q^*$.

To establish the other properties of Q_{comp}, I first characterize the negotiated coverage terms $l^*(0,0,\bar{\mathcal{P}})$.

To that end, recall that it was shown in the text of Appendix A that there exist network agreements that give both parties strictly positive payoffs. Inspecting (A1), it is thus clear that the negotiated agreement must have $\pi(\bar{p}, l^*(0,0,\mathcal{P})) > 0 = \tilde{\pi}$ and $W(\bar{p}, l^*(0,0,\mathcal{P})) > 0 = \widetilde{W}$ since other potential agreements would result in the maximand in (A1) being either zero or undefined.

It follows that the maximand in (A1) is differentiable as a function of l at the optimum. Let $h(l; \bar{p})$ be the natural log of the maximand in (A1) when $a^* = 1$, $p^* = \bar{p}$, and $\widetilde{W} = \tilde{\pi} = 0$. Then,

$$\frac{d}{dl}h(l;\bar{p}) = \frac{Q_l}{V(Q) - \bar{p}Q}\left[\left\{\theta V'(Q) + (1-\theta)\frac{V(Q)}{Q}\right\} - \bar{p}\right], \qquad (*)$$

where I have suppressed the arguments of the functions Q and Q_l to streamline notation. It is easily verified that the term in curly brackets is strictly decreasing in l, which implies in turn that the right-hand side of equation $(*)$ can change sign at most once as l increases, so equation $(*)$ has at most one zero and, if it has a zero, that zero occurs at $l^*(0,0,\bar{\mathcal{P}})$.

Now, to see that $Q_{\text{comp}}(\bar{p}) \to Q^*$ as $\bar{p} \to p^*(0,0,\mathbb{R})$, note that

$$\theta V'(Q^*) + (1-\theta)\frac{V(Q^*)}{Q^*} = \theta c + (1-\theta)\frac{V(Q^*)}{Q^*} = p^*(0,0,\mathbb{R}).$$

It follows that, for $\bar{p} = p^*(0,0,\mathbb{R})$, equation $(*)$ has a zero at the value l such that $Q(\bar{p},l) = Q^*$. Due to the continuity of the primitives, it follows that for $\bar{p}$ sufficiently close to $p^*(0,0,\mathbb{R})$, equation $(*)$ has a zero at a value of l such that $Q(\bar{p},l)$ is arbitrarily close to Q^*. The conclusion follows.

Finally, to see that that $Q_{\text{comp}}(\bar{p})$ is strictly decreasing as a function of $\bar{p}$ whenever $Q_{\text{comp}}(\bar{p}) < Q(\bar{p},1)$, observe that $Q^* < Q_{\text{comp}}(\bar{p}) < Q(\bar{p},1)$ implies that $l^*(0,0,\bar{\mathcal{P}}) \in (0,1)$, so $l^*(0,0,\bar{\mathcal{P}})$ is the unique zero of $(*)$. The conclusion then follows from the fact that the term in curly brackets is strictly decreasing in l.

Proof of Proposition A6. I begin with part (i). In the context of the model, the only difference between a default contract policy with a contract price of $\bar{p}$ and an out-of-network cap of $\bar{p}$ is the access standard. But the access standard is irrelevant in the cases considered in part (i) because providers either cannot reject patients or, as shown in Proposition A3, do not wish to. It follows that disagreement actions and negotiated contract terms are identical to those under an out-of-network cap of $\bar{p}$, so the result follows immediately from Propositions A2 and A3.

I now prove (ii). The analogy with an out-of-network cap of $\bar{p}$, together with Proposition A3, implies that the access standard is again irrelevant for $\bar{p} > \bar{p}_{\text{reject}}$, so (ii).a follows from Proposition A3.

Turning to (ii).b, I first show that $(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), \underline{a})$ is an equilibrium. Proposition A2 implies that $\tilde{l}_{\text{out}}(\bar{p})$ was the insurer's best response to $(\tilde{p}_{\text{out}}(\bar{p}), 1)$ under an out-of-network cap of $\bar{p}$, and this remains the case under the default contract policy since the insurer's problem is unchanged. Because $d^I(\tilde{p},\tilde{l},\tilde{a}) = \tilde{a}d^I(\tilde{p},\tilde{l},1)$, $\tilde{l}_{\text{out}}(\bar{p})$ is clearly also the insurer's best response to $(\tilde{p}_{\text{out}}(\bar{p}), \underline{a})$.

Similarly, Proposition A2 showed that $\tilde{p}_{\text{out}}(\bar{p})$ was the provider's best response to $\tilde{l}_{\text{out}}(\bar{p})$ under an out-of-network cap of $\bar{p}$ when the provider was required to play $\tilde{a} = 1$. Because $d^P(\tilde{p},\tilde{l},\tilde{a}) = \tilde{a}d^P(\tilde{p},\tilde{l},1)$ and Proposition A3 shows that $d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) < 0$, it follows easily that $(\tilde{p}_{\text{out}}(\bar{p}), \underline{a})$ is the provider's best response to $\tilde{l}_{\text{out}}(\bar{p})$ under the default contract policy.

I now show that this is the only equilibrium. In particular, let $(\tilde{p},\tilde{l},\tilde{a})$ be an equilibrium of the current game. Because $d^P(\tilde{p},\tilde{l},\tilde{a}) = \tilde{a}d^P(\tilde{p},\tilde{l},1)$ and $d^I(\tilde{p},\tilde{l},\tilde{a}) = \tilde{a}d^I(\tilde{p},\tilde{l},1)$, the analogy with an out-of-network cap implies that $(\tilde{p},\tilde{l},1)$ is an equilibrium of the game with an out-of-network cap $\bar{p}$ when the provider cannot reject patients absent an agreement. Since Proposition A2 implies that this game has a unique equilibrium, it follows that $\tilde{p} = \tilde{p}_{\text{out}}(\bar{p})$ and $\tilde{l} = \tilde{l}_{\text{out}}(\bar{p})$. Furthermore, Proposition A3 implies that $d^P(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1) < 0$, so the fact that $d^P(\tilde{p},\tilde{l},\tilde{a}) = \tilde{a}d^P(\tilde{p},\tilde{l},1)$ implies that $\tilde{a} = \underline{a}$.

Finally, observe that (A3) and (A4) imply that the negotiated price in this case is

$p^*(0{,}0,\mathbb{R}) + [1/Q^*]d^P\big(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), \underline{a}\big)$

$$= \underline{a}\big[p^*(0{,}0,\mathbb{R}) + (1/Q^*)d^P\big(\tilde{p}_{\text{out}}(\bar{p}), \tilde{l}_{\text{out}}(\bar{p}), 1\big)\big] + (1-\underline{a})p^*(0{,}0,\mathbb{R}) = \underline{a}p^*_{\text{out}}(\bar{p}) + (1-\underline{a})p^*(0{,}0,\mathbb{R}),$$

which completes the proof.□

Appendix E Public Option Proofs

This appendix states and proves a helpful lemma and then states and proves Propositions E1 and E2.

Lemma E1. Let $\mathcal{A}_{\text{pri}}$ be a private plan network that is viable with respect to a public option premium r_{pub} and public option network $\mathcal{A}_{\text{pub}} \neq \emptyset$. If Assumptions B1-B3 hold, then $GFT^I_h\big(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\big) + GFT^P_h\big(r_{\text{pub}}, \boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\big) \geq 0$ for each $h \in \mathcal{A}_{\text{pri}}$, where $\boldsymbol{\mathcal{A}} \equiv \{\mathcal{A}_{\text{pri}}, \mathcal{A}_{\text{pub}}\}$.

Proof. Throughout, I streamline notation by suppressing the public option premium r_{pub} where it appears as a function argument and short-handing the bilateral profit maximizing prices $\boldsymbol{p^J}(\boldsymbol{\mathcal{A}})$ as $\boldsymbol{p^J}$. Additionally, I let δ_h be defined as it is defined in the definition of viability.

I proceed by verifying two facts for any $h \in \mathcal{A}_{\text{pri}}$: (i) $GFT^P_h(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}) \geq 0$; and (ii) $GFT^I_h(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}) \geq 0$. To verify the first claim, simply observe that

$$GFT^P_h(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}) = D_{\text{pri}}\big(\boldsymbol{r}^*\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big), \boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}\big)Q^h_{\text{pub}}\big(\mathcal{A}_{\text{pub}}\big)[\bar{p}_h - c_h] \geq 0.$$

To verify the second claim, observe that

$\tilde{\pi}^I(\boldsymbol{r}^*(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}), \boldsymbol{\mathcal{A}})$

$$\geq D_{\text{pri}}\big(\big\{r^*_{\text{pri}}\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big) + \delta_h, r_{\text{pub}}\big\}, \boldsymbol{\mathcal{A}}\big)\left[r^*_{\text{pri}}\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big) + \delta_h - f_{\text{pri}} - \sum_{l \in \mathcal{A}_{\text{pri}}} p^J_l Q^l_{\text{pri}}(\mathcal{A}_{\text{pri}})\right]$$

$$= D_{\text{pri}}\big(\big\{r^*_{\text{pri}}\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big) + \delta_h, r_{\text{pub}}\big\}, \boldsymbol{\mathcal{A}}\big)\left[r^*_{\text{pri}}\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big) - f_{\text{pri}} - \sum_{l \in \mathcal{A}^{\setminus h}_{\text{pri}}} p^J_l Q^l_{\text{pri}}\big(\mathcal{A}^{\setminus h}_{\text{pri}}\big)\right]$$

$$\geq D_{\text{pri}}\big(\boldsymbol{r}^*\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big), \boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}\big)\left[r^*_{\text{pri}}\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big) - f_{\text{pri}} - \sum_{l \in \mathcal{A}^{\setminus h}_{\text{pri}}} p^J_l Q^l_{\text{pri}}\big(\mathcal{A}^{\setminus h}_{\text{pri}}\big)\right]$$

$$= \tilde{\pi}^I\big(\boldsymbol{r}^*\big(\boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}, \boldsymbol{p^J}\big), \boldsymbol{\mathcal{A}}^{\setminus \text{pri},\boldsymbol{h}}\big),$$

where the first inequality holds because r^*_{pri} maximizes the insurer's gross profits, the first equality follows from the definition of δ_h, and the second inequality follows because the network $\mathcal{A}_{\text{pri}}$ is viable and the term in brackets is strictly positive by equation (B4). The conclusion follows.□

Proposition E1. Let $\mathcal{A}_{\text{pri}}$ be a private plan network that is viable with respect to a public option premium r_{pub} and network $\mathcal{A}_{\text{pub}} \neq \emptyset$. If Assumptions B1-B3 hold, then the system (B6) has a unique solution. Furthermore, the per service price satisfies $p^*_h\big(r_{\text{pub}}, \boldsymbol{\mathcal{A}}\big) = p^J_h(\boldsymbol{\mathcal{A}})$, and $p^*_h\big(r_{\text{pub}}, \boldsymbol{\mathcal{A}}\big)$ and $t^*_h(r_{\text{pub}}, \boldsymbol{\mathcal{A}})$ together satisfy equation (B7) for each $h \in \mathcal{A}_{\text{pri}}$, where $\boldsymbol{\mathcal{A}} \equiv \{\mathcal{A}_{\text{pri}}, \mathcal{A}_{\text{pub}}\}$.

Proof. Throughout the proof, I suppress the network list $\boldsymbol{\mathcal{A}}$ and the public option premium r_{pub} when they appear as function arguments to streamline notation since they do not vary. To begin, note that the definitions of GFT_h^I and GFT_h^P, together with the fact that p_h^J (uniquely) maximizes the joint profits of the insurer and provider h for any vector $\boldsymbol{p_{-h}}$, implies that p_h^J (uniquely) maximizes $GFT_h^I(\{p_h, \boldsymbol{p_{-h}}\}) + GFT_h^P(\{p_h, \boldsymbol{p_{-h}}\})$ for any vector of prices for the other providers $\boldsymbol{p_{-h}}$.

To show existence, consider a potential solution with $\breve{p}_h = p_h^J$ and $\breve{t}_h = (1-\theta)GFT_h^I(\boldsymbol{p^J}) - \theta GFT_h^P(\boldsymbol{p^J})$ for each $h \in \mathcal{A}_{\text{pri}}$. Lemma E1 implies that $GFT_h^I(\boldsymbol{p^J}) + GFT_h^P(\boldsymbol{p^J}) \geq 0$ for all $h \in \mathcal{A}_{\text{pri}}$, and it was established above that p_h^J maximizes $GFT_h^I(\{p_h, \boldsymbol{\breve{p}_{-h}}\}) + GFT_h^P(\{p_h, \boldsymbol{\breve{p}_{-h}}\})$ for all $h \in \mathcal{A}_{\text{pri}}$. Lemma C2 then implies that $\breve{p}_h$ and $\breve{t}_h$ solves each equation in the system (B6). Simple algebra using the definitions of GFT_h^I and GFT_h^P then shows that equation (B7) is satisfied as well.

To show uniqueness, let $(\boldsymbol{\breve{p}}, \boldsymbol{\breve{t}})$ be any contract terms that satisfy (B6). By Lemma C2, each $\breve{p}_h$ maximizes $GFT_h^I(\{p_h, \boldsymbol{\breve{p}_{-h}}\}) + GFT_h^P(\{p_h, \boldsymbol{\breve{p}_{-h}}\})$ with respect to p_h. From above, that implies that $\breve{p}_h = p_h^J$ for each $h \in \mathcal{A}_{\text{pri}}$. Lemma C2 then implies that $\breve{t}_h = (1-\theta)GFT_h^I(\boldsymbol{p^J}) - \theta GFT_h^P(\boldsymbol{p^J})$ for each $h \in \mathcal{A}_{\text{pri}}$. Simple algebra using the definitions of GFT_h^I and GFT_h^P then shows that (B7) is satisfied as well.□

Proposition E2. Let $\mathcal{A}_{\text{pri}}$ and $\mathcal{B}_{\text{pri}}$ be private plan networks with $\mathcal{B}_{\text{pri}} \subset \mathcal{A}_{\text{pri}}$, let r_{pub} be a public option premium, and let $\mathcal{C} \neq \emptyset$ be a public option network, and define

$$k(r, \boldsymbol{\mathcal{D}}) \equiv \tilde{\pi}_*^I(r, \boldsymbol{\mathcal{D}}) - \sum_{h \in \mathcal{D}_{\text{pri}}} GFT_h^I\left(r, \boldsymbol{\mathcal{D}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{D}})\right).$$

for a public option premium r and network list $\boldsymbol{\mathcal{D}}$**.** If Assumptions B1-B4 hold, then $k\left(r_{\text{pub}}, \{\mathcal{A}_{\text{pri}}, \mathcal{C}\}\right) \geq k\left(r_{\text{pub}}, \{\mathcal{B}_{\text{pri}}, \mathcal{C}\}\right) \geq 0$, where $\boldsymbol{\mathcal{A}} \equiv \{\mathcal{A}_{\text{pri}}, \mathcal{C}\}$ and $\boldsymbol{\mathcal{B}} \equiv \{\mathcal{B}_{\text{pri}}, \mathcal{C}\}$**.**

Proof. Throughout the proof, I suppress r_{pub} where it appears as a function argument to streamline notation. To start, note that $k(\boldsymbol{\mathcal{B}}) = 0$ if $\left|\mathcal{B}_{\text{pri}}\right| \leq 1$.

To complete the proof, it then suffices to show that $k(\boldsymbol{\mathcal{A}}) \geq k(\boldsymbol{\mathcal{B}})$ for the case where $\mathcal{B}_{\text{pri}} = \mathcal{A}_{\text{pri}}^{\setminus h}$ for some $h \in \mathcal{A}_{\text{pri}}$ and $|\mathcal{A}_{\text{pri}}| > 1$ To that end, first note that:

$$\begin{aligned}k(\boldsymbol{\mathcal{A}}) &= \tilde{\pi}_*^I(\boldsymbol{\mathcal{A}}) - GFT_h^I\left(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right) - \sum_{l \in \mathcal{B}_{\text{pri}}} GFT_l^I\left(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right) \\ &= \tilde{\pi}^I\left(\boldsymbol{r}^*\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right), \boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right) - \sum_{l \in \mathcal{B}_{\text{pri}}} GFT_l^I\left(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right).\end{aligned}$$

Next, note that the fact that the insurer sets r_{pri}^* to maximize its gross profits implies that

$$\begin{aligned}\tilde{\pi}^I\left(\boldsymbol{r}^*\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right), \boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right) &= D_{\text{pri}}\left(\boldsymbol{r}^*\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right), \boldsymbol{\mathcal{B}}\right)\left[r_{\text{pri}}^*\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right) - f_{\text{pri}} - \sum_{l \in \mathcal{B}_{\text{pri}}} p_l^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^l(\mathcal{B}_{\text{pri}})\right] \\ &\geq D_{\text{pri}}\left(\boldsymbol{r}^*\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{B}})\right), \boldsymbol{\mathcal{B}}\right)\left[r_{\text{pri}}^*\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{B}})\right) - f_{\text{pri}} - \sum_{l \in \mathcal{B}_{\text{pri}}} p_l^J(\boldsymbol{\mathcal{A}}) Q_{\text{pri}}^l(\mathcal{B}_{\text{pri}})\right] \\ &= \tilde{\pi}_*^I(\boldsymbol{\mathcal{B}}) + D_{\text{pri}}^*(\boldsymbol{\mathcal{B}}) \sum_{l \in \mathcal{B}_{\text{pri}}} \left[p_l^J(\boldsymbol{\mathcal{B}}) - p_h^J(\boldsymbol{\mathcal{A}})\right] Q_{\text{pri}}^h(\mathcal{B}_{\text{pri}}).\end{aligned}$$

Now, observe that Assumption B4 implies that for each $l \in \mathcal{B}_{\text{rpi}}$,

$$D^*_{\text{pri}}(\boldsymbol{\mathcal{B}})\left[p^J_l(\boldsymbol{\mathcal{B}}) - p^J_h(\boldsymbol{\mathcal{A}})\right]Q^h_{\text{pri}}(\mathcal{B}_{\text{pri}}) - GFT^I_l\left(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right) \geq -GFT^I_l\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{B}})\right).$$

Combining the preceding three inequalities then yields the result:

$$k(\boldsymbol{\mathcal{A}}) \geq \tilde{\pi}^I_*(\boldsymbol{\mathcal{B}}) + \sum_{l\in\mathcal{B}_{\text{pri}}}\left[D^*_{\text{pri}}(\boldsymbol{\mathcal{B}})\left[p^J_l(\boldsymbol{\mathcal{B}}) - p^J_h(\boldsymbol{\mathcal{A}})\right]Q^h_{\text{pri}}(\mathcal{B}_{\text{pri}}) - GFT^I_l\left(\boldsymbol{\mathcal{A}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{A}})\right)\right]$$

$$\geq \tilde{\pi}^I_*(\boldsymbol{\mathcal{B}}) - \sum_{l\in\mathcal{B}_{\text{pri}}} GFT^I_l\left(\boldsymbol{\mathcal{B}}, \boldsymbol{p^J}(\boldsymbol{\mathcal{B}})\right) = k(\boldsymbol{\mathcal{B}}). \square$$

The USC-Brookings Schaeffer Initiative for Health Policy is a partnership between the Economic Studies Program at Brookings and the USC Schaeffer Center for Health Policy & Economics and aims to inform the national health care debate with rigorous, evidence-based analysis leading to practical recommendations using the collaborative strengths of USC and Brookings.

Questions about the research? Email communications@brookings.edu.
Be sure to include the title of this paper in your inquiry.