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ABSTRACT

From 1991 to 2003, the fraction of Medicaid recipients enrolled in HMOs and other forms of Medicaid managed care (MMC) increased from 11 percent to 58 percent. This increase was largely driven by state and local mandates that required most Medicaid recipients to enroll in an MMC plan. Theoretically, it is ambiguous whether the shift from fee-for-service into managed care would lead to an increase or a reduction in Medicaid spending. This paper investigates this effect using a data set on state and local level MMC mandates and detailed data from CMS on state Medicaid expenditures. The findings suggest that shifting Medicaid recipients from fee-for-service into MMC did not reduce Medicaid spending in the typical state. However, the effects of the shift varied significantly across states as a function of the generosity of the state's baseline Medicaid provider reimbursement rates. These results are consistent with recent research on managed care among the privately insured, which finds that HMOs and other forms of managed care achieve their savings largely through reduced prices rather than lower quantities.

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1. Introduction

The Medicaid program currently provides health insurance to more than 50 million low-income U.S. residents. Expenditures are jointly financed by the federal and state governments, and total program expenditures were $390 billion in 2009 (CMS, 2010). Each state administers its own Medicaid program and has some latitude with respect to eligibility rules, which services are covered, and how generously to reimburse health care providers. States also have flexibility in how they administer the benefit, with many opting to contract with health maintenance organizations (HMOs) and other managed care organizations (MCOs) to coordinate and finance care for Medicaid recipients.

The usual motivation for Medicaid managed care (MMC) contracting is that it will allow states to improve access to and quality of care, while also reducing Medicaid expenditures. By 2008, more than 70 percent of Medicaid recipients were enrolled in some form of managed care (KFF, 2010a). The corresponding share in the early 1990s was just 10 percent. The increases in MMC enrollment during this period were largely driven by state and local mandates that required certain categories of Medicaid recipients to enroll in a managed care plan.

In this paper, we use data for all fifty states and the District of Columbia to investigate the effect of MMC contracting on Medicaid expenditures. Theoretically, one might expect MMC contracting to reduce program expenditures, as health insurers would have a strong financial incentive to reduce the use of unnecessary treatments, to improve the coordination of medical care, and to keep patients healthy. On the other hand, Medicaid's provider reimbursement rates are generally much lower than those for commercial insurers. Thus even if insurers succeed in reducing the utilization of medical care, spending might increase if insurers reimbursed health care providers at higher rates than the fee-for-service Medicaid program.

Indeed, previous work has found that the key channel through which managed care reduces spending in the private health insurance market is by negotiating lower provider prices (Cutler et al, 2000; Dor et al, 2004; Shen and Melnick, 2006).

Previous work on the effect of MMC on Medicaid expenditures has focused on individual states, in most cases over relatively short time periods, rather than considering all states simultaneously. The results from this research provide mixed evidence, with some studies suggesting that MMC increases Medicaid spending and others finding the opposite. Of course, the results from any one state may not generalize to the nation as a whole, as each state's Medicaid program has unique features that might influence its benefits from MMC contracting. Thus it is ultimately an empirical question whether the shift of Medicaid recipients from traditional fee-for-service into managed care plans has on average reduced the strain on state budgets and also whether this effect varies across states.

Medicaid recipients who choose to enroll in MMC plans are likely to differ in both observable and unobservable ways from those who remain in traditional fee-for-service Medicaid (Glied et al, 1997). Thus to reliably estimate the effect on Medicaid spending, one needs a plausibly exogenous source of variation in MMC enrollment. For this we utilize a rich source of data from the Urban Institute regarding state and local mandates that required Medicaid recipients to enroll in an HMO or some other form of managed care. This data set allows us to identify which counties in the U.S. had an MMC mandate in effect for each year from 1991 to 2001, and we update this data through 2003. Furthermore, this data provides information on the type of mandate, distinguishing counties that require recipients to enroll in HMOs from those who require enrollment in primary care case management (PCCM). This additional information allows us to estimate whether the effect of MMC varies across different types of managed care.

We merge this data to administrative data for the same time period from the Centers for Medicare and Medicaid Services (CMS) on Medicaid enrollment, MMC enrollment, and Medicaid expenditures. This data is available annually at the state level,[1] and thus we aggregate the Urban Institute data to the state level by weighting each county by its share of the state's population in each year. The expenditure data contains both total Medicaid spending and spending by category, and thus we can explore how the effect of managed care enrollment differs across type of spending. During the time period that we consider, the fraction of Medicaid recipients enrolled in managed care plans increased from 11 percent to 58 percent.

Using these two data sources, we first estimate the effect of state and local MMC mandates on the fraction of Medicaid recipients in a managed care plan. Our key identifying assumption in this first set of analyses and all subsequent ones is that the timing of the mandates is orthogonal to other factors that would influence Medicaid expenditures. Our findings indicate that, for every 10 Medicaid recipients "exposed" to an MMC mandate, there is an increase of approximately 4 in the number of MMC enrollees. The relationship is not one-for-one for at least three reasons. First, some Medicaid recipients are already enrolled in voluntary MMC programs at the time of the mandates. Second, certain categories of Medicaid recipients are frequently exempt from the MMC mandates. And finally, some Medicaid recipients who are subject to the mandate do not end up enrolling, perhaps because they are granted an exception or because there is a lag between newly enrolling in Medicaid and being enrolled in an MMC plan.

[1] CMS currently has micro-level Medicaid claims and enrollment data, with the specific time periods for each state summarized here: https://www.cms.gov/MedicaidDataSourcesGenInfo/07_MAXGeneralInformation.asp
Medicaid data for all states are available beginning in 1999 but many states are missing data in previous years. Unfortunately, there is no nationally representative sample of Medicaid claims and enrollment data (as there is for Medicare) and thus it is necessary to obtain individual state-level files. For each state*year combination, there are five files (inpatient, outpatient, long-term care, prescription drugs, and enrollment). Similar data for the 1993 to 2001 period was used in Duggan (2004) to estimate the effect of MMC in just one state (California).

We next investigate the effect of the mandate-induced increases in MMC enrollment on the composition of Medicaid spending. Our findings indicate that increases in MMC enrollment are, as expected, significantly negatively related with the share of Medicaid spending going directly to health care providers such as hospitals and physicians and positively related to the share of payments going to managed care organizations. The effect is entirely driven by HMO mandates, as these organizations typically finance most of the care themselves, rather than by other types of MMC such as primary care case management. Among health care providers, the effect is especially strong for hospitals, physicians, and pharmacies. Interestingly, we estimate no effect for the share of spending going to nursing homes, reflecting the fact that most state Medicaid programs have kept their nursing home residents within fee-for-service.

In our third set of empirical analyses, we investigate the effect of the mandate-induced increases in MMC enrollment on Medicaid expenditures. Our baseline estimates suggest that the average effect on Medicaid spending of shifting recipients from FFS to managed care is close to zero. This result holds for both HMO contracting and other types of MMC, and suggests that the policy-induced shift of millions of Medicaid recipients from FFS to managed care during our study period did little to reduce the strain on the typical state's budget.

However, our evidence also suggests that the expenditure effect varies significantly with the generosity of a state's Medicaid provider reimbursement. More specifically, in states where Medicaid provider reimbursement is very low relative to commercial reimbursement, MMC contracting seems to increase Medicaid spending. The opposite is true in those states with relatively generous Medicaid reimbursement. This suggests that it is difficult for states to achieve cost savings through MMC contracting if their provider reimbursement rates are initially very low relative to rates negotiated by private health insurers in their state.

The results in this paper take on additional significance when one considers that many states are currently expanding MMC to more of their Medicaid recipients. For example, recent survey evidence indicates that at least twenty states are planning to expand the reach of their Medicaid managed care programs in the near future (KFF, 2010c). Additionally, Medicaid enrollment is projected to increase substantially during the next several years as a result of the recently enacted Patient Protection and Affordable Care Act (PPACA). The Congressional Budget Office (CBO) projects that PPACA will, by 2016, increase Medicaid enrollment by 16 million relative to the no-reform baseline (CBO, 2010), while CMS projects an increase of 23 million (CMS, 2010). It is plausible that the vast majority of these new recipients will be enrolled in MMC plans.

When one considers the budget difficulties that many state governments are currently confronting, it is likely that state policymakers will be looking for strategies to control the growth rate of Medicaid expenditures in the years ahead. The results in this paper suggest that Medicaid managed care is most likely to reduce spending in those states with relatively generous provider reimbursement rates. This is consistent with recent evidence from the private health insurance market that managed care achieves much of its savings through lower prices rather than through reduced quantities (Cutler et al, 2000).[2]

The outline of the paper is as follows. In section two we provide background on the growth in both MMC enrollment and in Medicaid expenditures during our study period and how this varies across states. Section three provides a brief overview of the previous literature on managed care generally and Medicaid managed care specifically. We outline our identification

[2] Earlier evidence did find large reductions in utilization from the HMO model. For example, the results from the RAND Health Insurance experiment indicated that inpatient utilization was significantly lower among those randomized to an HMO plan (Manning et al, 1987). This experiment was conducted in the mid-1970s.

strategy in section four and present our empirical results in section five. Section six discusses the implications of our results and possible avenues for future research.

2. The Growth in MMC Enrollment from 1991 to 2003

In 1991 and as shown in Table 1, just 10.6 percent of Medicaid recipients were enrolled in a managed care plan. Most (7.4 percentage points) of this enrollment was in HMOs and other prepaid health plans. These plans are typically paid a fixed amount per member per month, and are responsible for choosing a network of health care providers, negotiating reimbursement rates, and managing the care of their enrollees. The key feature of the HMO payment model is that the plan is at risk for the cost of their enrollees' medical care. If enrollees' costs turn out to be higher than anticipated, the MMC plan does not receive additional reimbursement. Because of this, HMOs and other prepaid health plans have a strong financial incentive to reduce the utilization of unnecessary or low-value treatments and to include relatively low-priced hospitals, physicians, and other health care providers in their network.

A less comprehensive form of managed care used by many states during our study period is primary care case management (PCCM). Under this model, a primary care physician is paid a fixed amount per member per month to coordinate care for MMC enrollees. In contrast to the HMO model, under PCCM the physician is not at financial risk for the cost of their patients' care and does not negotiate rates with health care providers. However, the physician can manage both the quantity and the kind of medical care that enrollees receive, and thus can affect Medicaid expenditures. In this baseline year, just 3.2 percent of Medicaid recipients were in PCCM.

Many of the Medicaid recipients enrolled in MMC during our baseline year were required to do so by state and/or local mandates.[3] More specifically and as shown in Table 1, 5.9 percent of Medicaid recipients resided in a county with an MMC mandate in effect in 1991. These mandates did not typically apply to all Medicaid recipients, which often excluded the elderly and disabled. When measured in terms of recipients affected, approximately half of the mandates (3.0 percent out of 5.9 percent) required enrollment in an HMO or similar prepaid health plan. The remaining mandates were a mixture of those requiring PCCM enrollment and those allowing a choice between a PCCM-type plan and an HMO-type plan. Given that the mandate percentages are substantially lower than the actual enrollment shares, it is clear that much of the MMC enrollment in 1991 was in voluntary MMC programs.

Table 2 sheds some light on the extent to which MMC enrollment varied across states in 1991. The median state had just 3.8 percent of its Medicaid recipients enrolled in an MMC plan in this baseline year, and more than one-third of states had exactly zero MMC enrollees. Thus while MMC enrollment was high in states such as Arizona, Colorado, and Utah, it was uncommon in most states. Consistent with this, the vast majority of states (39 out of 51) did not have any MMC mandates in effect in 1991, and thus MMC enrollment was voluntary in most states with any MMC penetration.

The reach of MMC mandates grew substantially during the next twelve years. As shown in the final column of Table 2, the majority of states (29 out of 51) had some type of MMC mandate in effect in *all* of their counties in 2003. Only six states did not have any MMC mandates in this year. We estimate that 78 percent of all Medicaid recipients in the U.S. resided in a county with an MMC mandate in 2003. As shown in Table 1, weighting each mandate by the

[3] We obtained information on state and county-level MMC mandates in each year from Urban Institute county-level surveys. These mandates are typically set at the state level but often vary across counties (thus we refer to them as "state and local mandates"). See the Data Appendix for more details on the Urban Institute surveys.

county population, most required enrollment in an HMO or similar prepaid health plan. The remaining mandates were split approximately equally between those that required enrollment in a PCCM and those that allowed a choice between an HMO type plan and a PCCM type plan.

Figure 1 gives some insight into the variation across states in both the timing and the ultimate reach of MMC mandates by plotting the share of Medicaid recipients with a mandate in their county in each year from 1991 to 2003 in five selected states. Massachusetts put MMC mandates in effect statewide beginning in 1992 while, on the opposite extreme, the state of Illinois did not have mandates in effect in any of their counties during our study period. Florida started to introduce MMC mandates in 1993 and had extended them statewide by 1996. The state of California gradually introduced MMC mandates from 1994 through 1999 but 15 percent of Medicaid recipients remained unaffected by MMC mandates at the end of our study period. The state of Nebraska introduced MMC mandates that affected approximately half of Medicaid recipients in 1997 but did not extend these mandates further in the next six years.

An examination of the data on actual MMC enrollment in 2003 displayed in Table 2 reveals a relatively close correspondence between it and the share of Medicaid recipients residing in a county with a mandate. For example, the six states with no MMC mandates in 2003 all have MMC enrollment below 15 percent in that year. None of the remaining forty-five states enrolled less than 28 percent of their Medicaid recipients in MMC in 2003.

It is worth noting that the actual share of Medicaid recipients enrolled in MMC in 2003 (58.4 percent) is substantially lower than the estimated share residing in a county with an MMC mandate in that same year (77.9 percent). This is true for at least three reasons. First, many categories of Medicaid recipients are not subject to the mandates. For example, the aged, blind, and disabled individuals who qualify for Medicaid through their receipt of federal Supplemental

Security Income (SSI) benefits are often excluded from the MMC mandates. Second, there is often a lag between an individual becoming newly eligible for Medicaid and her being enrolled in an MMC plan. And finally, some individuals who are subject to the mandate receive an exemption and thus remain in traditional FFS.

The growth in MMC enrollment summarized above coincided with a substantial increase in the share of Medicaid spending accounted for by payments to MMC plans. As shown in Table 3, just 2.8 percent of Medicaid spending was paid to MMC plans in 1991. During the subsequent years, this steadily increased, reaching 9.8 percent in 1997 and 16.5 percent by 2003. During this same period, the share of Medicaid spending going directly to hospitals, physicians, and long-term care facilities fell substantially, with these three accounting for 75.1 percent of Medicaid spending in 1991 versus just 47.1 percent in 2003.

Given that 58.4 percent of Medicaid recipients were enrolled in MMC in 2003, it is to some extent surprising that the payments to managed care plans accounted for just 16.5 percent of program spending in this year. There are three primary explanations for this. First, MMC mandates typically excluded Medicaid recipients with the highest utilization and expenditures, such as the elderly and disabled.[4] Second, many of the MMC enrollees are in primary care case management, which is unlikely to produce any sharp increases in managed care payments. Third, some states "carve out" certain services from their MMC contracts so that they would continue to reimburse, for example, long-term care facilities on a fee-for-service basis.

And of course, another possible explanation is that states are able to reduce Medicaid spending by shifting recipients from FFS into MMC, and thus MMC enrollees account for a smaller share of spending than they would if they were in fee-for-service. Regardless of the

[4] While accounting for just one-fourth of Medicaid recipients in 2007, the elderly and disabled accounted for 67 percent of Medicaid spending in that same year (KFF, 2010b).

explanation, when considering the possible effect of MMC on Medicaid expenditures, it is important to keep in mind that the plans accounted for just one-sixth of total program expenditures in the final year of our study period.

Another important factor to consider in the analyses below is the variation across states with respect to both the level and the growth rate of Medicaid spending per recipient during our study period. Weighting each state equally, average Medicaid spending per recipient rose from $6,217 in 1991 to $8,084 in 2003 (in 2010 dollars).[5] This represents an annual growth rate of 2.2 percent in real Medicaid spending per recipient. Of course, given Medicaid expansions, changes in economic conditions, and other factors during this period, the characteristics of Medicaid recipients are changing substantially over time.

There is substantial variation across states with respect to the level of spending in each year, as shown in Table 4. For example, Medicaid spending per recipient in New York was twice as high as average Medicaid spending in 1991 but grew by just 0.6 percent per year during the next twelve years. In contrast, Medicaid spending in California was 49 percent lower than average Medicaid spending in 1991 but grew by 5.4 percent during the next twelve years. Despite these very different growth rates, Medicaid spending per recipient in New York was still 123 percent higher than in California in 2003. These cross-state differences may partially reflect differences in the characteristics of enrollees, which services are covered, the prices paid to health care providers, and the average intensity of treatment.

[5] The corresponding growth in Medicaid spending per recipient when weighting each state by its Medicaid population in each year was a rise from $5,890 to $7,848.

While these cross-state differences in Medicaid spending per recipient are clearly of interest in their own right[6], in our empirical analyses below, we focus on *within-state* variation in Medicaid spending by investigating whether it increases or declines following the shift to MMC.

3. Previous Literature

A large body of previous research has investigated the effect of HMOs and other managed care organizations on the quality and cost of medical care among the privately insured. The evidence on quality of care is mixed, with one influential survey article finding an approximately equal number of studies suggesting improvements as reductions (Miller and Luft, 1997). Studies focusing on cost have generally found that managed care lowers health care spending in the private sector. These savings are often achieved primarily through reductions in provider prices rather than in reductions in the utilization of medical care (Cutler et al, 2000; Dor et al, 2004). Previous evidence also suggests that managed care was more successful in reducing costs during the 1990s than in more recent years, with one article referring to the period following this decade as the HMO "backlash period" (Shen and Melnick, 2006).

Much previous work has also explored the effect of managed care in the Medicaid program, where the growth in managed care enrollment was especially rapid during the 1990s. For a number of reasons, one might expect the effect of managed care to be different for Medicaid recipients than for the privately insured. First, Medicaid's reimbursement rates for hospitals, physicians, and other health care providers are on average much less generous than the rates negotiated by private health insurers (Gruber, 2003; Garrett and Zuckerman, 2005). Thus there may be little room for these rates to fall further and induce large reductions in spending.

[6] A large literature has explored the variation across geographic areas in Medicare spending per recipient (Fisher et al, 2003; Gottlieb et al, 2010). The variation shown in Table 4 for Medicaid is actually much greater than the corresponding variation for Medicare.

Second, Medicaid recipients "churn" in and out of the program more frequently than their counterparts with private insurance. To the extent that managed care in the private sector achieves savings by, for example, encouraging preventive care up front to reduce hospitalizations in the future, the Medicaid program may not benefit from those savings if the person is no longer enrolled. Third, the efficiency of care delivered by fee-for-service Medicaid may differ from that in the private sector. If, for example, Medicaid recipients receive more unnecessary services or care from costly sources such as emergency rooms than their counterparts in the private sector, there may be room for even greater cost savings.

Research examining the effect of Medicaid managed care has tended to focus on quality and utilization measures such as infant health outcomes, ER visits, and preventable hospitalizations (Kaestner et al, 2002; Howell et al, 2004; Aizer et al, 2007). The results from this literature, consistent with the evidence for the private sector, are mixed. Another body of research has explored the effect of MMC on the composition of medical care, with some studies finding a reduction in the amount of care delivered in the hospital and a corresponding increase in the amount of care in outpatient settings (Bindman et al, 2005; Basu et al, 2004; Baker and Afendulis, 2005; Currie and Fahr, 2005).

One especially relevant study from this prior literature used data from four rounds of the Community Tracking Study (CTS) to estimate the effect of Medicaid managed care on various measures of health care utilization (Herring and Adams, 2011). The authors take this analysis one step further by exploring the effect of Medicaid managed care on expenditures. However, because the CTS data does not contain information on health care spending, the authors must simulate it using data from another source (the Medical Expenditure Panel Survey) that allows them to estimate the average impact of each type of utilization on total spending. These

estimated effects are then multiplied by the corresponding individual-specific quantities for each type of service and aggregated by the person. As the authors note, they "measure the potential effect on state program expenditures," which is certainly an important outcome variable. But to the extent that MMC plans contract with different providers, negotiate different provider reimbursement rates, or have different administrative costs than fee-for-service Medicaid, this approach may provide a misleading estimate of the effect of MMC on actual Medicaid spending.

Relatively few studies have investigated the effect of MMC enrollment on actual Medicaid expenditures. One study examined this issue in the state of California by exploiting variation across counties during the 1993 to 2001 period in the timing of mandates requiring certain categories of Medicaid recipients to enroll in an HMO (Duggan, 2004). The results from this study demonstrated that the policy-induced shift of Medicaid recipients into managed care resulted in a substantial increase in Medicaid spending in the state of California. In contrast, a recent survey article prepared for America's Health Insurance Plans (AHIP) found that MMC achieved cost savings in several states during the 1990s (Lewin Group, 2009). Virtually all of the studies of Medicaid spending cited in this survey article focused on just one state.[7].

No previous study has exploited the considerable variation across states with respect to Medicaid managed care policy to estimate the effect of MMC on Medicaid expenditures. This is in some respects surprising given the importance of the Medicaid program to both the federal budget and to individual state budgets and given the increase in MMC enrollment since the early 1990s. Indeed, there are now more than 35 million U.S. residents in some form of Medicaid managed care, and this number is likely to grow substantially in the near future as a result of

[7] The one exception to this among the articles cited in the survey is a study by Mathematica, which examines the issue for 5 states over a 3 to 6 year period during the mid-1990s. Interestingly, the authors of this study "concluded that (MMC) had little effect on state expenditures." This study, like virtually all of the other studies cited in this Lewin Group report, was not published in a peer-reviewed journal.

additional policy changes requiring MMC enrollment and because of the PPACA-induced increase in Medicaid enrollment that will begin in 2014.[8]

In the pages that follow, we aim to fill this gap in the literature by combining a unique data set compiled by the Urban Institute on state and local-level MMC mandates with CMS data on state Medicaid expenditures. We focus on the 1991 to 2003 period, when the fraction of Medicaid recipients enrolled in managed care increased more than fivefold.

4. The Effect of State and Local Mandates on MMC Enrollment

This section outlines our strategy for using the presence of a state or local MMC mandate as an instrumental variable for Medicaid managed care enrollment. We begin by summarizing why an instrument is necessary in our application.

A. The Endogeneity of Voluntary MMC Enrollment

At the individual level, Medicaid spending varies substantially across individuals as a function of observable factors such as age, basis of eligibility, and state of residence and unobservable factors such as illness severity. Isolating the effect of MMC from these other factors is difficult if individuals have the option to enroll in Medicaid managed care plans. For example, health insurers may find it optimal to target marketing to Medicaid recipients with relatively low costs, conditional on their observable characteristics, given that they are paid a fixed amount per enrollee per month. Similarly, individuals with higher utilization may prefer to remain in traditional fee-for-service Medicaid, where they may face fewer restrictions on the quantity of care that they receive or may have long-standing relationships with certain health

[8] CMS projects that more than one-fourth of U.S. residents will be insured by Medicaid in 2014 and that Medicaid spending will exceed expenditures by the Medicare program in each year from 2016 through 2019 (CMS, 2010).

care providers. On the other hand, these same recipients may have more to gain from better coordination of their medical care, and thus may prefer to "opt in" to voluntary managed care plans. Thus it is theoretically ambiguous whether healthier (low-cost) Medicaid recipients would be more likely to "opt in" to a voluntary MMC program.[9]

Previous work on Medicaid managed care in the state of New York found that Medicaid recipients who voluntarily enrolled in MMC differed on both observable and unobservable dimensions from those remaining in fee-for-service (Glied et al, 1997). For example, MMC enrollees were much more likely to be in good or excellent health than those in traditional Medicaid. The authors conclude that "selection affects estimates of utilization savings between managed care and fee-for-service" in Medicaid. More recent work for the Medicare program, which does not require managed care enrollment, also indicates that healthier recipients are significantly more likely to join managed care plans (Brown et al, 2011). To the extent that the individuals who voluntarily enroll in MMC differ from their observably similar counterparts who remain in fee-for-service, a plausibly exogenous source of variation in MMC enrollment can be used to estimate its effect on spending or other outcome variables of interest.

B. State and Local MMC Mandates

As discussed above, virtually every state now requires at least some of its Medicaid recipients to enroll in managed care plans. These mandates typically vary by geography and/or by basis of Medicaid eligibility. For example beginning in the spring of 1994, individuals who qualified for Medicaid through the Aid to Families with Dependent Children (AFDC, now Temporary Assistance to Needy Families) in California's Sacramento County were required to

[9] These same endogeneity concerns would exist at the state level as well. If, for example, a state's Medicaid recipients were becoming unobservably healthier (or sicker) over time because of changes in state outreach efforts, eligibility rules, or economic conditions, one might find a mechanical change in the share in MMC.

enroll in a Medicaid managed care plan. Elderly and disabled Medicaid recipients in Sacramento had the option to enroll but were not required to do so. Previous work used county-level MMC mandates as a plausibly exogenous source of variation to estimate the effect of MMC enrollment on Medicaid spending in the state of California (Duggan, 2004).

The current study extends this approach by using data on MMC mandates and Medicaid spending for all fifty states during the period when MMC enrollment experienced most of its growth. As shown in Table 2, the vast majority of states had no MMC mandates in effect at the beginning of our study period in 1991. This changed significantly during the next twelve years, so that by 2003 all but six states required at least some of their Medicaid recipients to enroll in a managed care plan. In 2003, we estimate that 77.9 percent of Medicaid recipients resided in a county with an MMC mandate, versus just 5.9 percent in 1991. From 1991 to 2003, the fraction of Medicaid recipients enrolled in MMC plans increased from 10.6 percent to 58.4 percent.

To investigate whether and to what extent the mandates influenced MMC enrollment, we use thirteen years of state-level data when estimating specifications of the following type:

$$(1)\ MMC_{kt} = \alpha_{1t} + \rho_{1k} + \beta_1 * Mandate_{kt} + \delta_1 * X_{kt} + t * \rho_{1k} + \varepsilon_{1kt}$$

In this specification, k and t index states and years, respectively. MMC_{kt} represents the fraction of state k's Medicaid recipients enrolled in managed care in year t, while $Mandate_{kt}$ equals our estimate of the fraction of state k's Medicaid recipients residing in a county with an MMC mandate. Regarding this latter variable, we do not have county-level Medicaid enrollment for most of our study period. Thus to estimate the share of a state's Medicaid recipients residing in a county with an MMC mandate, we weight each county by its share of the state population in

each year[10]. In this specification, we also include some controls for the characteristics of each state's Medicaid recipients, such as the fraction who are under the age of 15 and the fraction who are elderly (65 and older), in the vector X_{kt}. The specification also includes 13 year fixed effects (α_{1t}) to control for common changes throughout the U.S. in MMC enrollment. The vector ρ_{1k} represents a full set of state fixed effects, and these are also interacted with the year to construct a full set of state-specific linear time trends.

The parameter of particular interest in equation (1) is β_1, which captures the relationship between the share of a state's Medicaid recipients residing in counties with MMC mandates and the fraction actually enrolled in MMC. The key assumption that is necessary to assign a causal interpretation to β_1 is that the MMC mandates are, after controlling for the characteristics of a state's Medicaid recipients, state fixed effects, and state-specific linear time trends, orthogonal to other unobserved determinants of MMC enrollment. If, for example, states tended to implement MMC mandates in counties where they expected voluntary MMC enrollment to decline, this would lead to a biased estimate of the average causal impact of the mandates.

C. The Effect of MMC Mandates on MMC Enrollment

Table 5 summarizes the results from several specifications similar to (1). The first (not numbered) column in this table displays the mean and standard deviation of several explanatory variables that we utilize. The first variable is simply the share of Medicaid recipients with an MMC mandate in their county as described above. The second explanatory variable is similarly defined, but includes only those MMC mandates requiring enrollment in an HMO or similar "at-risk" prepaid health plan. In many counties, Medicaid recipients were given the option to enroll

[10] Our results, which we summarize below, are very similar if we instead weight by the county's share of the state's low-income population or if we use the county population for just one specific year rather than allowing this population to change over time. See the Data Appendix for more details on our variable construction.

in an alternative form of managed care, such as primary care case management, rather than being required to enroll in an HMO.[11] A comparison of the average for this variable (0.242) and the average for the broader mandate variable (0.532) reveals that slightly less than half of the population living in a county with a mandate was required to enroll in an HMO. The other three explanatory variables are the share of Medicaid recipients between the ages of 0 and 14, the share aged 65 and up, and the share who qualify for Medicaid because of disability.

The first specification summarized in this table includes the key explanatory variable along with just state and year fixed effects. Standard errors in this table and all subsequent ones are clustered by state to account for the possibility of within-state interdependence in the residuals due to serial correlation (Bertrand et al, 2004). The statistically significant estimate of 0.465 for β_1 suggests that, for every 100 Medicaid recipients "exposed" to an MMC mandate, approximately 47 enroll in MMC. This estimate is precisely estimated (with a t-statistic of 9.5), is very similar to the analogous one from previous work on California's Medicaid managed care experience (Duggan, 2004), and is virtually unchanged in the next specification when the controls for the characteristics of Medicaid recipients are added. Interestingly, the estimated effects for the age and eligibility distribution are not precisely estimated, with this partly reflecting the fact that there is relatively little within-state variation in these variables.

The specification summarized in the column (3) includes state-specific time trends, and here the estimate for β_1 declines somewhat to 0.374, though it remains precisely estimated. In the next specification, we add as a control the share of Medicaid recipients with an HMO mandate. The small and statistically insignificant estimate of 0.057 for the coefficient on this variable

[11] Counties can either require enrollment in an HMO-type plan, enrollment in a PCCM-type plan, or give recipients the option between the two plan types. The first type of mandate is the most common, and an approximately equal share of Medicaid recipients are exposed to the second and third types of mandate.

indicates that the HMO mandate does not on average have a very different effect from the other types of mandates on the fraction of Medicaid recipients enrolled in MMC.

Columns (5) and (6) in this same table summarize the results from analogous specifications in which the outcome variables are the share enrolled in PCCM and the share enrolled in HMOs. These two variables are defined so that they sum to the managed care variable employed in the four previous specifications. The statistically significant estimate of 0.338 for β_1 in the PCCM specification indicates that MMC mandates do, on average, lead to substantial increases in PCCM enrollment. However, the statistically significant estimate of -0.372 for the HMO mandate coefficient demonstrates that this effect is restricted to those mandates that do not require HMO enrollment. This is as one would expect, as an HMO mandate would not typically lead to more PCCM enrollment. This general pattern is reversed in the next specification. More specifically, the estimate of 0.017 for β_1 and of 0.429 for the HMO mandate coefficient indicate that only the latter type of mandate leads to increases in HMO enrollment. These findings support the accuracy of the mandate variables.

Taken together, the results in this section demonstrate that the MMC mandates implemented by state and local governments during our study period led to significant increases in MMC enrollment. From 1991 to 2003, the fraction of Medicaid recipients with a mandate in their county increased from 5.9 percent to 77.9 percent. Multiplying the increase in this share by our estimate of the average effect of the mandates on MMC enrollment in the third specification (0.374), we estimate that the mandates induced a 26.9 percentage point increase in MMC enrollment. This represents more than half of the actual increase of 47.8 percentage points during our study period.

5. The Effect of MMC Enrollment on Medicaid Expenditures

As shown in Table 3, the shift from fee-for-service to managed care within the Medicaid program during our study period was associated with a significant shift in the composition of Medicaid spending. In the twelve years from 1991 to 2003, payments to managed care organizations grew by an average of 23.7 percent per year (from $4.2 billion to $54.0 billion) versus just 5.4 percent annually for all other Medicaid spending. As a result, payments to HMOs and other MCOs rose from 2.8 percent of Medicaid spending in 1991 to 16.5 percent by 2003.

This 2003 expenditure share is substantially below the corresponding share of Medicaid recipients enrolled in MMC for three reasons. First, approximately one-fourth of the MMC enrollment was in primary care case management programs, in which most Medicaid spending continues to be paid directly to health care providers on a fee-for-service basis. Second, the higher cost Medicaid recipients such as the elderly and disabled are typically kept within states' fee-for-service Medicaid programs. And third, many state Medicaid programs "carve out" services such as long-term care from their MMC programs, so that even for HMO enrollees some of the spending would still be paid directly to health care providers on a fee-for-service basis.

We begin our expenditure analyses by estimating the effect of MMC enrollment on the share of Medicaid spending paid to MMC organizations versus directly to health care providers. This sheds some light on the extent to which MMC could plausibly have affected total Medicaid spending. To do this, we use the mandate variables described above as instrumental variables for the share of a state's Medicaid recipients enrolled in MMC. The specifications summarized in columns (3), (4), and (6) of Table 5 represent our "first-stage" in the IV specifications below.

The key assumption of our empirical approach is that, after controlling for state fixed effects, state-specific linear time trends, and the other explanatory variables described above, the

timing of the MMC mandates is unrelated to unobserved factors that would influence the composition or level of total Medicaid spending in a state. If, for example, states tend to shift their Medicaid recipients into MMC plans in response to previous or expected future increases in Medicaid spending, our estimates could be biased.

While it is not possible to rule out all possible sources of omitted variable bias, we test our key identifying assumption in a number of ways. First, we explore whether the MMC mandates are systematically related with total Medicaid enrollment.[12] If state policymakers were responding to projected enrollment-induced increases in program expenditures by shifting more of their beneficiaries into MMC plans, one would expect to estimate a positive value for μ_2 in the following specification:

$$(2)\ Mandate_{kt} = \alpha_{2t} + \rho_{2k} + \mu_2 * Log(Medicaid\ Recipients_{kt}) + t * \rho_{2k} + \varepsilon_{2kt}$$

Note that in this specification, the outcome variable is the fraction of Medicaid recipients with an MMC mandate in their county while the key explanatory variable is (the log of) the number of Medicaid recipients. Our estimate for μ_2 from this specification is small in magnitude (.003) and statistically insignificant (p-value of 0.988), thus providing little support for the hypothesis that state policymakers responded to Medicaid enrollment increases by shifting more of their recipients into managed care plans.

We next investigate whether the mandates are driven by past increases in Medicaid expenditures by estimating specifications of the following type:

$$(3)\ Mandate_{kt} = \alpha_{3t} + \rho_{3k} + \theta_3 * Log(Medicaid\ Spending_{k,t-1}) + t * \rho_{3k} + \varepsilon_{3kt}$$

[12] We take the log of Medicaid enrollment given the very large differences across states in Medicaid enrollment. For example in 2003, Medicaid enrollment in California was 6.27 million versus just 53.8 thousand in North Dakota. Thus in specification (2), year effects control for common proportional changes in Medicaid enrollment, while state-specific linear trends allow for a constant growth rate in enrollment. For the same reasons in our analyses of total Medicaid spending, we take the log of this variable.

To the extent that state policymakers respond to increases in their Medicaid spending by shifting more of their recipients into managed care plans in the future, one would expect to obtain a positive estimate for θ_3. However, we once again obtain a small and statistically insignificant estimate (of .028 with a p-value of 0.862), suggesting that the mandates are not being driven by accelerations in state Medicaid spending.

A. The Effect of MMC Enrollment on the Composition of Medicaid Spending

Table 6 summarizes the results from specifications that investigate the effect of the mandate-induced increases in MMC enrollment on the composition of Medicaid spending. For example, the first column summarizes the estimates from this specification, in which the outcome variable is the share of a state's Medicaid spending being paid to hospitals, physicians, and other health care providers:

$$(4)\ ProviderShare_{kt} = \alpha_{4t} + \rho_{4k} + \beta_4 * MMC_{kt} + \delta_4 * X_{kt} + t * \rho_{4k} + \varepsilon_{4kt}$$

We instrument for MMC_{kt} using the fraction with a mandate (see the first stage specification 3 from Table 5). To the extent that MMC mandates cause a shift in Medicaid spending from health care providers to managed care plans, one would expect a negative estimate for β. Given that (1) MMC enrollees tend to have lower costs on average than their counterparts who remain in fee-for-service and (2) more than one-fourth of MMC enrollment is in primary care case management, one would expect the magnitude of this estimate to be substantially less than one. Consistent with this, the statistically significant estimate for β_4 displayed in column (1) is -0.125.

As discussed above, managed care programs that utilize PCCM are unlikely to shift a large share of payments from providers to insurers. However, HMOs typically coordinate and finance most of the medical care for their enrollees, so one would expect HMO enrollment to

induce a substantial shift. To investigate the difference between these two forms of managed care, we add a control for the share of a state's Medicaid recipients in a Medicaid HMO in the next specification. We instrument for this and for the fraction enrolled in any form of MMC with the same two mandate variables described above (see the corresponding first stage specifications 4 and 6 in Table 5).

As shown in the second column of Table 6, there is a strong negative relationship between the share of payments going to health care providers and Medicaid HMO enrollment. The significantly negative coefficient estimate of -0.382 for β_4 suggests that, for each 10 percentage point increase in the share enrolled in Medicaid HMOs, there is approximately a 3.8 percentage point decrease in the share of Medicaid spending going to providers. There is no corresponding relationship for PCCM enrollment, which is consistent with the predictions above.

The next two columns of Table 6 reveal that the decline in provider share is almost perfectly offset by an increase in the share of Medicaid spending going to managed care plans. The share of Medicaid spending going to other sources, such as administrative costs or Medicare premiums (for Medicaid recipients dually eligible for Medicare), is not significantly related with the mandate-induced increases in MMC enrollment, as shown in columns 5 and 6.

If one assumes that Medicaid HMOs finance all of the medical care for their enrollees (and thus there is no fee-for-service spending on their behalf), then the estimate of -0.382 suggests that HMO enrollees are much less expensive than the average Medicaid recipient. Suppose, for example, that half of the Medicaid recipients in a state are shifted into Medicaid HMOs. The statistically significant point estimates of -0.382 in column 2 and of 0.388 in column 4 suggest that approximately 20 percent of Medicaid spending would be shifted from providers to insurers. In this example, the other half of recipients remaining in fee-for-service would

account for 80 percent of spending, and thus the Medicaid HMO enrollees would on average be just one-fourth as expensive. This is plausible given that the elderly and disabled, for whom per-recipient Medicaid spending is several times more expensive, typically remained in FFS.

Table 7 displays the results from analogous specifications for specific types of health care providers. For example, the results displayed in specifications (1a) and (1b) reveal that the share of Medicaid spending paid to hospitals is significantly negatively related with the MMC share and that this relationship is especially strong for Medicaid HMOs. Among the other health care providers, the estimates are negative in most cases, though are typically significant only for Medicaid HMOs. Interestingly, there is no significant relationship between MMC enrollment and the share of Medicaid spending paid to intermediate and long-term care facilities. This is consistent with the evidence cited above, namely that the elderly and disabled have typically remained in fee-for-service Medicaid.

Taken together, the results in this subsection reveal that the policy-induced shift of Medicaid recipients from fee-for-service into Medicaid managed care has resulted in a shift of program expenditures from providers to insurers. Of course, many of these same providers ultimately receive the payments disbursed to health insurers. Interestingly, this shift in the composition of Medicaid spending is only present for Medicaid HMOs. Furthermore, revenues for certain categories of health care providers, such as long-term care facilities, have been relatively unaffected by Medicaid managed care. The next subsection explores whether the mandate-induced shift from fee-for-service to MMC has affected total Medicaid spending.

B. The Effect of MMC Enrollment on Total Medicaid Spending

The typical motivation for shifting Medicaid recipients from fee-for-service into Medicaid managed care is that it will lead to improved access and quality of care for Medicaid recipients while simultaneously allowing states to reduce Medicaid spending. While several case studies of specific states suggest the possibility of cost savings (Lewin Group, 2009), no systematic analysis of a large sample of states has ever been conducted. The analysis in this section aims to fill this gap by using CMS data on total annual Medicaid spending in each state from 1991 through and including 2003.

Before proceeding to the analysis, it is worth considering the relative strengths and weaknesses of using aggregate data to answer this question. Previous work on this same issue for California's Medicaid program used individual-level claims and enrollment data for a random 20 percent sample of the state's Medicaid population during the 1993 to 2001 period (Duggan, 2004). One advantage of this approach was that it allowed the author to use individual fixed effects for a large sample of program participants and thus estimate whether spending for the same individual increased or declined following a mandate-induced shift into MMC.[13] However, one important disadvantage was that it excluded certain categories of Medicaid spending such as administrative costs, which are not included in claims data and might plausibly change following a shift to MMC. Similarly, this previous study ignored the possibility of general equilibrium effects – namely that shifting Medicaid recipients into MMC might affect how health care providers treated those remaining in FFS. The aggregate state data utilized in the present study includes a more comprehensive measure of Medicaid spending and would capture those general equilibrium effects.[14]

[13] With a sample of more than one million Medicaid recipients, an additional benefit of the individual-level data was that it yielded relatively precise estimates.

[14] It is also worth noting that, in order to perform an analysis similar to the California one for the entire U.S., it would be necessary to obtain Medicaid claims data for all fifty states, as CMS does not currently produce a random

To estimate the effect of the mandate-induced increases in MMC enrollment on Medicaid spending, we begin by estimating specifications of the following type:

$$(5)\ \text{Log}(\text{McdSpend}_{kt}) = \alpha_{5t} + \rho_{5k} + \mu_5 * \text{Log}(\text{McdRecips}_{kt}) + \beta_5 * \text{MMC}_{kt} + \delta_5 * X_{kt} + t * \rho_{5k} + \varepsilon_{5kt}$$

In this regression, the outcome variable is the log of Medicaid spending in state k and in year t. We control for the same explanatory variables described above and also for the log of the number of Medicaid recipients.[15] State fixed effects control for time invariant differences across states in the level of Medicaid spending, while state-specific linear time trends control for differences across states in the average growth rate of Medicaid spending.

Table 8 summarizes the results from this set of analyses. The first specification summarized in column (1) is a reduced form estimate of the fraction of Medicaid recipients residing in a county with an MMC mandate. The point estimate of -0.005 for β_5 is small in magnitude and statistically insignificant, suggesting that a 10 percentage point increase in the fraction of recipients with an MMC mandate in their county would affect total Medicaid spending by less than 0.1 percent.[16] The IV estimate for the spending effect of the fraction enrolled in MMC is summarized in the next column. As one would expect given the first-stage estimates described above, the magnitude of this IV estimate is higher than the reduced form estimate. But it is also statistically insignificant, suggesting that a 10 percentage point increase in MMC enrollment is associated with just a 0.1 percent change in total Medicaid spending in the

sample for Medicaid as they do for Medicare. This no doubt also partially explains why many issues that have been researched extensively for Medicare, such as variation across geographic areas in spending and treatment patterns, have been virtually ignored for the Medicaid program.

[15] An alternative to this model would be to define the dependent variable as the log of Medicaid spending per recipient. The model above is more flexible as it does not impose a one-for-one relationship between the number of recipients and Medicaid spending. It could be, for example, that marginal enrollees have higher or lower costs than the average, and this specification allows for this possibility.

[16] The corresponding OLS estimate, in which the actual share in MMC (instead of the share with an MMC mandate) is used as the explanatory variable, is .053 with a t-statistic of 1.26.

state. These findings provide little support for the hypothesis that the shift to Medicaid managed care reduced the strain on the typical state budget.

The next two columns summarize the analogous reduced form and IV estimates that differentiate between Medicaid HMO enrollment and other forms of Medicaid managed care. All of the estimates in these columns are statistically insignificant, though the signs are interesting. For example, the point estimates in the IV specification in column 4 suggest that PCCM may lead to a modest reduction in Medicaid spending while the opposite is true for Medicaid HMO enrollment. More specifically, the point estimate of -.060 for the main MMC mandate coefficient suggests that a 10 percentage point increase in PCCM enrollment is associated with a 0.6 percent reduction in Medicaid expenditures. In contrast, adding this coefficient estimate to the one of .108 for the Medicaid HMO mandate coefficient estimate suggests that a 10 percentage point increase in HMO enrollment is associated with a 0.5 percent increase in Medicaid spending. It is not implausible that PCCM could lower Medicaid spending, as primary care physicians may be able to help Medicaid recipients increase the efficiency of their care despite not being at financial risk. However, it is important to emphasize that these estimated effects are only suggestive as neither coefficient is statistically significant.

As discussed above, one possible source of heterogeneity in the effect of MMC contracting is the generosity of Medicaid provider reimbursement relative to reimbursement by commercial insurers. If, for example, Medicaid pays providers much lower rates than private insurers, then it may simply not be possible for these insurers to lower Medicaid spending (even if they reduce utilization to some degree). If, on the other hand, Medicaid's reimbursement is close to that by private insurers, then there may be some scope to reduce Medicaid spending through reductions in utilization of care.

To test this hypothesis, we next augment these specifications by interacting the MMC mandate variable with an index for the generosity of a state's Medicaid reimbursement (MC_Index) relative to private insurers. This data was constructed using state Medicaid reimbursement rates in 1989, two years prior to the start of our study period, and represents the average ratio of Medicaid to commercial reimbursement for a newborn delivery, which is the most common type of inpatient admission among Medicaid recipients.[17] The mean value of MC_Index is 0.56, implying that Medicaid was 44 percent less generous than commercial reimbursement in the average state. This measure does not vary within a state over time in our analyses and we de-mean it in all specifications.

There is substantial heterogeneity across states with respect to this index of relative state Medicaid reimbursement, with the ninetieth percentile state at 0.88 and the tenth percentile state at just 0.36. Two states have a value of exactly 1.00, implying that Medicaid is as generous as commercial insurers there, and no states are above this level. Thus according to this measure, Medicaid was not more generous than commercial health insurance in any state around the beginning of our study period.

The results displayed in the fifth column of Table 8 strongly suggest that the generosity of a state's Medicaid reimbursement, relative to private insurers, is a significant determinant of the spending effects of MMC contracting.[18] More specifically, the statistically significant estimate of -0.251 for the interaction between the mandate variable and MC_Index indicates that

[17] See Schwartz et al (1991) for a detailed description of this data. Neither Arizona nor Wyoming were included in this survey. Also, this data is for just one year and is not updated over time. While national analyses of Medicaid reimbursement generosity have been conducted since this study appeared, virtually no studies aim to measure this on a state-by-state basis relative to commercial insurance. We therefore use this relatively old data, which was constructed just prior to the start of our study period.

[18] To investigate whether states with higher Medicaid provider reimbursement rates were more (or less) likely to shift Medicaid recipients into MMC plans, we regressed the twelve-year change in the state-level MMC mandate on this index. The point estimate was negative (suggesting that states with more generous provider reimbursement were less likely to shift recipients into MMC) though statistically insignificant with a t-statistic of -1.22.

MMC lowered spending by significantly more in states with generous provider reimbursement. This suggests that, if Medicaid provider rates are particularly low, then Medicaid managed care is unlikely to reduce spending. The estimate of -0.251 suggests that changing the index by one standard deviation (0.19) is associated with a 4.8 percentage point change in the reduced-form effect of the mandate. Given that MC_Index is demeaned, the point estimate of -.012 for the main mandate variable suggests that the effect of MMC contracting for a state with average Medicaid reimbursement generosity is very small.

In the next specification, we investigate whether this effect is specific to HMOs by interacting the Medicaid reimbursement index with both the main mandate variable and the HMO mandate variable. Theoretically, one might expect the difference to be present only for HMOs, as state governments continue to directly reimburse health care providers under PCCM. On the other hand, a state with relatively generous Medicaid reimbursement may experience more overutilization under a fee-for-service system. Thus there may be more scope for primary care case managers to reduce utilization through better care coordination in such a state. It is therefore theoretically ambiguous whether the spending effect of generous Medicaid reimbursement would be restricted to HMOs or would also be present in states that used PCCM.

The results summarized in the sixth column of Table 8 suggest that the effect of Medicaid provider reimbursement generosity is not significantly different for HMOs. More specifically, the estimate for the interaction between the MC_index and the HMO mandate variable is small in magnitude (.039) and statistically insignificant, while the point estimate for the coefficient on the interaction of this index with the main mandate variable is unchanged and remains statistically significant. This suggests that states that employ either HMO or PCCM contracting can achieve cost savings if a state has relatively high provider reimbursement.

In the next specification, we introduce an alternative estimate of Medicaid reimbursement generosity, which is the ratio of it to Medicare reimbursement.[19] The estimate for the interaction of this variable, which we label MM_Index, with the main mandate variable is small in magnitude and statistically insignificant. This finding, along with the similar one in the next specification when we include both mandate variables, suggests the generosity of Medicaid reimbursement relative to commercial insurers is the more important source of heterogeneity.

Taken together, the results in this subsection suggest that, on average, MMC contracting did not lead to lower Medicaid spending during the 1991 through 2003 period. However, our findings do suggest that in states with relatively generous Medicaid reimbursement, contracting did achieve cost savings, while the opposite was true in states with less generous provider reimbursement. These findings underscore the importance of considering a state's unique circumstances when considering the potential savings from shifting Medicaid recipients from fee-for-service into managed care plans.

6. Discussion

From 1991 to 2003, the fraction of Medicaid recipients enrolled in HMOs and other managed care plans increased from 11 percent to 58 percent. These increases were largely driven by state and local mandates that required Medicaid recipients to enroll in a managed care plan. Using panel data for all 50 states and the District of Columbia over a thirteen-year period, the results in this paper suggest that shifting Medicaid recipients into managed care plans did not reduce Medicaid spending in the typical state. However, in states with relatively generous provider reimbursement rates, our results suggest that MMC contracting did reduce Medicaid

[19] Our primary source for this ratio is Norton and Zuckerman (2002) and these ratios are for 1998. However, the data are missing for several states in this survey, and thus we supplement it with data from Zuckerman et al (2009) for 2008. We scale down these later values to account for the increase in the average ratio from 1998 to 2008.

spending below what it otherwise would have been. Our findings suggest that the opposite was true in states with low provider reimbursement rates at the start of our study period.

The fraction of Medicaid recipients enrolled in MMC plans has increased only gradually during the last several years, growing from 58 percent in 2003 to 71 percent by 2008. However, recent survey evidence suggests that a large number of states are planning to expand the reach of their MMC programs in the near future. This shift is likely to focus relatively more on elderly and disabled Medicaid recipients, who were largely exempted from the MMC mandates during the 1990s and early 2000s. While representing just one-fourth of Medicaid recipients, this group accounts for approximately two-thirds of Medicaid spending. Thus the share of Medicaid spending paid to managed care plans may increase by substantially more than the share of Medicaid recipients in MMC plans in the near future. Of course, because aged and disabled Medicaid recipients differ in many respects from most of the Medicaid recipients directly affected by previous MMC mandates, our findings would not necessarily translate to this group.

Projections from CBO and CMS suggest that the Patient Protection and Affordable Care Act will increase the number of Medicaid recipients by between 16 million and 23 million by 2015. Indeed, CMS projects that more than one-fourth of U.S. residents will be insured by Medicaid in 2014 (CMS, 2010). It is plausible that the vast majority of those newly eligible for Medicaid, which will include individuals without health insurance with family incomes below 138 percent of the poverty line, will enroll in MMC plans.[20]

For all of these reasons, it is plausible that the reach of Medicaid managed care will expand significantly in the years ahead. How states can achieve greater success in their MMC programs with respect to improved quality and lower Medicaid spending represents an important

[20] PPACA extended Medicaid to non-elderly U.S. residents with incomes at or below 133 percent of the federal poverty line (FPL). A provision of the subsequent Health Care and Education Reconciliation Act of 2010 effectively changed that to 138 percent of FPL.

area for future research. For this it would be especially fruitful to obtain individual-level longitudinal data on MMC enrollment and Medicaid spending for a large number of states over a long time period, which would allow one to telescope in on specific geographic areas or on particular subpopulations within these states.

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Data Appendix

This study utilized data on Medicaid expenditures, enrollment in Medicaid and in Medicaid managed care programs, and Medicaid demographic information from the Centers for Medicare and Medicaid Services (CMS) and mandate data from the Urban Institute.

Expenditure Data

Medicaid expenditure data comes from the CMS-64 Reports (available here for 1997-2009: https://www.cms.gov/MedicaidBudgetExpendSystem/02_CMS64.asp), which contain state-level expenditures for relatively narrow service categories for each year. These service categories were aggregated into broader categories as follows:

Hospital spending: inpatient and outpatient hospital spending, including disproportionate share payments

Physician: physician services, clinic services, labs and radiology, and other practitioners

Long-term care: hospice, intermediate care facilities, and nursing care facilities

Prescription drugs: prescription drug payments, net of manufacturer rebates

Home Health: home and community based services and home health services

Other providers: all other provider services, such as federally-qualified health centers and family planning services – excluding dental services or emergency services for undocumented immigrants

Managed care: payments to physicians for primary care case management programs; capitated payments to managed care organizations, prepaid health plans, all-inclusive elderly plans; and other Medicaid health insurance payments

Other expenditures: all other services such as administrative costs and premium and coinsurance payments on behalf of enrollees who are dually eligible for Medicare and Medicaid

Total expenditures include the sum total of all Medicaid expenditures, with the exception of dental expenditures and emergency services for undocumented immigrants; SCHIP expenditures are included in all of the above categories as applicable once the program began in 1998.

Medicaid Enrollment and Demographic Data

Both overall Medicaid and Medicaid managed care enrollment data as of June 30 come from the Medicaid Managed Care Enrollment Reports for the years 1991-2003 (The 2009 report is available here: http://www.cms.gov/medicaiddatasourcesgeninfo/04_mdmancrenrllrep.asp).

Overall MMC enrollment comes from the unduplicated total managed care enrollment figure. Before 1996, the unduplicated total was not reported, so it was constructed from summed enrollment in individual managed care plans, excluding prepaid health plans for carved out services such as diabetes, substance abuse, and mental health because these often enroll individuals who are also enrolled in comprehensive medical plans. Dental managed care plans are excluded because these are inherently different from those offering medical services.

Before 1996, the MMC Enrollment Reports did not report June 30 Medicaid enrollment. In order to construct MMC penetration rates with a consistent base for each state, we estimated June 30 Medicaid enrollment for 1991-1995 using fiscal year Medicaid enrollment and the state-specific ratio between June 30 enrollment and fiscal year enrollment for 1996. Fiscal year Medicaid enrollment came from Medicaid Statistical Information Statistics reports (described here: http://www.cms.gov/msis/). For the handful of cases where constructed unduplicated managed care enrollment exceeded constructed Medicaid enrollment, the percent of Medicaid beneficiaries enrolled in managed care was capped at 100 percent.

Medicaid demographic information on age and eligibility through blindness or disability status also came from the MSIS data reports. In the early-1990s, these reports were filled out & entered into CMS systems by hand, and in a two cases there were clear instances of data entry being swapped between columns. These instances are the following:

- Arkansas: age 85+ and age unknown were swapped for 1991 and 1992
- Connecticut: Eligibility through Blind/Disabled, Adults in FDC, and Title XIX were swapped in 1991

Mandatory Managed Care Enrollment Policies

The Urban Institute conducted surveys in 1998 and 2001 to determine what types of MMC policies existed for the welfare population in different geographic areas and years. Their surveys differentiated between primary care case management programs and comprehensive managed care organization programs and between voluntary and mandatory programs of both types. The resulting data set reports the existence of these managed care policies using binary variables for each county-year observation. The 1998 survey is described further in Garrett, et al 2003, which uses survey data from 1991-1995 to study the effect of MMC on access and utilization.

State-level mandate variables were constructed by combining these indicator variables with county-level population data. For example, if a state had two counties – one with 70 people and a mandatory managed care policy, and the other with 30 people and no managed care policy – the state-level variable, percent mandatory, would equal 70 percent because 70 percent of the state's population lives in a county with a mandatory managed care policy.

In order to capture additional years of data beyond the MMC expansions in the 1990s, the Medicaid mandate variables were extended to 2003. There were few changes in MMC mandates between 1999 and 2001, and the plan-level MMC enrollment report tables for 2002 and 2003 were used to identify which states expanded or contracted the geographic reach of their MMC policies. For example, Kentucky's mandatory PCCM program began operating statewide in 2002 and Mississippi dropped its mandatory PCCM program in 2002. Our empirical results are very similar if we restrict attention to the 1991 to 2001 period.

Reference List

Garrett, B., Davidoff, A., and Yemane, A. "Effects of Medicaid Managed Care Programs on Health Services Access and Use." *Health Services Research* 2003, 38(2), 575-594.

Figure 1: % of Medicaid Recipients with MMC Mandate in 5 Selected States

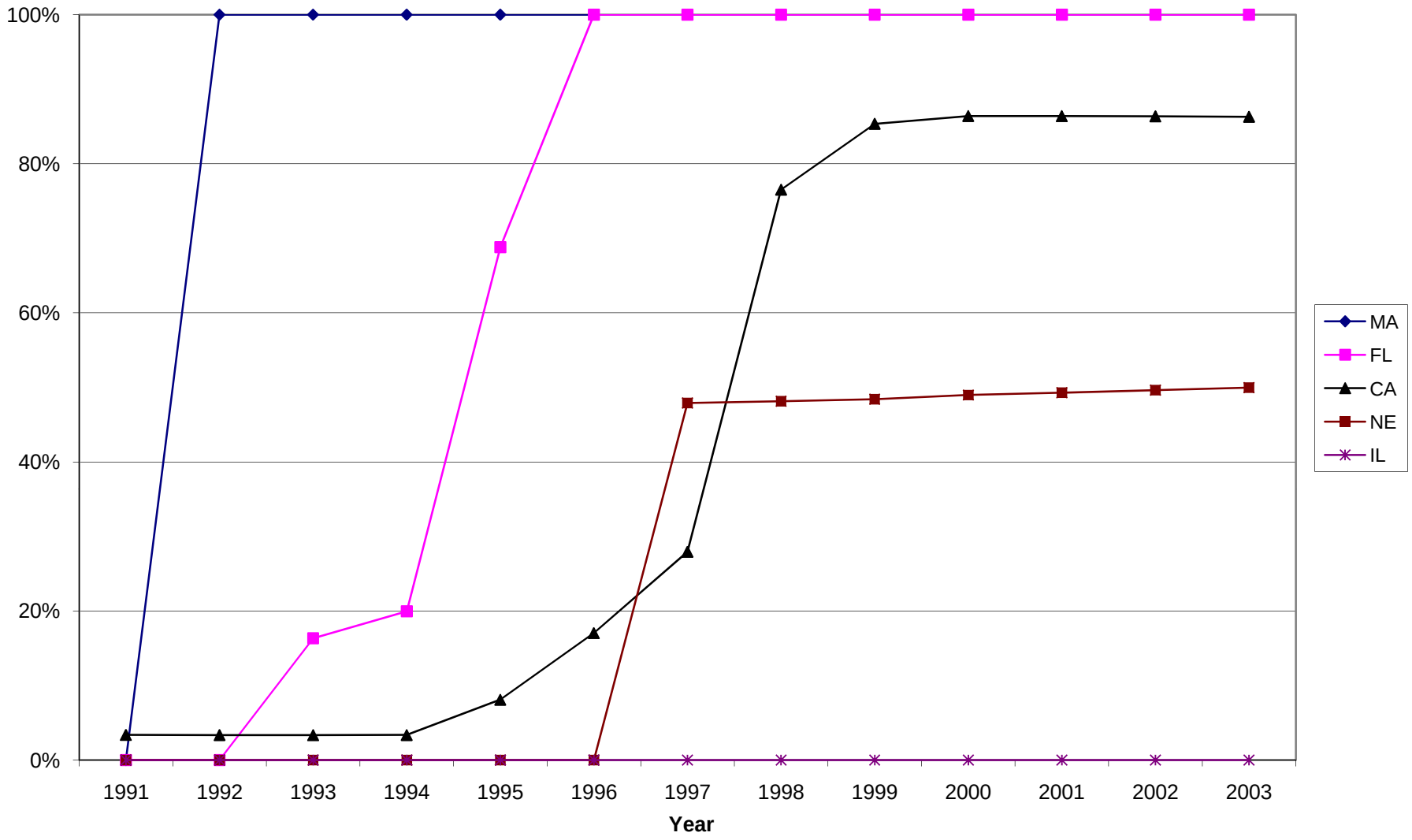

Table 1: % of Medicaid Recipients in Medicaid Managed Care and with MMC Mandates: 1991-2003

	Total Medicaid Enrollment in Millions	% in MMC	% in Risk / HMO	% Residing in Cnty with MMC Mandate	% Residing in Cnty with HMO Mandate
1991	25.3	10.6%	7.4%	5.9%	3.0%
1992	28.1	12.7%	8.6%	10.9%	3.0%
1993	30.5	15.8%	10.9%	12.9%	3.1%
1994	31.7	23.3%	14.6%	22.4%	6.8%
1995	32.3	32.9%	21.5%	35.3%	11.2%
1996	32.2	38.9%	26.5%	44.6%	17.1%
1997	30.8	47.5%	33.4%	55.3%	24.6%
1998	30.0	52.5%	39.2%	70.3%	35.4%
1999	30.9	55.0%	41.1%	75.9%	38.9%
2000	32.7	54.9%	40.7%	78.3%	42.9%
2001	35.5	56.0%	41.2%	78.7%	42.0%
2002	39.1	56.9%	42.6%	77.2%	41.9%
2003	41.8	58.4%	43.7%	77.9%	41.3%

Source: Enrollment in Medicaid and Medicaid managed care programs as of June 30 for each year come from Medicaid Managed Care Enrollment Reports for the years 1991-2003. June 30 Medicaid enrollment was not reported for the years 1991-1995; it was instead constructed using fiscal year enrollment from the Medicaid Statistical Information Statistics reports for those years and the ratio of fiscal year enrollment to June 30 enrollment for 1996. Both reports are CMS publications. Population shares living in counties with MMC mandates are constructed from Urban Institute mandate data and Census Bureau population data.

Table 2: MMC Enrollment and MMC Mandate Variation by State in 1991 and 2003

	% Medicaid Recips in MMC		% in County with MMC Mandate	
State	1991	2003	1991	2003
Alabama	4.1%	53.2%	0.0%	100.0%
Alaska	0.0%	0.0%	0.0%	0.0%
Arizona	100.0%	89.7%	100.0%	100.0%
Arkansas	0.0%	67.1%	0.0%	100.0%
California	10.6%	52.0%	3.4%	86.3%
Colorado	53.7%	79.4%	0.0%	100.0%
Connecticut	0.0%	72.7%	0.0%	100.0%
Delaware	0.0%	71.3%	0.0%	100.0%
District of Columbia	10.6%	66.6%	0.0%	100.0%
Florida	17.4%	61.2%	0.0%	100.0%
Georgia	0.0%	83.7%	0.0%	100.0%
Hawaii	1.4%	78.8%	0.0%	100.0%
Idaho	0.0%	64.5%	0.0%	54.1%
Illinois	9.0%	8.7%	0.0%	0.0%
Indiana	0.3%	71.0%	0.0%	100.0%
Iowa	22.7%	91.5%	33.1%	93.5%
Kansas	31.1%	57.3%	53.3%	100.0%
Kentucky	43.0%	92.3%	97.8%	100.0%
Louisiana	0.0%	58.6%	0.0%	66.5%
Maine	0.0%	59.3%	0.0%	100.0%
Maryland	14.6%	68.5%	0.0%	100.0%
Massachusetts	8.4%	62.6%	0.0%	100.0%
Michigan	13.5%	99.4%	0.0%	100.0%
Minnesota	17.1%	65.6%	30.8%	86.0%
Mississippi	0.0%	0.0%	0.0%	0.0%
Missouri	11.7%	44.7%	12.3%	67.5%
Montana	0.0%	68.9%	0.0%	97.8%
Nebraska	0.0%	72.1%	0.0%	50.0%
Nevada	14.7%	45.7%	0.0%	70.3%
New Hampshire	4.4%	14.7%	0.0%	0.0%
New Jersey	1.0%	67.2%	0.0%	100.0%
New Mexico	38.8%	64.5%	0.0%	100.0%
New York	3.8%	52.5%	0.0%	44.5%
North Carolina	7.3%	69.7%	0.5%	100.0%
North Dakota	0.0%	66.0%	0.0%	100.0%
Ohio	18.4%	28.8%	5.3%	47.8%
Oklahoma	0.0%	68.0%	0.0%	100.0%
Oregon	27.6%	77.7%	0.0%	100.0%
Pennsylvania	13.2%	79.9%	0.0%	100.0%
Rhode Island	0.3%	66.8%	0.0%	100.0%
South Carolina	4.2%	8.3%	0.0%	0.0%
South Dakota	0.0%	97.3%	0.0%	100.0%
Tennessee	3.1%	100.0%	0.0%	100.0%
Texas	0.0%	41.7%	0.0%	69.7%
Utah	86.4%	86.4%	77.5%	75.8%
Vermont	0.0%	65.4%	0.0%	100.0%
Virginia	0.0%	45.0%	0.0%	86.8%
Washington	3.4%	80.7%	5.2%	81.0%
West Virginia	0.0%	51.1%	0.0%	100.0%
Wisconsin	26.4%	47.2%	27.0%	79.3%
Wyoming	0.0%	0.0%	0.0%	0.0%

Source: Enrollment in Medicaid and Medicaid managed care programs as of June 30 for each year come from Medicaid Managed Care Enrollment Reports for the years 1991-2003. June 30 Medicaid enrollment was not reported for the years 1991-1995; it was instead constructed using fiscal year enrollment from the Medicaid Statistical Information Statistics reports for those years and the ratio of fiscal year enrollment to June 30 enrollment for 1996. Both reports are CMS publications. Population shares living in counties with MMC mandates are constructed from Urban Institute mandate data and Census Bureau population data.

Table 3: Composition of Medicaid Spending in 1991, 1997, and 2003

	1991	1997	2003
Hospital	$51,632 34.6%	$59,446 26.7%	$66,446 20.3%
Long and Intermediate Term Care	$47,397 31.7%	$59,179 26.6%	$67,767 20.7%
Physician	$13,129 8.8%	$17,705 7.9%	$19,946 6.1%
Prescription Drugs	$8,868 5.9%	$13,795 6.2%	$32,005 9.8%
Home Health	$4,396 2.9%	$14,607 6.6%	$26,808 8.2%
Mental Health	$4,438 3.0%	$9,179 4.1%	$9,156 2.8%
All Other Providers	$5,931 4.0%	$13,425 6.0%	$22,668 6.9%
Managed Care Payments	$4,197 2.8%	$21,873 9.8%	$54,041 16.5%
Administration	$6,079 4.1%	$7,669 3.4%	$16,395 5.0%
Premiums / Coinsurance	$0 0.0%	$0 0.0%	$4,433 1.4%
Medicare	$3,227 2.2%	$6,015 2.7%	$8,109 2.5%
Total Medicaid Spending	$149,293	$222,893	$327,774

Dollar amounts in millions of 2010 dollars, adjusted using the BLS Consumer Price Index for Urban consumers. Source: CMS-64 Medicaid Expenditure Reports.

Table 4: State Medicaid Spending per Recipient in 1991 and 2003

State	1991	2003
Alabama	$4,590	$5,679
Alaska	$4,903	$11,296
Arizona	$4,423	$5,994
Arkansas	$3,805	$5,229
California	$3,192	$5,980
Colorado	$6,034	$9,646
Connecticut	$8,667	$10,665
Delaware	$6,464	$7,453
District of Columbia	$7,892	$10,717
Florida	$5,424	$6,281
Georgia	$4,969	$5,518
Hawaii	$1,995	$5,472
Idaho	$6,650	$6,604
Illinois	$3,609	$7,410
Indiana	$8,668	$7,444
Iowa	$6,199	$9,904
Kansas	$6,726	$9,081
Kentucky	$5,122	$6,859
Louisiana	$4,664	$6,385
Maine	$6,638	$8,855
Maryland	$6,122	$8,438
Massachusetts	$11,666	$10,465
Michigan	$5,133	$7,592
Minnesota	$7,809	$11,141
Mississippi	$2,783	$5,014
Missouri	$5,654	$7,311
Montana	$5,872	$8,101
Nebraska	$5,800	$8,408
Nevada	$8,873	$7,959
New Hampshire	$13,452	$12,736
New Jersey	$9,311	$13,270
New Mexico	$3,080	$6,108
New York	$12,447	$13,350
North Carolina	$6,228	$8,144
North Dakota	$8,965	$10,789
Ohio	$8,718	$8,306
Oklahoma	$5,286	$5,946
Oregon	$4,845	$8,203
Pennsylvania	$5,417	$10,758
Rhode Island	$8,175	$10,361
South Carolina	$7,087	$5,012
South Dakota	$6,517	$7,193
Tennessee	$4,600	$6,146
Texas	$4,712	$7,478
Utah	$6,683	$7,461
Vermont	$5,679	$6,859
Virginia	$4,404	$7,745
Washington	$5,405	$6,000
West Virginia	$4,128	$7,768
Wisconsin	$6,311	$8,124
Wyoming	$5,270	$7,627

Dollar amounts in 2010 dollars. Source: CMS-64 Medicaid Expenditure Reports and Medicaid enrollment data described in Table 2.

Table 5: The Impact of State and Local Medicaid Managed Care Mandates on MMC Enrollment

		(1)	(2)	(3)	(4)	(5)	(6)
	μ,σ	All	All	All	All	PCCM	HMO
% of State Pop in Mandatory MMC County	0.532	0.465***	0.469***	0.374***	0.355***	0.338***	0.017
	(.442)	(.049)	(.050)	(.066)	(.062)	(.041)	(.045)
% of State Pop in Mandatory HMO County	0.242				0.057	-0.372***	0.429***
	(.382)				(.073)	(.036)	(.059)
% Medicaid Recipients Ages 0-14	0.466		0.058	-0.437	-0.397	-0.022	-0.375
	(.056)		(.299)	(.357)	(.372)	(.173)	(.262)
% Medicaid Recipients Ages 65+	0.115		-0.106	0.297	0.285	-0.036	0.321
	(.031)		(.621)	(.519)	(.469)	(.213)	(.427)
% Medicaid Recipients Blind / Disabled	0.159		-0.292	0.213	0.247	0.057	0.190
	(.042)		(.456)	(.389)	(.386)	(.192)	(.395)
# Observations	663	663	663	663	663	663	663
R-squared	-	0.876	0.877	0.918	0.919	0.914	0.911
Mean of Dependent Variable	-	0.424	0.424	0.424	0.424	0.156	0.268
Std Dev of Dependent Variable	-	0.320	0.320	0.320	0.320	0.215	0.303
State Fixed Effects	-	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	-	Yes	Yes	Yes	Yes	Yes	Yes
State-Specific Time Trends?	-	No	No	Yes	Yes	Yes	Yes

The data listed in the first (not numbered) column provide summary statistics for the explanatory variables. Results in columns numbered (1) through (6) summarize the results from OLS specifications of the percent of a state's Medicaid recipients in managed care plans on the percent of all state residents residing in a county with a Medicaid managed care mandate. Two mandate variables are considered - one that requires some managed care enrollment and another that requires HMO enrollment specifically. Unit of observation is the state*year, with years from 1991 through 2003 included and thus a total of 663 observations. Standard errors are clustered by state and are included in parentheses.

Table 6: IV Estimates of the Effect of MMC Enrollment on the Composition of Medicaid Spending

	(1)	(2)	(3)	(4)	(5)	(6)
	Provider Share		Managed Care Share		All Other Share	
% of Medicaid Recipients in Managed Care	-0.125**	0.035	0.135***	-0.028	-0.011	-0.009
	(.051)	(.047)	(.049)	(.046)	(.007)	(.008)
% of Medicaid Recipients in HMOs		-0.382***		0.388***		-0.005
		(.054)		(.054)		(.006)
% Medicaid Recipients Ages 0-14	0.507**	0.319*	-0.492**	-0.301	-0.015	-0.018
	(.228)	(.186)	(.237)	(.185)	(.033)	(.032)
% Medicaid Recipients Ages 65+	0.057	0.166	-0.024	-0.134	-0.031	-0.029
	(.377)	(.272)	(.393)	(.270)	(.053)	(.052)
% Medicaid Recipients Blind / Disabled	0.105	0.046	-0.142	-0.082	0.030	0.029
	(.118)	(.151)	(.125)	(.141)	(.050)	(.049)
# Observations	663	663	663	663	663	663
Mean of Dependent Variable	0.829	0.829	0.095	0.095	0.076	0.076
Std Dev of Dependent Variable	0.149	0.149	0.142	0.142	0.023	0.023
State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
State-Specific Time Trends?	Yes	Yes	Yes	Yes	Yes	Yes

Results in columns numbered (1) through (6) summarize the results from IV specifications in which the dependent variables are the share of Medicaid spending paid to health care providers (columns 1 and 2), managed care plans (columns 3 and 4), and to administration and other sources (columns 5 and 6). The two mandate variables described in Table 5 are used as instruments for MMC enrollment. Specifications 3, 4, and 6 from Table 5 represent the first stage specifications for these IV estimates. Unit of observation is the state*year, with years from 1991 through 2003 included and thus a total of 663 observations. Standard errors are clustered by state and are included in parentheses.

Table 7: IV Estimates of the Effect of MMC Enrollment on the Composition of Medicaid Spending

	(1a)	(2a)	(3a)	(4a)	(5a)	(6a)
	Hospital	Physician	LTC	RX	Home Health	Other Providers
% of Medicaid Recipients in Managed Care	-0.089**	-0.022	-0.009	-0.011	-0.016	0.019
	(.036)	(.016)	(.020)	(.012)	(.010)	(.019)
# Observations	663	663	663	663	663	663
Mean of Dependent Variable	0.245	0.088	0.264	0.071	0.072	0.088
Std Dev of Dependent Variable	0.106	0.048	0.088	0.028	0.047	0.053
State FE's, Year FE's, State Trends?	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls?	Yes	Yes	Yes	Yes	Yes	Yes

	(1b)	(2b)	(3b)	(4b)	(5b)	(6b)
	Hospital	Physician	LTC	RX	Home Health	Other Providers
% of Medicaid Recipients in Managed Care	-0.018	0.016	0.005	0.010	-0.004	0.022
	(.034)	(.018)	(.025)	(.008)	(.012)	(.022)
% of Medicaid Recipients in HMOs	-0.170***	-0.091***	-0.033	-0.050***	-0.028**	-0.008
	(.039)	(.024)	(.023)	(.012)	(.012)	(.019)
# Observations	663	663	663	663	663	663
Mean of Dependent Variable	0.245	0.088	0.264	0.071	0.072	0.088
Std Dev of Dependent Variable	0.106	0.048	0.088	0.028	0.047	0.053
State FE's, Year FE's, State Trends?	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls?	Yes	Yes	Yes	Yes	Yes	Yes

Results in columns numbered (1a) through (6a) and (1b) through (6b) summarize the results from IV specifications in which the dependent variables are the share of Medicaid spending paid to six different types of health care providers. Specifications 3, 4, and 6 from Table 5 represent the first stage specifications for these IV estimates. Unit of observation is the state*year, with years from 1991 through 2003 included and thus a total of 663 observations. Standard errors are clustered by state and are included in parentheses.

Table 8: The Impact of MMC Mandates and MMC Enrollment on State Medicaid Expenditures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	OLS	OLS	OLS
% of State Pop in Mandatory MMC County	-0.005		-0.019		-0.012	-0.021	-0.003	-0.005
	(.025)		(.027)		(.025)	(.027)	(.027)	(.026)
% in Mandatory MMC County * MC_Index					-0.251**	-0.251*		-0.293**
					(.115)	(.129)		(.134)
% in Mandatory MMC County * MM_Index							-0.051	0.103
							(.122)	(.149)
% of Medicaid Recipients in Managed Care		-0.014		-0.060				
		(.060)		(.071)				
% of State Pop in Mandatory HMO County			0.043			0.033		
			(.032)			(.029)		
% in Mandatory HMO County * MC_Index						0.039		
						(.115)		
% of Medicaid Recipients in HMOs				0.108				
				(.070)				
Log(Medicaid Recipients)	0.207***	0.206***	0.203***	0.204***	0.174***	0.169***	0.213***	0.179***
	(.058)	(.052)	(.058)	(.051)	(.055)	(.055)	(.062)	(.058)
% Medicaid Recipients Ages 0-14	-0.384*	-0.392*	-0.357*	-0.340*	-0.411*	-0.386*	-0.419*	-0.445**
	(.223)	(.211)	(.206)	(.189)	(.216)	(.200)	(.225)	(.218)
% Medicaid Recipients Ages 65+	0.437	0.438	0.417	0.402	0.324	0.323	0.359	0.281
	(.743)	(.671)	(.712)	(.625)	(.715)	(.695)	(.762)	(.730)
% Medicaid Recipients Blind / Disabled	0.294	0.295	0.315	0.310	0.354	0.365	0.315	0.374
	(.275)	(.247)	(.269)	(.238)	(.265)	(.257)	(.282)	(.272)
# Observations	663	663	663	663	637	637	650	624
State FE's, Year FE's, State Trends?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Results in columns numbered (1), (3) and (5) through (8) summarize the results from OLS specifications in which the dependent variable is the log of total Medicaid spending. Specifications (2) and (4) represent IV estimates with this same dependent variable. Specifications 3, 4, and 6 from Table 5 represent the first stage specifications for these IV estimates. Arizona and Wyoming are missing the MC_Index variable and Tennessee is missing the MM_Index variable. Thus the number of observations in specifications (5) through (8) are somewhat lower as a result. Unit of observation is the state*year, with years from 1991 through 2003 included and thus a total of 663 observations in specifications (1) through (4) and slightly fewer in specifications (5) through (8) because of missing data for MM_Index or MC_index. Standard errors are clustered by state and are included in parentheses.