Health Insurance

The Role of Product Design in Consumers' Choices in the Individual Insurance Market

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Objective. To evaluate the role of health plan benefit design and price on consumers' decisions to purchase health insurance in the nongroup market and their choice of plan.

Data Sources and Study Setting. Administrative data from the three largest nongroup insurers in California and survey data about those insured in the nongroup market and the uninsured in California.

Study Design. We fit a nested logit model to examine the effects of plan characteristics on consumer choice while accounting for substitutability among certain groups of products.

Principal Findings. Product choice is quite sensitive to price. A 10 percent decrease in the price of a product would increase its market share by about 20 percent. However, a 10 percent decrease in prices of all products would only increase overall market participation by about 4 percent. Changes in the generosity of coverage will also affect product choice, but have only small effects on overall participation. A 20 percent decrease in the deductible or maximum out-of-pocket payment of all plans would increase participation by about 0.3–0.5 percent. Perceived information search costs and other nonprice barriers have substantial effects on purchase of nongroup coverage.

Conclusions. Modest subsidies will have small effects on purchase in the nongroup market. New product designs with higher deductibles are likely to be more attractive to healthy purchasers, but the new benefit designs are likely to have only small effects on market participation. In contrast, consumer education efforts have a role to play in helping to expand coverage.

Key Words. Health insurance, price elasticity, subsidies

The growing numbers of uninsured and rising health care costs continue to plague health policy makers. Among solutions to this problem are policies to make health insurance more affordable for those who lack group health insurance and policies to promote new health insurance products that place greater financial responsibility for decision making on consumers.

The use of tax credits to help low-income people purchase individual health insurance has been advocated for a number of years and by a number of groups (Pauly 2004). The Bush Administration has proposed tax credits for low-income families who do not have access to employer-sponsored coverage. The American Medical Association proposed a system of tax credits that would replace the existing tax deductibility of employer-paid premiums and would encourage individually selected health insurance (Palmisano, Emmons, and Wozniak 2004). They believe such an approach would lead to a transformation of the market as insurers develop new and innovative designs to attract customers.

At the same time, new insurance products are already emerging that aim to control costs by increasing consumers' financial responsibility and involvement in their health care choices. The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 created health savings accounts (HSAs) permitting those who are covered by a high-deductible health insurance plan to make tax-deductible contributions in accounts that can be used to cover health expenses. In addition, the administration has proposed making premiums paid for high-deductible plans with HSAs tax deductible for those who buy individual insurance products to encourage the purchase of these consumer-directed health plans.

To design policies that will bring new purchasers to the market while encouraging them to make cost-conscious selections requires information about how premium and benefit design affect consumer choices. In this paper, we use a unique data set to estimate these effects in the individual insurance market.

PREVIOUS STUDIES

Role of Price

Measuring the price of insurance is complex because a "price" is not always observed for those who do not have insurance and because the price actually

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paid is often endogenous. Previous studies have used a variety of measures of price to solve these problems including: insurer price schedules (Marquis and Long 1995; Marquis et al. 2004); tax policy changes (Gruber and Proterba 1994); responses to hypothetical questions about purchase decisions (Marquis and Buchanan 1992); and estimates of reservation prices based on expected health care spending (Pauly and Herring 2001). Despite the different methods, most of these studies suggest that the price elasticity of participation in the insurance market is less than -1.0 .

Price also appears to affect plan choice among those who purchase insurance; however, previous research has been limited to employees' plan selections. Early studies suggested that an increase in plan premiums would result in a quite modest switching from that plan. Barringer and Mitchell (1994) found elasticities of demand for a plan with respect to the total premium of about -0.4 to -0.9 . Short and Taylor (1989) report an elasticity with respect to the out-of-pocket premium of -0.14 between fee-for-service plans but a lower price response in the choice between a fee-for-service plan and a health maintenance organization (HMO). In contrast, more recent studies by Royalty and Solomon (1999) and Cutler and Reber (1996) find higher elasticities—they report elasticities from the “insurer perspective” in the range of -1.0 to -3.5 , suggesting that a 10 percent increase in the price of a product could lead up to 35 percent of enrollees to switch from the plan.¹ Two other studies also suggest that price changes would result in substantial plan switching by employees (Feldman et al. 1989; Buchmueller and Feldstein 1997).

Role of Benefit Design

Past studies are inconclusive about the importance of benefit design features on health plan choices. Barringer and Mitchell (1994) conclude that a doubling of the deductible would reduce the market share of a plan by about 3–4 percent. Feldman et al. (1989) found somewhat larger effects. For example, a doubling of the deductible for a plan with about 50 percent of the market would reduce that plan's share by about 12 percent; a doubling of the out-of-pocket maximum would reduce its share by 16 percent. In contrast, Short and Taylor (1989) did not find a statistically significant effect of a change in the plan deductible, though they concluded that workers prefer plans with an out-of-pocket maximum and with a broad scope of benefits. Thus, the effect of benefit design on plan choices remains uncertain. Moreover, to our knowledge there are no empirical studies that evaluate the role of benefit design in consumers' decisions to purchase health insurance—information that is critical to assess

how market changes and new plan designs will affect the number of uninsured.²

The goal of this paper is to begin to fill this void by examining the effects of benefit design on consumer purchase decisions in the individual insurance market.

DATA AND METHODS

Overview of the Estimation Model

We assume that consumers evaluate the set of health insurance options available, including not purchasing coverage, and make the choice that maximizes expected utility. On the basis of the work by Feldman et al. (1989), we assume that some products are perceived to be close substitutes and these can be grouped to form distinct subsets of insurance products. The consumer's decision process is to determine the best option in each type, to compare these choices to select the best plan type, and then choose whether to purchase coverage. The decision process forms a nested decision tree; a schematic of the insurance decision is shown in Figure 1. The bottom row displays all the insurance options that are available to the consumer. We assume that the consumer views HMO products as close substitutes and preferred provider organization (PPO) products offered by one carrier as closer substitutes than PPO products offered by another carrier. We assume substitutability among the products offered by a carrier because research indicates that consumers do

Figure 1: Schematic of Insurance Decision.

select a health carrier and not just a health plan (Smith and Rogers 1986). This suggests that consumers perceive differences among carriers that are common in all of the policies they offer, for example, quality of networks or customer service. We group together all HMO plans because not all carriers offered a choice of HMO products in all years.³

Consumers will determine the best option in each of three plan types: all HMO products, PPO products offered by carrier A, and PPO products offered by carrier B. The no insurance option is another type, but as there is only the one option within it, there is no evaluation at this decision level. Consumers then compare the best option in each of the insurance types to determine the best type. Because the three insurance types are considered to be closer substitutes than the "no insurance" option, the second stage choice is limited to the three insurance types. Finally, the consumer compares the best insurance option to being uninsured.

The decision process shown in Figure 1 can be fit sequentially as a three-stage nested logit model; first, we investigate the factors affecting the preferred plan conditional on the insurance type selected (level 1); second, we estimate the preferred type conditional on the decision to insure (level 2); and third, we examine the decision to participate in an insurance plan (level 3). This means that we can fit the full model using different samples at each level. We fit the level 1 and level 2 choices, which are conditional on being insured, based on data from insurers about a sample of purchasers. And then we fit the level 3 participation decision using data from surveys that include information about people who choose the no-insurance option as well as purchasers of insurance. We use two samples to fit the level 3 decision. The first sample is from the Current Population Survey (CPS) and the Survey of Income and Program Participation (SIPP). The second is the sample from our survey of persons purchasing individual insurance and a sample of the uninsured in California.

DATA AND MEASURES

Insurer Data on Purchasers

The data to estimate decision levels 1 and 2 in Figure 1 come from the administrative files of the three largest carriers offering individual health insurance products in California; these carriers account for over 80 percent of individual policies sold in the state. We obtained data about all new enrollees in plans offered by these carriers from January 1997 through the fall of 2001. The administrative files include information about product choices, contract

type (e.g., single, family), the age and gender of the subscriber, and the residence zip code. There were about 1.2 million new subscribers over our study period. For our analysis, we selected about a 1.5 percent sample of these cases; our analysis sample includes 19,479 new subscribers.

Insurers' price files for this period provide premiums for each product available to new subscribers at the time of purchase by the age of subscriber and geographic pricing area. We linked premiums for all plans offered at the time of enrollment to subscribers based on the age of the person, time, and the county of residence. The premium measure that we use in our model is the price that a healthy subscriber of a given age would pay for self-only coverage. In the individual market, prices are often based on other individual characteristics as well, and so the premium actually paid by an individual is endogenous (Blumberg and Nichols 2004). Prices for a healthy individual are exogenous to an individual consumer and the relative prices for different products for a healthy consumer are highly correlated with the actual offer prices. Mark-ups for poor health are typically specified as a given percent of the price for a healthy consumer, and thus the percentage difference in the price of two products will be the same for a healthy and a less healthy consumer.⁴ In addition, we control for a proxy measure of health status in each stage of the estimation.

We also abstracted benefit data for all the plans offered during this study period. The Actuarial Research Corporation (ARC) used the abstracted data to develop measures of the actuarial value of each plan by simulating what each insurance product would pay for the health care services incurred by each person in a standardized population.⁵ The actuarial values were linked to each subscriber and time period. We used the linked premium and actuarial value measures to measure the actuarially adjusted level of the premium for all plan options the subscriber faced at the time of enrollment. The actuarially adjusted premium controls for variation in premiums that is due to quantity variation rather than due to variation in the price per unit of quantity.⁶ We also adjust for the price of medical care in the area and premiums are measured relative to the price of all other goods and services, as economic theory suggests that demand depends on this relative price. The price of medical care is based on the Medicare geographic practice cost index (for cross-section variation) adjusted by the consumer price index for Los Angeles over time. The cost of other goods and services is based on wages (for cross-section variation) adjusted by the consumer price index for Los Angeles over time. The cross-section wage index was based on occupational employment statistics collected by the Bureau of Labor Statistics.⁷

There were 78 different health products offered during the study period. The three carriers offered at least one HMO product in each year and two of them offered multiple PPO products in each year. Most products offered were available throughout the state, though a few were limited to specific geographic areas. The products offered by a carrier varied over time; the number of products offered per carrier per year ranged from one to 19.⁸ Variation in the product slate over time means that prices and product characteristics vary independently and vary across consumers in our database. In addition, geographic variation in prices provides additional variation in relative product prices. The actuarially adjusted price in real dollars ranged from \$37 to \$1,144 per month, depending on plan, age of subscriber, and pricing area. The average deductible in real dollars was \$1,000, ranging from \$0 to \$4,300. One-fifth of the plans were HMOs, 92 percent included drug benefits and 50 percent covered mental health.⁹ The vast majority of plans specified an out-of-pocket maximum, which averaged \$3,700 among plans with a maximum.

We had a claims history covering the period 1997–2001 for all subscribers in the cross-section, which we used to develop an indicator of health status. We chose our health measure to be predictive of future use of health care; we hypothesize that expectations about future health care spending factor into subscriber preferences for different plan benefits. We measure the presence of one of the following: chronic medical conditions in the family: arthritis, asthma (for children), hay fever, chronic ear infections (for children), cancer, depression, diabetes, heart disease, hypertension, lung disease, chronic skin problem (for children), spine or neck injury, or ulcers.¹⁰ We also measure the presence of mental health problems in a family member. Our analysis of the claims data revealed that chronic conditions indicators based on at least four quarters of enrollment fairly closely matched prevalence rates for these conditions reported by a similar population included in the National Health Interview Survey. Therefore, we measure enrollment health status by treatment for a chronic condition based on claims data for the four quarters immediately following entry into the market.

The administrative data provide limited information about subscribers' demographic characteristics, and do not include information about family income. If insurance is a normal good, we expect that higher income people will purchase more of it, that is, they will purchase more generous benefits. Therefore we included a proxy measure of income based on the average family income of other people residing in the subscriber's zip code area as measured in the 2000 Census. We define low-income families to be those with proxy income below the median.

Survey Data on the Participation Decision

Data from the insurers do not provide any information about those who do not purchase coverage. Therefore, we turn to other sources of data to model the third-level decision. We use data from the CPS and the SIPP as our primary source because they have observations over time. The product slates offered by the carriers changed over time, this means that there is variation in the choices that sample persons in the CPS and SIPP faced in making the insurance participation decision. To explore the role of nonmonetary barriers in the purchase decision, we also use data from a new survey that we carried out in 2003 of people who purchased individual coverage and those who remained uninsured. This survey collected information about perceived nonprice barriers to purchasing insurance. As others have observed, we know little about the role of these factors, but they may be quite important as evidenced from the difficulty in enrolling people in public insurance programs, even when there is no premium (Blumberg and Nichols 2004). Identifying the relative importance of these factors is a first step in designing policy to influence them.

CPS and SIPP Data. The CPS is a monthly survey of about 50,000 households conducted by the Bureau of the Census for the Bureau of Labor Statistics. A supplement to the CPS administered in March of each year includes questions on health insurance coverage for each family member. The SIPP is a longitudinal survey conducted by the Bureau of the Census to provide detailed information about income and program participation of individuals and households in the United States. Our analysis uses the California sample in the CPS for 1996–2001 and in the SIPP 1996 panel, which covers the years 1996–1999. We selected these surveys because they provide information over time, they include a large sample in California, and they measure insurance coverage.

Our unit of analysis is the family, which is defined to include a person, his/her spouse, and their children aged 18 or younger, or under 23 if the child is a student. We limit our analysis to families who do not have access to group insurance and are not enrolled in public insurance plans, as this is the population that is most likely to purchase individual health insurance.¹¹ Our analysis sample included 13,469 families. In the analysis, we pooled the data from the CPS and SIPP panels because earlier analysis of participation using these samples suggested that the underlying models were essentially the same (Marquis et al. 2004). For each family in the analysis data, we identify the set of health insurance choices that were available to them to purchase based on

the county of residence and the year. We link the benefits and premiums for each option available to the family based on the year, the county of residence, and the age of the potential subscriber.¹²

New Survey Data. We interviewed 3,964 subscribers enrolled in the individual and family health plans offered by the three insurers and 409 families with an uninsured adult in California. A sample of subscribers, stratified by age, gender, type of policy, and duration of enrollment was selected from the enrollment files of each insurer. Surveys were administered from October 2002 through February 2003 by phone, with a self-administered version of the questionnaire mailed to those who we were unable to contact by phone. We completed 2,195 subscriber interviews by phone and 1,769 by mail. This represented 35 percent of the sample selected for the survey. The vast majority of incompletes were enrollees for whom we did not have sufficient information to locate a phone number or address (20 percent of incompletes) or enrollees who failed to return any of the three forms we mailed after we were unable to contact them by phone or locate a phone number (74 percent of incompletes).

To survey the uninsured, we conducted a brief random-digit dialing survey to identify households with an uninsured adult and to obtain information on family income. We attempted to complete a longer telephone interview with all high-income households with an uninsured adult and one in four low-income households with an uninsured adult.¹³ In total, we completed screening interviews with 5,947 households, selected 483 for full interviews, and completed 409 interviews. Sample weights adjust both surveys for differential probabilities of selection and we also use poststratification weights to adjust for differences in response rate by group. These latter weights are based on the composition of the individually insured and uninsured in the 2002 CPS.

The surveys collected economic and demographic data about the family and asked about the presence of a number of chronic conditions. We also asked a series of questions to explore the role of nonprice barriers in the purchase decision. Respondents were asked to report their attitude about risk ("I'm more likely to take risks than the average person"), the availability of a safety net ("Good care at low cost can be found in public clinics," "Health care is easy to get even without money"), the efficacy of medical care ("My own behavior determines how soon I will get well," "I understand my health better than most doctors," "Home remedies are often better than drugs prescribed by a doctor," "I can overcome most illness without help from a medically

trained professional”), perceived search costs (“Searching for health insurance is difficult,” “Searching requires a lot of time,” “I have no one to trust when searching,” “Don’t know where to search”), and the burden of disclosure requirements (“Purchasing health insurance requires too much paperwork,” “Reveals too much personal information”). Responses to the questions were on a five-point scale ranging from “strongly agree” to “strongly disagree.” Each barrier is an index measured as the share of questions in the construct to which the respondent reported “strongly agree” or strongly disagree.”

Estimation

Model. To formalize the decision tree shown in Figure 1 into a form for estimation, we let i denote the purchase of health insurance versus no health plan, j the type of health plan, and k the specific health plans within each type, then we can write the probability of the ikj choice as

$$P_{ijk} = P_{k|ij} \times P_{j|i} \times P_i \quad (1)$$

where $P_{k|ij}$ is the conditional probability of choosing plan k given that the consumer has chosen to purchase insurance and chosen plan type j (level 1 in Figure 1), $P_{j|i}$ is the probability of choosing plan type j conditional on purchasing coverage (level 2 in Figure 1), and P_i is the probability of purchasing insurance (level 3).¹⁴

Using utility maximization as the framework, McFadden (1978) has shown that these conditional probabilities can be written as¹⁵

$$P_{k|ij} = e^{b'X_{ijk}} / \sum_k e^{b'X_{ijk}} \quad (2)$$

while

$$P_{j|i} = e^{(a'_{Yij} + \gamma J_{ij})} / \sum_j e^{(a'_{Yij} + \gamma J_{ij})} \quad (3)$$

and

$$P_i = e^{(c'Z_i + \delta I_i)} / \sum_i e^{(c'Z_i + \delta I_i)} \quad (4)$$

Level 1 Choice. Equation (2) is fit to explain the choice of product within a type over other products of the same type (level 1 in Figure 1) and it is based on characteristics X_{ijk} that vary across specific health plans (such as the deductible or price).¹⁶ In our data, the choice set and the characteristics of the choice set also vary across families because prices vary over time and

across counties. In fitting equation (2), the observations are families who have purchased insurance and the choice set for a family includes the products in the type they have chosen. Our sample comprises new enrollees; therefore the choice set facing each consumer includes the products offered by the three carriers at the time of the enrollment decision.¹⁷ The number of choices facing any consumer varied between 19 and 31. The choice set defined for estimation does not include the full choice set faced by consumers because we do not have data from all carriers in the market; however, as noted earlier, the participating carriers account for the vast majority of products sold.¹⁸

The explanatory variables, the X_{ij} , are characteristics that we expect to be related to the utility of choosing one of the health products including remaining uninsured. These include the price of the option and the expected out-of-pocket health care expenses if the option is elected. A family's expected out-of-pocket health care expenses will depend in part on the generosity of coverage it chooses. To capture this, we include measures of the deductible, the maximum-out-of-pocket spending, and indicators for coverage of prescription drug benefits and mental health care services. Because the slate of products offered changed over time, prices and product characteristics vary independently and vary across the consumers in our database.

Interactions of demographic characteristics of the family and product attributes account for differences among families in their preferences. As noted earlier, actual prices may vary with health status although relative prices of different products are typically the same. In addition, the expected out-of-pocket effects of different plan provisions will depend on health status, and so we include interactions of health status and product attributes in one model specification.¹⁹ We also explore interactions of age with product attributes. In earlier work, we found differences in the price elasticity among different age groups (Marquis et al. 2004). We include interactions with age as well because age is another indicator of health. Moreover, we do not have common health measures across the administrative data and the surveys to include in estimating all three decision levels. Therefore, we estimate a version of the level 1 choice model in which age is the only proxy for health status in order to fit the complete model.

Level 2 Choice. Equation (3) examines the choice of the optimal plan type conditional on purchasing insurance. It depends on characteristics that vary across the types (such as whether the plan is a PPO or an HMO) and on

J_{ij} , which is given by

$$J_{ij} = \log \left(\sum_k e^{b' X_{ijk}} \right) \quad (5)$$

This is called the “inclusive” value and it represents the maximum utility to be derived by the family from the product options available in type j . The parameter γ associated with this inclusive value in equation (3) represents the degree of similarity between options in a type. If this parameter is 0, it implies that a product in another nest is viewed as equally a good substitute as another product in the same nest. This equation is also fit using observations for insurance purchasers and the options are the three product types. In addition to indicator variables indicating the type of nest, we also include interactions of the nest and other characteristics of the family. The first of these is an interaction with the location of residence—northern versus southern California—to capture any differences in marketing strategies. For similar reasons, we interact year and the nest. Other research has suggested that younger, single subscribers prefer HMOs, so we include interactions of age and family structure with the HMO nest (Kemper, Reschovsky, and Tu 1999).

Level 3 Choice. Equation (4) is the decision to purchase insurance. It depends on characteristics that affect participation and another inclusive value I_i , which equals

$$I_i = \log \left\{ \sum_j e^{(a' Y_{ij} + \gamma J_{ij})} \right\} \quad (6)$$

This inclusive value represents the maximum utility from having insurance or going uninsured, and it depends on the parameter estimates and characteristics used in fitting the first two decision-level equations. If the coefficient δ in equation (3) is between 0 and 1, this indicates a consumer who chooses an insurance product from one of the plan types is more likely to substitute an insurance product from another type than to switch to the uninsured status if there is a change that induces people to alter their choices.

We use data from the CPS/SIPP and our new survey data to estimate the third stage (equation [4]). Notice that to estimate this third stage, we do not need to observe the specific product choice that is made. We only need to observe the choice set that is available and the characteristics of the choice set. In fact, we do not know the specific product choice made by respondents in

the CPS/SIPP sample, but we do know the choice set they face because it depends only on the year and their residence location. We assume that the relationships from the first- and second-stage choices estimated from purchasers in the insurer data set apply to the respondents in the surveys. This appears to be a reasonable assumption as the survey data are a sample of potential purchasers from the same time periods and geographic areas as the purchases in the insurer database.

In the CPS/SIPP data there is variation in the choice set available to consumers making a participation decision because of changes in the plans offered over time. In our survey data, there is limited variation in the characteristics of the choices that consumers face; it stems from limited variation in the plans offered in different areas and from cross-section variation in prices. Thus, the CPS/SIPP data are a better source for evaluating the role of plan characteristics on participation. However, we also use our new survey in order to assess the effect of nonprice barriers. In addition to the inclusive value I_i , variables in the third stage include age of the subscriber, race/ethnicity, family income, family structure, whether self-employed, and self-reported health status. The model fit to the new survey data follows the same specification, except we include an indicator of whether a family member has a chronic illness for the health measure and indices measuring nonprice barriers to purchasing insurance.

Table 1 presents key characteristics of the samples used in our estimation. The administrative data, used for estimating levels 1 and 2, describe purchasers. The two sources of survey data, used for estimating level 3, describe all market candidates. While the surveys are similar on most dimensions, there are some differences in the samples that stem primarily from changes in the composition of potential market candidates over the time represented by the CPS/SIPP to the 2003 composition reflected in our survey.

RESULTS

Choices of Product by Purchasers of Individual Insurance

The parameter estimates for the first two levels of the nested logit model, which are estimated from the choices of participants observed in the administrative data, are given in Table 2. Two versions of these equations are given. The most complete model allows for differences in the effect of plan benefits depending on the health status of the enrolled unit. These claims-based health measures are not present in the survey data and therefore cannot be used in

Table 1: Characteristics of Samples Used in Analysis

	<i>Levels 1 and 2 Administrative Data Purchasers Only</i>	<i>Level 3 Survey Data Purchasers and Uninsured</i>	
		<i>CPS/SIPP Sample</i>	<i>Survey of Insured and Uninsured</i>
Age of subscriber			
Under age 25	19.1	21.4	19.1
25–34	32.1	24.3	28.8
35–44	23.5	22.2	23.4
45–54	15.3	17.1	17.2
55–64	10.0	15.0	11.5
Male subscriber	45.1		
Single person	73.9	52.8	55.6
Married couple	8.2	18.8	15.7
Family	17.9	28.4	28.7
Median family income*	25,938	17,716	20,000
Any chronic conditions [†]	19.9	40.9	NA
Race/ethnicity			
White, non-Hispanic	NA	32.6	38.7
White, Hispanic		47.7	42.9
Asian		NA	10.5
Black		6.4	4.2
Other		13.3	3.7
Number of families	19,479	13,469	4,205

*Based on average income of residence area for administrative data.

[†]Family member with arthritis, cancer, diabetes, hypertension, heart disease, lung disease, back pain, ulcers (adults); asthma, ear infections, hay fever, skin problems (children).

estimating the participation equation (level 3). Thus the alternative version of the equations in Table 2 omits the health status measures. While the health measures are statistically significant, the effects are generally small as noted below. Moreover, their exclusion does not alter most other parameter estimates.

A key finding here is that the inclusive value in the second stage is < 1 , confirming that consumers view products within a nest as closer substitutes than products in different nests.²⁰ The inclusive value also falls between zero and one, which is consistent with utility maximization. Although the result indicates that there is substitutability and therefore that the conditional logit and its assumption of independence of irrelevant alternatives does not apply, in practice our estimates of the marginal effects of changing a plan's characteristics on take-up of the plan were not very different under the nested logit model and the conditional logit (the latter results are not presented). We chose the particular nesting structure because we believe that there is likely to be

Table 2: Nested Logit Model: Levels 1 and 2 Administrative Data

	With Health Status Measures		No Health Status Measures	
Variable	Parameter Estimate	Standard Error	Parameter Estimate	Standard Error
First stage: choice of plan conditional on plan type				
Ln actuarially adjusted premium	− 2.54	0.05	− 2.47	0.05
Ln deductible	− 0.18	0.01	− 0.19	0.01
Has out-of-pocket maximum	0.34	0.34	0.34	0.33
Ln out-of-pocket maximum	− 0.19	0.04	− 0.20	0.04
Has mental	1.16	0.05	1.19	0.05
Has drug	0.31	0.05	0.36	0.05
Interactions with age				
Ln actuarial adjusted premium	− 0.24	0.07	− 0.21	0.07
Ln deductible	0.07	0.01	0.06	0.01
Has out-of-pocket maximum	1.08	0.45	1.10	0.45
Ln out-of-pocket maximum	− 0.14	0.06	− 0.13	0.07
Has drug	− 0.14	0.07	− 0.08	0.07
Has mental benefit	0.24	0.07	0.25	0.07
Interaction Ln adjusted premium with low income [‡]	− 0.18	0.06	− 0.21	0.06
Interactions with poor health*				
Ln actuarial adjusted premium	0.32	0.09	Excluded	
Ln deductible	− 0.07	0.01		
Has out-of-pocket maximum	− 0.22	0.61		
Ln out-of-pocket maximum	− 0.11	0.08		
Has drug	0.98	0.11		
Mental benefit with poor mental health [‡]	0.75	0.28		
Second stage: choice of plan type				
Inclusive value	0.27	0.03	0.24	0.03
HMO	0.17	0.06	0.13	0.06
Carrier A	− 0.54	0.07	− 0.60	0.07
HMO by age of subscriber (age 55–64 omitted)				
Under 25	− 0.02	0.06	− 0.02	0.06
Age 25–34	− 0.15	0.06	− 0.14	0.06
Age 35–44	− 0.46	0.06	− 0.47	0.06
Age 45–54	− 0.61	0.06	− 0.61	0.06
Poor health if HMO*	− 0.32	0.05	0.00	0.03
Low income if HMO [‡]	0.42	0.03	0.42	0.03
Family structure by HMO				
Family	0.07	0.04	0.07	0.04
Two persons	− 0.37	0.06	− 0.38	0.05

Note: Plan type stage also includes year by plan type and year by resides in North California interactions. These are not shown for reasons of confidentiality.

*Family member with arthritis, cancer, diabetes, hypertension, heart disease, lung disease, back pain, ulcers (adults); asthma, ear infections, hay fever, and skin problems (children).

[‡]Any family member with mental health problems.

[‡]In residence area with average household income below median.

substitutability among products offered by a carrier because of carrier's marketing and the role of brokers in the individual market.²¹

The marginal effects of changes in a plan's characteristics on participation in the plan estimated from the model shown are given in Table 3. The derivative is given by (Anas and Chu 1984)

$$\delta P_{ij} / \delta X_{ij} = bP_{ij}[(1 - \gamma P_{ij}) - P_{ji}(1 - \gamma)]$$

and thus depends on the plan's initial market share as well as on the plan's share within its type.

Table 3: Change in Product and Group Market Share: Nested Logit Results

<i>Group Market Share (%)</i>	<i>40</i>	<i>20</i>	<i>80</i>	<i>40</i>
<i>Plan Original Market Share (%)</i>	<i>10</i>	<i>10</i>	<i>20</i>	<i>20</i>
<i>Plan Share of Nest (%)</i>	<i>25</i>	<i>50</i>	<i>25</i>	<i>50</i>
Change in a product's market share				
10% decrease in price				
High income, under age 35, healthy enrollee (%)	2.0	1.5	3.9	3.0
Low-income enrollee (%)	2.2	1.7	4.2	3.2
Enrollee over age 35 (%)	2.2	1.7	4.2	3.2
Family member with chronic condition (%)	1.8	1.3	3.4	2.6
20% decrease in deductible				
Under age 35, healthy enrollee (%)	0.3	0.2	0.5	0.4
Enrollee over age 35 (%)	0.4	0.3	0.8	0.6
Family member with chronic condition (%)	0.2	0.1	0.3	0.3
20% decrease in out-of-pocket maximum				
Under age 35, healthy enrollee	0.3	0.2	0.6	0.4
Enrollee over age 35 (%)	0.5	0.4	1.0	0.8
Family member with chronic condition (%)	0.5	0.4	0.9	0.7
Add drug benefit				
Under age 35, healthy enrollee (%)	2.5	1.9	4.7	3.6
Enrollee over age 35 (%)	1.3	1.0	2.6	2.0
Family member with chronic conditions (%)	10.2	7.6	19.9	15.0
Add mental health benefit				
Under age 35, healthy enrollee (%)	9.2	7.1	17.7	13.5
Enrollee over age 35 (%)	11.1	8.6	21.5	16.4
Family member with mental health condition (%)	15.1	11.6	29.2	22.2
Change in the plan group's market share				
Change for one product in the group (for healthy, high-income, under age 35 enrollee)				
10% decrease in price	0.41	0.55	0.27	0.82
20% decrease in deductible (%)	0.06	0.08	0.04	0.12
20% decrease in out-of-pocket maximum (%)	0.06	0.39	0.19	0.12
Change for all products in group				
10% decrease in price (%)	1.65	1.10	1.10	1.65
20% decrease in deductible (%)	0.12	0.08	0.08	0.12
20% decrease in out-of-pocket maximum (%)	0.12	0.08	0.08	0.12

A decrease in the actuarially adjusted price of a plan will lead to an increase in its enrollment, all else constant. (Below, we report on a specification that includes the unadjusted premium.) For example, a 10 percent decrease in the actuarially adjusted price of a plan that enrolls 10 percent of the total market and has 25 percent of the enrollment of its plan type (e.g., the plan type accounts for 40 percent of the market) will lead to an increase in the enrollment in the plan of about 2 percentage points. This is a 20 percent increase, or a price elasticity of -2.00 . The effect is slightly smaller when the plan accounts for a greater share of its nest. The effect of a change in price is significantly greater for low-income subscribers and older subscribers, and significantly smaller for subscribers with a family member with chronic conditions (Table 2).²² The magnitude of the differences, however, is not very large (Table 3).

Increases in the generosity of coverage—either a decrease in the deductible or a decrease in the out-of-pocket maximum—increase the demand for a particular product. This is the response controlling for the actuarially adjusted price, which means that the nominal premium will increase with generosity. The increase in the nominal premium equals the expected increase in the insurance payout. We believe that the economic question is how much insurance the consumer demands at varying prices per unit; we would expect consumers to prefer a greater quantity if the nominal premium is fixed and they do not have to pay an additional amount for the higher quantity. However, below we discuss a specification that controls for the nominal premium rather than for the adjusted price. The demand responses to changes in generosity shown in Table 3 are not large—a 20 percent decrease in deductible increases a plan's market share of younger, healthy enrollees by 0.2–0.5 percentage points depending on its original share, an elasticity of about -0.1 . A 20 percent decrease in the out-of-pocket maximum increases market share from 0.3–0.6 percentage points; an elasticity of -0.2 . The effects are somewhat smaller for those in poor health and greater for older enrollees. Elsewhere we have shown that older enrollees retain individual coverage longer than younger enrollees who purchase it; hence, the benefits to an older enrollee from switching policies when price or benefits change may be more likely to outweigh the transaction costs of doing so (Marquis et al. 2006). In contrast, beneficiaries in poor health may be constrained in switching policies even when the price or benefits change, because they risk reunderwriting (Marquis and Buntin 2006; Marquis et al. 2006).

Consumers prefer products that have a broader scope of benefits as shown in Table 3. Coverage for prescription drugs and mental health services

significantly increase a plan's expected market share. The results also indicate that plan design can potentially be used to separate the healthy and the sick; offering drug benefits is especially attractive to those in poor health, and offering mental health services is more attractive to those with mental health problems than to others. However, our health effects are a reduced form that reflects both consumer preferences and insurer underwriting practice. That is, the effects that we observe may represent current insurer practice rather than consumer preference or a mix of behaviors.

Because of substitutability, a change in the characteristics of one plan within a plan type will have much smaller effects on the number of people who choose some plan in the type; many who switch from a plan when it raises its price will turn to another plan of that type. This is illustrated in the bottom part of Table 3.²³ Because consumers exhibit a preference for a particular plan type, a change in a characteristic of all products of that type will also have a smaller effect on the number who purchases a plan of that type than the effect of a change in the characteristic of one plan on take-up of that plan. That is, consumers are more willing to switch between products within a type than to switch to another type of plan. The elasticity of demand for the plan types ranges from about -0.3 to -0.5 , depending on the market share.

Specification Checks

We fit several variants of the level 1 choice equation and found that it was robust to alternative specifications. In one alternative specification, we included the actuarial value rather than the specific benefit characteristics and interactions of the actuarial value and health. We also fit the models using nominal price rather than the actuarially adjusted price. The magnitude of the price response was the same in all specifications. However, the effect of changes in benefits is larger when we control for nominal price, rather than the quantity-adjusted price, as we would expect because people will prefer more generous coverage if their total premium remains constant. For example, the effects of a 20 percent change in the deductible or a 20 percent change in the maximum are about 45 percent higher when we control for the nominal premium than when we control for the quantity-adjusted price. The goodness of fit of the model was largely unaffected by the choice of the price measure, but we obtained a better fit including the specific benefit characteristics rather than the actuarial value.²⁴ We also prefer the model with the specific benefit characteristics from a policy perspective because it is more readily apparent how benefit redesign will influence choice.

We also examined alternative definitions of the health variable. In particular, we defined an indicator for the more serious and costly conditions (cancer, heart disease, hypertension, and lung disease) and one for the other, less costly conditions and included interactions of each of these indicators with the benefits and premium. We did not find significant differences between those with the more serious chronic conditions and those with other conditions in their response to premium or cost-sharing parameters. The only statistically significant difference was in the interaction with whether the policy offered drugs. The results suggested that a drug benefit is more attractive for those with less serious conditions than for those with the more serious conditions.

Choice of Plan Type

The level 2 equation given in Table 2 shows the role of demographic characteristics on preference for an HMO plan versus the PPO plan. Low-income families are more likely to choose an HMO plan; the coefficient estimate indicates an 11 percentage-point increase in choosing an HMO for the low-income families (when measured from a base probability of HMO participation of 49 percent). Those in poorer health have about an 8 percentage-point higher probability of choosing an HMO plan.²⁵ Increasing age is associated with a decrease in the likelihood of HMO choice up to age 55; but the oldest enrollees are more likely than other groups to choose HMO products.

Decision to Purchase Individual Insurance

The parameters of the participation decision are given in Table 4 for the model fit to the CPS/SIPP data and the model fit to our survey of the individually insured and the uninsured. In both models, the inclusive value is >0 , which indicates that product features factor into consumers' decisions to purchase health insurance.²⁶ A coefficient of 0 would indicate that product prices and benefit design do not influence this decision and instead it is driven by characteristics of the potential purchaser. The inclusive value also differs significantly from 1, indicating that changes in the design of products that induce consumers to alter their choice are more likely to lead insured consumers to switch to a product of another type than to drop insurance. In addition, product design changes will be less likely to induce uninsured consumers to enter the market than to lead to product switching by insured consumers. That is, nonpurchasers are less sensitive to product design changes than are purchasers.

Table 4: Nested Logit Stage 3: Participation Decision Survey Data

Variable	CPS/SIPP Data		Insured/Uninsured Survey	
	Parameter Estimate	Standard Error	Parameter Estimate	Standard Error
Intercept	− 0.892	0.318	− 0.519	0.761
Inclusive value	0.381	0.113	0.392	0.236
Ln family income	0.131	0.013	0.233	0.040
Nonprice barriers	Inap			
High cost of search			− 1.297	0.165
Burden of disclosure requirements			− 0.396	0.135
Risk taker			− 0.448	0.106
Perceive free care alternatives			− 0.475	0.157
Low efficiency of medical care			− 0.145	0.148
Age of subscriber				
Under 25	− 1.362	0.127	− 1.043	0.264
Age 25–34	− 0.997	0.107	− 0.747	0.222
Age 35–44	− 0.563	0.076	− 0.611	0.169
Age 45–54	− 0.135	0.078	− 0.390	0.158
Family structure				
Family	0.261	0.068	0.938	0.124
Two persons	0.124	0.073	1.333	0.132
Self-employed	0.480	0.057	0.738	0.106
Race/ethnicity				
White Hispanic	− 1.552	0.068	− 2.761	0.151
Black	− 0.552	0.115	− 1.792	0.295
Asian			− 0.588	0.135
Other	− 0.185	0.071	0.117	0.211
Self-reported health status			Inap	
Very good	− 0.249	0.060		
Good	− 0.538	0.066		
Fair poor	− 0.616	0.090		
Family member with chronic condition	Inap		− 0.646	0.100
Year indicator			Inap	
2000	− 0.147	0.111		
1999	− 0.198	0.109		
1998	− 0.120	0.113		
1997	− 0.043	0.114		
1996	− 0.141	0.115		
Indicator if SIPP sample	0.229	0.060		

Inap, inapplicable; SIPP, Survey of Income and Program Participation; CPS, Current Population Survey.

The change in purchase probabilities as characteristics of products are changed is shown in Table 5.²⁷ A 10 percent decrease in the price of insurance (i.e., a decrease in the price of all products offered holding the benefits of these

Table 5: Marginal Effects of Changes in Product Offerings and Nonprice Barriers

	<i>Percent Change in Participation (from Base Probability of 20%)</i>	
	<i>CPS/SIPP Model</i>	<i>Insured/Uninsured Survey Model</i>
10% decrease in all prices		
Under age 35	1.7	1.8
Over age 35	1.9	1.8
20% decrease in deductible		
Under age 35	0.3	0.3
Over age 35	0.2	0.2
20% decrease in out-of-pocket maximum		
Under age 35	0.3	0.3
Over age 35	0.5	0.5
5% increase in family income	0.5	0.9
One standard deviation decrease in index of:	NA	
High cost of search		31.0
Burden of disclosure requirements		11.4
Risk taking		17.6
Perceive free care alternatives		13.8
Low efficacy of medical care		3.8

Marginal effects of changes in all plan characteristics are give by $p^*(1 - p)^*b^*(\gamma)^*(\delta)$ where p is the base probability, b is the coefficient from the first-stage model, and γ and δ are the inclusive values. Marginal effects of the other variables are give by $p^*(1 - p)^*c$, where c is the coefficient from the third-stage model.

SIPP, Survey of Income and Program Participation; CPS, Current Population Survey; NA, not applicable.

plans constant) would increase purchase probabilities among those under age 35 by about 1.7–1.8 percent. The response for persons aged 35 and older is greater, about 1.9 percent assuming a base participation probability of 20 percent. The implied price elasticity estimate is about -0.2 and is consistent with our earlier estimates using a different estimation approach applied to the same data (Marquis et al. 2004). A 50 percent price subsidy, which is comparable with the subsidy the Bush Administration proposed for low-income workers, would increase the number of purchasers in the individual market by about 10 percent, but it would decrease the number of uninsured by only about 3 percent.²⁸

Changes in plan cost sharing also affect participation. A 20 percent decrease in deductibles of all products in the market, holding the actuarial value constant, would increase purchase probabilities by about 0.3 percent, given a base participation rate of 20 percent—an elasticity of about -0.02 .

The average deductible across all products offered in the individual market in California in 2002 was \$1,500, hence a decrease of 20 percent in the deductible would represent a \$300 change. A 20 percent across-the-board decrease in the out-of-pocket maximum (which would be about an \$800 change given 2002 products) similarly has modest effects on participation. As we would hypothesize, a decrease in the deductible has slightly greater effects for younger persons; because of higher expected health status a greater share of them would expect to exceed the lower deductible and find insurance more attractive. Similarly, a decrease in the out-of-pocket maximum has smaller effects for younger persons as fewer of them would expect to reach even the lower out-of-pocket maximum.

Overall, the effects of a 20 percent decrease in the cost-sharing provisions of plans are slightly smaller than the effect of a 5 percent increase in income on participation rates. The income elasticity of -0.1 is slightly larger than the income effects on demand found in other studies (Marquis and Long 1995; Marquis et al. 2004).

In contrast, most of the other potential barriers to purchasing health insurance that we measured have quite sizeable and significant effects on participation (Tables 4 and 5). A decrease in the index measuring the perceived cost of searching for information equal to 1 SD would increase the purchase of insurance by 30 percent from the base probability of 20 percent, or by about 6 percentage points. Similarly, changing attitudes about the burden of disclosure requirements, attitudes toward risk, and the perception of alternatives to insurance would have large effects on participation rates. Differences in attitudes about the efficacy of medical care, however, are not a factor in the purchase of insurance, controlling for all other characteristics.

We simulated the effects on the purchase of insurance if carriers add a new high-deductible PPO to the products that are offered in the market. The new plan has a \$2,500 deductible and a maximum out-of-pocket expenditure of \$5,000 per year, which represents the mid-range of new HSA-compatible products. The first row of Table 6 predicts participation probabilities for all persons in the 2001 CPS sample given the products then available in the market in that year, and reports the average predicted probability. The rest of the table explores how participation rates change when the new high-deductible plan is added, under alternative assumptions about the premium for the plan.²⁹ If the new plan is introduced at the median actuarially adjusted premium as we would expect, we estimate about a 1 percent increase in purchase probabilities among persons older than 65 and virtually no change for

Table 6: Predicted Increase in Participation Rate When Carriers Add a High Deductible PPO Plan to Product Offerings

	<i>Predicted Percent Purchasing by Age</i>	
	<i>Under Age 35</i>	<i>Over Age 35</i>
Participation rate with 2001 product slate	11.4	25.9
Add \$2,500 deductible, \$5,000 maximum plan at actuarially adjusted premium equal:		
10th percentile of distribution	11.6	27.4
25th percentile of distribution	11.5	27.0
50th percentile of distribution	11.4	26.1

Predictions are made to the 2001 CPS sample.
 CPS, Current Population Survey.

younger persons. If the product was introduced with a heavy subsidy, say at a premium representing the lowest 10 percentile of actuarially adjusted prices, purchase rates among persons older than 35 increase by 1.5 percentage points, or by about 6 percent. The increase for younger persons is only about 2 percent, or 0.2 percentage points.

DISCUSSION

This study is the first to produce estimates of how the purchase of individual insurance depends upon the characteristics of the plans that are offered as well as the price of insurance. While our findings are limited to one market, the results have implications for policy.

They indicate that consumers' plan choices are quite responsive to changes in health insurance premiums. Our elasticity estimate of -2.0 for plan choice among purchasers is similar to the recent estimates (Cutler and Reber 1996; Royalty and Solomon 1999). However, the results also indicate that much of the plan switching occurs within a plan type. One possibility is that with a wide range of choice, consumers pare down their choice set by limiting their choices to a specific carrier or a specific type of product in order to simplify the evaluation task. Managed competition requires that consumer shopping will stimulate competition among insurers, but for this to happen consumers must be willing to switch between carriers. Our findings suggest that this choice is less responsive to price with an elasticity of about -0.4 . Moreover, the results confirm earlier studies suggesting that tax credits and other subsidy approaches are likely to have only modest effects on the number

of uninsured. For example, our estimates suggest that even a 50 percent subsidy would decrease the number of uninsured by only about 3 percent.

Our findings indicate that consumers prefer more generous benefits, and in particular prefer products with lower deductibles to high deductible products, even though they have to pay a higher premium to cover the additional insurance payout. And those in poor health are willing to pay a higher price for a low deductible than are those in good health.³⁰ Our results suggest that a 3 percent decrease in the actuarially adjusted price (or a 4 percent decrease in the nominal premium) would induce a healthy consumer to switch to a plan with a 50 percent higher deductible. For a riskier consumer, however, it would take a 4.5 percent decrease in the actuarially adjusted premium (or a 5.5 percent decrease in the nominal premium) to make the switch. This suggests that there is potential for selection in consumer-directed health plans—an outcome that concerns many critics of these new plans. In addition, the findings suggest that introducing new high-deductible products is unlikely to play a major role in reducing the number of uninsured.

On the positive side, our findings indicate that consumer education efforts have a role to play in helping to expand coverage. Reducing the costs of obtaining insurance and the application process can have effects that are even greater than the effects of price reductions. For example, if policy could reduce the perceived costs of search from their current value to the lowest 25 percent of perceived costs, that would produce gains equivalent to a 50 percent tax subsidy. While the solution to the problem of information barriers is not known, some believe that online tools that make information easily accessible and that can deliver tailored information will help spur growth in the individual insurance market (Weismantel 2004). Our results do not provide solutions for eliminating these barriers, but they suggest that efforts to test new interventions and approaches that emphasize nonprice barriers may have substantial payoff in reducing the number of the uninsured.

Our analysis is based on the choices that consumers have made given the range of options and prices that have been offered in the past. Therefore, our estimates of response reflect how consumers will react to variations in the types of benefits and the changes in prices that are within this historical range. Although we predict little effect of introducing a new high deductible plan, we have no data to assess how people will value these when they are accompanied by HSAs. Moreover, even behavioral responses to changes in prices and benefit features might change if the nature of the market alters substantially. Nonetheless, this study presents a first step in understanding how policies that will alter product design might affect the number of uninsured.

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Disclaimer: This manuscript has not been disseminated previously except to the research sponsors. However, a few of the results presented in this manuscript were included in an article in *Health Affairs* that synthesized the findings of the larger research project under which this manuscript was prepared. The reference to that article is: Marquis, M. S., M. B. Buntin, J. J. Escarce, K. Kapur, T. A. Louis, and J. M. Yegian. 2006. "Consumer Decision Making in the Individual Health Insurance Market." *Health Affairs Web Exclusive*, May 2, 2006. Available at: <http://content.healthaffairs.org/cgi/content/full/hlthaff.25.w226v1/DC1>.

NOTES

1. The studies estimate the demand response to variation in employee-paid premiums and adjust this to reflect the change in a product's market share from a change in total price—the difference stems from the different price base as employees only pay a fraction of the premium. It is this "insurer" perspective price that we are interested in as a measure of competitive pressure, and is comparable with the measure we will estimate in the individual market where consumers bear the full price.
2. Glied (2003) simulates the value of different benefit packages for the uninsured using estimates of the additional medical spending, changes in out-of-pocket medical payments, and assumptions about risk aversion; she uses these estimates to assess the relative likelihood of participation by the uninsured in public programs that would provide these benefits. However, this study does not use observational data on how peoples' decisions actually vary with benefit design.

3. Including separate nests by HMO and carrier would thus eliminate some of the plan options from the estimation.
4. The mark-ups by tier were quite similar for the carriers that had rating tiers in our study. We do not have data on the share of applicants who were quoted above average prices, though others have suggested that fewer than 30 percent are (Musco and Wildsmith 2004). However, elsewhere we have reported that difference in the prices paid by healthy and riskier purchasers is not large (Marquis and Buntin 2006). Similarly, others have found that risk premiums are fairly small. Pauly and Herring (2001) report that a 50 percent increase in risk is associated with a premium increase of < 10 percent.
5. The standardized population was based on privately insured persons under age 65 years in the 1997 National Medical Expenditure Panel survey (MEPS); see Buntin et al. (2003) for more details.
6. In a competitive market, we would expect there not to be variation in the price per unit of benefit. However, although we are looking at one state, there is more than one market because of time and geographic variation. Moreover, lack of perfect information in the market may also permit variation in unit price within a market. Nonetheless, some of the variation in our adjusted price measure may be due to unmeasured attributes of plans.
7. We used 46 occupations for which statistics were available in all areas in California over our full time period—this accounts for about 50 percent of employees in the state. We applied a constant set of weights, based on the mix of employment within the state within these occupations, for each geographic area to derive the index.
8. A product is defined by the benefits, and any change in benefit, such as an increase in the deductible or an increase in the out-of-pocket maximum, is a new product offering. More information about the products sold in the individual insurance market in California is found in Buntin et al. (2003).
9. Policies that provide benefits for only a very limited number of severe mental health conditions are considered not to provide mental health coverage.
10. As discussed below, we also considered indicators that distinguished between the more serious and costly conditions (cancer, heart disease, hypertension, and lung disease) and the other less-costly conditions and obtained similar results.
11. Those who are eligible for public programs but do not enroll are also unlikely to be candidates for individual insurance; however, we are unable to identify these families in the survey.
12. To merge these data required us to access restricted files at the Census data center.
13. Low income was 200 percent of the poverty threshold.
14. Here and throughout we suppress the subscript for the individual consumer for convenience.
15. The empirical economics literature includes numerous applications of this general model to explore demand for differentiated products and implications of policy changes or the introduction of new products. Examples include participation in recreational activities and the choice of activity location to evaluate the costs and benefits of new facilities (Morey 1997) and the role of price in the purchase of a

vehicle and the choice of type of vehicle to assess financial incentives for pollution control (Feng et al. 2005).

16. These characteristics also vary across individuals but as noted in the previous note we have suppressed the individual subscript.
17. As noted earlier, there is some limited geographic variation in the products available at any given time, and the choice set is defined based on the products available in the enrollee's area. We limited our analysis to new enrollees for several reasons. The time of their decision is easily defined. They are actively making a choice rather than passively continuing an earlier choice. Continuing enrollees can continue enrollment in plans closed to new enrollees, thus the definition of the choice set is more complicated for continuing enrollees.
18. Based on a comparison of observed enrollment in the plans offered by the three carriers and reported individual coverage in the Current Population Survey, the market share for these dominant carriers was approximately constant over our observation period. Thus, variation in benefit designs and premiums served mostly to shift enrollment shares among the products we observe rather than to shift enrollment to or from products that we do not observe.
19. The interaction of health with other characteristics reflects both consumer choice and supply considerations. Insurers selling in the individual insurance market underwrite to manage risks. Insurers may restrict access to insurance based on their risk assessment, charge higher prices to higher risk individuals, or restrict access to specific products. To separate out the effects of health on consumer choice and insurer underwriting decisions would require a structural equation model that included information on insurers' response to enrollee applications. Without this information, our results concerning the effects of health on product choices should be interpreted as reduced form estimates.
20. Although the test suggests that nested logit model is appropriate, in practice, combining the levels 1 and 2 decision and including indicators to distinguish groups in the combined model produced estimates that were quite similar to the estimate with the nested version. We have retained the two-level decision because it provides a better fit.
21. We also tried an alternative nesting structure that distinguished only between HMO and PPO products. There is no formal test for differences in nesting structures (Greene 2002); however, in practice we obtained similar estimates of the marginal effects of plan characteristics using either structure. We also tested for further subnests within our structure, by performing three Hausman tests, each based on eliminating a plan from one of the nests. The tests failed to reject the null hypothesis that the coefficient vectors do not differ when we eliminate a product from a nest.
22. As Ai and Norton (2003) demonstrated, the magnitude of interaction effects in nonlinear models may not equal the marginal effect of the interaction term and the statistical significance of the interaction may not be determined by the standard error of the coefficient. This is because in a nonlinear model the marginal effect depends on where one starts on the curve, and two individuals alike in all but one characteristic may start from different points when there is a main effect and an interaction effect associated with the characteristic. While there are no main

effects of demographic characteristics in our models, individuals alike except for health may differ in their initial probabilities because there are multiple interactions of health and policy characteristics. However, the marginal effects that we report assume two individuals who start from the same initial probability, and the standard errors of the coefficients appropriately measure that response.

23. The change in the probability of enrolling in group i given a change in the X_{ij} of one plan in the group is given by $b_i P_{ij} (1 - P_i)$.
24. We compared the models using the Akaike Information Criterion (AIC, see Akaike 1973), which is $-\ell + k$ where ℓ is the logarithm of the likelihood function and k is the number of estimated parameters; the smallest AIC is the preferred model. With the adjusted price and the actuarial value as explanatory variables the AIC was 66,823, and with the nominal premium and the actuarial value it was 66,826. With the adjusted price and the specific benefit provisions, our preferred model, the AIC was 58,882, and with the nominal price the AIC for this model was 58,950.
25. Health status is not significant in the second-stage group choice when we do not control for health in the first-stage product choice; however, the effects of other variables are not affected.
26. Again, the inclusive value for this level is based on the levels 1 and 2 equations that omit the health status measures.
27. The effect of a change in the characteristic X_{ijk} of one plan on participation in the market is given by $\delta \gamma b_i X P_{ijk} (1 - P_i)$, and the change in the characteristic across all plans is $\delta \gamma b_i X P_i (1 - P_i)$.
28. The Bush Administration also proposed a subsidy for all purchasers of high-deductible individual policies coupled with HSAs by making the premiums tax deductible; we do not simulate that approach. Our estimate of the increase in purchasers does not account for any shift from the group market in response to the subsidy; however, elsewhere we have shown that this is very small (Marquis et al. 2004).
29. A key assumption in using the model to predict in this way is that any new product in a group will not be a closer substitute for some products in the group than for other products. However, if there are unobserved product characteristics, as more and more products are added to a group, it seems likely that there may be some bundling of products on unobserved dimensions that may affect substitutability and lead to a violation of the assumption of independence of irrelevant alternatives (Akerberg and Rysman 2005). Earlier we noted that this assumption was valid within nests given the observed slates. Our simulation assumes that the new products will not alter this.
30. Responses to hypothetical insurance offers to participants in the RAND health insurance experiment to reduce the family's out-of-pocket liability also suggested that people, especially those in poorer health, are willing to pay a sizeable risk premium to reduce their deductible (Marquis and Phelps 1987).

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