Estimation of a Hedonic Pricing Model for Medigap Insurance

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Objective. This paper uses a unique database to examine premiums paid by beneficiaries for Medigap supplemental coverage. Average premiums charged by insurers are reported, as well as premiums by enrollee age and gender, and additional policy characteristics. Marginal prices for Medigap benefits are estimated using hedonic price regressions. In addition, the paper considers how additional policy characteristics and geographic differences in the use and cost of medical care affect premiums.

Data Sources/Study Setting. A comprehensive database on premiums paid by beneficiaries for newly issued Medigap policies in the year 2000 along with state-level characteristics.

Study Design. Hedonic pricing equations are used to estimate implicit prices for Medigap benefits.

Data Collection/Extraction Methods. The Centers for Medicare & Medicaid Services contracted for the creation of a detailed database on Medigap premiums. Data were collected in three stages. First, letters were sent directly to insurers requesting premium data. Second, letters were directly to state insurance commissioner's offices requesting premium data. Last, each state insurance commissioner's office was visited to collect missing data.

Principal Findings. With the exceptions of the part B deductible and drug benefit, Medigap supplemental insurance is priced consistent with the actuarial value of benefits offered under the standardized plans. Premiums vary substantially based on rating method, whether the policy is guaranteed issue, Medigap Select, or explicitly for smokers. Premiums increase with enrollee age, but do not vary between men and women. The relationship between premiums and enrollee age varies across rating methods. Attained-age policies show the strongest relationship between age and premiums, while community-rated premiums, by definition, do not vary with age. Medigap supplemental insurance premiums are higher in states with poorer health, greater utilization, and greater managed care penetration.

Conclusions. Despite the high cost, Medigap plans are generally priced in accordance with the actuarial value of benefits. The primary exception is the drug benefit, which appears to be subject to substantial adverse selection. Benefits such as the part B deductible and at-home recovery benefit offer little value to consumers. Several states require insurers to community rate premiums. Such regulation has important implications for premiums, and research needs to consider the impact of such regulation on the Medigap market.

Key Words. Medigap, premiums, Medicare supplemental insurance, hedonic pricing models

While Medicare benefits are extensive, the program has deductible and co-insurance requirements as well as limitations on payments to providers. For many Medicare beneficiaries, the financial risk introduced by out-of-pocket requirements is considerable. On average, basic Medicare benefits cover 45 percent of the personal health care expenditures of aged beneficiaries in the United States (Kaiser Family Foundation 2005). Because of these gaps in coverage, many beneficiaries are also covered by supplemental policies provided by employers or purchased individually. About 89 percent of Medicare beneficiaries have some form of supplemental insurance; with 23 percent of beneficiaries covered by individually purchased Medigap plans (Laschober 2004).

Despite the importance of supplemental insurance to Medicare beneficiaries, little is known about the premiums charged for individual Medigap coverage. Chulis, Eppig, and Poisal (1995) used Medicare Current Beneficiary Survey (MCBS) data and found that premiums increase with age, are higher for women than men, are slightly higher for those with functional limitations, but show no relationship with health status. While premiums are expected to increase with age for most plans, the gender difference is unexpected. However, it is unclear whether the higher premiums for women indicate the purchase of plans with greater benefits, that women with Medigap plans are older than men, or that insurers charge women more for the same benefits. In a report to Congress, the GAO (2001) reported on the availability of Medigap plans and average premiums. The report noted substantial variation in premiums across states, and suggested this variation “may in large part reflect geographic differences in use and costs of health care services” (GAO 2001, p. 14).

This paper uses a unique database to examine premiums paid by beneficiaries for Medigap supplemental coverage. Marginal prices for Medigap benefits are estimated using hedonic price regressions. In addition, the paper considers how additional policy characteristics and geographic differences in the use and cost of medical care affect premiums.

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BACKGROUND

Medicare is the primary health insurance for most seniors. Under traditional fee-for-service Medicare, beneficiaries are responsible for 20 percent of part B physician expenditures and a part B deductible. Also not covered under basic Medicare are deductibles and copayments for hospital expenditures up to 90 days per episode of care (there may be multiple episodes in a year), copayments during a lifetime reserve of 60 additional days of inpatient care, all costs beyond the 150-day limit (or 90 days if the lifetime reserve has been exhausted), copayments for some SNF services, and limited costs for other services. In addition, with the introduction of Medicare drug coverage in 2006, patient liability for outpatient prescription drugs ranges from very little for those qualifying for low-income subsidies to 100 percent of costs for those not purchasing part D coverage.

Medicare supplemental coverage has been available since nearly the inception of the Medicare program. Concern regarding marketing abuses and confusion among beneficiaries eventually prompted Congress to mandate Medigap policy standards. As a result of the Omnibus Budget Reconciliation Act of 1990 (OBRA 1990, P.L. 101-508, November 5, 1990), effective in 1992, most newly issued Medigap policies have been required to conform to one of ten standardized benefit packages. The benefits offered under each plan are summarized in Table 1.

There are additional Medigap policies that may be sold by insurers. Medicare Select is a standardized Medigap policy that offers lower premiums in exchange for a limited choice of providers (Lee et al. 1997; GAO 2001). Insurers may also offer plans F and J with deductibles. Policies originally sold before July 1992 are not required to conform to the standardized benefit packages. In addition, Massachusetts, Minnesota, and Wisconsin have alternative standardized plans and insurers do not sell the national standardized plans in these states.

Several studies focus on two important requirements legislated in OBRA (1990). First, Medicare beneficiaries cannot be refused Medigap coverage by insurers during certain time periods, most notably for 6 months after signing up for Medicare part B coverage. Open enrollment requirements may create adverse selection since individuals in poorer health expect to use more services and have greater incentive to purchase supplemental insurance. The available evidence regarding adverse selection in the supplemental insurance market is mixed (e.g., Chulis, Eppig, and Poisal 1995; Ettner 1997; Hurd and McGarry 1997).

Table 1: Standardized Medigap Plans—2000

<i>Benefits</i>	<i>Plan Type</i>									
	<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	<i>E</i>	<i>F</i>	<i>G</i>	<i>H</i>	<i>I</i>	<i>J</i>
Basic benefits	X	X	X	X	X	X	X	X	X	X
\$194 per day coinsurance for days 61–90 in hospital										
\$388 per day coinsurance for days 91–150 in hospital										
Payment in full for 365 additional hospital days										
20% part B coinsurance										
3 pints of blood										
Hospital deductible		X	X	X	X	X	X	X	X	X
\$776 per hospitalization										
SNF coinsurance			X	X	X	X	X	X	X	X
\$97 a day coinsurance for days 21–100 in SNF										
Foreign travel emergencies			X	X	X	X	X	X	X	X
Part B deductible			X			X				X
\$100										
Home health care				X			X		X	X
Home health aide after SNF care										
Maximum \$40 per visit for 40 visits										
Part B excess charges						X	X		X	X
Difference between doctor's charge and Medicare's										
Approved charge (up to 115% of approved charge)										
Preventive care					X					X
\$120 per year for preventive care										
Basic prescription								X	X	
50% of outpatient drugs (after a \$250 deductible)										
Maximum \$1,250 benefit per year										
Extended prescription										X
Same as basic but maximum annual benefit of \$3,000										

Source: Centers for Medicare & Medicaid Services, 2001 Guide to Health Insurance for People with Medicare.

The second important requirement legislated in OBRA is that, with the exception of prescription costs, beneficiaries can reduce their marginal cost of health care to near zero depending on which plan is purchased. According to Cutler and Zeckhauser (1999), a socially optimal health insurance policy requires coinsurance payments by patients to cover a portion of the costs of care. If copayments are too low, excess care is demanded by patients. With the exception of prescription drugs, Medigap plans offer first dollar coverage for covered benefits. As a result, Medicare enrollees who purchase Medigap insurance use more services than those without supplemental insurance (e.g., Ettner 1997; Khandker and McCormack 1999).

Several aspects of Medigap regulation were reformed as part of the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (MMA). The MMA created two new Medigap plans (K and L). The plans have basic benefits similar to those offered in plans A–G except that instead of paying 100 percent of the Medicare cost sharing requirement, the plans pay 50–75 percent. The plans also have annual out-of-pocket limits, \$4,000 for plan K and 2,000 for plan L. Once the annual limit is met, the plan pays 100 percent of the Medicare Part A and Part B copayments and coinsurance for the rest of the calendar year. In addition, the Act created a Medicare prescription drug benefit, and eliminated sales of new Medigap plans that cover drugs (plans H–J). Individuals currently enrolled in plans H–J may keep such coverage, but if they do are ineligible to participate in the Medicare prescription drug benefit.

DATA

As part of the efforts of the Centers for Medicare & Medicaid Services (CMS) to examine supplemental insurance policies available to Medicare beneficiaries, CMS contracted for the creation of a comprehensive database on the Medigap premiums paid by beneficiaries for newly issued policies. Data collection occurred in several steps. First, letters were sent directly to insurers requesting premium data. Approximately 40 percent of the data were collected during this stage. Second, letters were sent directly to state insurance commissioner's offices requesting premium data. This step was least productive, accounting for only 10 percent of the data. After these steps, it was decided that a considerable number of insurers were still unaccounted for in the database. Thus, each state insurance commissioner's office was visited to collect missing data. Approximately half the data was collected during this stage.

The database contains variables denoting the state,¹ insurer, plan type (A–J), rating method (attained-age, issue-age, or community-rated), whether the policy is underwritten or guaranteed issue, Select or non-Select, and for smokers or nonsmokers. Each observation contains information on premiums paid by state residents in the year 2000 for a newly issued policy with premiums reported separately by gender and age. For example, an insurer selling plan A with attained-age rating, that was guaranteed issue, non-Select, for nonsmokers has an observation for each state in which the insurer sold the policy. Within a state, an insurer has one observation for each combination of policy characteristics. We use premiums reported for three ages: 65, 75, and

85. The three states (Massachusetts, Minnesota, and Wisconsin) exempt from selling the standardized plans are excluded from the analysis.

While this database represents a substantial improvement over prior data on Medigap premiums paid by beneficiaries, no information was collected on the number of lives covered by each policy. Data on the number of covered lives by insurer, state, standardized plan, and whether a Medigap Select plan are from the National Association of Insurance Commissioners' (NAIC) Medigap Experience Files.² The final sample contains 6,193 observations for which there was information on premiums and covered lives.

AVERAGE PREMIUMS

Average premiums paid by beneficiaries are computed with each observation weighted by the number of covered lives. The weighted average premium for each standardized plan is provided in Table 2, with premiums reported separately by gender and age (65, 75, and 85 years old). Despite insurers being required to offer plan A if they sell Medigap insurance, plan F has the greatest number of observations. The majority of insurers also sell plans B, C, D, and F. Relatively few insurers offer the plans that include prescription drug coverage (H–J).

The average premium paid by beneficiaries for Medigap insurance increases with age, but there is a trivial difference in premiums charged to men

Table 2: Average Premiums by Plan—Year 2000

<i>Plan</i>	<i>Observation</i>	<i>Males</i>			<i>Females</i>		
		<i>65</i>	<i>75</i>	<i>85</i>	<i>65</i>	<i>75</i>	<i>85</i>
Total	6,193	1,234 (404)	1,459 (480)	1,593 (544)	1,233 (404)	1,457 (480)	1,591 (543)
A	1,152	843 (330)	929 (382)	999 (440)	843 (330)	928 (382)	999 (439)
B	732	1,240 (241)	1,394 (238)	1,522 (316)	1,240 (241)	1,394 (238)	1,521 (316)
C	1,149	1,301 (276)	1,525 (310)	1,659 (397)	1,299 (276)	1,522 (308)	1,655 (394)
D	543	1,112 (193)	1,451 (283)	1,632 (325)	1,111 (194)	1,449 (283)	1,630 (325)
E	239	1,207 (171)	1,358 (227)	1,416 (235)	1,207 (171)	1,358 (227)	1,415 (235)
F	1,223	1,229 (383)	1,547 (442)	1,724 (495)	1,228 (384)	1,544 (442)	1,721 (494)
G	503	1,209 (113)	1,442 (123)	1,587 (146)	1,200 (114)	1,429 (123)	1,570 (139)
H	198	2,045 (169)	2,161 (200)	2,203 (223)	2,045 (169)	2,161 (200)	2,203 (223)
I	285	1,858 (165)	2,058 (263)	2,107 (348)	1,855 (166)	2,054 (262)	2,102 (345)
J	169	2,221 (474)	2,548 (805)	2,688 (990)	2,221 (474)	2,547 (805)	2,687 (990)

Note: Standard deviations are in parentheses.

and women. Premiums vary considerably across the 10 plans with higher premiums charged for plans with more benefits.

Insurers can use three different premium rating methods: attained-age, issue age, and community rated. Attained-age premiums increase with age due to the increasing health care needs of older individuals. Issue-age premiums are based on the age when initially covered under the Medigap plan. A few states (e.g., Florida and Georgia) require issue-age rating. Community-rated premiums are the same for all individuals in the community regardless of age. Several states (e.g., Maine, Washington, New York) require that premiums be community-rated. Approximately 62 percent of the observations are for attained-age policies, while 15 percent are community rated. Weighted average premiums are reported by rating method in Table 3. Given the trivial difference in premiums between men and women, only the premiums for men are reported (which, in this case, is equivalent to pooling the data). Attained-age policies are the least expensive for younger (i.e., 65) individuals, but attained-age premiums are similar to issue-age policies for older (i.e., 85) enrollees. Issue-age policies are more expensive at age 65 since the premiums incorporate future increases in utilization as the individual ages, while attained-age premiums are based only on current utilization. The premium difference falls with age since future utilization becomes less of a factor as the individual

Table 3: Weighted Average Premiums for Various Plan Characteristics—Year 2000

Select	Observation	Percentage of Observation	Age		
			65	75	85
Medigap select					
Standard	5,722	92.4	\$1,249 (409)	\$1,470 (489)	\$1,607 (555)
Select	471	7.6	1,050 (264)	1,316 (321)	1,415 (347)
Rating method					
Age	3,821	61.7	1,118 (216)	1,470 (311)	1,741 (364)
Issue age	1,437	23.2	1,264 (435)	1,610 (569)	1,737 (614)
Community	935	15.1	1,325 (741)	1,326 (743)	1,326 (749)
Underwriting					
Underwritten	5,692	91.9	1,241 (328)	1,540 (387)	1,738 (425)
Guaranteed issue	501	8.1	1,221 (894)	1,343 (1,019)	1,390 (1,097)
Smoking					
Nonsmoker	5,571	90.0	1,233 (426)	1,457 (506)	1,590 (574)
Smoker	622	10.0	1,147 (50)	1,505 (65)	1,771 (82)

Note: Observations are weighted by the number of covered lives. Standard deviations are presented in parentheses.

becomes older. On the other hand, community-rated policies are relatively expensive for individuals age 65 since younger enrollees subsidize the premiums for older beneficiaries.

Premiums are lower for Medigap Select plans due to the limited provider network. Interestingly, average premiums are lower for guaranteed issue plans than underwritten plans and, among individuals age 65, for policies that explicitly cover smokers. Policies underwritten or for smokers are expected to have lower premiums since insurers are able to screen out sicker individuals (outside open enrollment periods).

HEDONIC PRICING MODEL SPECIFICATION

Rosen (1974) estimated hedonic pricing models to examine how product attributes affect price in a perfectly competitive market. The basic idea behind the hedonic pricing model is that the price of a good is related to the characteristics of the product. For example, the price of a house reflects the characteristics of the house—location, size, condition, etc. The hedonic pricing model examines how the price of the product changes as the characteristics change. In other words, the model estimates an implicit price for each characteristic.

The assumption of perfect competition in hedonic pricing models was relaxed to include buyer characteristics (Lucas 1977) and firm effects (Berndt, Griliches, and Rappaport 1995) in hedonic pricing equations. Buyer characteristics include health status and expected utilization. Firm effects may be an important determinant of price due to market power or brand name recognition. For example, in the Medigap market, two groups (AARP/United Healthcare and Blue Cross Blue Shield plans) have a combined market share exceeding 60 percent.

Hedonic pricing models were used by Jensen and Morrissey (1990) to examine premiums in the group health insurance market. Product attributes include policy characteristics such as plan benefits, cost-sharing, and limits on out-of-pocket expenses. Their study found that cost-sharing lowers premiums while coverage for alcoholism/chemical dependence, inpatient mental health care, and other psychological services increases premiums.

Policy Characteristics/Product Attributes

Among the policy characteristics outlined in Jensen and Morrissey (1990), only plan benefits are included in the specification. While cost sharing is an important product attribute in most insurance markets, only Medigap plans

offering prescription drug benefits require cost-sharing. Also, the extent of cost sharing does not vary across insurers.³ Medigap plans do not have limits on out-of-pocket expenses for noncovered services.

Covered services, particularly among nonacute services, can vary substantially among most health insurance policies, but plan benefits are standardized for Medigap insurance. The available benefits can be placed into the 10 categories outlined in Table 1. While each category is meaningful, due to the structure of the standardized plans there is not sufficient variation in the benefit packages to estimate the marginal price for each benefit. For example, the 10 standardized plans always bundle coverage for foreign travel emergencies with SNF coinsurance, and require inpatient deductible coverage in order to buy SNF or home health care coverage. Indeed the lack of variation in the benefit packages consistently resulted in negative marginal premiums for SNF/foreign travel benefits. To arrive at meaningful estimates, the SNF/foreign travel benefit was combined with the remaining benefits.

The final specification contains seven categorical variables with the basic benefits (inpatient coinsurance, part B coinsurance, and three pints of blood) available under all 10 plans used as the omitted category. The seven variables denote: (1) inpatient deductible coverage; (2) SNF coinsurance, foreign travel emergencies, and the part B deductible; (3) SNF, foreign travel, and home health care; (4) SNF, foreign travel, and preventive care; (5) SNF, foreign travel, and part B excess charges; (6) SNF, foreign travel, and basic prescription drug coverage; and (7) SNF, foreign travel, and extended prescription drug coverage.

Additional policy characteristics include the type of rating method with categorical variables denoting issue-age and community-rated plans. Categorical variables denoting whether the premium is for a Medigap Select plan, is guaranteed issue, or explicitly for smokers, are also included in the specification.

State/Buyer Characteristics

Four state-level variables account for geographic differences in health status, cost of health care services, practice patterns, and use of substitute goods. Premiums are expected to be lower in states where residents are healthier. Given the difficulty in objectively measuring health status for large groups of individuals, a risk-adjusted measure of health is used. While risk adjustment can refer to several different concepts, for the purposes of this paper “risk adjustment . . . describes a way of accounting for differences in health status among various study populations” (Greenwald 2000, p. 1). We use the

PIPDCG score for each state to measure the average health of potential enrollees. CMS computed PIPDCG risk scores by predicting Medicare expenditures for each individual by regressing expenditures for individual beneficiaries in year $t+1$ on demographic characteristics (age and gender) and inpatient diagnoses in year t .⁴ County average risk scores are available at <http://www.cms.hhs.gov/healthplans/rates/default.asp>. We aggregate to the state level by taking a beneficiary weighted average across counties. Since a lower risk score indicates that residents are healthier, we predict a positive relationship between premiums and state risk scores.

The price of health care varies across geographic areas, and some of this variation is expected to influence Medigap premiums. For example, coverage for physician services such as the 20 percent part B coinsurance and part B excess charges are likely to reflect geographic differences in Medicare physician payments. The part B deductible is not subject to such geographic variation since the vast majority of Medicare beneficiaries meet this deductible regardless of location. The inpatient hospital deductible was fixed at \$776 in the year 2000, and the per day hospital coinsurance is fixed regardless of geographic location, and as a result geographic differences in inpatient hospital costs have little impact on Medigap premiums.⁵ Thus, we expect that areas with higher physician costs have higher Medigap premiums. The price index used in this comparison is the geographic adjustment factor (GAF) for physician services (Zuckerman, Welch, and Pope 1990).⁶ The GAF represents the sum of three geographic practice cost indexes (GPCIs), weighted by their shares in the overall index:

$$GAF = [0.545] GPCI_{wj} + [0.423] GPCI_{pj} + [0.032] GPCI_{mj}$$

where $GPCI_{wj}$, $GPCI_{pj}$, and $GPCI_{mj}$ are the work, practice expense, and malpractice GPCIs for area j .⁷ The weights in this formula represent each component's share of total physician practice costs.

Studies find that practice patterns vary considerably across areas (Wen-berg 1999), and Medigap premiums are expected to reflect such differences in utilization. Average State Medicare expenditures per fee-for-service enrollee (standardized based on age and gender) are deflated for geographic differences in risk score and GAF, and to some degree, remaining differences reflect practice patterns. Of course, the adjusted average expenditure may reflect differences in utilization due to illness not accounted for by the risk score. However, whether due to practice pattern differences or unaccounted for health differences, states with greater utilization are expected to have higher Medigap premiums.

Medicare managed care plans cover many of the same benefits offered by Medigap plans. In most product markets, the availability of substitute goods leads to lower prices, but it is unlikely areas with a greater managed care presence have lower Medigap premiums. Managed care plans enroll healthier than average beneficiaries (Greenwald, Levy, and Ingber 2000). As such, Medigap plans in areas with greater managed care penetration are expected to enroll less healthy people (on average) than Medigap plans in areas with less penetration. With healthier beneficiaries selecting into managed care, premiums are expected to be higher when Medigap plans face greater competition from managed care organizations.

HEDONIC PRICING MODEL RESULTS

The specification for the hedonic pricing model includes policy and state characteristics:

$$Price_{ijk} = \beta_0 + \beta_1 Policy_{ijk} + \beta_2 State_{jk} + \beta_3 Insurer_k + \varepsilon_{ij}$$

where i indexes specific policies, j states, and k insurers, *Price* denotes the annual premium, *Policy* is the vector of policy characteristics including plan benefits, *State* is the vector of state characteristics, and *Insurer* is a vector of categorical variables denoting insurers. Separate ordinary least squares equations are estimated for three ages: 65, 75, and 85, with observations weighted by the number of covered lives. The regression results are presented in Table 4. The discussion focuses on the marginal premiums for policy and state characteristics, as well as how the premiums change with enrollee age.

For a 75-year old, the basic package in plan A (i.e., the omitted category in the regression) costs \$929 (see Table 2). Inpatient deductible coverage available in plans B–J costs an additional \$243. Coverage for the part B deductible and SNF coinsurance costs \$321. Home health care and SNF coverage is available for a marginal cost of \$96. Part B excess charges are covered for \$76. Basic drug coverage is available in plans H and I for \$888, while extended drug coverage is available in plan J for \$983.

We compare the implicit prices estimated in the hedonic model to actuarially fair values (AFV) from Alecxi and Foreman (2002). With the exception of the part B deductible and basic drug coverage, the implicit prices are consistent with the AFV for the benefit. The AFV for the core benefits is \$954 for a 75-year-old male, quite consistent with the average premium. The AFV for the inpatient deductible is \$198, consistent with \$243 premium given

Table 4: Hedonic Pricing Equation Results

	<i>Beneficiary Age</i>		
	65	75	85
Intercept	− 2,148.3 (164.5)	− 2,258.9 (230.3)	− 2,498.5 (268.5)
<i>Plan benefits</i>			
Inpatient deductible	229.0 (11.9)	243.2 (16.7)	235.8 (19.5)
Part B deductible*	259.1 (8.5)	321.3 (11.9)	358.2 (13.9)
Home health*	51.6 (9.7)	95.8 (13.6)	123.2 (15.6)
Excess charges*	46.3 (5.0)	75.6 (7.0)	78.5 (8.2)
Preventive care*	67.1 (14.6)	94.1 (20.4)	108.7 (23.7)
Basic drug coverage*	807.9 (11.6)	887.6 (16.2)	925 (18.9)
Extended drug coverage*	942.6 (23.5)	982.5 (32.8)	1,026.6 (38.2)
<i>Other policy characteristics</i>			
Issue age rated	230.2 (9.9)	165.4 (13.9)	51.2 (16.2)
Community rated	326.9 (13.5)	− 124 (18.9)	− 377.1 (22.3)
Guaranteed issue	212.1 (11.7)	284.6 (16.1)	309.6 (18.7)
Medigap Select plan	− 212.9 (9.9)	− 326.1 (13.9)	− 383.5 (16.1)
Tobacco plan	107.9 (28.7)	141 (40.2)	170.6 (46.7)
<i>State/market characteristics</i>			
PIP-DCG risk score	1,981.8 (81.5)	2,306 (114.1)	2,567.6 (133.1)
Geographic adjustment factor (geographic price index)	− 230.2 (81.5)	− 250.7 (114.1)	− 244.5 (133.6)
Adjusted expenditures	2.22 (0.1)	2.5 (0.14)	2.8 (0.17)
M+C penetration rate	367.8 (34.6)	394.9 (48.4)	418.9 (56.3)
R ²	0.9086	0.8732	0.8668

Notes: Standard errors are in parentheses. The specification also includes categorical variables denoting firms.

*Denotes the benefit also includes coverage for SNF coinsurance and foreign travel emergencies.

administrative costs. The AFV of SNF/foreign travel coverage is \$67, indicating a substantial premium for the part B deductible. The AFV for the at-home recovery benefit is \$19, which when combined with the SNF/foreign travel AFV is quite consistent with the estimated \$96 price. The same holds for part B excess charges with an AFV of \$34. The AFV for the basic drug benefit is \$594, well below the estimated price of \$888.

The marginal premium for most benefits increases as the beneficiary ages. Such increases are expected due to the increased utilization of medical care for older individuals. For example, the *Medicare and Medicaid Statistical Supplement* reports that the 1998 Medicare beneficiary cost-sharing liability (i.e., the liability that a Medigap plan might cover) increased from \$664 for those 65–74 to \$1,185 for those 85 and older.

Issue-age and community-rated policies are more expensive than attained-age policies for individuals age 65. As discussed earlier, issue-age

premiums must account for the increased future utilization as enrollees become older, while younger enrollees subsidize the premiums of older beneficiaries for community rated policies. At age 75, issue-age plans remain more expensive than attained-age plans while community-rated plans are less expensive than attained-age plans. By age 85, the premium difference between issue-age and attained-age plans diminishes further while the difference between community-rated and attained-age plans increases to \$377.

Medicare Select premiums are consistently lower than standard Medigap plans. The difference increases from \$212 at age 65 to \$384 at age 85. Premiums for policies explicitly for smokers are significantly greater than other policies.

Each of the area characteristics is a significant determinant of premiums. The magnitude of the coefficients is largely meaningless. A one-unit change in the average risk score, geographic adjustment factor, or Medicare managed care penetration rate represents a very large change, while a one dollar change in real expenditures is a relatively trivial change. In order to interpret the importance of the coefficients, the distribution of the geographic variables is examined to determine the marginal effect on premiums by moving from the state at the 25th percentile to the state at the 75th percentile. The results are provided in Table 5. The managed care penetration rate increases by 14.7 percentage points from 3.5 to 18.2 percent as we move from the 25th percentile to the 75th percentile. Quadrupling managed care penetration increases premiums by only \$54 for 65-year-olds. Premiums are more responsive to changes in health. An increase in the average risk score of 6.0

Table 5: Marginal Effects of State/Market Characteristics

			<i>Beneficiary Age</i>			<i>Marginal Effect</i>		
	<i>25th Percentile</i>	<i>75th Percentile</i>	<i>65</i>	<i>75</i>	<i>85</i>	<i>65</i>	<i>75</i>	<i>85</i>
<i>State/market characteristics</i>								
Geographic adjustment factor (geographic price index)	0.929	1.012	-230.2	-250.7	-244.5	-19	-21	-20
Adjusted expenditures	396	468	2.22	2.5	2.8	160	180	202
PIP-DCG risk score	0.953	1.013	19,81.8	2,306	25,67.6	119	138	154
M+C penetration rate	0.035	0.182	367.8	394.9	418.9	54	58	62

Notes: For each state/market characteristic, the sample is ranked by the characteristic and the quantity for the state at the 25th and 75th percentiles are reported. The coefficients are from Table 4. The marginal effect is the coefficient multiplied by the difference between the 25th and 75th percentile values.

percent from 0.953 to 1.013 leads to a \$119 increase in premiums. Similarly, a 18.2 percent increase (from \$396 to 468) in real expenditures would increase premiums by \$160. The price index is inversely correlated with premiums suggesting that premiums are higher in states with lower physician costs, but the effect of this counterintuitive result is rather small.

DISCUSSION

This paper highlights a number of issues important to researchers, policy makers, and consumers. Prior research has found mixed evidence for adverse selection into Medigap plans. The results here suggest little adverse selection for most benefits with the estimated implicit prices consistent with the AFVs of the benefits. The two exceptions are the part B deductible and prescription drug benefits. The part B deductible benefit is not subject to adverse selection. The vast majority of Medicare beneficiaries meet the deductible, thus the high implicit price for the benefit likely reflects the demand by seniors for plans that offer the benefit. The disparity between the price and AFV for prescription drug coverage is more likely due to adverse selection. Demand is unlikely to be a factor in the high price given that the prescription drug plans have accounted for less than 10 percent of the (standardized) Medigap market. Adverse selection may also be a factor in the higher premiums for guaranteed issue policies. Underwriting allows insurers to exclude sicker beneficiaries, allowing for lower premiums. Thus, there is evidence of adverse selection in segments of the Medigap market.

Medigap insurance changed in 2006 when drug coverage became available through the Medicare program. As such, prescription drug coverage is no longer available to new purchasers of Medigap policies. Given adverse selection into Medigap drug plans and low market share, Medigap has not been a viable method for providing drug coverage to large numbers of Medicare beneficiaries. Presumably, more Medicare beneficiaries will purchase part D coverage, increasing the size of the risk pool and bringing costs closer to the AFV.

Several Medigap benefits besides prescription drugs appear questionable. Fox, Snyder, and Rice (2003) argue that few enrollees use the preventive care or at-home recovery benefits. Medigap carriers indicated that these benefits add only a few dollars to premiums because they have such low use. Our estimates, while higher than theirs, still indicate that these benefits have little value. As others have mentioned, given the high marginal premium, coverage of the part B deductible could be reconsidered.

A number of states restrict rating methods that insurers may use. Attained-age rating is often criticized because older individuals pay higher premiums making the policies unaffordable to some seniors. However, with community rating younger individuals pay \$326 more per year than with attained-age rating. The States of Florida and Georgia require issue-age rating, but again younger individuals pay substantially higher premiums. While the argument that older individuals cannot afford the high cost of attained-age policies has merit, keeping premiums lower for older people has implications for the affordability of policies for younger beneficiaries. Given the number of states that prohibit the use of attained-age pricing, research should study the effect of such regulations on the Medigap market. Higher premiums reduce demand among the young limiting the ability of plans to subsidize the premiums of the old. While community rating may enable some older individuals to purchase Medigap coverage, the relative elasticity of demand may differ considerably between the young and old. Over time the effect of community rating may be that fewer consumers are covered at higher premiums.

Lastly a note on the methodology used in the paper. The empirical work used ordinary least squares regressions which have rather strong assumptions regarding the distribution of the dependent variable and residuals. Tests for normality rejected the null hypothesis that the dependent variable and residuals are normally distributed. Normality was also rejected for common transformations of the dependent variable including the log and square root transformations. Plots exploring the relationships between the dependent variable, predicted values, and residuals showed substantial positive outliers in the dependent variable and residuals, but showed no relationship between the predicted values and residuals. Examination of the outliers found they represented less than 0.1 percent of the covered lives and their removal had virtually no impact on the coefficients. Thus, it was decided to report the OLS coefficients.

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NOTES

1. All 51 states plus the District of Columbia are represented in the database.
2. There are several assumptions implicit in using the NAIC data. For example, we assume that the number of covered lives is correlated with the number of newly issued

policies, and the relative distribution of gender/age groups is constant across policies. The NAIC does not report separate data for policies for smokers. When insurers report smoking and non-smoking rates, 90 percent of covered lives are attributed to the non-smoking policy and 10 percent to the smoking policy. The distribution is from Centers for Disease Control data on smoking rates among the elderly.

3. Insurers are able to issue plans F and J with deductibles, but these policies are excluded from the sample due to a lack of information on covered lives.
4. See Ellis et al. (1996) for more information on inpatient diagnosis based risk adjustment.
5. Geographic variation in prices is relevant for inpatient care when individuals exceed 150 days for an episode of care (90 days if the individual has exhausted their lifetime reserve days). However, less than one percent of hospitalizations exceed these limits, so they have a small effect of premiums.
6. I also used the hospital wage index to reflect geographic variation in outpatient hospital costs (a component of part B coinsurance), and a weighted average of the GAF and hospital wage index. In each case, the results were similar to those reported here.
7. Payments to physicians only reflect one-quarter of the geographic variation in the work GPCI. We use the full GPCI to more fully measure geographic differences in costs.

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