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Individual Expenditures and Medical Saving Accounts
Can They Work?

Matthew J. Eichner, Mark B. McClellan, and David A. Wise

6.1 Introduction

Only a couple of decades ago a large fraction of private insurance plans paid for care on a fee-for-service basis, with any incentives for limiting expenditures provided through typically small co-payments and deductibles. The rising cost of medical care encouraged a progression to managed care plans and today a large proportion of plan participants are enrolled in plans that to some extent limit cost through supply-side restrictions on the care that is provided. For a few years, it appeared as though the introduction of managed care arrangements was indeed reducing the rate of increase in the cost of medical care. There is substantial anecdotal evidence, however, that the ability of managed care plans to limit cost increases may be coming to an end. Patients' rights legislation and the move to "turn decisions back to doctors," for example, suggest that strict supply limits on care are increasingly coming under attack. The efficient provision of medical care remains a critical economic concern.

In this paper, we return to consideration of demand-side plan provisions that may help to control cost and to provide care more efficiently. The plan we consider is the medical saving account (MSA). MSAs have recently received considerable policy attention as an alternative approach to improving the efficiency of individual spending decisions for health care. The 1996

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"Kennedy-Kassebaum" Health Insurance Portability and Availability Act (HIPAA) includes specific tax incentives to support the use of MSAs on a limited basis beginning in 1997.[1] The inclusion of MSAs in the HIPAA perhaps reflects the recent consideration by economists and legislators of tax reforms to encourage "demand-side" incentives to reduce medical expenditures. The MSA relies on catastrophic health insurance—which, since Arrow (1963), has been thought to be the most efficient way to provide health insurance—in conjunction with a saving plan dedicated to medical expenditures.

Notwithstanding the efficiency benefits of catastrophic health insurance, the practical use of such plans has been limited by the low saving rate of most Americans. Even rather small unexpected medical costs could be greater than the liquid saving of a large fraction of American families. Poterba, Venti, and Wise (1998), for example, find that even the median level of liquid financial assets of American families with heads aged fifty-five to sixty-four is only about $3,000.[2] The median for all families is much smaller. Eichner and Wise (1999) show that the median of family liquid assets is a paltry $1,900. For families with heads under forty-five, the median is much smaller, and it is only $300 for families with heads under twenty-five. Large firms are more likely than small firms to offer medical insurance. Among single people and families in which either spouse works in a firm with over 500 employees, the median is $1,800. Among families in which either spouse is covered by an employer- or union-provided health insurance plan, the median is somewhat higher, but still only $2,700. Even if other financial assets are counted, it is clear that a large fraction of families have saved very little. Thus it is evident that a large proportion of households, having chosen not to save, have also virtually assured that they will be "risk averse" with respect to unanticipated expenditures and—perhaps ironically—willing to pay for generous health insurance. Indeed, too much health insurance may be a companion to too little saving. A person who doesn't save may also find himself spending too much for health insurance to cover the risky situation in which no saving has placed him.

The fact that a very large fraction of families has almost no liquid savings and would find it hard to make even small out-of-pocket payments for medical care presents a practical argument against catastrophic insurance. An MSA is a way to address this concern. An MSA is, in our conception, a combination of a catastrophic health insurance plan with a significant deductible established in conjunction with a medical saving account. By

1. House resolution 3103 in the 104th Congress, which was renamed the Health Insurance Portability and Availability Act, was signed by President Clinton in August 1996.

2. Based on 1991 *Surveys of Income and Program Participation* (SIPP) data and excluding individual retirement account (IRA), 401(k), and any other personal retirement plans. *Survey of Consumer Finance* data, tabulated for us by Andrew Samwick, show higher but still very low medians.

providing a saving account that could be used to pay for substantial medical costs, without causing major short-term disruptions in family budgets, the MSA is intended to make insurance plans with high deductibles and copayments practical for a larger number of Americans. The typical plan would allow tax-free contributions to an MSA. At retirement, the MSA balance could be used for support in retirement, with taxes paid upon withdrawal of funds.

Low saving rates, however, may not be the only reason for the limited market for catastrophic health insurance. The current tax treatment of health insurance favors low-deductible plans. Employer-provided health insurance is financed with pretax dollars, so that individuals are likely to choose more coverage than they would if they faced the full price of insurance. Moreover, because out-of-pocket payments for medical care are only deductible if they exceed 7.5 percent of income, tax law favors plans that minimize out-of-pocket payments. Favorable federal tax treatment of MSAs would tend to counteract these obstacles to the purchase of health insurance with substantial out-of-pocket payments.[3]

Because a larger share of their actual medical expenditures would be financed from their own savings, individuals covered by an MSA would be more sensitive to costs of treatment over a broader range of expenditures. An MSA thus combines the desirable features of catastrophic coverage for reducing medical expenditures with a mechanism that creates a reserve for paying individual expenses. Thus an MSA coupled with a catastrophic insurance plan may reduce medical expenditures and encourage saving. To the extent that catastrophic insurance costs less than more generous plans, the MSA will also induce lower insurance costs.

Still, there remain important impediments to the feasibility of such plans. Perhaps the most important of these is the extent to which individual medical expenditures persist for long periods of time. A person who incurs high expenditures every year over a lifetime would essentially be self-insured and would accumulate no assets in the medical saving account. On the other hand, a person who is never sick would have a tax-free saving account.

In an earlier paper (Eichner, McClellan, and Wise 1998) we considered the persistence of the medical expenditures of members of a large Fortune 500 firm health insurance plan. We concluded that persistence in expenditures seemed not to pose an overriding impediment to the implementation of an MSA. In another paper (Eichner, McClellan, and Wise 1997), we discussed the attributes of such plans in a larger context, again focusing on the

3. At least thirteen states have already enacted tax breaks for MSAs, but these reforms have involved much lower state marginal tax rates. Existing federal law also allows employers to establish "flexible spending accounts," which permit employees to use pretax dollars for out-of-pocket medical expenditures. However, balances not spent at the end of the year are lost, so that employees tend to rely on them in a limited way for predictable expenses only.

crucial equity consideration: the extent to which the feasibility of MSAs is limited by the persistence of medical expenditures over an individual's working life. The broad implications of such tax incentives for insurance and health care purchasing decisions are also reviewed in this paper, and we discuss the key behavioral issues that are important in evaluating such plans. In particular, the analysis illustrates how the MSAs envisioned in the Kennedy-Kassebaum legislation would work in practice, describing the important features of MSA tax incentives and considering how these incentives might affect individual behavior.

We continue the analysis of MSAs in this paper, focusing again on the implications of persistence in individual expenditures. Two important improvements in recently available data prompt us to revisit this question: One is that we now have access to a six-year panel of individual medical expenditures in a large firm, whereas the prior analysis was based only on a three-year panel. The persistence in expenditures can be much more accurately gauged with the six-year panel. The second reason is that the new data allow more accurate identification of plan enrollees who do not use care in a given year. In our prior work we were in some instances unable to distinguish persons who left the firm from those who simply had no medical expenditures in a year. With the current data, we can identify all persons covered by the plan, even if they have no medical expenditure in a given year. In addition, in this paper we give more careful attention to the potentially important saving effects of MSAs. In particular, we consider the accumulation in the MSA account, based on how the funds are invested.

In the next section we describe the Fortune 500 firm data used in this analysis. In section 6.3, we present summary data on the persistence in expenditures and on the proportion of plan members who have high expenditures in successive years. In section 6.4, we describe the method that we use to project the lifetime expenditures of plan members under an MSA. The goal is to approximate the distribution of medical expenditures over a working lifetime in a large firm. We estimate a model that captures the pattern of expenditures among employees and then use the model to simulate the lifetime distribution of expenditures. Particular attention is given to two issues: One is the extent of persistence, the expected expenditure in one year conditional on expenditure in prior years. The second is the "unexplained" residual variance, or "shock" in expenditures, conditional on expenditure in prior years. An important aspect of the data is that this unexplained variance is very large and, much more than persistence, determines the lifetime distributions of expenditures. Moreover, these shocks are not approximated well by any analytic distribution. Thus our simulation procedure depends heavily on nonparametric analysis based on the empirical distribution of conditional expenditures.

The key results are in the form of simulations based on the estimated

models. Under the illustrative plan we have simulated, most employees would approach retirement with a substantial proportion of MSA contributions remaining in the account. Only a small fraction would approach retirement with very small balances. Based on our illustrative plan, if investment of MSA assets were in equities, more than 50 percent of employees would have MSA balances greater than 300 percent of lifetime contributions to the MSA. Only about 10 percent of men would retain less than 200 percent of contributions and only about 10 percent of women would retain less than 125 percent of contributions. If investment were in bonds, balances would be much lower. In this case about 10 percent of both men and women would retain less than 50 percent of contributions. Thus we believe that persistence of medical expenditures does not present an overriding obstacle to the adaption of MSA plans.

6.2 The Data

The data are medical claims of employees in a large Fortune 500 manufacturing firm. The analysis is based on all fee-for-service insurance claims over the six-year period 1990 through 1995. Over this period approximately 500,000 employees and their dependents were covered through these insurance plans. All reported inpatient and outpatient medical expenditures for this population are included in our analysis.[4]

The firm has two fee-for-service plans, one for hourly and another for salaried employees. The hourly plan, with benefits negotiated in union contracts, provides "first-dollar" coverage for virtually all health care. Because of this virtually unlimited coverage, hourly employees have no financial incentives to join managed-care or health maintenance organization (HMO) plans, although specific provider relationships and location considerations may provide some nonfinancial incentives. The salaried plan has an annual deductible of $200 per individual and $250 per family, a 20 percent coinsurance rate for all expenses, and an out-of-pocket annual limit (including the deductible) of $500 per family. Routine physical examinations are not covered. Both plans incorporate limited case management for certain high-cost medical conditions and concurrent review of hospital stays. The hourly plan includes preadmission certification requirements for certain elective admissions; patients who elect admission despite precertification denial are responsible for 20 percent copayments up to $750 per individual

4. We do not include dental services, vision care, or outpatient pharmaceuticals, which account for approximately 15 percent of medical expenditures. Because these expenditures are relatively less concentrated in particular individuals than other inpatient and outpatient services, incorporating them would be unlikely to lead to a more concentrated distribution of medical expenditures in this population. Indeed, to the extent that such expenditures are not covered by traditional plans, their eligibility for MSA coverage would reduce individuals' net out-of-pocket medical expenses.

and $1,500 per family. Both plans also require second opinions for sixteen elective surgical procedures, although the procedures are covered regardless of the second-opinion finding. Both plans have very generous hospital stay limits: 365 days per stay, renewable after 60 days out of the hospital.

As emphasized in the introduction, there are two important features of the new data used in this analysis: One is the longer panel, and the other is the "enrollment" data that allow us to track employees who are plan members but have no medical expenditures in a given year. The enrollment data are available, however, only for the last three years of the panel. For the first three years, we must estimate whether a person who has zero expenditure is still enrolled in the plan. We do this by using the relationship between enrollment on the one hand and personal expenditure and other attributes on the other hand, based on the last three years of the panel. In this way, we create a synthetic data file that contains reported expenditures of all enrollees for the last three years; for the first three years positive expenditures are as reported, but zero expenditures are simulated. For example, suppose a person has no expenditure in year three. Based on the estimated probability that the person is still enrolled in the plan—a probability based on the enrollment data for the last three years—the person is randomly maintained in the file with zero expenditure, or removed from the sample.

6.3 Summary Descriptions of Persistence

Do employees who have high expenditures in one year also have high expenditures in subsequent years as well? To begin to answer this question, we have divided plan enrollees into annual expenditure deciles. Panel A of figure 6.1 shows average annual expenditures in each of the years 1990 through 1995 for two groups of enrollees: those who were in the top expenditure decile in 1990, and those who were in the top expenditure decile in 1995. Consider the first group: In 1990, their average expenditure was $10,295. In the next year, their average expenditure was $4,329; two years later, in 1992, they spent an average of $3,804; and so forth. By 1995, their average expenditure had fallen to $3,636. For comparison, the figure also shows the average expenditures for all enrollees over these three years, which was $1,293 in 1990 and increased 27 percent to $1,646 by 1995. Because of the overall "inflation" in expenditure, it is perhaps more informative to consider expenditure relative to the average, as shown in panel B of figure 6.1. Persons in the 10th decile in 1990 spent eight times as much as the average in that year. But six years later, in 1995, they spent just over twice the average.

Thus these data show two important regularities: Employees in the top decile continue to have expenditures above the average over the next five years, but there is also a substantial, almost fourfold, decline in expenditures—relative to the overall average—over these six years. Rather than considering the subsequent expenditures of employees conditional on ex-

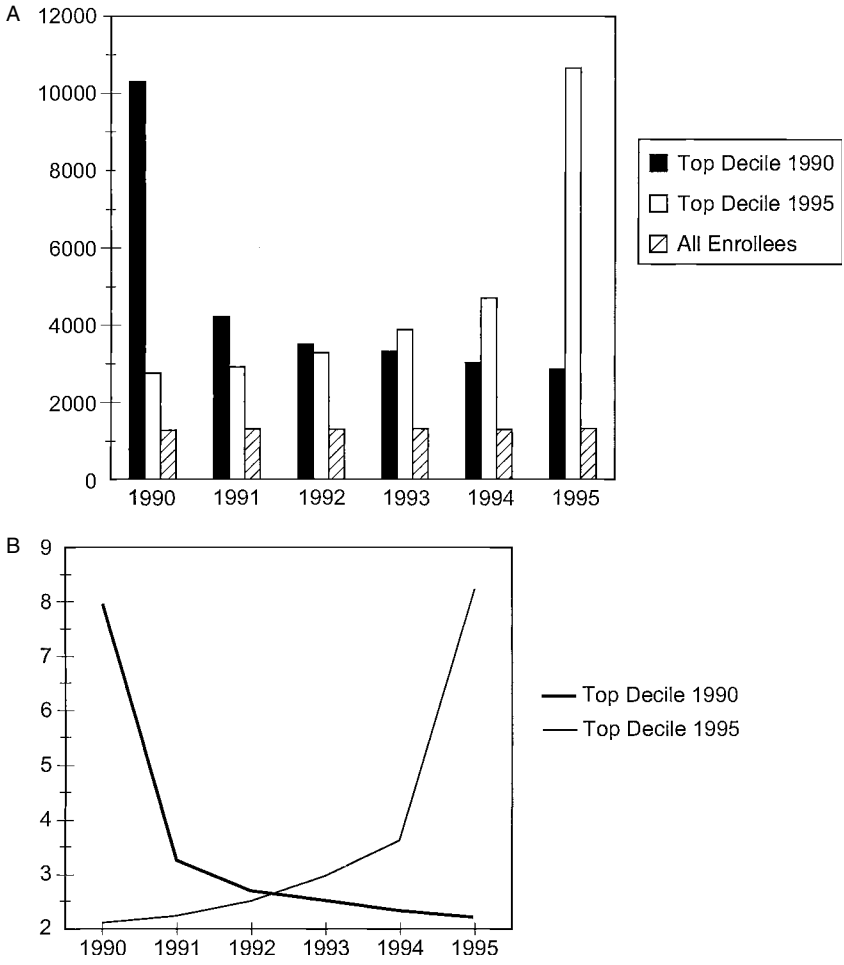

Fig. 6.1 Expenditure for top 1990 and 1995 deciles: *A,* Mean annual expenditure; *B,* Relative annual expenditure

penditure level in 1990, an alternative is to consider previous expenditure conditional on expenditures in 1995. What were the prior expenditures of employees in the top decile in 1995? Did they also have higher-than-average expenditures in the previous five years? Yes, but whereas the expenditures of employees in the top decile in 1995 were over eight times the average in that year, five years prior to that their average expenditure was only about two times the average, as shown in panel B of figure 6.1. Thus the subsequent expenditure pattern of persons in the top decile in 1990 is almost a mirror image of the prior expenditure pattern of persons who were in the top decile in 1995.

Table 6.1 **Distribution of 1993 and 1995 Expenditures (%)**

	Expenditure Interval in 1995				
Expenditure Interval in 1993	$0	$1–300	$301–1,000	$1,001–5,000	>$5,000
Joint Distribution of 1993 and 1995 Expenditures					
$0	32.18	6.02	2.98	2.02	1.24
$1–$300	8.76	7.37	3.76	2.53	1.30
$301–$1000	3.53	3.55	3.18	2.46	1.18
$1001–$5000	2.44	2.37	2.39	2.90	1.53
>$5000	1.27	1.09	1.02	1.49	1.44
Distribution of 1995 Expenditures Conditional on 1993 Expenditures					
$0	72.41	13.54	6.70	4.55	2.80
$1–$300	36.92	31.09	15.87	10.65	5.47
$301–$1000	25.41	25.53	22.85	17.69	8.52
$1001–$5000	20.96	20.39	20.54	24.94	13.17
>$5000	20.13	17.30	16.20	23.56	22.82
Distribution of 1993 Expenditures Conditional on 1995 Expenditures					
$0	66.79	29.50	22.34	17.73	18.56
$1–$300	18.18	36.14	28.25	22.17	19.36
$301–$1000	7.33	17.39	23.82	21.58	17.68
$1001–$5000	5.05	11.61	17.90	25.43	22.84
>$5000	2.64	5.36	7.69	13.09	21.56

On the other hand, employees with the lowest expenditures in 1990, which are not shown, had higher expenditures in the next six years. For example, those in the bottom three deciles, who spent nothing in 1990, had expenditures near the average six years later in 1995. In all deciles, expenditures tend to gravitate toward the mean. Only in the top decile do expenditures remain substantially above the mean for six years.

Another way to view persistence is to consider the distribution of employee expenditure intervals for two different years. Table 6.1 shows the distribution for 1993 and 1995 for all employees. Expenditures in each year are divided into five intervals, and three versions of the distribution are shown. The first panel shows the joint distributions of expenditures in the two years. For example, 7.37 percent of employees had expenditures between $1 and $300 in both years, and 8.76 percent had expenditures between $0 and $300 in 1993 and zero expenditures in 1995 (the percentages sum to 100 over all cells). The most important part of this panel pertains to the fraction of employees who had high expenditures in both years. Only about 7.4 percent had expenditures above $1,000 in both years, and only 1.44 percent had expenditures above $5,000 in both years. Thus only a very small proportion of employees have high expenditures in one year as well as two years later, or two years earlier.

The data also show persistence, consistent with the data in panels A and B of figure 6.1. The second panel of table 6.2 shows the distribution of 1995

Table 6.2 Distribution of 1990 and 1995 Expenditures (%)

	Expenditure Interval in 1995				
Expenditure Interval in 1990	$0	$1–300	$301–1,000	$1,001–5,000	>$5,000
Joint Distribution of 1993 and 1995 Expenditures					
$0	21.46	7.27	4.02	3.08	1.78
$1–$300	12.22	6.99	4.09	2.95	1.62
$301–$1000	5.30	3.65	3.12	2.65	1.36
$1001–$5000	3.58	2.42	2.21	2.59	1.49
>$5000	1.86	1.10	0.90	1.19	1.10
Distribution of 1995 Expenditures Conditional on 1990 Expenditures					
$0	57.05	19.33	10.69	8.19	4.74
$1–$300	43.85	25.07	14.66	10.59	5.82
$301–$1000	32.97	22.71	19.42	16.47	8.43
$1001–$5000	29.14	19.71	17.95	21.08	12.12
>$5000	30.18	17.82	14.70	19.36	17.93
Distribution of 1990 Expenditures Conditional on 1995 Expenditures					
$0	48.30	33.93	28.03	24.71	24.23
$1–$300	27.51	32.61	28.50	23.68	22.08
$301–$1000	11.94	17.04	21.77	21.26	18.43
$1001–$5000	8.07	11.31	15.39	20.80	20.27
>$5000	4.18	5.11	6.30	9.55	14.99

expenditures conditional on the expenditure interval in 1989. For example, 22.82 percent of persons who spent more than $5,000 in 1993 also spent more than $5,000 in 1995, whereas only 2.80 percent of persons who had no expenditures in 1989 spent more than $5,000 in 1991. Rather than looking forward, as in the second panel, the third panel of table 6.2 looks backward; it shows the distribution of 1993 expenditures conditional on the expenditure interval in 1995. Although only a small proportion of employees with expenditures above $5,000 in 1995 also had high expenditures two years earlier in 1993, these employees are more likely to have had high expenditures two years earlier than were persons who had low expenditures in 1991. For example, 21.56 percent of employees who spent more than $5,000 in 1995 had also spent more than $5,000 two years earlier, whereas only 2.64 percent of employees who spent nothing in 1995 had spent more than $5,000 two years prior.

Table 6.2 is just like table 6.1 except that it considers the distribution of expenditures five years apart, in 1990 and 1995. Again, the key fact is that only a very small fraction of enrollees have high expenditures in successive years; just 1.10 percent had expenditures above $5,000 in both 1990 and 1995. Only 6.37 percent had expenditures above $1,000 in both years.

These data may at first appear to be inconsistent with the known high concentration of medical expenditures among a small fraction of enrollees in any given year. In fact, they are consistent with those data. Although

only a very small proportion of employees has high expenditures in the first and third years, for example, the mean expenditure among the top percentile is very large. Thus in any one year, about 20 percent of enrollees in our sample account for about 90 percent of total health care costs. What our data allow, in contrast to cross-sectional data sources, is the analysis of individual expenditures over time. Even over a longer period of time, a small proportion of enrollees accounts for the bulk of expenditures. But they are not the same employees from one year to the next. Again, even over an extended period of time only a small proportion of enrollees has large expenditures, and thus the few that do account for a large fraction of the cost.

6.4 A Semiparametric Model of Expenditures

We use the same basic model that we have used in our previous papers. The goal is a formal description of medical expenditures that will allow us to simulate the pattern of expenditures over the working life, based, in this paper, on the expenditure observed over six years. We begin with a description of the model and its use to predict expenditures and then give. A critical feature of the model is the extent to which it captures actual expenditure patterns.

6.4.1 The Model

A useful way to think about the problem is to assume that large medical expenditures arise as random shocks, which in practice are infrequent. But when they do occur, they may persist for several years. Thus, there are two critical aspects of health care expenditures that the model must capture. One is the relationship between expenditures in successive years, the persistence in expenditures. The other is the random shocks in health care expenditures that are not predicted by prior expenditures or individual demographic characteristics. No matter what the expenditures of employees in prior years, there is an enormous variation in expenditures the next year. Thus enrollees with no expenditure in one year stand some chance of having very high expenditure in the next year. Likewise, enrollees with very high expenditures in one year stand a good chance of having very low expenditures in the next year. Indeed, the lifetime distribution of expenditures is determined much more by these random shocks than by persistent expenditures that are predictable based on prior expenditures or demographic characteristics.

Because a large fraction of employees have no expenditures in a given year, it is useful to consider explicitly the expected value of expenditures in year $t M_t$, given by

$$E(M_t) = \Pr[M_t = 0] \times 0 + \Pr[M_t > 0] \times E(M_t \mid M_t > 0) \tag{1}$$

We estimate the two components of this equation—$\Pr[M_t > 0]$ and $E(M_t \mid M_t > 0)$—separately. The probability of nonzero expenditures is estimated using a linear probability specification, and the level of expenditures given that expenditures are positive is estimated using a log-linear regression. In both cases, the estimated relationship is of the form

$$M_t = \alpha + \beta D + \gamma M_{\text{lag}} + \varepsilon, \tag{2}$$

where medical expenditures in year t, M_t, are predicted by three factors: (a) demographic characteristics, denoted by D, and which include age, sex, and employment status (hourly or salaried); (b) past health care expenditures M_{lag} which include expenditures in years $t-1$, $t-2$, . . . , $t-5$; and (c) random shocks, ε.

The critical part of our analysis is the use of the resulting estimates to predict future expenditures. The fit of these predictions depends not only on our ability to model expected expenditures given an individual's characteristics, but also on the distribution of shocks to expenditures. We want the distribution that is used in prediction to match the actual distribution as closely as possible, and this distribution is extremely skewed within any given cell of expenditures. We model this critical "error" component nonparametrically: Instead of assuming a particular distribution for the random shocks ε, we use the actual distribution of expenditure errors, given demographic characteristics and past expenditures. For example, consider the prediction of expenditures in the third year, given expenditures in the prior two years. The sample is divided into groups determined by age, sex, and employee status (hourly or salaried). Then, within each of these groups the sample is further divided into expenditure groups defined by expenditures in prior years. Now the prediction of expenditure in year six, for example, has two parts. First, the parameters estimated in equation (2) are used to predict mean expenditures in year six. This "systematic" part would show, for example, that enrollees with high expenditures in year one tended on average to have much lower expenditures five years later, as revealed in figure 6.1. Second, a random shock is added to this systematic component. Within each cell, the random component is selected randomly from the actual distribution of residuals within that cell. Suppose that the prediction is for enrollees who had high expenditures in years one through five. This method assures that if a given proportion of persons in this high-expenditure cell have high expenditures in the sixth year, then our predictions will also show this same proportion (on average) to have high expenditures in the sixth year.

Thus, the method captures not only the average relationship between expenditures over time, but if high expenditures persist for some proportion of persons with a given set of demographic and past expenditure characteristics, then the model will also capture the proportion with high persistence. Predictions for years beyond six are obtained by repeated applications of this procedure.

The predictions based on the analysis here should be more accurate than those presented in our previous papers, for two reasons: One is the longer panel and the other is that we take account of the departure of enrollees from the firm. There remains an additional limitation that even this longer panel may not capture. Suppose that expenditure twenty years hence is related to current expenditure. A six-year panel cannot capture the effect of any such long lag effects. We could augment our model with information from other sources on the relationship between medical care use over very long time periods. For example, are heart problems at age fifty preceded by high health care expenditures at age thirty? No available panel of medical claims information can be used to determine directly whether such a relationship exists. However, we can observe expenditures in the next five years of persons who had high expenditures at age thirty, as in the descriptive statistics in table 6.2, for example. Additionally, going to older ages and looking backwards, we can observe the expenditures in the previous five years of persons who had high expenditures at age fifty. Both of these approaches suggest that, for the most part, very high expenditures do not persist. Thus we believe that our predictions provide a good approximation to the distributions that would be observed in very long panels. We do not show parameter estimates in this paper, but parameter estimates based on the three-year panel are discussed in Eichner, McClellan, and Wise (1998).

6.4.2 Fit

In our previous work (Eichner, McClellan, and Wise 1998), we gave considerable attention to the fit of the model and found that the specification fit the data very well. In particular, the simulated distribution of expenditures at various ages matched the actual distributions very closely. Here we present only a few indicators of fit. Because predicting nonzero expenditure is an important component of prediction, we show estimates of the predicted proportion of enrollees with positive expenditure, conditional on demographic characteristics and expenditures in the prior two periods. Table 6.3 shows the actual and predicted percent with positive expenditures in 1995, conditional on expenditures in 1993 (t–2) and 1994 (t–1). The data are grouped by expenditure interval in the prior two periods. The simulated and actual percents are very close.

Figure 6.2 shows projections three years ahead, based on the prior three years of data, compared to actual data. The projections are by age, gender, and employee group. For example, data for persons when they were aged twenty-five, twenty-six, and twenty-seven are used to predict the proportion with positive expenditures at age thirty. The match between simulated and actual proportions is quite close.

Finally, figure 6.3 shows simulated proportions with positive expenditures over a "working life." These simulated proportions are determined as follows: Begin with a sample of 1,000 employees age twenty-five, for each

Table 6.3 **Actual Versus Simulated 1995 Expenditures, Conditional on Expenditures in 1993 and 1994 (%)**

	1993 Expenditure				
1994 Expenditure	$0	$0–300	$300–1,000	$1,000–5,000	$5,000+
$0					
Actual	22.94	42.50	45.22	48.29	44.47
Simulated	22.75	41.84	48.28	46.38	47.11
$0–$300					
Actual	51.32	66.62	69.85	71.77	69.16
Simulated	50.25	68.10	70.62	71.37	69.39
$300–$1000					
Actual	55.79	73.35	79.49	79.97	81.14
Simulated	56.68	74.93	78.26	78.72	78.00
$1000–$5000					
Actual	61.73	74.63	83.73	85.51	84.63
Simulated	60.27	72.27	83.05	85.69	83.75
$5000+					
Actual	66.03	74.88	76.70	85.57	90.00
Simulated	62.82	77.65	77.67	85.74	90.19

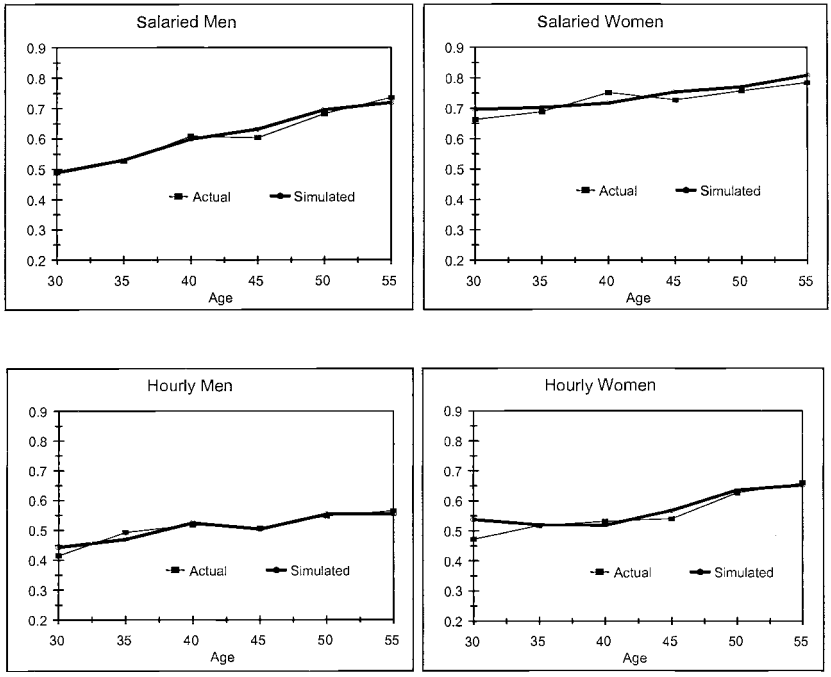

Fig. 6.2 **Three-year-ahead projections, by age, gender, and employee group**

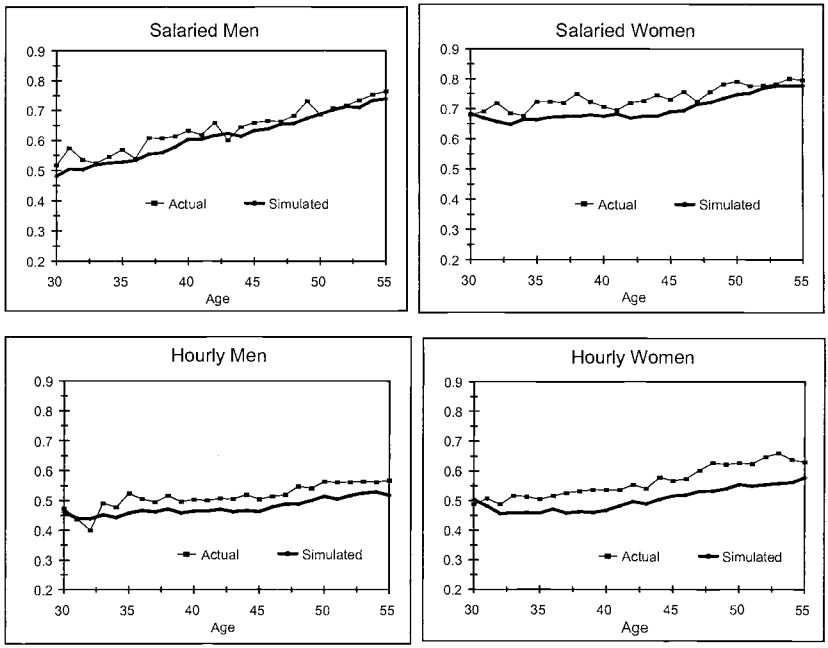

Fig. 6.3 Projections of positive expenditures over a working life of salaried men, salaried women, hourly men, and hourly women

gender and employee group. Then apply equations (1) and (2) repeatedly, producing a stream of expenditures for each person through age fifty-five. The simulated proportions at a given age are the proportion of enrollees simulated to have positive expenditures. The actual proportions are the actual proportions of enrollees at a given age with positive expenditures. Although the match for salaried men and women is quite close, for salaried enrollees the simulated proportions are somewhat lower than the actual proportions—thus exaggerating to some extent the proportions of enrollees for zero expenditures. Overall, though, we conclude that simulated expenditures compare closely with actual expenditure patterns.

The descriptive data above suggest that persistence is not as prevalent as might be thought. We would like to know, however, how the MSA accumulations of plan enrollees over a working life would vary among enrollees. Would a large number spend all contributions for medical expenditures, while others spent little or nothing? Or would the distribution of MSA balances tend to be much less extreme?

To answer this question, we have simulated lifetime expenditures. The simulations are based on a model of individual expenditures over time, which in turn is based on the pattern of expenditures over the six years of observed data. Here, we explain only the key features of the model. A useful way to think about expenditures is to assume that large medical expen-

ditures arise as random shocks, which in practice are infrequent. But when they do occur, they may persist for several years. Thus, there are two critical aspects of health care expenditures that the model must capture. One is the relationship between expenditures in successive years, the persistence in expenditures. The other is the random shocks in health care expenditures that are not predicted by prior expenditures or by demographic variables. No matter what the expenditures of employees in prior years, there is an enormous variation in expenditures the next year. Thus enrollees with no expenditure in one year stand some chance of having very high expenditure in the next year. Likewise, enrollees with very high expenditures in one year stand a good chance of having very low expenditures in the next year. Indeed, the lifetime distribution of expenditures is determined much more by these random shocks than by persistent expenditures that are predictable based on prior expenditures or demographic characteristics. Extensive evaluation of actual versus predicted medical spending shows that the model predicts actual expenditure patterns quite well.[5] Importantly, the method captures not only the average relationship between expenditures over time, but if high expenditures persist for some proportion of persons with a given set of demographic and past expenditure characteristics, then the model also captures the proportion with high persistence.

Using the model, we have simulated the lifetime expenditures of 1,000 employees who begin work at age twenty-five and retire at sixty. To predict expenditures at age twenty-six, for example, we consider age, sex, employee group, and any expenditures over the prior six years. To predict for age twenty-seven, we use age twenty-six predicted expenditures plus the earlier five years of actual expenditures, and so forth. We realize that few, if any persons, would work for the same firm over an entire working life, but it is the expenditure pattern that we want to capture, assuming that employees continue to use a similar MSA plan.

The cumulative distribution of (i.e., the common logarithm of) lifetime expenditures for men and for women through age sixty is shown in figure 6.4. Translating to dollars, over a working lifetime, expenditures of both men and women vary from about $10,000 (about 10 percent of employees) to over $100,000 (about 10 percent of employees). The median is about $32,000.

Given the distribution of expenditures, how might an MSA plan work? We consider this plan:

- The employer puts $2,000 in each employee's MSA at the beginning of each year.[6] For illustration, we assume that MSA assets are invested

5. For details of the model and tests of predictive validity see Eichner, McClellan, and Wise (1997, 1998).

6. We assume that employees do not withdraw from their MSA balances for other purposes or contribute less than the full $2,000 in each year. This allows us to focus on the maximum variation in accumulation that is likely to result with this MSA plan.

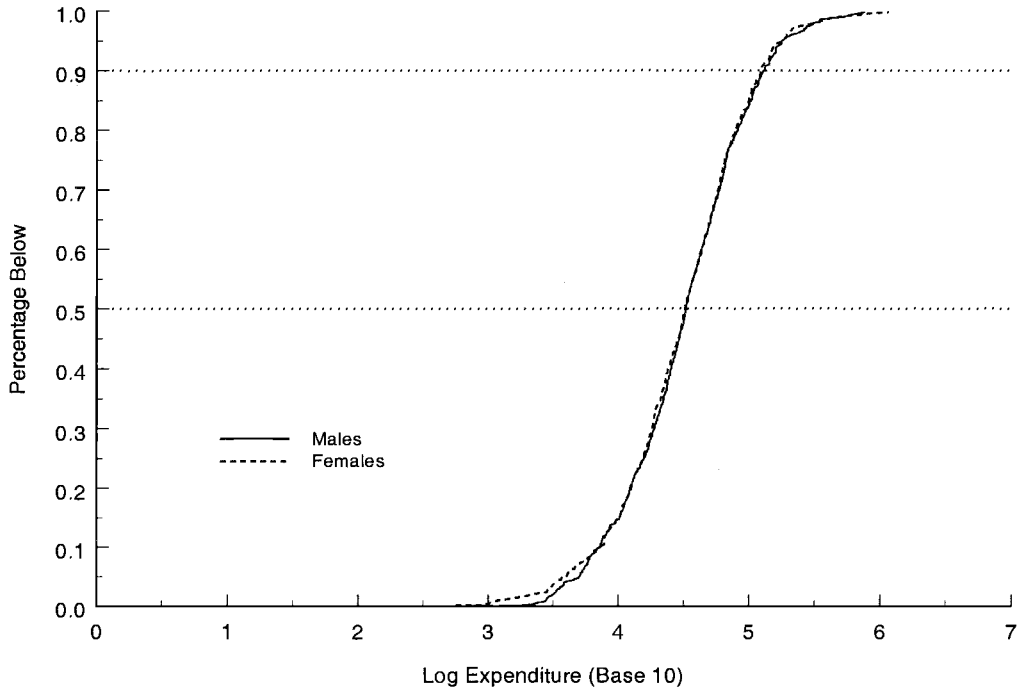

Fig. 6.4 Cumulative expenditures, ages 26–60

either in a bond fund or in a Standard & Poor's 500 index (S&P 500) market index fund. The real return on the bond fund is assumed to be equal to 2.5 percent, the average real return on high-grade long-term corporate bonds between 1926 and 1995, and the return on the market index fund equal to 7.7 percent, the average real return on large company stocks between 1926 and 1995 (see Ibbotson Associates 1998).

- The health insurance plan has a $4,000 annual deductible, with expenses below the deductible paid by the employee (out of the MSA) and 100 percent of expenditures above the deductible covered by the health insurance plan. If the MSA balance goes to zero, all expenses are paid by the insurance plan.

By assuming a real rate of return in the MSA we are in effect assuming that health care costs increase at the same rate as the consumer price index. Sensitivity analysis could of course be conducted for any number of other assumptions.

Under these assumptions, the distribution of MSA balances at age sixty are shown in panels A and B of figure 6.5. After a working lifetime, most employees are left with a substantial accumulation. With investment in stocks, the median balance for men is about $250,000. About 90 percent of the salaried men have a balance at age sixty that exceeds $150,000. For women, the median is somewhat less than $250,000. About 90 percent of women have balances that exceed $100,000. The balance with bond investment is much smaller: the median for both men is somewhat over and for women somewhat less than $100,000.

Perhaps an easier way to understand the plan implications is to consider the ending balance in the MSA relative to the sum of the $2,000 annual contributions to the MSA. The distribution of this ratio at age sixty is shown in panels A and B of figure 6.6. At retirement, the median balance for men with investment in stocks is about 350 percent of total contributions to the MSA; the median balance for women is about 325 percent of contributions. For only 10 percent of men is the balance less than 200 percent of contributions; for only 10 percent of women the balance is less than about 125 percent of total contributions. For 10 percent of men the balance is greater than about 450 percent of contributions, and for 10 percent of women the balance is over 450 percent of contributions.

It is clear that the typical employee would accumulate substantial balances in an MSA such as the one illustrated here.[7] Thus, with no counter-

7. The accumulation is, in fact, underestimated a bit. For technical reasons, simulated expenditures as a person ages are predicted two years at a time, assuming that the employee would pay all expenditures up to $8,000 over the two-year period, rather than up to $4,000 in any single year. This exaggerates a bit the actual employee expenditure under our plan. In addition, the investment return is assumed to apply to the balance remaining at the end of each two-year period—(balance)$(1 + r)(1 + r)$—which produces lower accumulation than a return applied continuously or at the end of each year.

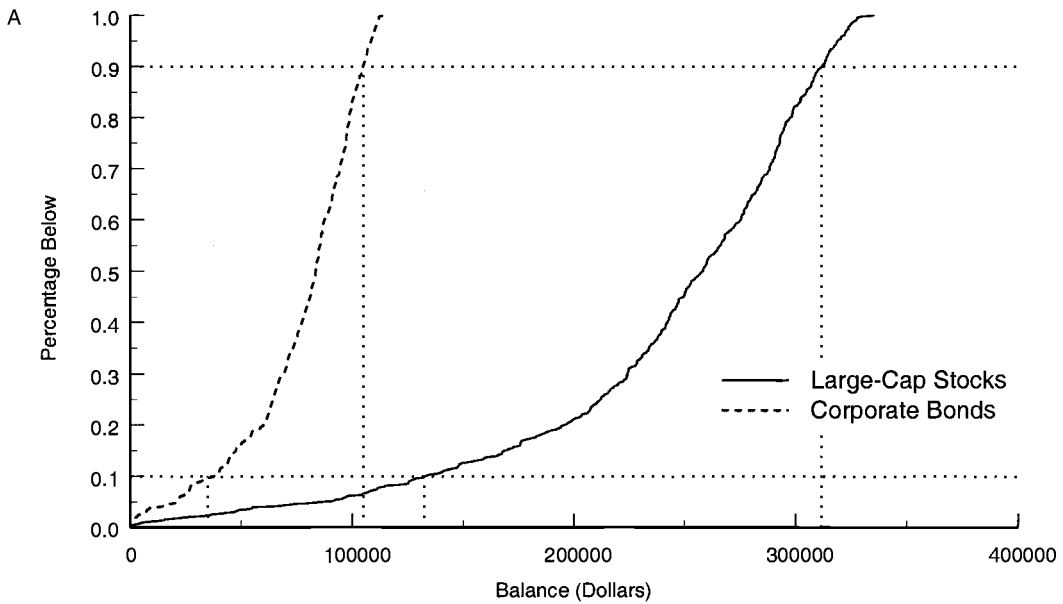

Fig. 6.5 MSA balances at age 60: *A*, Males; *B*, Females

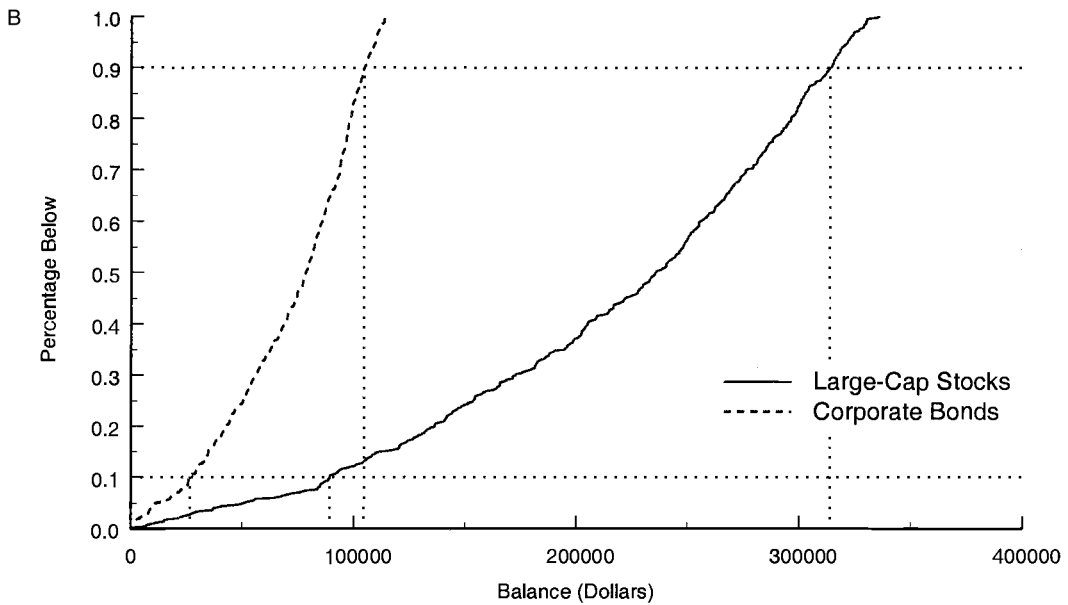
B
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Percentage Below
0
100000
200000
300000
400000
Balance (Dollars)
Large-Cap Stocks
Corporate Bonds

Fig. 6.5 (cont.)

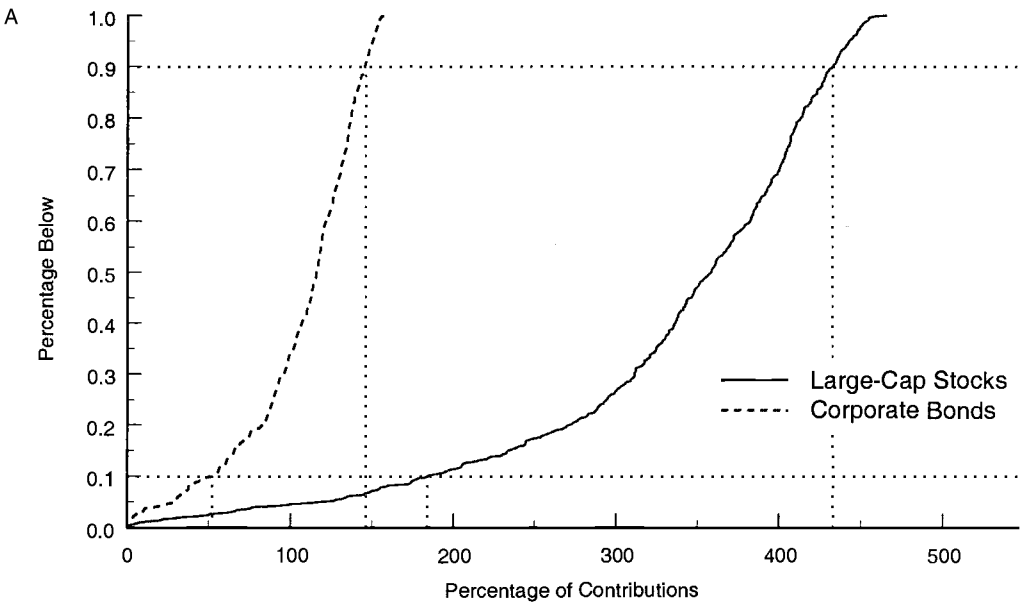

Fig. 6.6 MSA balances at age 60 as percentage of contributions: *A*, Males; *B*, Females

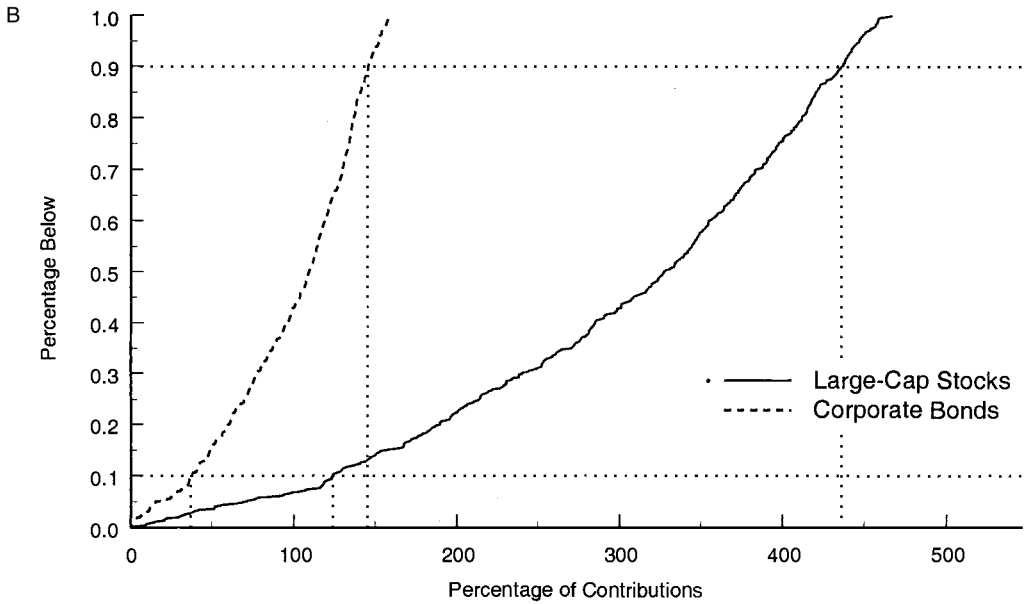
B
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Percentage Below
0
100
200
300
400
500
Percentage of Contributions
Large-Cap Stocks
Corporate Bonds

Fig. 6.6 (cont.)

balancing changes, the typical employee would see a substantial increase in assets at retirement. It is also clear that the accumulation depends critically on the level of annual contributions to the MSA.

6.5 Summary and Further Discussion

Low household saving in the United States essentially makes catastrophic health insurance plans infeasible, since most households would find it difficult to pay even modestly large medical expenditures. MSAs are a way to accumulate a fund from which medical expenses could be paid under a catastrophic health insurance plan, thus—over a broad range of treatment—making individuals responsible for determining whether the benefit of the treatment is worth the price of care. But there is an additional potential obstacle to such an arrangement. If some persons have consistently high medical expenditures whereas others have consistently low expenditure, an MSA plan would essentially be self-insurance for the former and a tax-free saving account for the latter group. Thus we have considered whether the pattern of individual medical expenditures over time would present an important limit on the feasibility of MSAs. We find that although there is some persistence, the prospect of participants with consistently high medical expenditures is rare. This work follows our prior work in this area but relies on a longer panel data file than was available before and uses a data file that allows persons with zero expenditures to be distinguished from those who may have left the firm.

Under the illustrative plan we have simulated, most employees would approach retirement with a substantial proportion of MSA contributions remaining in the account. Only a small fraction would approach retirement with very small balances. Based on the illustrative plan we simulated, if investment of MSA assets were in equities, more than 50 percent of employees would have MSA balances greater than 300 percent of lifetime contributions to the MSA. Only about 10 percent of men would retain less than 200 percent of contributions and only about 10 percent of women would retain less than 125 percent of contributions. If investment were in bonds, balances would be much lower. In this case about 10 percent of both men and women would retain less than 50 percent of contributions. Thus we believe that persistence of medical expenditures does not present an overriding obstacle to the adaption of MSA plans.

The simulations do not incorporate any behavioral response and thus consider neither the reduction in medical expenditures that would likely result from such a plan, nor the ensuing reduction in medical insurance premiums that such a plan would allow. It is reasonable to assume that expenditures below the $4,000 deductible would be reduced. According to price elasticity estimates obtained by Eichner (1997), which are based on analysis of price response in another Fortune 500 firm, expenditure below the

deductible would be reduced by about perhaps 35 percent. Since very high-cost treatments account for a large fraction of medical expenditures, the reduction in total cost would depend importantly on the size of the catastrophic insurance deductible.

It might well be, of course, that expenditures above the deductible would also be affected.

Such a plan would also add to individual "risk," increasing the variance in expected individual lifetime medical expenditures. The increased variance, however, must be evaluated in the context of increased saving, which would likely result from the MSA. Essentially all participants would accumulate more retirement assets than they otherwise would have. The risk is that the amount of the addition to saving is uncertain: Some would accumulate more than others.[8]

Plans like our illustrative MSA arrangement could have substantial implications for the composition of employee compensation, and possibly for the total level as well. A $2,000 MSA contribution when combined with any realistic reduced health insurance premium would still "cost" more than the current health plan. However, "forced savings" is perhaps a better characterization than "increased cost." Rough estimates suggest that the overall cost of the current firm plan is about $1,400 per participant (including spouses and children). With no behavioral effects, the MSA plan would reduce firm insurance costs by half, to about $700. With an MSA contribution of $2,000 and no reduction in other benefits, the net increase in the benefit portion of employee compensation due to the IHA package is $1,300. Employee health care expenditures are increased by about $700 because the decrease in the firm's insurance cost is due to the employee payments from the MSA balances. Thus, net benefits are increased by about $1,300.

We have not considered the tax implications of an MSA plan. The actual additional cost that must be divided between the firm and its employees may be substantially lessened by the favorable tax treatment accorded contributions to 401(k) and similar accounts. Nor have we considered the feasibility of combining it with a retirement plan such as a 401(k). (Many 401[k] plans were established with no apparent reduction in other pension benefits.[9]) Now, both the insurance premium and the MSA contribution, if it were treated like a retirement saving plan, would be tax deductible. In contrast, employee out-of-pocket health care expenses at present would typically not be tax deductible. Nor have we considered here the important adverse-selection problems that plague all health care systems with choice among a menu of plans. These issues remain to be explored.

8. We show the simulated distribution of asset accumulation. We do this to illustrate the risk of low (or high) accumulation. We do not assign a given utility function to the distributions. A small chance of a small accumulation could have a substantial affect on the overall utility attached to a distribution of outcomes.

9. See Poterba, Venti, and Wise (1996, 1998), for example.

In addition, small changes in the structure of the plan, can change substantially the way the numbers look. For example, if the MSA contribution is made at the end of the year—and thus is not available to fund expenditures in that year—accumulated MSA balances at retirement would be larger. The results would also look quite different if the MSA contribution were $1,000, say, instead of $2,000. This sensitivity suggests that a contribution could be set so that, taking into account the tax implication, for example, the MSA package would not increase health care costs.

Private retirement saving is now dominated by personal retirement saving—401(k)s and IRAs—and current trends suggest even greater reliance on personal retirement accounts in the future, as shown by Poterba, Venti, and Wise (2000). In particular, 401(k) plans established by employers are likely to expand further. Such plans place greater reliance on individual choice, perhaps engender greater self-reliance, and will almost surely lead to substantial increases in household assets at retirement. The market risk associated with such plans may also increase the risk faced by individuals, but, like the MSA risk, such risk must also be evaluated in the light of much greater accumulation of retirement assets. Many current proposals for Social Security reform also suggest the establishment of individual accounts, which place further choice in the hands of individuals and would also likely increase individual and national saving. The "medical saving account" portion of the MSA would likely have a similar effect. And it is natural to consider MSAs combined with 401(k) plans. In addition, the MSA holds the prospect of providing medical care more efficiently and reducing medical care expenditures. It does this by relying on individuals to decide whether the care they receive is worth the price they pay for it.

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