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The Value Of Medicare Managed Care Plans and Their Prescription Drug Benefits

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Abstract

I estimate the welfare, both gross and net, provided by the Medicare managed care program in 1999 through 2002. First, I estimate a model of demand for the benefits offered by managed care plans to Medicare beneficiaries. I then use the demand estimates to form estimates of welfare provided by the program. Medicare beneficiaries derived $14.9 billion of gross welfare per year from the Medicare HMO program. Depending on the amount of selection in the program, the Medicare managed care program provided from -$10.3 billion to $35.1 billion of net welfare total over the four-year period. I also estimate the welfare that beneficiaries receive from the prescription drug benefits offered by Medicare HMOs. HMO enrollees in plans offering drugs received on average $13 of consumer surplus per month from the drug benefits in 1999, and this estimates drops to $10 by 2002.

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1 Introduction

Medicare managed care plans contract with the government to provide health insurance for Medicare beneficiaries who choose to enroll in them. These plans offer extra benefits, such as vision coverage, dental coverage, and outpatient prescription drug benefits, which, for a long time, were not included in the standard Medicare benefit package. They also charge enrollees a premium and, unlike traditional Medicare, restrict which doctors and hospitals enrollees can use. In 2005, 5.7 million Medicare beneficiaries, or 13% of the total Medicare population, were enrolled in HMOs and the program cost Medicare $39.6 billion in reimbursements, or 15% of the total budget for Medicare.

What are the Medicare HMO plans and their benefits worth to beneficiaries? In this paper, I estimate a nested logit model of demand for Medicare HMO benefits using data on HMO market shares and detailed benefit and premium data from the Medicare HMO program in 1999-2002. I use the method outlined in Berry (1994) for estimating structural functions of demand for differentiated products with market share and product characteristic and price data. I address correlation between unobserved plan quality and plan premiums in two ways: first, by using plan fixed effects, and second, by instrumenting for plan premium with the premiums of the plan's competitors in other markets. I then use the resulting demand estimates to estimate consumer surplus derived from the Medicare HMO program during these years and conduct a rough cost-effectiveness analysis of the program under different assumptions about how much the HMO enrollees would have cost the program if they had remained in traditional Medicare. I also estimate the welfare derived from prescription drug benefits to see how much of the welfare provided by the HMOs is attributable to prescription drug benefits.

The demand results show that beneficiaries are willing to pay $13 per month on the margin for the first $100 of monthly brand-name prescription drug coverage. They are also willing to pay per month $1 to reduce the primary co-payment by $1, $2 to reduce the inpatient deductible by $100, $37 to remove the requirement for seeking a referral to

see a specialist, $8 for dental benefits, and $15 for vision benefits.

I estimate that the program provided $83 of monthly consumer surplus per beneficiary in 1999, and this estimate drops to $70 in 2002. The decline was due to plans withdrawing from the program, and cutting benefits. In the aggregate, beneficiaries received $16.4 billion in gross welfare in 1999, and this estimate drops to to $12.3 billion in 2002. The net welfare provided by the HMO program depends on what HMO enrollees would have cost if they had been enrolled in traditional Medicare and I calculate net welfare under several different assumptions about their counterfactual costs. If HMO enrollees would have cost the same in traditional Medicare as beneficiaries who stayed in traditional Medicare, then the HMO program generated $34.9 billion in net welfare over the four-year period. If HMO enrollees would have cost 65% of what enrollees in traditional Medicare cost (as one study has suggested), then the HMO program generated -$10.8 billion in net welfare over the same period.

Welfare derived from prescription drug benefits is estimated to be $13 per month in 1999, and drops to $10 per month in 2002. The welfare level is low compared to average level of spending on prescription drugs by the elderly and given the level of benefits being provided, and suggests that either HMO enrollees have much less demand for prescription drugs than those who stay in traditional Medicare or beneficiaries are not willing to pay for prescription drug benefits, due to the persistence of prescription drug spending (Pauly and Zeng 2003).

This paper takes an approach close to that of Town and Liu (2003) who also estimate demand for Medicare HMOs in 1993 through 2000 using a nested logit model applied to market share data. It offers two improvements over that paper. First, Town and Liu (2003) had no benefit data besides a dummy for whether or not the plan offered prescription drug benefits while I have highly detailed benefit data on the level of prescription drug benefits and on nondrug benefits. Second, they nest HMOs into two groups by whether or not they offer prescription drug benefits but do not, in addition, nest all the HMOs together. Since

their model has only two levels of nesting, it does not allow for correlation in utility across all the managed-care choices. In the model that I present in this paper, all the HMOs are nested together in addition to being nested by whether or not they offer prescription drug benefits and the results show that this three-level model is the preferred model. The three-level model, however, results in significantly lower effects of prescription drug benefits. I find that the willingness to pay for the first $100 of brand-name prescription drug coverage in Town and Liu's (2003) two-level model is $25, while, in the three-level model, it is only $13.

Measuring the amount of welfare provided by Medicare HMOs clarifies how much favorable selection the HMOs can have and still deliver positive net welfare. In the early 1990s, several studies showed that the beneficiaries who chose HMOs were considerably healthier than those who remained in traditional Medicare. (For a review of these studies, see Hellinger and Wong (2000).) Many policy analysts concluded that the HMOs were "overpaid" and this perception led to the growth rate of their reimbursements being reduced by the Balanced Budget Act of 1997. The change in the reimbursement formula, however, caused many plans to exit the program and there was a large outcry from beneficiaries who were involuntarily disenrolled from their Medicare HMO. The plans' exits called attention to how much benefit they were providing to Medicare beneficiaries who lacked other sources of supplementary coverage. In this paper, I measure in dollar terms how much benefit the Medicare HMO program provided and show that the HMOs can enjoy a fair amount of favorable selection and still deliver positive net welfare.

2 Background: the Medicare managed care program

Traditional Medicare has high requirements for patient cost sharing relative to most modern private insurance plans. Medicare requires 20% co-insurance on most outpatient services, a high deductible ($812 in 2002) on hospital stays and only covers the first 150

days of hospitalization per year. To cover the remaining costs, a large proportion (87% in 1999 (Kaiser Family Foundation 2001)) of beneficiaries have some kind of supplemental insurance. In 1999, about a third had employer-sponsored coverage, 24% had private Medigap insurance, 11% were on Medicaid and 17% were enrolled in a Medicare managed care plan.

The Medicare managed care program was created to take advantage of the supposedly greater efficiency of managed care plans in providing health insurance for Medicare beneficiaries. The program was called "Medicare+Choice" during 1999-2002, the period under study here, and is now called "Medicare Advantage." Commercial plans contract with the Center for Medicare and Medicaid Services (CMS), the agency that runs Medicare, to provide health care for Medicare beneficiaries within a defined service area (usually a county or group of contiguous counties). The contract, which is revised and renewed each year, specifies benefits to be provided and possibly a premium that will be charged by the plan to the beneficiary. During the period studied here, the government reimbursed the plan at a flat rate that was set at a base level by county and then adjusted for the individual beneficiary's age, sex, Medicaid eligibility status, and employment status. The flat rate passed the financial risk of the beneficiary's medical care to the plan. Beneficiaries could enroll in the private plans or remain in traditional Medicare as they choose and were allowed to switch in and out of traditional Medicare or among plans whenever they want. The plans must either accept all enrollees or close the plan completely.

From the beneficiary's point of view, the advantage of the managed care plans is that they require less cost-sharing for the beneficiary. Co-payments for doctor visits, for example, are usually about \$10-\$15 per visit, which is usually less than traditional Medicare's 20% co-insurance. Medicare HMOs also often cover benefits that are not covered by traditional Medicare such as preventive care and outpatient prescription drugs. On the other hand, as managed-care plans, they usually require beneficiaries to see only providers within their network, while traditional Medicare places little constraint on what

providers beneficiaries can see.

Several studies of plan entry and exit in the Medicare HMO program have been conducted (General Accounting Office 1999, Abraham, Arora, Gaynor, and Wholey 2000, Ellis and Gurol 2002, Pai and Clement 1999, Penrod, McBride, and Mueller 2001). Most of them show that the payment rate is one of the most important factors determining whether an HMO decides to offer a Medicare plan in a county. In addition to having higher payment rates, counties with Medicare HMOs tend to have higher Medicare populations, wealthier and more educated populations, and be more urban than counties without Medicare HMOs.

3 A model of demand for Medicare HMO benefits

Berry (1994) showed that, by inverting the function relating market shares to utility, it is possible to estimate ordinary and nested logit models of demand using linear regressions on aggregate data. The example he used was a two-level model where the choices are grouped exhaustively into G groups, other than one choice which is referred to as the "outside" choice and for which consumer surplus is normalized to zero.

Town and Liu (2003) apply this model to the demand for Medicare HMOs. They sort the HMOs into two nests by whether or not they offer prescription drug benefits while defining remaining in traditional Medicare as the outside choice. The problem with this model, however, is that, intuitively, we would expect all the managed care choices to be nested together. Managed care plans have many features in common, such as limited provider choice, demand for which might be correlated across plans for the same individual. Nesting the managed care plans together allows for this correlation.

I therefore nest all the managed care choices together. In addition, like Town and Liu, I nest them within that nest by whether or not they offer prescription drug benefits.

Utility of individual i for plan j in this model is given by:

$$\begin{aligned} U_{ij} &= X_j\beta + \xi_j + \zeta_{iHMO} + (1-\sigma_1)[\zeta_{ig} + (1-\sigma_2)\epsilon_{ij}] \\ &= \delta_j + \zeta_{iHMO} + (1-\sigma_1)[\zeta_{ig} + (1-\sigma_2)\epsilon_{ij}] \end{aligned} \tag{1}$$

X_j consists of the observed characteristics of the choices, and ξ_j is a scalar measuring quality observable to the consumer, but not to the econometrician. These together make up δ_j, which is the part of utility that is the same for choice j across individuals. Each individual also has a random draw ζ_{iHMO} for the managed-care nest, a random draw of utility for each prescription-drug nest g, ζ_{ig}, and a draw for each plan, ϵ_{ij}. Each individual chooses the plan j that gives them the maximum utility.

The parameters σ_1 and σ_2 (both $\in (0,1)$) measure the correlation in utility across choices in the same nest. That is, they measure the importance membership in the nests has in determining individuals' choices relative to the characteristics of the plan contained in δ_j and to ϵ_{ij}. σ_1 measures the correlation in utility across all the managed-care choices and σ_2 measures the correlation in utility across the plans within the two prescription-drug nests.

I derive the estimating equation for this model as follows. (The derivation is similar to Berry's for the two-level model.) The share of plan j within prescription-drug nest g is given by:

$$\begin{aligned} s_{j|g} &= \frac{\exp(\frac{\delta_j}{1-\sigma_2})}{\sum_{k\in g}\exp(\frac{\delta_k}{1-\sigma_2})} \\ &= \frac{\exp(\frac{\delta_j}{1-\sigma_2})}{D_g} \end{aligned} \tag{2}$$

The share of nest g within the HMO group is in turn given by:

$$\begin{aligned} s_{g|HMO} &= \frac{D_g^{\frac{1-\sigma_2}{1-\sigma_1}}}{\sum_1^2 (D_g^{\frac{1-\sigma_2}{1-\sigma_1}})} \\ &= \frac{D_g^{\frac{1-\sigma_2}{1-\sigma_1}}}{D_{HMO}} \end{aligned} \tag{3}$$

Finally, if we normalize δ_0 to 0, the share of the HMO group is given by:

$$s_{HMO} = \frac{D_{HMO}^{1-\sigma_1}}{D_{HMO}^{1-\sigma_1} + 1} \tag{4}$$

And the share of the outside choice is given by:

$$s_0 = \frac{1}{D_{HMO}^{1-\sigma_1} + 1} \tag{5}$$

The unconditional share of plan j is therefore:

$$\begin{aligned} s_j &= s_{j|g} s_{g|HMO} s_{HMO} \\ &= \frac{\exp(\frac{\delta_j}{1-\sigma_2})}{(D_g^{1-\frac{1-\sigma_2}{1-\sigma_1}})(D_{HMO}^{\sigma_1})(D_{HMO}^{1-\sigma_1} + 1)} \end{aligned} \tag{6}$$

Algebraic manipulation similar to Berry's for the two-level model yields the following equation that can be used to estimate β, σ_1, and σ_2:

$$\ln(s_j) - \ln(s_0) = X_j\beta + \sigma_2 \ln(s_{j|g}) + \sigma_1 + \ln(s_{g|HMO}) + \xi_j \tag{7}$$

The difference between this equation and Berry's equation for the two-level model is that Berry's equation omits $\ln(s_{g|HMO})$ as a regressor, forcing σ_1 to be 0. If $s_{g|HMO}$ is correlated with X_j, however, omitting it leads to inconsistent estimation of β and σ_2. To test which is the preferred model, I will include $\ln(s_{g|HMO})$; if the coefficient σ_1 is

significantly different from zero, the three-level model is preferred to the two-level.

4 Data

Data were collected for the years 1999-2002. Market shares for Medicare HMOs come from the Medicare Managed Care Market Penetration State/County/Plan Data files, which contain enrollment in Medicare managed care plans by plan and county. Reimbursement levels come from the Medicare+Choice Payment Rate files and the base reimbursement rate for the aged in each county is used. Benefit and premium data come from the Medicare Compare database, which is the database underlying the online plan chooser for Medicare beneficiaries. All of these data sources were obtained from CMS.

The enrollment data give enrollment by contract number within a county. One contract may, however, cover more than one package of benefits since HMOs are allowed to offer more than one within a county. Usually, the offerings consist of a "basic" plan with an optional supplement for an extra premium. Since enrollment is not split up by packages however, I attribute all of the enrollment to the HMO's "basic" plan, defined as the plan with the lowest premium. (Atherly, Dowd, and Feldman (2004) report that 87% of Medicare HMO enrollees with prescription drug coverage receive it through the plan's basic benefit package.)

The market share for each plan was calculated by dividing the plan's enrollment by the number of Medicare eligibles in the country, adjusted to reflect state-level rates of Medicaid and employer-sponsored plan participation. These rates were calculated by pooling the March demographic supplements of the Current Population Survey for the four years, identifying respondents reporting being covered by Medicare and then tabulating the rates at which these respondents also report being covered by Medicaid and employer-sponsored insurance by state. It was necessary to use state-level rates since the sample sizes for MSAs would not have been large enough.

The Medicare HMO program experienced some instability in 1999-2002. In response to provisions in the Balanced Budget Act of 1997 which lowered the growth rate in reimbursements for plans participating in the program, numerous plans left the program during this period and many of those that stayed reduced their benefits and raised their premiums. Table 1a shows the decline as measured by the number of plans participating in the program and the number of counties with at least one Medicare HMO available. The number of plans participating declines from 280 to 139 and the number of counties with plans declined from 794 to 540.

As Table 1b shows, Medicare HMOs have a small but substantial presence in the counties of their service areas. The average Medicare HMO market share is about 11%, and the average enrollment in a Medicare HMO is about 3,900. The share of traditional Medicare is, on average, about 75%. There is strong regional variation in the strength of the HMOs' presence. In California, for example, about 93% of those eligible for an HMO and not enrolled in Medicaid or an employer-sponsored plan are enrolled in one, while in Maine, only 2% are.

Table 2 gives statistics about the availability of and enrollment in Medicare HMOs. While there is a strong decline in the number of beneficiaries that have an HMO available to them, from 68% to 59%, the enrollment rate, conditional on eligibility, declines only slightly from 22% to 20%. Similarly, while there is a decline in the percentage of HMO-eligible beneficiaries that have access to a plan that offers prescription drug benefits, from 87% to 72%, the enrollment rate in plans with prescription drug coverage drops only from 21% to 20%. These numbers suggest that the observed variation is on the supply side, and that the underlying demand is constant.

In addition to many HMOs dropping out of the program during this period, a further effect of reducing the reimbursement was that the HMOs who stayed in raised premiums faster than the rate of inflation and reduced coverage. Table 3a shows the average real premium in 2000 dollars and the percentage of plans offering drug benefits by year. The

average premium nearly tripled from $13 to $36 between 1999 and 2002 while at the same time the percentage of plans offering prescription drug benefits dropped from 71% in 1999 to 60% in 2001, and then rose again to 67% in 2002.

4.1 Prescription drug benefits

Medicare HMOs vary the generosity of their drug benefits along several dimensions. They can vary in what categories of drugs they cover, the coverage limits, the number of tiers, the amount of the co-payments, the presence of a formulary (or list of drugs favored by the plan), and whether the formulary is open or closed. The main distinction in pricing among drugs is whether a drug is brand-name or generic. Brand-name drugs are still under patent and are therefore priced much higher than generic drugs.

The main way in which plans reduced their generosity during the period 1999-2002 was by removing brand-name drug coverage. Between 1999 and 2002, as Table 3a shows, the percent of plans with drug benefits that offer brand-name coverage dropped from 97% to 59%. Conditional on offering brand-name drug coverage, the average coverage amounts decline only slightly, from $1,127 in 1999 to $906 in 2002.

In the regressions, drug benefits are specified in two ways. The first specification is a simple indicator for whether or not the plan offers prescription drug benefits. This specification is reported for purposes of comparison with other studies with less detailed drug benefit data, such as Town and Liu (2003).

The second specification includes the brand-name coverage amount and the amount squared, and the brand-name co-payment. The coverage amounts are deflated using the Consumer Price Index for prescription drugs to 2000 levels. Generic co-payments and coverage were omitted because they did not have a significant effect on plan choice in any specification.

4.2 Nondrug benefits

The Medicare Compare database also contains extensive information on the nondrug benefits of the plans. For the purposes of this paper, information about the following benefits were extracted: the co-payment for a primary care visit, the co-payment for a specialist visit, the inpatient deductible, and whether or not the plan required a referral to see a specialist, offered vision benefits and offered dental benefits.

Table 3b shows the variation in these benefits over time. Both of the average doctor visit co-payments increased slightly between 1999 and 2002. The average deductible for inpatient hospital stays more than sextupled during the same period, from $21 to $132. This change is largely driven by plans switching from not charging a deductible to charging a positive deductible. The percentage of plans that do not require a referral to see a specialist is very small but rises slightly in 2002.

The plans also have the option of offering vision and dental benefits above the level of traditional Medicare. Traditional Medicare's vision benefits are limited; it covers exams for glaucoma for high-risk patients, and glasses following cataract surgery. The HMOs typically cover routine eye exams and/or glasses and contact lenses. Traditional Medicare has almost no dental coverage, while the HMOs cover from one to an unlimited number of preventive dental exams. Since information about vision and dental coverage was sometimes incomplete, however, I only control for whether they offer each kind of coverage, not what the level of coverage is. As Table 3b shows, most plans offer vision benefits and the percentage of plans offering vision benefits declines only slightly, from 93% to 86%. The percentage of plans offering dental benefits halves, from 35% to 19%.

5 Empirical strategy

As discussed in Section 3, the regression to be estimated is:

$$\ln(\frac{s_{jmt}}{s_{0mt}}) = \alpha Premium_{jmt} + X_{jmt}\beta + \sigma_2 \ln(s_{j|gmt}) + \sigma_1 \ln(s_{g|HMOmt}) + \xi_{jmt} \qquad (8)$$

where s is the plan's market share, j is the plan, m is the county and t is the year (1999-2002). X_{jmt} is a vector of benefit characteristics, the exact specification of which will be discussed below. s_{0mt} is the share of traditional Medicare in the county.

ξ_{jmt} contains characteristics of the plan that are unobserved by the econometrician but are observed by the beneficiaries and affect their valuation of the plan. In this case, among other things, it might include the extensiveness and quality of the HMO's provider network.

Unobserved quality is correlated with premium, the log of the plan's share within its nest, and the log of the nest's share within the total HMO share of the market. In order to partially overcome this problem, plan-county fixed effects are used. Plan-county fixed effects capture the plan-county mean quality $\overline{\xi}_{jm}$ leaving the time-specific deviation in plan quality $\Delta\xi_{jmt}$ as the error term. This strategy for dealing with the correlation between price and unobserved quality is very similar to that of Hausman (1997) and Nevo (2001). The only potential remaining inconsistency in estimation therefore would arise from factors that change over time for a given plan in a given county that affect both their premium and conditional shares, and demand for their product.

To deal with this remaining concern, the premium, the log of the plan's share within its nest, and the log of the nest's share within the HMO group are all instrumented. Two instruments for premium are used. The first is created by calculating the mean of the premiums charged by the plan's competitors for each of the other counties in the plan's service area, and then calculating the mean of these means, weighted by the number of Medicare eligibles in each county. The weighting takes into account the relative

importance of the other markets to the plans' pricing decisions.

For example, in 2002, Harvard Pilgrim Health Care offered a Medicare HMO plan in Essex, Middlesex, Suffolk and Norfolk counties in Massachusetts. Tufts HMO and Blue Cross/Blue Shield also offered Medicare HMO plans in Middlesex, Suffolk, and Norfolk counties, and Fallon Health Plan offered one in Norfolk County. The instrument for the Harvard Pilgrim Health Care-Essex county-2002 observation would be calculated by taking the means of Tufts and Blue Cross Blue Shield's premiums in Middlesex County, of the same two plans' premiums in Suffolk County and of Tufts, Blue Cross Blue Shield and Fallon in Norfolk County, and then calculating the mean of these three numbers weighted by the number of Medicare eligibles in each of the three counties.

In using competitors' premiums, this paper differs from most previous work in this area which use the firm's own prices in other geographic regions as instruments rather than competitors' prices. The assumption behind using own premiums is that shocks to marginal cost will be reflected in the firms' prices across counties. Their strategy requires, however, the assumption that the different regions' deviations from the mean valuation of the same good be independent of each other. This assumption can be justified in the case where regions are geographically separated from each other and the good that is being sold is the same across regions (as in the case of ready-to-eat cereal being sold in different cities across the US). Medicare HMOs, however, tend to operate in a group of counties that are contiguous and beneficiaries are likely to be crossing over county boundaries to receive their medical care. In this case, a plan's time-specific deviations from the means of quality for each county are not going to be independent of each other in adjacent counties, limiting the applicability of the type of instrument used in previous work. For example, if Harvard Pilgrim Health Care adds a Boston hospital to its network, the time-specific deviation from its county means of quality will be correlated across Suffolk, Middlesex and Norfolk counties since many residents of Middlesex and Norfolk counties go into the city of Boston in Suffolk County to receive hospital care.

Using competitors' premiums in other counties overcomes this problem. Competitors' premiums are correlated with the premium because of the component of marginal cost common to the region. They are, on the other hand, unlikely to be correlated with the time-specific deviation from quality because it is plausible to assume that Medicare HMOs' pricing decisions in a county are based on factors specific to that county, such as marginal cost and reimbursement. Marginal cost is derived from exogenous supply-side factors such as the level of competition among providers and the average health status of the elderly in the county while reimbursement is set according to a formula.

The other instrument for premium is the base reimbursement rate for the county since that is an exogenous determinant of price. The reimbursement rate is set by legislation and is the same for all plans within a county.

To instrument for the logs of the conditional shares, I use functions of the characteristics of other firms in the same market. These variables will capture the part of the firm's nest share that is determined by other firms' behavior but not the part that is set by the firm's own characteristics. The instruments for the plan's share within its drug group are therefore the means of the brand-name drug coverage amount and the means of the non-drug benefits offered by competing plans in the same drug group in the same county. The instruments for the group's share of the overall HMO share are the means of the same variables for the plans in the other drug group within the same county. If there are no other plans in the other group, these are set to zero.

Finally, dummy variables for years are included to control for yearly shifts in demand for HMOs and their associated medical care.

6 Results

Table 4 reports the results of estimating the demand equation for the two different specifications of drug benefits. As it shows, which specification used does not significantly affect

the coefficients on premium. The coefficient on premium ranges from -0.007 to -0.005 (with a standard error of about 0.001) across specifications.

When we compare the results for the three utility specifications (logit, two-level nested logit, and three-level nested logit), we see that, since σ_1 is estimated to be about .5 in the three-level nested logit model, this latter model is the preferred one. This model allows for beneficiaries' utility functions to be correlated across all managed-care choices. The positive and significant estimate for σ_1 suggests that failing to allow for this correlation will lead to the estimates of the effects of the benefits being inconsistent, and that we should therefore focus on the results from the three-level nested logit.

Turning to the effect of the benefits, we find that they generally are significant (other than vision benefits and the specialist co-payment) and have the expected sign. The estimated effect of the drug benefits is lower in the three-level model than in the second-level model, however.

To make the results in table 4 clearer, table 5 translates the marginal utilities given in table 4 into willingnesses to pay by dividing by the marginal utility of income as estimated by the coefficient on premium. It gives the results of this calculation for the three models (ordinary logit, two-level nested logit, and three-level nested logit), both specifications of drug benefits, and for the nondrug benefits in the equations where drug benefits are specified in detail.

While the differences across the equations are generally not significant, the point estimates of the effect of drug benefits drop noticeably in the three-level model. The marginal willingness to pay for a drug benefit is estimated to be about \$13 in the two-level model and drops to about \$0 in the three-level model. Similarly, the estimated marginal willingness to pay for the first \$100 of brand-name coverage drops from \$25 in the two-level model to \$13 in the three-level model.

For the nondrug benefits, the estimates show that beneficiaries are willing to pay \$1 per month to reduce the primary care co-payment by \$1, \$1.84 per month to reduce

the inpatient deductible by $100, $37 per month to remove the requirement to seek a referral before seeing a specialist, and $8 per month for dental benefits. The response to the primary care co-payment can be characterized as strong, since it implies that, if beneficiaries are rational, they are visiting their primary care doctors once a month on average. According to the Medicare Current Beneficiary Survey (Kaiser Foundation 2005), however, the median number of visits to the doctor made by Medicare beneficiaries is six per year, or one ever other month on average. The strength of the enrollees' response may reflect that they do go to the doctor more than the typical Medicare beneficiary, or that they are overreacting to the level of the primary care co-payment because it is usually listed first in the output of the Medicare Compare database. We cannot distinguish between the two explanations with these data. For the other benefits, there is little to benchmark them against.

7 Aggregate beneficiary welfare and the cost-effectiveness of the Medicare HMO program

The next section uses the demand function estimated in the previous section to calculate the consumer welfare provided by the Medicare managed care program, and from that, draw some conclusions about the cost-effectiveness of the program. As Small and Rosen (1981) show, surplus per consumer in a market in a discrete-choice model is found by integrating over the share function. Intuitively, this result is analogous to the result for continuous choice that compensating variation is found by integrating over the compensated demand function. For a representative consumer, the compensating variation of a change either in the number of choices available, or their characteristics is given by:

$$W_{mt} = \frac{1}{|\hat{\alpha}|} \int_{\underline{\delta}^0}^{\bar{\delta}^1} s_{jmt}(\delta_{jmt}) d\delta \tag{9}$$

$\overline{\delta}^0$ is the vector of mean utilities from the choices available before the change and $\overline{\delta}^1$ is the same vector after the change. As Small and Rosen (1981) show, this integral can be applied to multiple changes in choice characteristics or the number of choices at once.

If we integrate the share formula for the three-level nested logit model (equation 6) in this way, we obtain:

$$W_{mt} = \frac{1}{|\hat{\alpha}|} ln\{[\sum D_g^{\frac{1-\sigma_2}{1-\sigma_1}}]^{1-\sigma_1} + 1\}\Big|_{\overline{\delta}^0_{mt}}^{\overline{\delta}^1_{mt}} \tag{10}$$

where, as in equation (2),

$$D_g = \sum_{k \in g} \exp(\frac{\delta_k}{1-\sigma_2}) \tag{11}$$

Table 6 shows beneficiary welfare provided by the Medicare HMO program calculated from this formula. In the first column, monthly compensating variation per Medicare eligible was calculated as in equation (10) for each county and averaged across counties, while weighting by the number of eligibles in each county. (Note that, since we have normalized the utility of traditional Medicare to zero, the integral will evaluate to zero when evaluated at $\overline{\delta}^0_{mt}$.) As it shows, average monthly compensating variation per beneficiary was \$83 in 1999, rose to \$84 in 2000, and then dropped to \$70 by 2002. The differences across the years are not statistically significant, however. The changes in welfare are due both to changes in the plans' benefits and changes in the number of choices due to plans entering and withdrawing the program.

Column 3 shows aggregate annual welfare from the Medicare HMO program. Aggregate annual welfare is calculated by multiplying average monthly compensating variation in each market by the number of Medicare eligibles, summing up total compensating variation over the counties, and multiplying by twelve. Estimated aggregate welfare is \$16.4 billion in 1999, rises to \$16.5 billion in 2000, and then falls to \$12.3 billion by 2002. The decline from 2000 to 2002 is due both to the drop in average consumer surplus per

beneficiary and to the drop in the number of beneficiaries who have a plan available to them.

Measuring aggregate welfare in this way allows us to do a rough analysis of the cost-effectiveness of the Medicare HMO program. Net welfare provided by the Medicare HMO program is gross welfare minus the costs of the program plus what the outlays in traditional Medicare would have been if the HMO beneficiaries had been enrolled in it.

I obtained the costs of the HMO program from CMS's financial statements for the years in question. What the costs of HMO beneficiaries would have been had they been enrolled in traditional Medicare, however, is harder to calculate. The counterfactual costs depend on how much favorable selection the HMOs were experiencing during this period. Hellinger and Wong (2000) summarize the evidence on the level of favorable selection in the Medicare HMO program. Most studies found evidence that Medicare HMO enrollees were healthier than beneficiaries who stayed in traditional Medicare. The only studies that directly measured costs, however, used data from the early 1990s, somewhat earlier than the period studied here. The estimates of the ratio of HMO beneficiaries' costs to those of beneficiaries in traditional Medicare range from 65% (Riley, Tudor, Chiang, and Ingber 1996) to 89% (Brown, Clement, Hill, Retchin, and Bergeron 1993).

Table 7 presents estimates of what Medicare HMO enrollees' costs would have been under the traditional Medicare program, under different assumptions of the ratio of HMO enrollee costs to the costs of beneficiaries in traditional Medicare. Column 1 gives the monthly spending per beneficiary in the traditional Medicare program averaged across counties where HMOs are present. This figure was calculated from the county-level spending data for traditional Medicare beneficiaries from CMS. For each county, Part A (hospital) and Part B (doctor) spending were totaled separately for aged and disabled beneficiaries and spending was averaged across the two eligibility categories, weighted by the number of beneficiaries in each. (The spending data for beneficiaries eligible for Medicare because of end-stage renal disease (ESRD) were omitted because the studies

above looked at subsequent enrollment in HMOs by beneficiaries originally in the traditional program and ESRD beneficiaries are not eligible to enroll in Medicare HMOs.) To get a more direct comparison of costs, I used the level of Part A spending that omitted reimbursements for indirect and graduate medical education and adjustments for hospitals that treat disproportionately large shares of Medicaid patients. As Column 1 shows, average spending per beneficiary in traditional Medicare calculated in this way rose from $437 in 1999 to $517 in 2002 (in 2000 dollars).

The righthand columns multiply spending per beneficiary in traditional Medicare by the number of HMO enrollees in each county and sum up over the counties (and multiply by twelve) to give counterfactual estimates of aggregate annual spending on HMO beneficiaries in the traditional Medicare program. The ratios considered are 100%, 95%, 80%, and 65% and cover the range of estimates in the studies referenced above. Aggregate spending on HMO beneficiaries would have been $32.7 billion in 1999 if they had been enrolled in the traditional Medicare program and cost the same as beneficiaries in the traditional program and this figure drops to $21.2 billion if the average HMO beneficiary cost 65% of what the average beneficiary in traditional Medicare cost.

Table 8 presents estimates of net welfare of the Medicare HMO program under the four different assumptions of the counterfactual costs of HMO beneficiaries in the traditional Medicare program. Net welfare was calculated as described above, by subtracting HMO expenditures from consumer surplus and adding the estimate of what the HMO enrollees would have cost in traditional Medicare. As it shows, the more favorable selection the HMO program enjoys, the less cost-effective it is. If there is no favorable selection and HMO beneficiaries cost the same as beneficiaries in traditional Medicare, the Medicare HMO program generates $35.1 billion of total net welfare over the four-year period. Under the assumption that Medicare HMO beneficiaries would have cost 65% of what beneficiaries in traditional Medicare cost, the Medicare HMO program generates -$10.3 billion in total net welfare. In the intermediate scenario where HMO beneficiaries would have

cost 80% of what beneficiaries in traditional Medicare cost, the Medicare HMO program generates $9.1 billion of total net welfare over the four-year period from 1999 to 2002.

Many participants in the debate surrounding payment policy in the Medicare HMO program assume that the HMOs are "overpaid" if the Medicare program reimbursed the HMOs for more than the beneficiaries would have cost in traditional Medicare. Prior to 1998, the HMOs were reimbursed 95% of the per-beneficiary spending in the traditional Medicare program in each county so if HMO beneficiaries had average spending that was less than 95% of the per-beneficiary spending in traditional Medicare, the HMOs were viewed as overpaid. Not surprisingly, once we include estimates of consumer surplus, the HMOs appear more cost-effective. As table 8 shows, even if the average HMO beneficiary would have cost only 80% of the average beneficiary in traditional Medicare when enrolled in the traditional program, the Medicare HMO program still generated positive net welfare.

8 Welfare effects of the drug benefits offered by Medicare HMOs

Much of the outcry surrounding the withdrawal of the Medicare HMOs after the Balanced Budget Act revolved around the loss of the prescription drug benefits offered by the HMOs. Laschober, Neuman, Kitchman, Meyer, and Langwell (1999) found that rates of prescription drug coverage fell from 84% to 70% among those involuntarily disenrolled from a Medicare HMO in 1999.

How much were the drug benefits worth to those who had chosen them? On the one hand, we might believe a priori that they were quite valuable because prescription drugs were becoming increasingly important to the elderly during this period. Using the Medical Expenditure Panel Survey, Moeller, Miller, and Banthin (2004) find that total expenditures on prescription drugs among noninstitutionalized Medicare beneficiaries grew by

72% from 1997 to 2001, while the noninstitutionalized Medicare population only grew by 7%. Average spending per Medicare beneficiary in 2001 was approximately $1400 for the year or $113 per month.

On the other hand, high use of prescription drugs does not necessarily translate into a willingness to pay for insurance benefits that cover them. As Pauly and Zeng (2003) find, expenditures on outpatient prescription drugs tend to be much more persistent for individuals across years than other categories of medical spending. Beneficiaries may therefore be less willing to pay for insurance to cover prescription drugs if their spending on prescription drugs is more predictable than their spending on doctor visits and hospital stays.

Table 9 shows estimates of welfare derived from prescription drug benefits by beneficiaries who choose plans offering them. To calculate welfare from prescription drug benefits, aggregate annual consumer surplus was calculated as described above, by multiplying surplus in each county by the number of Medicare eligibles in the county. Aggregate surplus was calculated with and without the prescription drug benefits, as shown in columns 1 and 2. The difference was then divided by the number of beneficiaries enrolled in prescription drug benefits in column 3 (and by twelve) to give monthly surplus from drug benefits per beneficiary in column 4. Since the consumer surplus formula shown in section 7 calculates welfare per beneficiary, dividing by the number of enrollees assumes that beneficiaries who are offered prescription drug benefits but do not take them up receive zero consumer surplus from them, and therefore that the difference in consumer surplus per eligible is received entirely by those beneficiaries who actually choose prescription drug benefits.

As column 4 shows, the estimated welfare derived from prescription drug benefits is about $13 per month in 1999 and drops to $10 per month by 2002. Recall from Table 3a that the average coverage limit for brand-name drugs in these plans was $1,084 per year (or $90 per month) in 1999, dropping to $868 per year (or $72 per month) in 2002.

Since the average Medicare beneficiary spent $113 per month on prescription drugs in 2001 (Moeller, Miller, and Banthin 2004), the average beneficiary would make full use of a typical prescription drug benefit offered by a Medicare HMO.

The welfare estimates are therefore surprisingly low and have two possible implications which are not mutually exclusive. The first possible implication is that the beneficiaries who enroll in Medicare HMOs are sufficiently healthier than the average Medicare beneficiary that they only spend $10 to $13 per month on prescription drugs and therefore only derive that amount of welfare from the drug benefits offered by HMOs. The second possible implication is that, as Pauly and Zeng (2003) find, beneficiaries are not willing to pay very much for prescription drug insurance, even if they have a demand for prescription drugs, because prescription drug spending is predictable.

Both of these possibilities could be true at the same time and it is not possible to disentangle them with these data. In any case, I cannot find any evidence of a strong welfare effect from the Medicare HMOs' prescription drug benefits during this period.

9 Conclusion

I have estimated a nested logit model of demand for Medicare HMO benefits by Medicare beneficiaries using market share, benefit, and premium data from 1999 to 2002. Beneficiaries' utility functions for health insurance, in addition to including the premium and benefits offered, are correlated across all HMO choices and are correlated within the HMO group by whether or not the HMO offers prescription drug benefits. Nesting all HMOs together is an innovation with respect to Town and Liu (2003), the previous paper that looked at this question and turns out to lower significantly the estimated effect of prescription drug benefits on demand.

The results show that beneficiaries are willing to pay $13 for the first $100 of brand-name drug coverage, $1 to reduce the primary co-payment by $1, $2 to reduce inpatient

deductible by $100, $37 to remove the requirement for a referral before seeing a specialist, $8 for dental benefits, and $0 for vision benefits. The response to primary care co-payment is strong compared to how often Medicare beneficiaries typically visit the doctor but the response to brand-name prescription drug coverage is weak relative to Medicare beneficiaries' demand for prescription drugs. There is little to benchmark the other nondrug estimates against.

I then use the parameter estimates of the demand function to calculate welfare provided by the Medicare HMO program during this period. Monthly consumer surplus is estimated to be $83 per Medicare eligible in the counties where Medicare HMO plans are offered in 1999. The estimate rises to $84 in 2000, then drops over the next two years to $70 in 2002. The decline in consumer surplus is due both to plans reducing their benefits and counties losing some, but not all, of their plans. (If a county loses all of its plans, it is not included in the calculation.)

Aggregate annual welfare is found by multiplying the monthly consumer surplus in each county by the number of Medicare eligibles in the county and summing up over the counties (and multiplying by twelve). Aggregate annual welfare is $16.4 billion in 1999, rises to $16.5 billion in 2000, and then drops to $15.3 billion in 2001, and $12.3 billion 2002. The decline in aggregate welfare results both from plans reducing their benefits, plans exiting and counties losing all plans.

I then do a rough analysis of the cost-effectiveness of the Medicare managed care program during this period. The cost-effectiveness of the program depends on the cost of the program, the surplus derived from the program, and what the costs of the HMO enrollees would have been if they had been enrolled in the traditional Medicare program. I calculate the net welfare under several different assumptions about the amount of favorable selection HMOs receive. If HMO enrollees would have cost the same in traditional Medicare as beneficiaries in the same counties who stayed in traditional Medicare, the Medicare HMO program generated $35.1 billion in net welfare over the four-year period.

If HMO enrollees would have cost 65% as much as beneficiaries who stayed in traditional Medicare (as one study suggested they might have), the Medicare HMO program generated a $10.3 billion loss in net welfare over the four-year period. Even if HMO enrollees would have cost only 80% as much as beneficiaries in traditional Medicare, the Medicare HMO program still generated $9.1 billion in positive net welfare. Many policy analysts have assumed that if payments to Medicare managed care plans are more than what beneficiaries in traditional Medicare cost, the plans are overpaid (Biles, Nicholas, Cooper, Adrion, and Guterman 2006) but this result shows that even when there is a fair amount of favorable selection into Medicare HMOs, the program can still deliver positive welfare. The value of the Medicare managed care program has already been implicitly recognized in the Medicare Prescription Drug, Improvement, and Modernization Act, which raised the reimbursement formula for private plans to encourage then to enter the program. As of 2004, some plans had re-entered the program but the percent of Medicare beneficiaries enrolled in the program was still well below its peak of 17% in 1998 (Kaiser Foundation 2005).

I then estimate the welfare provided by prescription drug benefits for those who chose them by calculating total welfare both with and without the benefits, and subtracting one from the other. To get per-enrollee welfare, I divide total welfare by the number of enrollees who chose plans with prescription drug benefits. Prescription drug benefits are estimated to provide $13 in monthly consumer surplus per enrollee in 1999 and this estimate drops to $10 in 2002, due to plans reducing the level of benefits offered. These estimates are weak relative to the level of benefits being offered and relative to how many prescriptions per month Medicare beneficiaries fill according to other data sources. We would expect that a typical Medicare beneficiary who has prescription drug benefits at the level of those offered by Medicare HMOs, would make full use of them. The weakness in the estimates could reflect that Medicare HMO enrollees are sufficiently healthier than beneficiaries in traditional Medicare that they use prescription drugs less, or that using

prescription drugs does not necessarily translate into a willingness to pay for insurance to cover them, or both. As expenditure on prescription drugs has been shown to be more persistent and predictable than other kinds of health care spending (Pauly and Zeng 2003), beneficiaries may not be willing to pay the full cost of insurance to cover prescription drugs.

If we took the welfare results for prescription drug benefits as representative of the entire Medicare population, they would have implications for the welfare effect of the new Medicare prescription drug benefit, which started providing benefits to all Medicare beneficiaries in January 2006. With these data, however, it is impossible to distinguish whether the welfare results are low because beneficiaries in general do not receive much welfare from prescription drug insurance, or because enrollees who choose HMOs are healthier and therefore do not receive as much benefit from prescription drugs. Both explanations may be true simultaneously, but if the second one is true at all, we cannot apply the welfare results to the new prescription drug benefit. The welfare results do imply, however, that, for whatever reason, HMO enrollees did not suffer that much of a loss in welfare from plans cutting back their prescription drug benefits.

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Table 1a
Summary of Medicare HMO program 1999-2002

Year	Number of Medicare HMO contracts	Number of different benefit packages	Number of counties with Medicare HMOs	Number of HMO-county combinations (observations)
1999	280	400	794	1,924
2000	257	465	752	1,790
2001	169	374	601	1,175
2002	139	330	540	954

Table 1b
Medicare HMO and county summary statistics 1999-2002

	Year	N	Mean	Minimum	Maximum
HMO market share in a county	**1999**	1,924	10.2%	0.03%	71.3%
	2000	1,790	10.7%	0.02%	73.2%
	2001	1,175	12.6%	0.05%	73.1%
	2002	954	13.4%	0.004%	69.9%
Enrollment in HMO-county	**1999**	1,924	3,150	25	144,730
	2000	1,790	3,444	25	138,268
	2001	1,175	4,672	25	131,357
	2002	954	5,069	25	130,755
Share of traditional Medicare for county	**1999**	794	74.9%	7.0%	99.8%
	2000	752	74.6%	7.7%	99.8%
	2001	601	75.3%	12.7%	99.8%
	2002	539	76.2%	20.1%	99.8%
Number of Medicare eligibles in county	**1999**	794	20,748	104	562,217
	2000	752	21,638	110	567,896
	2001	601	25,441	113	578,009
	2002	539	27,114	117	586,727
Number of plans in county	**1999**	794	2.42	1	11
	2000	752	2.38	1	12
	2001	601	1.96	1	9
	2002	539	1.77	1	10
Number of counties in service area of benefit package	**1999**	400	4.81	1	46
	2000	465	3.85	1	28
	2001	374	3.14	1	22
	2002	330	2.89	1	22

Note:

The share of traditional Medicare and the number of Medicare eligibles have been adjusted to reflect that beneficiaries enrolled in Medicaid or an employer-sponsored supplemental retirement plans are not counted among those eligible for a Medicare HMO.

Table 2
Changes in plan availability in the Medicare HMO program 1999-2002

	1999	2000	2001	2002
Number of Medicare beneficiaries	39,851,816	40,245,218	40,655,479	41,123,495
Percent eligible for HMO enrollment	68.4%	67.1%	62.6%	59.3%
Number enrolled in Medicare HMOs	6,060,072	6,172,824	5,505,773	4,869,328
Medicare HMO enrollment rate among all beneficiaries	15.2%	15.3%	13.5%	11.8%
Medicare HMO enrollment rate among those eligible	22.2%	22.9%	21.6%	20.0%
Percent of HMO-eligible beneficiaries that have an HMO with prescription drug benefits available to them	86.6%	86.2%	73.4%	72.0%
Take-up rate of plans offering prescription drug benefits among those eligible	20.8%	20.3%	19.1%	19.5%

Note:
Enrollment rates have been adjusted up to reflect that beneficiaries enrolled in Medicaid or an employer-sponsored supplemental retirement plans are not counted among those eligible for a Medicare HMO.

Table 3a
Medicare HMO plan characteristics: Premium and drug benefits 1999-2002

	Year	N	Mean	Minimum	Maximum
Percent of benefit packages offering prescription drug benefits	**1999**	400	71.3%		
	2000	465	68.8%		
	2001	374	59.9%		
	2002	330	66.7%		
Premium (2000 $)	**1999**	400	$13.35	$0	$114
	2000	465	$25.03	$0	$110
	2001	374	$28.27	$0	$129
	2002	330	$36.38	$0	$153
Premium if offering prescription drug benefits (2000 $)	**1999**	285	$9.20	$0	$114
	2000	320	$22.13	$0	$110
	2001	224	$25.71	$0	$116
	2002	220	$36.00	$0	$153
Prescription drug benefits					
Percent of benefit packages offering brand-name drug coverage (conditional on offering drug coverage)	**1999**	285	96.8%		
	2000	320	95.6%		
	2001	224	82.6%		
	2002	220	58.6%		
Annual brand-name coverage limit (conditional on offering brand-name drug coverage and not offering unlimited coverage) (2000 $)	**1999**	252	$1,127.57	$52	$4,698
	2000	262	$973.09	$50	$4,000
	2001	176	$1,039.41	$190	$11,382
	2002	124	$906.46	$180	$3,607
Percent of benefit packages offering unlimited brand-name drug coverage (conditional on offering brand-name drug coverage)	**1999**	276	8.70%		
	2000	306	14.38%		
	2001	185	4.86%		
	2002	129	3.88%		
Co-payment for brand-name drugs (2000 $)	**1999**	276	$15.62	$0	$43
	2000	320	$19.37	$0	$65
	2001	224	$22.40	$0	$58
	2002	220	$25.70	$0	$72

Note: The premium and brand-name drug co-payment were deflated to 2000 levels by the CPI for all items. The brand-name drug coverage limit was deflated to 2000 levels by the CPI for prescription drugs.

Table 3b
Medicare HMO plan characteristics: Nondrug benefits 1999-2002

	Year	N	Mean	Minimum	Maximum
Co-payment for primary care visit (2000 $)	**1999**	400	$7.61	$0	$21
	2000	465	$8.30	$0	$25
	2001	374	$9.22	$0	$24
	2002	330	$10.05	$0	$24
Co-payment for visit to specialist (2000 $)	**1999**	400	$8.23	$0	$28
	2000	465	$9.92	$0	$25
	2001	374	$12.01	$0	$34
	2002	330	$15.61	$0	$96
Inpatient hospital deductible (2000 $)	**1999**	400	$21.52	$0	$778
	2000	465	$42.81	$0	$750
	2001	374	$91.69	$0	$872
	2002	330	$126.66	$0	$815
Percent of benefit packages not requiring a referral to see a specialist	**1999**	400	2.5%		
	2000	465	2.4%		
	2001	374	2.1%		
	2002	330	5.8%		
Percent of benefit packages offering vision coverage (beyond traditional Medicare coverage)	**1999**	400	92.8%		
	2000	465	90.8%		
	2001	374	88.2%		
	2002	330	86.1%		
Percent of benefit packages offering dental coverage (beyond traditional Medicare coverage)	**1999**	400	35.8%		
	2000	465	23.7%		
	2001	374	28.3%		
	2002	330	18.5%		

Note: The co-payments and deductible were deflated to 2000 levels by the CPI for all items.

Table 4
Estimates of demand for Medicare HMO benefits by Medicare beneficiaries 1999-2002

	Logit (1)	Two-level nested logit (2)	Three-level nested logit (3)	Logit (4)	Two-level nested logit (5)	Three-level nested logit (6)
Premium	-0.005	-0.007	-0.007	-0.005	-0.007	-0.007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Dummy for prescription drug benefits	0.034	0.088	-0.004			
	(0.030)	(0.033)	(0.030)			
Brand-name co-payment in $10s				0.006	0.011	0.012
				(0.008)	(0.008)	(0.008)
Monthly brand-name coverage amount in $100s				0.133	0.185	0.094
				(0.038)	(0.040)	(0.039)
Monthly brand-name coverage amount in $100s squared				-0.012	-0.018	-0.009
				(0.004)	(0.004)	(0.004)
Co-payment for visit to primary care doctor in $10s	-0.148	-0.133	-0.085	-0.137	-0.130	-0.067
	(0.039)	(0.039)	(0.041)	(0.038)	(0.037)	(0.039)
Co-payment for visit to specialist in $10s	-0.015	-0.034	-0.028	-0.006	-0.018	-0.024
	(0.020)	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)
Inpatient deductible in $100s	-0.010	-0.009	-0.014	-0.009	-0.006	-0.012
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Plan does not require referral to see specialist	0.181	0.251	0.239	0.180	0.256	0.251
	(0.071)	(0.075)	(0.076)	(0.071)	(0.073)	(0.076)
Plan offers vision benefits	0.000	-0.032	0.060	-0.024	-0.065	0.033
	(0.041)	(0.042)	(0.043)	(0.042)	(0.042)	(0.043)
Plan offers dental benefits	0.110	0.087	0.060	0.101	0.076	0.051
	(0.030)	(0.030)	(0.031)	(0.029)	(0.029)	(0.030)
Log(plan share | group share)		0.296	0.469		0.341	0.518
		(0.088)	(0.104)		(0.080)	(0.101)
Log(group share | HMO share)			0.494			0.525
			(0.098)			(0.094)
Observations	5,272	5,272	5,272	5,272	5,272	5,272

Dependent variable: Log(plan market share) - log(traditional Medicare market share)

Notes:

All regressions include year effects and plan-county fixed effects. Robust standard errors are reported in parentheses and are calculated by the formula for fixed-effects estimators given in Arellano (1987).

Market shares for plans and for traditional Medicare have been adjusted to reflect that beneficiaries enrolled in Medicaid or an employer-sponsored supplemental retirement plans are not counted among those eligible for a Medicare HMO.

Premium, log(plan share | group share), and log(group share | HMO share) are instrumented. Instruments for premium include the weighted average of competitors' premiums in other counties in the plan's service area and the county reimbursement rate. The instruments for log(plan share | group) are the average covered drug expenditure and the averages of the nondrug benefits of other plans in the same drug/nondrug group. The instruments for log(group share | HMO) are the average covered drug expenditure and the averages of the nondrug benefits of plans in the other drug/nondrug group in the same county.

The premiums, co-payments, and deductibles were deflated to 2000 levels with the CPI for all items. The brand-name drug coverage amount was deflated to 2000 levels with the CPI for prescription drugs.

Table 5
Willingness-to-pay for Medicare HMO benefits by Medicare beneficiaries 1999-2002 (2000 $)

	Logit	Two-level nested logit	Three-level nested logit
Drug benefits			
Prescription drug benefit	$6.77	$13.33	-$0.58
	($5.72)	($4.81)	($4.64)
First $100 of brand-name drug coverage	$25.59	$25.10	$12.70
	($10.41)	($7.23)	($5.94)
Nondrug benefits			
Reduce co-payment for visit to primary care doctor by $1	$2.90	$1.95	$1.00
	($1.22)	($0.71)	($0.63)
Reduce inpatient deductible by $100	$1.87	$0.94	$1.84
	($1.20)	($0.79)	($0.82)
Remove requirement for referral before seeing specialist	$37.97	$38.26	$37.37
	($17.32)	($12.40)	($12.56)
Dental benefits	$21.25	$11.43	$7.54
	($8.28)	($4.89)	($4.67)
Vision benefits	$0.39	-$4.01	$9.10
	($8.18)	($6.40)	($6.62)

Note:

Based on estimates in Table 4. The estimates for nondrug benefits are based on columns (4) through (6) of table 4.

The premiums, co-payments, and deductibles were deflated to 2000 levels with the CPI for all items. The brand-name drug coverage amount was deflated to 2000 levels with the CPI for prescription drugs.

Table 6
Gross welfare provided by the Medicare HMO program 1999-2002

Year	Average monthly welfare per Medicare eligible (2000 $)	Total number of Medicare beneficiaries eligible for a Medicare HMO (millions)	Aggregate annual welfare (2000 $ billions)
1999	82.72	16.5	16.4
	(13.63)		(2.45)
2000	84.41	16.3	16.5
	(14.11)		(2.47)
2001	78.48	15.3	14.4
	(13.43)		(2.15)
2002	69.88	14.6	12.3
	(12.53)		(1.83)

Notes:

Bootstrapped standard errors are reported in parentheses.

The number of Medicare beneficiaries in HMO counties has been adjusted to reflect that beneficiaries enrolled in Medicaid or an employer-sponsored supplemental retirement plans are not counted among those eligible for a Medicare HMO.

Table 7
Potential aggregate annualcosts of HMO enrollees in traditional Medicare 1999-2002

Year	Average monthly spending per beneficiary in traditional Medicare (2000 $)	Number of HMO enrollees (millions)	Costs of HMO enrollees in traditional Medicare if the average HMO enrollee costs 100% of the average traditional Medicare enrollee	Costs of HMO enrollees in traditional Medicare if the average HMO enrollee costs 95% of the average traditional Medicare enrollee	Costs of HMO enrollees in traditional Medicare if the average HMO enrollee costs 80% of the average traditional Medicare enrollee	Costs of HMO enrollees in traditional Medicare if the average HMO enrollee costs 65% of the average traditional Medicare enrollee
			(2000 $ billions)			
1999	436.89	6.1	32.7	31.0	26.1	21.2
2000	425.25	6.2	34.2	32.5	27.4	22.2
2001	476.51	5.5	32.1	30.5	25.7	20.8
2002	516.72	4.8	30.7	29.2	24.5	19.9

Note:

Average monthly spending per beneficiary in traditional Medicare is calculated by averaging across counties that have HMOs available and weighting by number of Medicare eligibles in each county.

Table 8
Net welfare of the Medicare HMO program 1999-2002
(2000 $ billions)

Year	Aggregate consumer surplus A	Aggregate expenditures B	Costs in traditional Medicare if the average HMO enrollee costs 100% of the average traditional Medicare enrollee C	Net welfare if the average HMO enrollee costs 100% of the average traditional Medicare enrollee A-B+C	Costs in traditional Medicare if the average HMO enrollee costs 95% of the average traditional Medicare enrollee D	Net welfare if the average HMO enrollee costs 95% of the average traditional Medicare enrollee A-B+D	Costs in traditional Medicare if the average HMO enrollee costs 80% of the average traditional Medicare enrollee E	Net welfare if the average HMO enrollee costs 80% of the average traditional Medicare enrollee A-B+E	Costs in traditional Medicare if the average HMO enrollee costs 65% of the average traditional Medicare enrollee F	Net welfare if the average HMO enrollee costs 65% of the average traditional Medicare enrollee A-B+F
1999	16.4	41.2	32.7	7.9	31.0	6.2	26.1	1.3	21.2	-3.6
	(2.5)									
2000	16.5	39.8	34.2	10.9	32.5	9.2	27.4	4.0	22.2	-1.1
	(2.5)									
2001	14.4	40.7	32.1	5.8	30.5	4.2	25.7	-0.6	20.8	-5.4
	(2.2)									
2002	12.3	32.4	30.7	10.6	29.2	9.1	24.5	4.5	19.9	-0.1
	(1.8)									
Total	59.5	154.1	129.6	35.1	123.2	28.6	103.7	9.1	84.3	-10.3
	(8.9)									

Notes:

Bootstrapped standard errors are reported in parentheses.

Expenditures of the Medicare HMO program in 1999 are taken from the Medicare Chart Book for 2001 issued by the Kaiser Family Foundation. Expenditures for 2000-2002 are taken from HCFA/CMS's financial reports for the respective fiscal years.

Table 9
Welfare derived from Medicare HMO drug benefits

Year	Aggregate annual consumer surplus with drug benefits (2000 $ billions)	Aggregate annual consumer surplus without drug benefits (2000 $ billions)	Number of enrollees choosing plans offering drug benefits (millions)	Monthly consumer surplus derived from drug benefits per enrollee (2000 $)
1999	16.4	15.6	4.9	13.13
	(2.5)	(2.4)		(3.47)
2000	16.5	15.8	4.7	12.70
	(2.5)	(2.4)		(3.18)
2001	14.4	13.9	3.6	11.94
	(2.2)	(2.1)		(3.09)
2002	12.3	11.9	3.4	9.78
	(1.8)	(1.8)		(2.30)

Note:
Bootstrapped standard errors are reported in parentheses.