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Insurer pricing and consumer welfare: evidence from Medigap

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This article examines the welfare impact of imperfect competition in the Medicare supplement insurance (Medigap) market. Two firms control nearly three fourths of the Medigap market, and premiums exceed claims by over 25%. I find that a low price elasticity and consumers' brand preferences lead firms to engage in substantial marketing and price above cost. Therefore, the strategic behavior of insurers facing relatively inelastic demand is critical in explaining poor market performance. I also find that insurers do not capture all of the rents in this market; rents also accrue to actors who perform marketing functions, including agents and brokers.

1. Introduction

■ The Patient Protection and Affordable Care Act (ACA) was signed into law in March 2010 and represents a substantial health insurance expansion. The legislation relies on health insurance markets to organize the affordable provision of health insurance and assumes that competition will reduce premiums. Yet rising insurance market concentration has contributed to rising premiums for consumers and families (Dafny et al., 2012), and the cost of insurer market power, often borne by consumers, has led to arguments for increased antitrust enforcement and stricter regulation. This article examines a market in which insurer market power leads to inefficient outcomes despite regulation: the Medicare supplement insurance (Medigap) market. In this market with standardized products and caps on insurer profits, two firms sell nearly three fourths of the Medigap policies, and premiums exceed claims by nearly 30%. Although the market is policy relevant on its own, this article also addresses a broader issue by asking *why* insurance markets are often highly concentrated and, simultaneously, plagued by high premiums. What are the sources and consequences of insurer market power?

I model insurer behavior and consumer demand and estimate the model using data that contain the price and quantity of policies sold as well as claims, which represent medical costs to the insurers. Because I observe claims, I can separately estimate broker commissions, the largest component of nonmedical costs. To estimate these commissions, I assume profit maximization

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by firms, following the standard approach. However, I must incorporate regulation as a constraint on firm pricing. Insurers are subject to minimum loss ratio (MLR) regulation, which requires them to pay out a fixed proportion of premiums in claims. If this regulation binds, I assume that firms may have been able to profitably raise prices in an unregulated market.

The model of firm behavior requires estimates of consumer demand, which I obtain using a discrete choice framework that allows for the calculation of elasticities while incorporating consumer selection between plans. Asymmetric information is potentially a feature of any insurance market. Insurers are aware of the potential for selection and incorporate it into optimal pricing; therefore, it cannot simply be ignored. Failing to account for (adverse) selection in this setting would lead to overstating the importance of marketing. Therefore, I control for unpriced observables, including self-reported health (SRH), which may affect demand.

My estimates suggest a low own-price demand elasticity for Medigap insurance, strong brand preferences, and limited evidence of asymmetric information. The average own-price demand elasticity, at –1.1, allows insurers to price far above marginal cost, and the brand preferences are associated with brand-promoting activity. I show that these rents are dissipated throughout the supply chain, flowing to agents and brokers, as well as groups such as AARP (the organization formerly known as the American Association of Retired Persons) that perform vital marketing functions for insurers. Three counterfactual exercises, representing average cost pricing, tighter pricing regulation, and reduced incentives for marketing, describe the magnitude of market power in this market and examine policies that improve consumer welfare.

The first counterfactual shows that average cost pricing lowers premiums by 17%, illustrating the value of more competitive pricing to consumers. Based on this finding, I conclude that imperfect competition is a critical issue in this market and investigate policies to reduce insurer market power. In the second counterfactual, I examine the impact of more stringent MLRs imposed by the ACA and show that strengthening pricing regulation can reduce the premiums paid by consumers.[1] The third counterfactual shows that providing information to consumers to reduce the impact of marketing can also improve consumer surplus.

A key contribution of this article is the ability to explore the sources and consequences of firm market power in the health insurance industry. This article builds on the evidence in Dafny (2011) and Dafny, Duggan, and Ramanarayanan (2012) describing the role of imperfect competition in insurance markets. Similar to Cebul et al. (2011), the article highlights the importance of marketing in driving outcomes in insurance markets.[2] The article is organized as follows. Section 2 describes the Medigap market in greater detail. Section 3 describes the data, and Section 4 outlines the model. Section 5 presents the empirical estimates, which imply a small elasticity of demand driven by brand preferences. Section 6 describes counterfactual results highlighting the role of marketing in shaping consumer welfare, and Section 7 concludes.

2. The Medigap market

■ Medicare, the federally run health insurance for the elderly, has significant cost-sharing provisions. The program was designed to resemble private insurance available at the time of its inception in 1965, and the cost-sharing provisions left Medicare beneficiaries exposed to a large degree of risk. Part A, which covers hospitalization, has a deductible, the amount the patient must pay before insurance begins, of around $1,000. Part B, which covers outpatient services, requires that the patient cover 20% of services (copayments) with no limit on out-of-pocket expenditure. As a result, nearly all seniors obtain some form of supplemental insurance to cover these costs. This section describes the market for supplemental insurance.

[1] However, this may also make firms unprofitable and create disincentives for cost-cutting innovations. Reducing the impact of marketing would also lead to a more competitive market with premiums approaching average cost pricing.

[2] See Maestas, Schroeder, and Goldman (2009) for a model of search costs, Fang, Keane, and Silverman (2008) for a discussion of cognitive constraints, and Hall (2000) for a description of the role of brokers.

TABLE 1 Medicare Supplement Plans

	A	B	C	D	E	F	G	H	I	J	K	L
Part A coinsurance	X	X	X	X	X	X	X	X	X	X	X	X
Part B coinsurance	X	X	X	X	X	X	X	X	X	X	0.5	0.75
Blood	X	X	X	X	X	X	X	X	X	X	0.5	0.75
Hospice											0.5	0.75
Skilled nursing			X	X	X	X	X	X	X	X	0.5	0.75
Part A deductible		X	X	X	X	X	X	X	X	X	0.5	0.75
Part B deductible			X			X				X		
Part B excess charges						X	0.8		X	X		
Foreign travel emergency			X	X	X	X	X	X	X	X		
At-home recovery							X		X	X		
Preventative care coinsurance	X	X	X	X								
Preventative care						X				X		
Market share	4%	3%	12%	4%	2%	49%	8%	1%	1%	15%	1%	1%

Source: NAIC data. Percentages do not add to one because of rounding. The "X" denotes plan coverage. The numbers in the final two columns represent the fraction of cost covered.

□ **Product standardization.** Medigap insurance arose to meet the demand for wrap-around coverage for extra expenses not covered by Medicare. Minimum standards were introduced in various states in the 1970s due to allegations of insurer fraud, consumer confusion, and duplicate coverage, and minimum standards were implemented nationally in 1980 (Finkelstein, 2004). The plans' financial and network characteristics were standardized in 1990, and prescription drug coverage was eliminated with the introduction of Medicare Part D, the federal prescription drug benefit. In the period of this study, consumers chose from a federally mandated menu of ten Medigap policies. A few states, such as Massachusetts and Minnesota, designed their own menus and are dropped from my analysis for simplicity. The plans and the distribution of consumers across plans are described in Table 1. The plans are similar, with the exceptions of policies K and L, which require substantial cost sharing on the part of the insured. Plans A to J cover the coinsurance on Part B outpatient services in full and plans B to J cover the Part A hospital deductible. Plan F is the most popular, covering nearly half of the Medigap population, and plans C and J capture significant portions of the market as well.

□ **Plan differentiation.** Standardization limits the ability of insurers to offer differentiated contracts. Although the plans all have standard coverage and pay claims automatically, some firms offer additional services. For example, UnitedHealth offers a nurse call line. However, Alecxih et al. (1997) note that companies choose to compete on brand reputation rather than product differentiation. The second-largest firm in the Medigap market, Mutual of Omaha, pays 16% of premiums of Medigap policies to agents in the form of commissions.[3] Other firms use a national strategy to market their policies. The largest firm, UnitedHealth, is a large player in other lines of health insurance and also uses its relationship with AARP in branding all of its marketing efforts. According to Cohn and Preston (2008), writing for Bloomberg, AARP collected nearly $500 million in royalties and fees in 2007. They have estimated that approximately $200 to $300 million of those royalties were from UnitedHealth during the time period of this study. UnitedHealth captures a large proportion of the Medigap market by advertising using the AARP brand name and selling their policies directly to consumers.[4]

[3] The commission rate is taken from a Mutual of Omaha Agent Guide. UnitedHealth's relationship with AARP closely approximates a two-part tariff, with a fixed fee and a relatively low (4%–5%) royalty fee, according to a Congressional Research report (Jacobs, 2012).

[4] Often these firms, such as Aetna, specialize in other lines of insurance but will directly sell Medigap on their website or over the phone. As a result, they do not sell many policies but also do not need to pay commissions on the policies they sell.

□ **Modified community rating.** Consumers have six months to choose a Medigap policy after turning 65 and enrolling in Medicare Part B without being subjected to medical underwriting. After that, insurers can ask about, and price based upon, preexisting conditions and current health status. In addition to supplemental coverage through a previous employer or Medigap, seniors can choose a Medicare HMO (health maintenance organization) or a prescription drug plan; some seniors are also eligible for additional benefits from Medicaid or the Veterans Administration. During the open-enrollment period, insurers can only price coverage based on age, gender, and smoking status. Evidence from Robst (2006) indicates that most consumers purchase Medigap during the open-enrollment period and are not subject to medical underwriting; premiums are primarily a function of state of residence, age, and gender. Firms may choose to base premiums on the age at which the policy was issued (issue age), the current age of the consumer (attained age), or community rated. The premiums for attained-age policies are cheaper initially but increase over time.

□ **Minimum loss ratios.** Medigap insurers are subject to loss ratio regulations. Federal regulation requires a MLR, defined as claims incurred divided by premiums collected, of 65% for individual plans. In other words, for each $1 in premiums collected, $0.65 must be spent on medical claims. If plans violate this regulation, they are required to pay transfers to policyholders to make up the difference. In practice, however, the insurer often contests the potential fine and the rates are allowed to stand. These loss ratios are measured, calculated, and enforced at the insurer-by-plan level (Rapaport, 2012).

□ **Retaliatory taxes.** Finally, Medigap insurers are subject to retaliatory taxes based on their state of incorporation. Retaliatory taxes work as follows: suppose insurance company A is incorporated in Illinois, a state with a 1% premium tax, and company B is incorporated in Indiana, a state with a 4% premium tax. Illinois charges company B a retaliatory tax of 4% on the premiums it collects in Illinois. Therefore, different companies in the same state face different tax rates. These taxes are exempt from rules governing interstate commerce, and are levied by all states. These retaliatory taxes will be used as a price instrument in estimation.

3. Data and summary statistics

■ I use two sources of data in this study. Market-level administrative data from the National Association of Insurance Commissioners (NAIC) contain premiums, quantities of new policies sold, and claims at the state-insurer-policy level. The data are aggregated into three-year periods: the 2006 data contain new policies sold from 2004 to 2006, the 2007 data contain new policies sold from 2005 to 2007, and the 2008 data contain new policies sold from 2006 to 2008. Individual-level data from the 2005 Medicare Current Beneficiary Survey (MCBS) provide information about the types of consumers who purchase Medigap insurance. The MCBS is a survey of a nationally representative panel of Medicare beneficiaries that is linked to administrative records from Medicare. It provides information on expenditures, coverage, and a wide variety of demographic characteristics. I use several variables from this data, including demographic characteristics and a dummy for having any Medigap coverage. In order to match the demographics of consumers represented in the plan-level data, I restrict the MCBS sample to consumers under the age of 72, who are most likely to be the new policy holders in the NAIC data. Summary statistics describing consumers are found in Table 2. About 24% of the sample purchases Medigap insurance; this is representative of the Medicare eligible population as a whole. The income variable indicates an average income of $36,803, with a substantial amount of variation.

The American Medical Association (AMA) reports that nearly all acute care health insurance markets qualify as "highly concentrated" by the standards of the Department of Justice. Plan-level NAIC data confirm high insurer concentration in the Medigap market. Table 3 shows Medigap market share data at both the national and state level. UnitedHealth is the dominant player in

TABLE 2 Subsample Demographics

	Subsample
Income	$36,803.60
	($57,278.53)
Self-reported health	2.59
	(1.11)
% Medigap	23.62%
	(42.48%)
Private insurance premium paid	$1,702.13
given purchase	($1,440.84)

Source: MCBS individual-level data. Standard deviations in parentheses. Self-reported health is ranked on a 1–5 scale where 1 is excellent and 5 is poor. Sample is restricted to consumers under 72 years of age. Medigap coverage is defined as having self-purchased private insurance. Consumers who are eligible for VA benefits (TRICARE) or Medicaid are not included in the subsample.

TABLE 3 Firms and Market Structure

	National Market Share	Share of Active Markets	Average Premium
UnitedHealth	0.46	0.98	1534.82
Mutual of Omaha	0.24	0.95	1398.38
Conseco	0.09	0.90	1615.26
American Financial	0.04	0.78	1630.09
HCHSC	0.03	0.05	1815.55
Genworth Financial	0.02	0.88	1517.81
State Farm	0.02	0.59	2159.99
American Republic Mutual	0.02	0.53	1323.05
Universal American Financial	0.01	0.79	1771.63
Guarantee Trust	0.01	0.50	1756.02
Physicians Mutual	0.01	0.68	1596.92
USAA	0.01	0.90	1677.31
American National Financial	0.01	0.67	1247.75
Atlantic American	0.01	0.63	1531.27
Thrivent Financial for Lutherans	0.01	0.38	1629.46
State Mutual Company	0.01	0.16	703.04
Humana	0.01	0.67	1247.23
Liberty National	0.01	0.88	1736.36

Source: NAIC plan-level data. The first column is the percentage of all Medigap plans sold by the firm. The second column gives the percentage of markets in which the firm offers any policy, and the third column is the average list premium.

the market, capturing 46% of the national market and nearly 50% of each state's market on average. Mutual of Omaha sells nearly one fourth of all policies nationwide; taken together, the two firms sell nearly three fourths of all Medigap policies. Beyond the top ten firms, no insurer captures more than 1% of the market, even though recognizable companies offer coverage. For example, State Farm, a firm normally associated with property and casualty insurance, captures approximately 2% of the market.

Despite modified community rating and product standardization, premiums paid vary considerably. Furthermore, MLRs are low in this market, implying that loads, calculated as one minus the MLR, are high. Loads represent an upper bound on insurer variable profits; however, any nonmedical costs reduce this margin. Table 4 shows prices, claims, and loads. For plans F and

TABLE 4 Premiums and Claims by Plan

Plan	% Load	Number of Policies	Weighted Premium ($)	Weighted Claim ($)	Enrollment
A	0.2006	1403	1457.25	1223.8	356.33
	(0.8152)		(743.26)	(1161.64)	(1789.9)
B	0.2192	1079	1562.31	1218.03	350.83
	(0.9803)		(493.55)	(554.31)	1159.28
C	0.2387	1764	1729.26	1398.4	908.62
	(0.5814)		(389.37)	(460.22)	(4973.19)
D	0.3182	1822	1546.58	1150.81	325.11
	(0.5145)		(459.44)	(451.93)	(1057.07)
E	0.3055	668	1691.22	1235.19	424.98
	(0.3863)		(511.84)	(459.03)	(1343.59)
F	0.3213	3518	1518.81	1170.77	1908.30
	(0.4834)		(663.37)	(524.24)	(7807.93)
G	0.3228	1936	1500.26	1094.19	591.17
	(0.4301)		(446.44)	(380.99)	(2034.61)
H	0.2414	266	1379.37	1033.05	394.96
	(0.4582)		(1379.37)	(493.11)	(1326.39)
I	0.3778	327	1675.13	1252.45	573.50
	(0.3777)		(352.85)	(310.48)	(1363.90)
J	0.3539	716	1503.1	1130.17	2977.45
	(0.4335)		(380.23)	(341)	(9524.50)
K	0.4543	308	712.59	477.71	176.87
	(0.4739)		(196.4)	(183.35)	(429.76)
L	0.36	339	1183.35	784.1	251.01
	(0.5218)		(263.68)	(784.3)	(1502.79)

Source: NAIC market-level data. Standard deviations in parentheses. Self-reported health is ranked on a 1–5 scale where 1 is excellent and 5 is poor. Column 2 describes the unweighted average load, and column 3 describes the number of policies. Columns 4 and 5 represent total enrollment-weighted averages of premiums and claims, respectively, with the weights reported in the final column.

J, loads average 32% and 35%, respectively. Given that loads average nearly 30% of premiums, MLRs are often violated in the NAIC data set.[5]

Figure 1 details enrollment-weighted MLRs for all plans. The median consumer is enrolled in a plan that pays out roughly $0.75 in claims for every $1 collected in premiums. As this exceeds the current minimum loss ratio in the Medigap market, it is below the guidelines set forth in the Affordable Care Act. Roughly 10% of enrollees are enrolled in a plan that violates the minimum loss ratio of 65% in the Medigap market, though roughly half of those consumers are enrolled in plans that violate the MLR regulation by 5% or less. Because MLRs are monitored at the plan level in the Medigap market, it is important to account for the possibility that firms are likely constrained by the regulation when pricing.

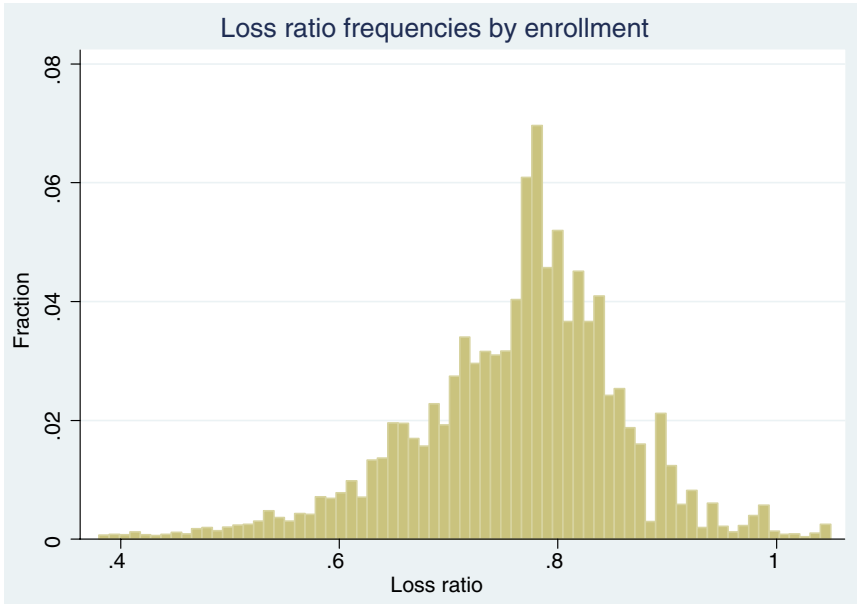
4. Model

■ The model reflects several key Medigap market characteristics: firms are constrained by MLRs, consumers are allowed to have preferences over brands even though the financial features of the plans are standardized, and policies are not medically underwritten. A market is defined as the pool of first-time enrollees in a state-year combination. A set of products J, defined by the contract letters discussed earlier, are offered by a set of firms F in a set of markets M. For

[5] The data used includes new policies sold, and the enrollees in the data are likely to be younger and healthier than average, a fact insurer actuaries are likely to point out to regulators. Therefore, the regulators may not strictly enforce minimum loss ratios in this setting.

FIGURE 1

LOSS RATIOS



an individual consumer, the firm earns the difference between the premium charged and the combination of medical costs (claims) and nonmedical costs (commissions).

□ **Insurer behavior.** Firms set prices p_{jfm} for all offered policies to maximize variable profits, cognizant of the fact that the vector of market prices p_m affects not only shares s_{jfm}, but also additional marginal costs a_{jfm} and claims γ_{jfm} if there is selection. Firm $f's$ problem is to maximize variable profits over policies j in market m with market size M and is written as:

$$\max_{p_{jfm}} \Sigma_j[(p_{jfm} - \gamma_{jfm}(\mathrm{p}_m) - a_{jfm}(\mathrm{p}_m))s_{jfm}(\mathrm{p}_m)\mathrm{M}] \quad (1)$$
$$s.t. \gamma_{jfm} \geq .65 p_{jfm}.$$

Because additional marginal costs are largely broker commissions, a_{jfm} is parameterized as a percentage of the premium charged. The constraint represents MLRs; however, I do not assume that regulation is strictly enforced. I only assume that a firm violating or facing binding MLR regulation cannot improve its profits by lowering its price.[6] If the MLR is violated or binding, it must be that $\frac{\partial}{\partial p_{jfm}}(\Pi_{fm}) \geq 0$, and if the regulation is not binding, $\frac{\partial}{\partial p_{jfm}}(\Pi_{fm}) = 0$.[7] That is, if the MLR is violated or binding, there are two possibilities. Either the first-order condition is zero, and the firm is setting the optimal premium, or the first-order condition is positive and the firm could profitably deviate by setting a higher price in the absence of the regulation.

□ **Consumer preferences.** The supply-side model relies on knowledge of consumer preferences to construct $\partial s_{jfm}/\partial p_{jfm}$ and $\partial \gamma_{jfm}/\partial p_{jfm}$. Insurers offer a wide range of products; even within Medigap's standardized policies, consumers choose from a standardized menu of policies offered

[6] Given the assumption that regulation need not strictly hold, the complementary slackness condition is relaxed such that $\mu_{jm}\left(.65 p_{jfm} - \gamma_{jfm}\right) \leq 0$ if $\mu_{jm} \geq 0$, where μ_{jm} is the Lagrange multiplier.

[7] The results of a counterfactual in which loss ratio regulation is lifted are in Appendix B. In the absence of regulation, premiums would rise; the regulation does manage to restrain premiums.

by a large number of insurers. For all consumers, a product is valued as a bundle of characteristics: the premium, the letter of the policy A to L, denoted by x_j, a dummy variable for the brand of the company from which the product is purchased, denoted by b_j, and a market fixed effect x_m. I model consumers as having preferences over individual brands; therefore, a consumer could obtain higher utility from an AARP-sponsored policy A than a Mutual of Omaha-branded policy A, even if the latter has lower premiums. Consumer i's valuation from product j offered by firm f in market m is given by:

$$v_{ijm}\left(x_j, \xi_{jfm}, p_{jfm}, \omega_i, z_i; \theta^d\right) = x_j'\beta_1 + b_f'\beta_2 + x_m'\beta_3 + \xi_{jfm} + \alpha p_{jfm} + \mu_{ijfm} + \varepsilon_{ijfm}. \quad (2)$$

The unobserved product characteristics, ξ_{jfm}, represents deviations from the brand and lettered-policy fixed effects (i.e., UnitedHealth's plan J may be especially attractive). The individual-specific deviation from the mean utility, μ_{ijm}, depends on consumer income ω_i and SRH status z_i.[8]

In insurance markets, consumer heterogeneity is a key feature of the pricing problem facing insurers: firms care about the types of consumers they attract because different types of consumers will incur higher or lower claims. Therefore, both the elasticity of demand and the relationship between premiums and claims, measured by the slope of the claims function $\partial\gamma_{jfm}/\partial p_{jfm}$, will affect equilibrium prices. The claims function $\gamma_{ijm}\left(x_j, \omega_i, z_i\right)$ relates claims to plan and consumer characteristics. Let γ_{ijm} be the claim of individual i under policy j in market m and write:

$$\gamma_{ijm}\left(x_j, \omega_i, z_i\right) = \theta_0 + x_j'\theta_1 + \omega_i'\theta_2 + z_i'\theta_3 + \vartheta_{ijm}, \quad (3)$$

where the error ϑ_{ijm} is a function of both an individual-level and plan-level error $\vartheta_{ijm} = \varepsilon_{jm} + \eta_i$. Section 5 describes how claims are aggregated and used to generate moments.

□ **Discussion.** Three modelling decisions deserve additional discussion. First, the demand system does not model consumer risk aversion directly. In the most basic model of insurance, consumers value both their health status and consumption. The two are linked because medical expenditures depend on health status and may, in turn, improve health. Such a model requires a great deal of data about the potential states of the world, the probabilities of those states, and expenditures in those states. Except for binary cases, such as Handel (2013), or Cohen and Einav (2007), it is nearly impossible to even enumerate the states of the world due to data limitations. Given the data available in this market, it is impossible to estimate the full distribution of risk types and risk preferences. Therefore, I consider a simplification where the consumer has a valuation over insurance contracts using a discrete choice model.

Second, the demand system and insurer's problem are both static simplifications of a dynamic problem. The choice to model the decision as static is data driven and provides tractability. The market-level data provide information on new policies sold, which allows me to abstract away from issues related to plan switching or cancellation. Because I observe consumers the first time they purchase a given policy, it is less likely that they are being subjected to medical underwriting. Because they have no history in this market, consumer inertia or switching costs do not bias my demand estimates. In addition, the static model reflects that potential consumers who are already confused by a wide array of options may not be completely forward looking.[9]

In addition to modelling the problem as a static consumer problem in a discrete choice model, I allow consumers to have brand preferences when choosing policies. The structural parameters illustrate that even within a lettered contract, own-price elasticities are not infinite. The UnitedHealth plan A in a given market captures a large share of the market even when it is far from being the cheapest plan available. This is sufficient to imply that consumers do not

[8] The Appendix provides alternative specifications for μ_{ujfm}.

[9] Finally, because firms almost always rate all policies in their portfolio according to the same rating method (attained-age, issue age, or community), I can simplify the dynamic component of the consumer's choice problem using brand fixed effects.

view the products as perfect substitutes, that they incur search costs and may not choose from the full set of contracts available, or both. Incorporating both search costs and brand preferences into a model of consumer choice is challenging: both will give rise to similar patterns in aggregate data.[10] Therefore, in this application, I model consumers as having brand preferences, rather than incurring search costs. Consumers may want to purchase a plan from a trusted name or because that plan is more likely to be in the consumer's choice set. I view brand effects as a reduced-form proxy for the combination of the intrinsic preference for a trusted name and any potential search costs that are reduced by insurer marketing. Therefore, insurer marketing may increase the absolute or relative ranking of a plan within a consumer's choice set or may increase the probability that a plan is in the consumer's consideration set. This modelling decision limits my ability to interpret some counterfactuals; however, both search costs and brand preferences give rise to similar incentives for insurers to heavily market their policies, and subsequently price them above medical costs.

In addition to these assumptions, I take the market structure as given, though estimates of entry costs are available in the Appendix. Finally, although I control for consumer heterogeneity in preferences, which may give rise to adverse or advantageous selection, this article does not explicitly consider asymmetric information as a source of welfare loss. However, I model observed consumer heterogeneity and incorporate selection into firm pricing decisions. Bundorf, Levin, and Mahoney (2010) consider selection and the impact of risk rating using a model of consumer demand, and find that more sophisticated, risk-based pricing would do little to improve consumer surplus. Lustig (2010) presents a model of consumer choice that uses assumptions about firm pricing to identify (unobserved) costs. Both studies implicitly argue (along with an increasingly voluminous literature, including Einav, Finkelstein, and Cullen, 2010) that selection is unlikely to cause decreases in consumer surplus of any significant magnitude due to mispricing. I expand this work by providing a mechanism through which market failure occurs in insurance markets, even in the absence of selection.

5. Estimation

■ Estimation of consumer preferences and the determinants of medical claims utilizes three sets of moments. First, demand moments are constructed using the Berry, Levinsohn, and Pakes (1995) algorithm. Price is likely to be endogenous and correlated with the unobserved product characteristic, ξ_{ifm}. The unobserved product characteristic contains anything about the insurance product that is not captured by plan, brand, and market fixed effects. The exclusion restriction could be violated if, for example, firms use different rating methods in different markets based on local demand, or if brokers differentially push certain policies within a company's line of products.[11] The data do not contain information on the rating method, but firms often use only one form of rating; for example, UnitedHealth uses only community rating, which will be absorbed in the brand fixed effect. Therefore, in the presence of the brand dummy variables (Nevo, 2003), I have controlled for a significant amount of potential for price endogeneity in my specifications.

In addition, I use two sets of price instruments to correct for the endogeneity problem. Retaliatory tax regimes allow me to instrument for prices and include firm fixed effects, because the taxes vary for the same firm across markets.[12] Figure 2 details the impact of retaliatory taxes. Although just over one third of policies do not face retaliatory taxes, a large fraction of policies

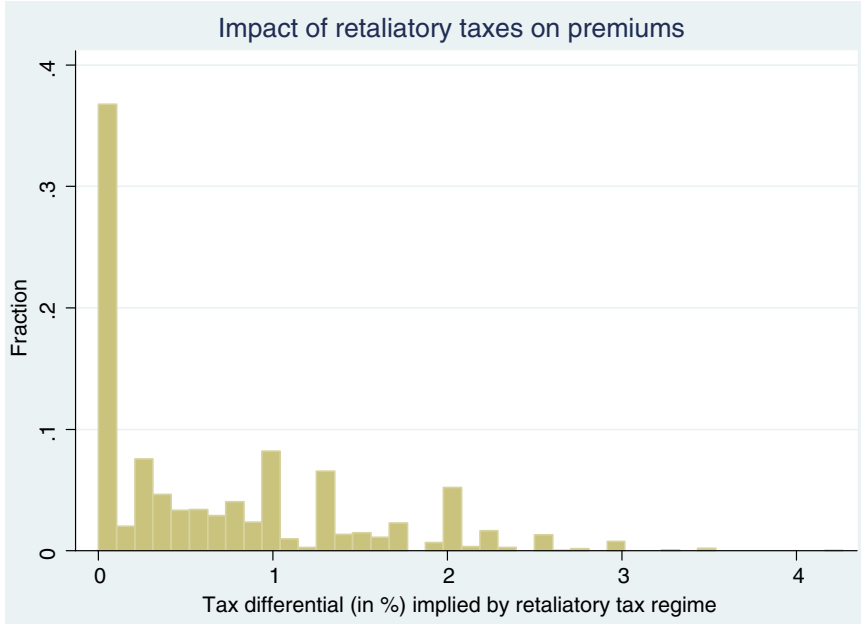
[10] To separately identify search costs from brand preferences, there must be a variable that shifts search costs without changing brand preferences.

[11] It is also possible, but highly unlikely in practice, that firms rate policies differentially within the same market. However, most firms, including UnitedHealth, rate all policies the same way. Using brand, market and policy dummies should absorb a great deal of variation.

[12] The retaliatory taxes have an effect on entry (indirectly) and prices (directly). A company only enters a market in which it will face higher than average taxes if it can compete on price, but some of the additional tax is passed on to consumers in the form of higher premiums.

FIGURE 2

RETALIATORY TAXES



are affected by these policies; the median retaliatory tax is 1% of the premium, or roughly $15. Because retaliatory taxes vary at the firm-market level, rather than the firm-market-policy level, I also include a second set of instruments: the average premiums of policies in other markets (Hausman, 1999). For example, for policy A in Pennsylvania in 2006 offered by UnitedHealth, the instrument is the average premium of policy A offered by UnitedHealth in any state-market combination *except* Pennsylvania in 2006.

In addition to the Berry et al. (1995) moments, the model incorporates the individual MCBS data to simulate consumer characteristics, relate consumer characteristics to claims, and construct micro moments. For each market, I take *ns* draws of consumers from the analysis subsample. I hold their demographic measures of health and income, as well as an indicator for whether or not they purchased a Medigap plan and the premium paid conditional on purchase, in memory. At the aggregate level, I observe plan-level claims from the NAIC data. Therefore, I construct the average consumer characteristics in a plan given consumer choices and relate consumer and plan characteristics to claims. To minimize the extent to which outliers drive my results, I model claims in logs, rather than levels. The log plan-level claims γ_{jm} are given by:

$$\log(\gamma_{jm}) = \log(E_i[\gamma_{ijm}|J = j]) = \theta_0 + x_j'\theta_1 + E_i[\omega_i|J = j]'\theta_2 + E_i[z_i|J = j]'\theta_3 + x_m'\theta_2 + \varepsilon_{jm}, \quad (4)$$

where x_m are market fixed effects and x_j are lettered-plan dummies, as before.[13] This equation can be estimated using the firm-level claims data and information from the demand system, forming the second set of moments. Finally, micro moments that match the probability that individual i purchases a Medigap policy $(1 - s_{i0m})$ and that the premium paid by an individual $(\Sigma_{j\in m} p_{ijm} s_{ijm})$ to the data are used. In other words, the estimation combines the standard BLP moments with

[13] Although claims may depend on the observed consumer characteristics and the plan's contract letter, the unexplained part of an individual's claims does not depend on the plan chosen. This implies that $E_i(\eta_i|J = j) = 0$; there is no *plan-individual* specific moral hazard.

the moments generated by the claims equation and micro moments that utilize individual-level information.

Commissions are estimated separately, conditional on the estimated demand parameters. If MLRs were never binding or violated, identification of commissions would be straightforward given an assumption of an interior, pure strategy Nash equilibrium in price (Bresnahan, 1981). By contrast, if every firm violated or was bound by MLR regulation, the model would provide *partial identification* of the parameters of interest. Intuitively, if firms facing binding regulation can profitably raise prices in the absence of regulation, the marginal cost is bounded above by the difference between the premium charged and the optimal markup. Costs can be written as $c_{jfm} = \gamma_{jfm} + \beta_f p_{jfm} + \omega_{jfm} = \overline{c}_{jfm} + \omega_{jfm}$, where ω_{jfm} is a linear unobserved cost term. The assumption above in the single product case implies that[14]:

$$p_{jfm} \leq \overline{c}_{jfm} - \frac{s_{jfm} - \partial \overline{c}_{jfm}/\partial p_{jfm}}{\partial s_{jfm}/\partial p_{jfm}} + \omega_{jfm}. \tag{5}$$

Firm-specific broker commissions, β_f, are identified by the assumption that firms price optimally given regulation. If MLRs bind or are violated, the model assumes that firms may prefer to raise their price in the absence of regulation, and the estimation routine does not penalize parameter vectors that imply a price higher than the observed premium. For any potential vector of estimates and any given policy, if MLR regulation binds or is violated and the first-order condition is positive, the estimation routine sets the moment equal to zero. I then minimize the inner product of the moments.

□ **Structural parameters.** Table 5 presents estimates of the main effect of premiums and lettered policies on consumer utility, and Table 6 describes the impact of consumer heterogeneity on utility and claims. In both tables, column 1 does not allow SRH to affect demand and, therefore, cannot accurately describe the relationship between SRH and claims. The specifications in columns 2–4 vary in how they incorporate consumer heterogeneity. Column 2 allows SRH to affect price sensitivity, and column 3 allows health status to affect preferences for holding any Medigap policy and the disutility of the premium. Column 4 allows consumers to vary in their preference for a UnitedHealth or Mutual of Omaha plan. Column 4 shows that consumers in poorer SRH prefer trusted brand names (UnitedHealth and Mutual of Omaha) more than other brands. Because both price and brand are vertical characteristics, the two models imply similar results, yet column 4 has a more natural interpretation and is the preferred specification used in the supply-side estimation routine.[15] In the preferred specification, sicker consumers (a higher numerical value for SRH) sort into more expensive plans from trusted insurers, leading to a positive relationship between premiums charged and claims: a $100 increase in premium is associated with a $9 increase in average claim.[16]

Across all specifications, premiums enter utility with the expected sign, and the most popular policies (F and J) have a large, positive effect on consumer utility. Less generous plans, such as K and L, are less valuable to consumers. Throughout all of the specifications, I estimate similar own-price elasticities. The average elasticity in column 4 is –1.13, indicating that a $100 increase in price results in a 7.5% reduction in market share. Given that the coverage of lettered contracts is identical and they are likely to be close substitutes, I interpret this as a relatively small price sensitivity. Underpinning this elasticity is a combination of strong brand preferences and,

[14] Assuming negative own-price elasticities and that the unobserved cost term is unaffected by prices directly.

[15] The exact magnitudes of the coefficients in Table 6 differ because the derivatives of average SRH with respect to price differ.

[16] The relationship would indicate that people who report being in poor health incur higher claims than those who report being in excellent health. This effect works not through financial generosity, as in many models of adverse selection, but through the level of the vertical brand effect.

TABLE 5 Demand Parameters

	(1)	(2)	(3)	(4)
Premium (in hundreds of $)	−0.0767	−0.1053	−0.1049	−0.0771
	(0.0070)	(0.0070)	(0.0070)	(0.0076)
B	0.1007	0.1046	0.1043	0.0995
	(0.0819)	(0.0818)	(0.0818)	(0.0848)
C	0.5484	0.5521	0.5520	0.5434
	(0.0864)	(0.0860)	(0.086)	(0.0900)
D	0.5235	0.5350	0.5347	0.5247
	(0.0826)	(0.0826)	(0.0827)	(0.0845)
E	0.4254	0.4395	0.4390	0.4315
	(0.1105)	(0.1107)	(0.1108)	(0.1129)
F	1.5931	1.6028	1.6024	1.5987
	(0.0765)	(0.0764)	(0.0764)	(0.0782)
G	0.8371	0.8478	0.8474	0.8471
	(0.0856)	(0.0856)	(0.0856)	(0.0873)
H	−0.4497	−0.4403	−0.4406	−0.4455
	(0.1229)	(0.1232)	(0.1232)	(0.1309)
I	0.1165	0.1236	0.1233	0.1219
	(0.1071)	(0.1072)	(0.1072)	(0.1119)
J	1.8904	1.8999	1.8996	1.9010
	(0.0960)	(0.0961)	(0.0961)	(0.0985)
K	−1.4513	−1.4460	−1.4463	−1.4439
	(0.1094)	(0.1096)	(0.1096)	(0.1161)
L	−1.0290	−1.0224	−1.0228	−1.0206
	(0.1054)	(0.1057)	(0.1057)	(0.1114)

Notes and Sources: MCBS data, NAIC data, and author calculations described in the text in detail. Brand dummies are included in the demand moments. Standard errors, adjusted for simulation error, are in parentheses.

potentially, search costs. The final row shows that the value of the AARP/UnitedHealth brand is equivalent to a $100–$200 price reduction for a consumer in average health.[17]

The results of the demand system are driven by strong relationships in the market-level data. The low own-price demand elasticity and brand preferences are driven by the large amount of dispersion in premiums paid and the lack of a strong relationship between premium and market share. The interactions with consumer characteristics and the implication that sicker patients sort into trusted brand names are driven by a strong positive relationship between premiums and claims in the raw data, even when you instrument for claims, as described in Table A1. The key parameters from the demand-side estimation—the relationship between average claim and the insurer's choice variables, own-price elasticities, and the value of being a trusted brand in monetary terms—are inputs into supply-side estimation.

Table 7 contains estimates of commissions. The second row estimates a mean commission for all firms, ignoring different marketing strategies, and finds that the average commission is equal to 16% of premiums. The remaining rows contain estimates from the preferred specifications that allow for heterogeneity across firms, using a full set of group dummy variables to capture firm-specific administrative costs. The estimates for UnitedHealth are small; they pay only 7% of premiums collected in administrative costs.[18] By contrast, Mutual of Omaha, which employs a fleet of agents to sell its policies, is estimated to pay 18% out of premiums in administrative costs.

The estimates of commissions are very sensible. MLR regulation theoretically bounds margins net of administrative costs from above at 35% of premiums, and commissions are estimated

[17] This effect is so large that it swamps any dynamic concerns discussed above. It would take nearly 20 years for issue age premiums to fall below this amount (see Robst, 2001). The average UnitedHealth consumer pays a 15% premium; the dynamic premium increase varies by only 1%–2%.

[18] This is consistent with the 4%–5% royalty rate to AARP, cited earlier, plus a small cost of processing claims.

TABLE 6 Additional Demand and Claim Parameters

	(1)	(2)	(3)	(4)
Panel A. Parameters of claim equation				
income	0.0075	0.0012	0.0013	0.0082
	(0.0005)	(0.0008)	(0.0284)	(0.0011)
SRH	−0.0795	0.6696	0.6581	0.1643
	(0.0338)	(0.0324)	(1.2776)	(0.0122)
B	0.3728	0.3234	0.3249	0.3170
	(0.0410)	(0.0410)	(0.0410)	(0.0480)
C	0.5091	0.4750	0.4765	0.4857
	(0.0365)	(0.0354)	(0.0365)	(0.0357)
D	0.2708	0.2426	0.2436	0.2793
	(0.0366)	(0.0357)	(0.0366)	(0.0361)
E	0.2667	0.2574	0.2581	0.2670
	(0.0464)	(0.0457)	(0.0464)	(0.0451)
F	0.2031	0.1980	0.1985	0.2367
	(0.0348)	(0.0338)	(0.0348)	(0.0340)
G	0.2372	0.2226	0.2233	0.2422
	(0.036)	(0.0351)	(0.036)	(0.0353)
H	0.2486	0.2559	0.2561	0.2045
	(0.064)	(0.0632)	(0.064)	(0.0612)
I	0.1512	0.1550	0.1554	0.0955
	(0.0646)	(0.0640)	(0.0646)	(0.0637)
J	−0.0760	−0.0443	−0.0446	−0.0521
	(0.0548)	(0.0535)	(0.0548)	(0.0523)
K	−0.9429	−0.8876	−0.8891	−0.9487
	(0.0723)	(0.0715)	(0.0723)	(0.0673)
L	−0.3868	−0.35419	−0.35493	−0.39877
	(0.0695)	(0.0638)	(0.0603)	(0.0625)
Panel B. Consumer demand heterogeneity				
income*premium	0.0002	0.0002	0.0002	0.0001
	(0.0000)	(0.0000)	(0.0000)	(0.1669)
Self-reported health*premium		0.0106	0.0104	
		(0.0004)	(0.0055)	
Self-reported health*1(Medigap)			0.0023	
			(0.1398)	
Self-reported health*1(United or Mutual of Omaha)				2.2397
				(0.1669)
Panel C. Impact of estimates				
mean elasticity	−1.1301	−1.1227	−1.1230	−1.1338
Mean derivative of claims w/r/t price	0.0091	0.0716	0.0697	0.0940
Value of AARP brand effect (in hundreds of $)	1.1863	1.1122	1.1131	2.0279

Source: NAIC market-level data, MCBS individual-level data, and author calculations described in the text in detail. Brand dummies are included in the demand side moments. Standard errors in parentheses. Self-reported health is ranked on a 1–5 scale where 1 is excellent and 5 is poor.

at 15%–20% in this industry.[19] As a proportion of premiums and claims, marketing costs appear substantial. However, this estimate masks the heterogeneity of marketing costs. UnitedHealth is estimated to have substantially lower commissions, which is intuitive, because the firm engages in a substantial amount of direct sales.[20] The estimated commissions paid to proprietary Mutual of Omaha agents match the stated value of 16%, coupled with a relatively small cost of paying

[19] For an in-depth discussion of the role of brokers, see Hall (2000).

[20] Mechanically, this is for two reasons. UnitedHealth offers a broader portfolio of plans: if it raises its price on any individual plan, consumers may switch to other plans in its portfolio. In addition, because Mutual of Omaha is constrained by loss ratio regulation more often, their estimated markup is lower.

TABLE 7 Marginal Costs

	Estimate	S.E.
Market Average, Unconstrained Model	0.1942	0.0049
Market Average	0.1587	0.0011
UnitedHealth	0.0747	0.0000
Mutual of Omaha	0.1809	0.0252
Conseco	0.0814	0.0029
American Financial	0.1061	0.0010
HCHSC	0.0700	0.0002
Genworth Financial	0.1495	0.0003
State Farm	0.1630	0.0019
American Republic Mutual	0.1486	0.0001
Universal American Financial	0.1437	0.0004
Guarantee Trust	0.1506	0.0002
Physicians Mutual	0.1558	0.0002
USAA	0.1643	0.0002
American National Financial	0.1602	0.0001
Atlantic American	0.1624	0.0001
Thrivent Financial for Lutherans	0.1511	0.0002
State Mutual Company	0.2405	0.0000
Humana	0.1653	0.0001
Liberty National	0.1533	0.0006

Source: NAIC market-level data, MCBS individual-level data, and author calculations described in the text in detail. Standard errors are obtained using a bootstrap procedure that accounts for error in the demand estimates.

claims. UnitedHealth has much lower marginal costs than Mutual of Omaha; however, that does not mean their national marketing strategy is a dominant one. The licensing fee paid to AARP represents much of UnitedHealth's variable profit. Mutual of Omaha has an 8% variable profit rate, and UnitedHealth has a 16% variable profit rate. An exercise in the Appendix bounds the potential transfer to the AARP that is implied by UnitedHealth's variable profit rate and argues that it could be between $100 and $500 million dollars, in line with other sources (Cohn and Preston, 2008). It is reasonable to assume that a substantial proportion of the 16% variable profit rate accrues to the AARP.

□ Robustness checks.

Demand. The Appendix presents robustness checks. Table A1 shows the strong relationship between premiums charged and claims incurred that drives the demand estimates. Tables A2 and A3 use an alternative measure of consumer health to estimate consumer demand. Throughout, the estimates of elasticities are similar. The fourth specification in Table A3 allows the premium charged to affect claims directly and instruments for the premium charged.[21] Table A4 describes nested logit results in which all of the inside goods constitute one nest; these imply that Medigap products are fairly good, but imperfect, substitutes.

Supply. Table 7 presents an estimate of commissions that assumes firms are unconstrained by MLRs. The resulting commission is higher (19%), as firms must capture a smaller percentage of the difference between premiums and medical claims in order to justify not charging higher

[21] See Einav, Finkelstein, and Cullen (2010). The results imply similar elasticities, but a slightly larger relationship between premiums and claims, suggesting that the existing estimates may slightly understate the true relationship, and that my estimates of commissions are an upper bound.

TABLE 8 Average Cost and Claim Pricing

	Average Claim	Average Cost
Median premium (in hundreds of $)	8.8604	10.355
Median % change in premium	−0.24241	−0.17447
Median % change in enrollment	0.31231	0.21809
Median compensating variation	4.7237	3.5532
Median CV net of profit loss	2.0227	1.8458

Notes: The median premium paid is calculated as the median average premium paid across all state-year markets. The median percentage change in premium paid is calculated similarly. When noted, the change in total surplus includes both compensating variation and insurer profits. Compensating variation is calculated as the average across consumers within a market using the standard log-sum formula; the number reported is the median acrossmarkets.

premiums. [22] The Appendix also contains results testing the robustness of the supply-side model. First, I describe an alternative model that allows insurers to keep a percentage of the difference between premiums and claims if they appear to have violated the MLR regulation; I show in Table A5 that the results are qualitatively similar.[23] Second, I estimate commissions using only the 2007 and 2008 data and use the model to predict 2006 premiums. The results, in Table A6, show a relatively close fit between the predicted and observed premiums; the predicted premiums are only 4% lower than observed premiums.

6. Counterfactuals

■ The challenge of marketing insurance products leads firms to invest in marketing their products and subsequently price their products above the average claim. The rents created by consumer preferences often accrue not to the insurers themselves, but to intermediaries such as agents and brokers. Given this description of the market, how do firm market power and the role of commissions lead to higher prices for consumers?

I perform a counterfactual that requires firms to price at the average cost, inclusive of commissions, to answer this question. The counterfactual requires knowledge of preferences, costs—in the form of both claims and commissions—and the new pricing rule, which sets $p_{jm} = \gamma_{jm} + \beta p_{jm}$. Because heterogeneity in consumer preferences affects insurer costs, we need to find an entirely new vector of premiums such that for each policy the price equals the average/marginal claim of consumers that sort into that policy in equilibrium. This is closest in spirit to eliminating the impact of market power, but retaining the mispricing due to selection in which insurers price to the average, rather than marginal, claim (Einav, Finkelstein, and Cullen, 2010). Table 8 describes the results. Consumers would benefit from average cost pricing: equilibrium prices fall by 17%. The market expands by 22% and consumers would be willing to pay $355 to face the new vector of prices.[24]

Although it is clear that prices to consumers would fall if insurers were forced to price at average cost, it is not clear how to achieve such a policy goal. However, several policies discussed in the recent health-care reform have the potential to improve outcomes for consumers. I discuss two: the enactment and enforcement of minimum loss ratio regulation and federally sponsored insurance policies.

First, I consider strengthening the current MLR regulations, following the guidelines in the ACA and implemented in July 2012.[25] To simulate this regulation in the Medigap market, I

[22] An interesting implication of this result is that commissions have an ambiguous effect on the level of premiums: they raise costs, but also mute insurer incentives to raise premiums. I also estimate an unconstrained pricing counterfactual, which would predict premiums that are approximately 20% higher.

[23] Additional details are available in the Appendix.

[24] Prices fall more if the firms are forced to price at the average *claim*, exclusive of commissions. The difference between the two reflects the enrollment-weighted average commissions in this market.

[25] www.healthcare.gov/law/resources/reports/mlr-rebates06212012a.html.

TABLE 9 Policy Counterfactuals

	65% MLR	80% MLR	Mutual of Omaha Branding	United Branding
Median premium (in hundreds of $)	12.1970	11.4540	10.3520	10.2600
Median % change in premium	−0.0573	−0.1148	−0.1999	−0.2070
Median % change in consumer surplus	0.0320	0.0668	−0.1823	0.0884

Notes: The median premium paid is calculated as the median average premium paid across all state-year markets. The median percentage change in premium paid is calculated similarly.

perform two counterfactuals. In the first, I enforce the existing 65% MLR as a binding constraint for firms. In the second, I implement the MLRs in the federal reform. Table 9 describes the results. Stringent enforcement of existing MLR regulations, requiring insurers to pay out at least 65% of the premiums they collect in claims, has a small but noticeable effect on the market, lowering the average premium *paid* by 6%. The results are much larger under the new ACA regulation, which reduces premiums by nearly 12%.[26] Consumers are made better off by the regulation: consumer surplus increases by 3%–6%, and these regulations may have even larger effects than estimated if the regulation alters the equilibrium in terms of marketing decisions as well as prices. However, this regulation is a blunt tool for reducing insurer market power and lowering premiums, and the lower prices might also make some firms in my simulation unprofitable. Commissions paid to agents and brokers do not count against the MLR and some firms may find it unprofitable to pay out 80% of the premium in claims and 15%–20% in commissions. They may subsequently exit the market, which is unmodeled in this simulation. Finally, these regulations may dissuade some insurers from undertaking cost-cutting investments that do not count in the medical loss ratio.

In addition to MLR regulation, federal regulators can provide a seal of approval to two or more insurance products. This indicates that they have been vetted by regulators, may be viewed by consumers as denoting quality, and can be used as an attempt to improve the level of competition in health insurance markets by reducing the role of insurer marketing (Pear, 2012).[27] To the extent that this seal of approval lowers search cost or alters consumer perception of brand names, this can change the equilibrium in insurance markets, and reduce insurer incentives to pay large commissions or embark on costly national advertising strategies. To implement a related counterfactual in the Medigap market, I give all firms the UnitedHealth brand preference and recompute equilibrium prices, taking consumer sorting and insurer incentives into account. I test the robustness of the premium results to the exact parameterization of utility by repeating the exercise using the Mutual of Omaha brand preferences.

Table 9 describes the results. Reducing brand preferences in the market leads to lower premiums. Premiums fall by approximately 20%; the premium results are fairly robust to the exact specification of utility. Although consumer surplus clearly increases in the case where all plans are given the UnitedHealth brand effect, consumer surplus decreases if all plans are given the Mutual of Omaha brand effect. Therefore, the effect of a seal of approval or similar counterfactual depends largely on the interpretation of brand preferences.[28] If marketing by insurers simply changes the relative value of brands to consumers, the seal of approval could provide valuable information without an expensive distribution network and could also increase consumer surplus. If marketing by insurers instead has an impact on the level of preference for Medigap insurance or increases the number of plans in the consumer's consideration set, the

[26] The MLR regulations have a larger than anticipated effect because prices are strategic complements in a standard Bertrand pricing model.

[27] www.nytimes.com/2012/10/28/health/us-to-sponsor-health-insurance-plans-nationwide.html.

[28] Advertising can be informative or persuasive. In this model, it could also potentially capture unmodeled dynamic effects, due to differential rating methods, or the value that consumers place on nonpecuniary characteristics, such as a nurse call line.

welfare effects are more ambiguous. However, by eliminating nonpecuniary differentiation in the Medigap market, regulators could lead to premiums that are close to average cost pricing.

Conceptually, search frictions and brand preferences play different roles in this counterfactual. If we could separately identify brand preferences and search frictions and found that price dispersion reflects search frictions, this policy intervention would be extremely appealing. However, if the brand purchased impacts welfare because the brand effects represent primitive preferences, more caution is warranted.

These results show that policy can certainly affect both the level and distribution of surplus in this market by regulating firm pricing and altering consumer perceptions of policies. MLRs reduce premiums by 6%–11%, and a federal seal of approval can lead to increased competition and reduce premiums by approximately 20%. Both policies lead to prices closer to those implied by a competitive equilibrium in which prices are equal to average costs.

7. Conclusion

■ In the Medigap market, strong brand preferences and relatively low own-price elasticities incentivize firms to market their policies heavily and subsequently set premiums higher than medical costs. I separate the difference between average claims and average premiums (one minus the minimum loss ratio) into marketing costs and variable profits. This analysis shows that these marketing costs are both potentially large and also vary across firms. Estimates of commissions indicate that the two largest firms engage in different strategies: UnitedHealth engages in direct sales, paying a large fee to AARP, whereas Mutual of Omaha pays large commissions to brokers. However, insurers are not abnormally profitable in this market. The economic rents in the market flow to the resource in short supply: the ability to sell insurance policies. Insurance brokers and the AARP collect commissions and fees that represent much of the difference between premiums and claims in this market.

By modelling optimal insurer pricing, subject to regulation, I can identify marginal costs, such as commissions, that large firms like Mutual of Omaha incur, in addition to claims. Furthermore, given estimates of commissions and consumer preferences, I highlight policies that can potentially increase consumer surplus. Enforcing or strengthening MLRs reduces premiums, but may cause firms to be unprofitable. Reducing the impact of marketing on consumer preferences reduces the level of premiums paid and has the potential to improve consumer surplus.

Understanding this market can affect how federal and state officials think about designing the new health insurance markets called for in the 2010 health-care reform bill. The final counterfactual eliminating brand preferences shows that providing information to consumers is a critical feature of ensuring a well-functioning marketplace. In addition, provisions that directly limit the market power of insurers, if applied in a judicious way, can ensure better outcomes for consumers.

Appendix

This appendix contains robustness checks and alternative counterfactuals.

Demand.

Table A1 considers the relationship between premiums and claims. Controlling for plan fixed effects, the estimates in the first column indicate that a $100 increase in premiums is associated with an $80 increase in claims. This is for policies that are contractually identical; the results cannot be driven by unobserved plan differences, or moral hazard, though reverse causality, geographic, and temporal differences may drive the results. Therefore, the second column additionally controls for state by year fixed effects. The results are similar when including these fixed effects; these results imply that more expensive policies incur higher claims, even conditional on all contractual variation and the market (state by year) in which the policy is offered. However, in any basic pricing model, prices and costs are likely to be tightly linked, as prices will be equal to claims in a perfectly competitive market, and equal to claims plus some markup in an imperfectly competitive one.

In the empirical specification in column 3, I instrument for price with both a dummy variable that takes on a value of one if the plan faces retaliatory taxes and also the difference in taxes between the plan and the (lower) base rate in that

TABLE A1 Regressions of Claims on Price

Dependent Variable: Average Claim			
	(1)	(2)	(3)
Price	.8025***	.7930***	.4318***
	(.0109)	(.0111)	(.1336)
C	−1.113**	−.9150**	1.328
	(.3976)	(.3974)	(.9237)
F	−2.584***	−2.393***	−1.025*
	(.3480)	(.3492)	(.6206)
J	−1.791***	−1.683***	−1.331**
	(.5031)	(.5034)	(.5379)
First stage			
Retaliatory tax dummy			−1.111***
			(.2166)
% Increase in taxes above the local base			1.482***
			(.1452)
Observations	14146	14146	14146
F-stat on excluded instruments			52.45***
Adjusted R^2	0.2941	0.3013	0.2486
Controls	policy	policy, state*year	policy, state*year

Notes: OLS and IV regressions of claims on premiums and covariates. "% Increase in taxes above the local base" is the difference between the retaliatory tax rate (if applied) and the local tax rate. "Retaliatory tax dummy" takes on a value of one if the policy is subjected to a retaliatory tax on premiums. Significance levels are denoted by asterisks (*$p<0.1$, ** $p<0.05$, *** $p<0.01$).

TABLE A2 Construction of Expectation of Expenditure

Dependent Variable: Claim	
Income	.00001
	(.00002)
Female	2.7254
	(1.2055)
Age-65	.6100
	(.6443)
(Age-65)^2	−.0346
	(.0438)
(Age-65)^3	.0006
	(.0009)
Self-reported health (omitted category=excellent)	
Very good	1.5366
	(1.5366)
Good	6.3365
	(1.7777)
Average	15.089
	(2.128)
Poor	32.530
	(3.178)
Adjusted R^2	0.0584
N	2591

Source: Medicare Current Benefiiciary Survey. The regression is run on the nonage-restricted sample, conditional on Medigap purchase. Also included are controls for education, race, and region. This construction allows for the computation of expected expenditure for individuals choosing not to purchase insurance.

TABLE A3 Additional Demand Estimates

	(1)	(2)	(3)	(4)
Price	−0.0967	−0.0973	−0.0964	−0.0732
	(0.0075)	(0.0075)	(0.0075)	(0.0076)
Consumer Heterogeneity				
E(claim)*coverage		−0.0006		
		(0.0057)		
E(claim)*AARP brand effect	0.0047		0.0129	
	(0.0048)		(0.0004)	
Income*price	0.0005	0.0005	0.0005	0.0000
	(0.00002)	(0.1233)	(0.00003)	(0.1896)
Price*E(claim)	0.0003	0.0005		
	(0.0001)	(0.0001)		
SRH*1(United or Mutual of Omaha Brand)				2.5406
				(0.1895)
Log Claim Regressed on Consumer Characteristic				
Income	0.0185	0.0189	0.0175	
	(0.0196)	(0.0254)	(0.0006)	
E(claim)	0.0536	0.0634	0.0348	
	(0.2087)	(0.1838)	(0.0048)	
Price				0.0616
				(0.0086)
N	14146	14146	14146	14146
Mean price semi-elasticity	−1.1173	−1.1227	−0.9324	−1.0854
Mean $\frac{\partial \gamma}{\partial p}$	0.1228	0.1433	0.2903	0.6453

state. The coefficients on both variables are statistically significant and in the expected direction. The relationship between premiums and claims falls by about half when instrumenting for price using variation in tax regimes; these results indicate that a $100 increase in premiums attracts a group of consumers that incur approximately $40 more in claims on average. This provides some evidence that consumer preferences may be correlated with underlying risk (perhaps because higher risk individuals are less price sensitive), which could lead to distortions in pricing.

Table A2 details consumer characteristics for an alternative demand specification. The income variable has an average of $36,803, with a substantial amount of variation.[29] The mean of private health insurance expenditure is low because it is equal to zero for those consumers without private health insurance, including Medigap. Therefore, I form an expectation of insured expenditure that conditions on having insurance, as well as income, demographic characteristics, and SRH status, and extrapolate to the whole sample. The regression used is detailed in Table A2; the expectation depends heavily on the consumer's own perception of their health as well as demographic characteristics, including income, which may affect utilization of health-care services. This measure, which is assumed to proxy for Medigap claims, averages $1537.99, which is slightly higher than the average claim in the market-level data, which may reflect overlap between Medigap and other private insurance plans. [30] The key difference in this robustness check is the use of this alternative, claim based measure of consumer health, and allows this heterogeneity to affect price sensitivity rather than brand preferences.

Table A3 shows the alternate demand system estimates. The average elasticity is –1.1714, indicating that a $100 increase in price results in a 7.5% reduction in market share. Given that the coverage of lettered contracts is identical and they are likely to be close substitutes, I interpret this as a relatively small price sensitivity. The elasticity is again similar across specifications that allow for different types of consumer heterogeneity: in column 1, consumers are only allowed to vary by income, and in the second specification, expected claim is only allowed to affect preference for insurance, not price sensitivity. The first specification shows that high income consumers are especially price insensitive: a 1% increase in income leads to a 0.35% decrease in this elasticity. The second specification allows consumers with different expected claims to value insurance differently in addition to allowing consumers with different incomes to vary in their price sensitivity. Conditional on income-varying price sensitivity, consumers with higher expected claims gain higher utility for holding insurance. However, sicker consumers are also more price sensitive, even conditional on income, and the preference for holding insurance does not vary with health status. Finally, Table A4 shows nested logit results.

[29] Income is truncated above at $200,000 in the MCBS.

[30] In practice and for computational simplicity, I divide the income variable by $1000 and demean the expected expenditure variable such that it is orthogonal to income.

TABLE A4 Nested Logit Demand Estimates

	(1)	(2)	(3)	(4)
Within-Group Share		0.680***		0.681***
		(0.0248)		(0.0251)
Premium	−0.0283***	−0.0285***	−0.0545***	−0.0633***
	(0.00180)	(0.00175)	(0.00621)	(0.00609)
B	0.370***	0.403***	0.484***	0.555***
	(0.0689)	(0.0672)	(0.0741)	(0.0727)
C	0.799***	0.815***	0.947***	1.012***
	(0.0610)	(0.0595)	(0.0701)	(0.0687)
D	0.907***	0.913***	0.986***	1.018***
	(0.0612)	(0.0597)	(0.0642)	(0.0630)
E	0.882***	0.896***	0.939***	0.972***
	(0.0817)	(0.0796)	(0.0833)	(0.0817)
F	1.972***	1.980***	2.057***	2.094***
	(0.0538)	(0.0525)	(0.0576)	(0.0565)
G	1.272***	1.283***	1.342***	1.377***
	(0.0606)	(0.0590)	(0.0631)	(0.0618)
H	−0.0511	−0.0988	−0.0178	−0.0546
	(0.115)	(0.112)	(0.116)	(0.114)
I	0.424***	0.458***	0.507***	0.568***
	(0.106)	(0.103)	(0.108)	(0.106)
J	2.310***	2.304***	2.329***	2.328***
	(0.0799)	(0.0778)	(0.0806)	(0.0790)
K	−0.732***	−0.783***	−0.884***	−0.986***
	(0.109)	(0.107)	(0.115)	(0.113)
L	−0.444***	−0.495***	−0.522***	−0.600***
	(0.105)	(0.102)	(0.107)	(0.105)
Constant	−9.896***	−8.693***	−9.815***	−8.582***
	(0.198)	(0.197)	(0.200)	(0.201)
Fixed effect	brand	brand	brand	brand
observations	14,146	14,146	14,146	14,146
R^2	0.392	0.423	0.382	0.406

TABLE A5 Alternative Pricing Parameter Estimates

	(1)	(2)	(3)
Constant	0.1536	0.1925	
	(0.0087)	(0.0111)	
United		−0.1139	0.0785
		(0.0109)	(0.0013)
Mutual of Omaha		−0.0134	0.1775
		(0.0181)	(0.0168)
(1-% fine)	0.6525	0.6525	0.7413
	(0.2590)	(0.0004)	(0.00003)
Constant	0.1531	0.2202	
	(0.0055)	(0.0125)	
United		−0.1456	0.0743
		(0.0126)	(0.0006)
Mutual of Omaha		−0.0444	0.1717
		(0.0187)	(0.0034)

TABLE A6 Alternative Pricing Counterfactuals

	Unconstrained	Average Cost, 15% Commission	2006 Prices
Median premium	15.485	10.391	9.5043
Median % change in premium	0.1968	−0.1570	−0.0435

TABLE A7 Fixed and Sunk Cost Estimates

	Lower Bound	Upper Bound
Sunk cost,	\$99, 261, 645.01	\$487, 935, 210.41
UnitedHealth	(\$1, 530, 902, 861, 706.31)	(\$23, 031, 614, 127.02)
Fixed cost,	\$445, 010.32	\$796, 342.56
Mutual of Omaha	(\$225, 593.04)	(\$3, 578, 033.82)

TABLE A8 Marketing Expenditure and Advertising Value

	United Health	Mutual of Omaha
L.B. of sunk (fixed) cost/consumer	\$23.65	\$8.37
U.B. of sunk (fixed) cost/consumer	\$73.09	\$14.81
Average marginal cost/consumer	\$98.27	\$238.67
L.B. of total marketing cost/consumer	\$121.92	\$247.05
U.B. of total marketing cost/consumer	\$171.36	\$253.48

Notes: Compensating variation is calculated as the average across consumers within a market using the standard log-sum formula; the number reported is the median across markets.

Supply.

□ **Pricing.** I estimate an alternative model of supplier pricing in which firms violating the minimum loss ratio are allowed to keep a fixed proportion of the difference between premiums and medical claims. Profits are given by:

$$\pi_{jfm} = \left(p_{jfm} - \gamma_{jfm}(\mathbf{p}_m) - a_{jfm}(\mathbf{p}_m)\right) s_{jfm}(\mathbf{p}_m)\,\mathbf{M},$$

if $\mu_{jm} = 0$ and given by:

$$\pi_{jfm} = \left(\phi\left(p_{jfm} - \gamma_{jfm}(\mathbf{p}_m)\right) - a_{jfm}(\mathbf{p}_m)\right) s_{jfm}(\mathbf{p}_m)\,\mathbf{M},$$

otherwise, where ϕ is equal to the fixed proportion of the difference between premiums and medical claims kept, and is estimated in the model. Table A5 contains the results. In the final, preferred specification, ϕ is equal to .74, which indicates that the minimum loss ratios are implemented imperfectly (under perfect implementation, $\phi = .65$).

□ **Entry.** Sutton (1992) suggests that the sunk costs (potentially of marketing) can lead to asymmetric firm sizes similar to those seen in this market. I will consider the potential for a firm to duplicate the strategy of either UnitedHealth or Mutual of Omaha by offering the same mix of products with the same brand preferences induced by similar marketing expenditures. I will estimate the fixed or sunk cost of such a strategy. However, this analysis will require a number of additional assumptions. I will not be able to separately identify all of the fixed and sunk costs. However, institutional detail can focus my analysis and allow for reasonable assumptions that capture the costs most relevant to insurers. First, I assume that the fixed cost of offering an additional policy conditional on being active in a market, ϕ_{jm} is zero or small.[31] Furthermore, firms may incur a fixed cost of entry or marketing in an additional market, denoted by Θ_{jm}. This may encapsulate the cost of setting up a network of agents in a given geographic area to sell policies or the cost of being certified by the state insurance commissioner to sell Medigap insurance. The degree to which insurers choose to enter markets and offer policies is likely to impact pricing and consumer surplus.

Because of Mutual of Omaha's strategy of employing brokers to sell their policies, this is likely to be the most relevant cost they face. UnitedHealth, however, faces one large sunk cost Φ_J—the cost of the AARP endorsement—that is likely to dwarf any market-level fixed costs. Therefore, I cannot separately identify fixed cost of entry into a specific geographic market and sunk costs of national operation, and I will focus on the fixed costs of Mutual of Omaha's strategy and the sunk cost of UnitedHealth's strategy. Conditional on this set of potential entrants, the assumption identifying fixed or sunk costs follows Mazzeo's model of entry,[32] modified to incorporate an inequality approach. This will require the calculations of the profits of a second firm duplicating the strategy of one of the two largest firms. This estimate is formed by adding a firm with the same brand effect and policies, and recomputing optimal prices. Given optimal prices, I can calculate costs and shares, which are functions of prices, and sum across policies to obtain an estimate of variable profits.

First, consider Mutual of Omaha. Because I observe one firm employing Mutual of Omaha's strategy, I assume that two inequalities hold. First, Mutual of Omaha is currently profitable; in addition, a new entrant mimicking the strategy of

[31] See Sethi-Iyengar, Huberman, and Jiang (2003) for a discussion of the negative impacts of additional choice.

[32] Mazzeo (2002) analyzes a game in which hotels choose a differentiated type (low, middle, or high quality) and whether or not to enter a specific market. I will consider two types based on presumed cost structure rather than quality.

Mutual of Omaha would be unprofitable, because such a firm does not exist. Taken together, these inequalities will allow me to bound fixed costs of entry into an additional market. In order to simplify notation, let $\Pi_{Mm}(2,1)$ be the profits of a firm employing Mutual of Omaha's strategy in a market in which two firms employ Mutual of Omaha's strategy and one firm employs UnitedHealth's strategy. Given the estimates from the demand system and the estimates of claims and administrative costs, the assumption above, along with the assumption that the firm's expectations are, on average, correct, implies:

$$\Pi_{Mm}(1,1) = \sum_{j \in J_f} \pi_M(1,1) \geq \Theta_{Mm} \geq \sum_{j \in J_f} \pi_M(1,2) = \Pi_{Mm}(2,1).$$

The mean of the distribution of the lower bound of fixed costs for Mutual of Omaha can be written as:

$$\underline{\beta}_M = E_m(\Pi_{Mm}(2,1)).$$

Likewise, the mean of the distribution of the upper bound of fixed costs for Mutual of Omaha can be written as:

$$\overline{\beta}_M = E_m(\Pi_{Mm}(1,1)),$$

and likewise for high marginal cost firms. These equations imply that the lower bound of Mutual of Omaha's fixed costs is equal to the expectation of variable profits of a firm duplicating its strategy; likewise, the upper bound of firm $f's$ fixed costs is equal to the expectation of variable profits. Estimates of $\underline{\beta}_M$ and $\overline{\beta}_M$ are easily obtained by taking sample averages, and standard errors can be obtained using the bootstrap procedure outlined in Pakes, Porter, Ho, and Ishii (2006). The estimates are based on a single firm across markets; therefore, the standard errors are large.

By contrast, the biggest cost facing UnitedHealth is the sunk, national-level cost of acquiring the AARP seal of approval. Therefore, I will assume that Θ_{Um} is equal to zero and focus on this sunk cost Φ_J plus national-level advertising. The assumption that identifies this sunk cost is the same: UnitedHealth is profitable, but it would not be profitable for another firm to replicate UnitedHealth's strategy. This can be written as:

$$\sum_{m \in J_{mt}} \sum_{j \in J_f} \pi(1,1) \geq \Phi_U \geq \sum_{m \in J_{mt}} \sum_{j \in J_f} \pi(1,2).$$

The mean of the distribution of the lower bound of sunk costs for UnitedHealth can be written as:

$$\underline{\beta}_U = E_t\left(\sum_{m \in J_{mt}} \Pi_{Um}(2,1)\right),$$

where t denotes a year. Because I only have three years of data, my estimates will be imprecise. Likewise, the mean of the distribution of the upper bound of sunk costs for UnitedHealth can be written as:

$$\overline{\beta}_U = E_t\left(\sum_{m \in J_{mt}} \sum_{j \in J_f} \Pi_{Um}(1,1)\right).$$

The confidence interval for UnitedHealth's sunk cost will be based on only three years of data. Therefore, the standard errors are quite large. Despite this, the estimates of fixed cost of entering another market and the sunk cost of national market provides a number of insights into the Medigap market by illustrating how the strategies of different firms can shape outcomes.

In addition to marginal costs incurred beyond claims, fixed and sunk costs shape this market. Table 8 describes these costs. The fixed cost of a firm duplicating Mutual of Omaha's strategy entering an additional market (a state) is between $450,000 and $796,000; across states, this implies fixed costs between $22 and $98 million. By contrast, the sunk cost of a low marginal cost firm entering all markets is between $100 million and $488 million. The latter number in each pair represents an aggregation of the variable profits observed in the data. The former represents the mean of variable profits of the firm duplicating UnitedHealth or Mutual of Omaha across years or markets in a counterfactual calculation. The estimates are extremely noisy; this is unsurprising, as the estimates of UnitedHealth's sunk costs are based on three observations: one from each year of the data and the estimates of Mutual of Omaha are based on estimates from a single firm.

However, these estimates contain some insight into the operation of the Medigap market. AARP collects nearly $500 million—over half of its revenues—from endorsements, royalties, and fees. Nearly half of this is collected from UnitedHealth alone. Though United Health sells a number of lines with the AARP endorsement, and can spread costs across these lines, they must also maintain some website and phone bank infrastructure as well as pay for advertising on television and on the Internet. The sunk costs are in line with these costs; the lower bound is slightly less than the royalties and fees paid to AARP and the upper bound allows for additional costs of advertising. Despite the large standard errors, these estimates reflect the right order of magnitude for sunk costs and explain why an additional firm might not choose to replicate UnitedHealth's strategy: the cost of purchasing an endorsement is likely to be higher than the variable profits of a second firm, but lower than UnitedHealth's profits. Furthermore, the sunk costs estimates illustrate why AARP provides its brand exclusively to a single firm: UnitedHealth's current profits are more than the combined counterfactual profits of UnitedHealth and a second firm with the AARP brand.

Table A4 describes the total costs of marketing to consumers. As expected, I estimate that UnitedHealth spends more on sunk costs of marketing than Mutual of Omaha does on fixed costs of marketing. On a per consumer basis, UnitedHealth spends between $24 and $73 marketing its policies, whereas Mutual of Omaha spends between $8 and $15 per consumer. By contrast, Mutual of Omaha spends substantially more on broker costs. As a result, Mutual of Omaha spends almost twice as much–between $247 and $253–per consumer on marketing and administration; however, this is only because UnitedHealth spreads its sunk costs over such a high volume of consumers.

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