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Does Concurrent Introduction of Small Cost-sharing and Gatekeeping Arrangements Reduce Health Care Spending?

Evidence from Medical Aid Reform in South Korea

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On July 1, 2007, South Korea's Medical Aid program for financially needy families introduced a major reform to dampen spending growth. The reform was comprised of two elements, which were simultaneously implemented: small patient copayments for outpatient services, and a financial incentive for patients to designate a primary health care provider (a gatekeeping arrangement). We test whether this reform led to reductions in health spending. Using 32-quarter region-level panel data for the entire South Korean Medical Aid beneficiaries from 2003 to 2010, we calculate difference-in-differences estimates of per-enrollee health care costs separately for outpatient visit, hospitalization and medication. We also test mechanisms through which the reform could influence health care spending. We find that the Medical Aid reform led to approximately 15.6% reductions in spending per quarter during the 3 1/2-year follow-up period, primarily due to a reduction in outpatient visits. There is no evidence that the reform led to reductions in hospitalization and medication costs. We conclude that even a small copayment, in combination with a gatekeeping arrangement, could lead to substantial reductions in outpatient spending in a government-funded health care assistance program.

Keywords: Medical Aid, Cost-sharing, Health Care Spending

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Ⅰ. Introduction

Government plays a significant role as a purchaser of health care. Regardless of the level of government involvement in health care, ensuring equal access to health services for the entire population is arguably among the most important functions of government. Of particular interest is the provision of health care benefits to individuals with limited financial resources. They are often subsidized to use health services under a limited cost-sharing requirement or free of charge. However, as health expenditures continue to rise in almost all countries, it has become increasingly difficult for those countries to continue to provide free or near-free coverage to financially-needy families and individuals.

Cost sharing and gatekeeping represent typical methods that countries increasingly use to control unnecessary utilization and health care expenditures. In the UK and the Scandinavian countries, patients usually need a referral from their general practitioners to receive secondary care such as hospital or specialty services. Most recently, France implemented the Preferred Doctor scheme – a variant of gatekeeping aiming to control outpatient specialty care costs – in January 2006 after a long contentious debate since the early 1990s (Dourgnon & Naiditch, 2010). In the US, a strong gatekeeping role of primary care providers is found in some health maintenance organizations. Despite recent doubt about gatekeeping arrangements as an effective cost-constraint instrument (Blumenthal, 2001; Forrest, 2003; Pati et al., 2003; Dourgnon & Naiditch, 2010), several U.S. studies suggest that gatekeeping may prevent inappropriate utilization of secondary health services and reduces health spending (Martin et al., 1989; Leibowitz et al., 1985; Ferris et al., 2001). Among European countries, as compared to countries with a gatekeeping system in place, those without it appear to spend a greater portion of their national GDP on health care (Anderson et al., 2000).

Imposing copayments and deductibles can result in a greater financial burden for the patient, especially if patients do not change their utilization of health services.

For low-income individual, patient cost sharing may adversely affect affordability, and possibly lead to harmful health consequences due to delayed or forgone health care (Ku, 2003; Ku et al., 2004). Nevertheless, a wealth of the literature shows that a user-charge arrangement reduces excess demand for health care services (Cutler & Zeckhauser, 2000; Zweifel, 2000; Baicker & Goldman, 2011). A recent comparative analysis of data from France, Germany and Spain concludes that patient cost sharing leads to reduced physician visits, but its effect on hospital use is inconclusive (Lostao et al., 2007). The Rand Health Insurance Experiment (HIE) shows that patient cost sharing reduces health service utilization in the experimental setting among non-elderly individuals (Newhouse & Group, 1993; Manning et al., 1987). This well-accepted conclusion was recently replicated in a Belgian study that provides consistent findings comparable in magnitude in a real world setting (Van de Voorde et al., 2001). Further, a recent analysis of retired employees enrolled in the California Public Employees Retirement System finds that the effect of patient cost sharing on physician visits for the elderly is comparable to that of the Rand HIE for non-elderly individuals (Chandra et al., 2010). Findings from both experimental and non-experimental settings also consistently find an inverse relationship between cost sharing and prescription drug usage (Newhouse & Group, 1993; Manning et al., 1987; Chandra et al., 2010; Skipper, 2013; Winkelmann, 2004).

Gatekeeping and patient cost sharing are often used in combination. For example, in Norway and Portugal, general practitioners act as gatekeepers to specialized, costly care, and patients pay copayments for consulting general practitioners (Ros et al., 2000). The effects of gatekeeping and cost sharing have been independent subjects of extensive investigation. However, the extent to which a blend of these two strategies could lead to a reduction in health expenditures and utilization in a non-experimental setting is not well understood. A recent policy change in South Korea presents a unique situation that allows for the study of both cost-sharing and gatekeeping.

In July 2007, the Korean government introduced a major policy change to the Medical Aid (Class 1) Program for people with low income to control its rapidly

increasing health expenditures. The Medical Aid reform has two major components, the introduction of patient cost sharing and the use of designated health providers. The former aims to promote enrollees' personal responsibility to reduce excessive utilization and costs of health care while the latter intends to enhance the gatekeeping mechanism of health care delivery through which a designated physician serves as the only entry point into the health care system. These changes present an interesting policy experiment that other countries can look to for guidance when searching for ways to reduce health care expenditures.

Surprisingly, only a few studies investigated the impacts of this important policy change. Roh & Yoon (2008) analyzed monthly South Korean time-series data from 2002 to 2007, and estimated that in six months following the reform, Medical Aid Class 1 health expenditure was reduced by 138 million dollars in 2012 USD(or152 billion Won in local currency based in the currency exchange rate of 1 USD = 1,146 Korean Won). Lim(2010) analyzed cross-sectional South Korean survey data on 535 Class1 patients, and reported a decreased outpatient and medication days. Yang(2009) analyzed person-level administrative data, and reported a 0.004% reduction in outpatient days per episode during the 1½ follow-up period. Only one study examined and did not find difference in healthcare utilization between Class1 patients who designated healthcare providers and those who did not(Lim 2010).

Although research by Roh & Yoon (2008), Yang (2009) and Lim (2010) offer some evidence that the South Korean Medical Aid reform (i.e., concurrent introduction of patient cost sharing and gatekeeping) might lead to cost reductions, causal inference is limited. The short follow-up period, the lack of control for confounding factors (e.g., changes in sociodemographic compositions of beneficiaries), and the non-experimental research design limits the ability to fully evaluate the cost and utilization impact of the policy change. To our knowledge, only Roh & Yoon (2008) directly tested the effect of the Medical Aid reform on the program's health expenditures. No study has examined mechanisms by which the reform may reduce health spending.

In this study, we test whether, and to what extent, the Medical Aid reform in

South Korea led to reductions in health care spending in order to evaluate Medical Aid reform. We analyze region-level quarterly panel data on the entire Medical Aid beneficiaries for the years 2003 – 2010. We present a quasi-experimental difference-in-differences estimates of per-enrollee health care costs separately for outpatient visit, hospitalization, and medication.

We also examine mechanisms through which the Medical Aid reform could influence health expenditure. Because per-enrollee health expenditures can be expressed as average price multiplied by average utilization, we investigate whether the reform influenced health spending through changes in health care utilization patterns and changes in price. The reform might lead to declined spending through reductions in health services use either by consumers who became more price-sensitive or by providers who served as a barrier to cost-inefficient services. If the reform led to reductions in provider visits, health care providers might be incentivized to charge higher amounts for the same services or increase service intensity at the time of service delivery. Such provider behavior is of concern especially in places such as South Korea where providers are reimbursed on a fee-for-service basis.

Ⅱ. Background

All Korean citizens are eligible for coverage under the National Health Insurance (NHI) System. In 2006, the NHI covered over 47 million individuals or 96.3% of the entire population. The remaining 3.7% are supported by the Medical Aid program (Mathauer et al. 2009).

Since its start in 1977, Medical Aid has provided medical assistance to the nations' most vulnerable families in poverty. Medical Aid is a means-tested program for which eligibility is determined based on income and property (Lee, 2013). Depending on the capability to work, beneficiaries are classified into one of two categories. "Class

1" covers persons with no work-capability or households without a working person, the elderly over 65, those with disabilities, persons of national merit, human cultural assets, refugees from North Korea, homeless individuals, and patients with sexually transmitted diseases. "Class 2" is for households with a person capable of working who passes stringent eligibility criteria (Mathauer et al., 2009).

Medical Aid has grown over time, gradually expanding the benefits and population coverage. For example, in 2004 the program started to cover patients with rare, intractable, and chronic diseases as well as children under 18 (Shin, 2007). In 2008, it covered 3.8% of the national population (approximately 1.8 million persons), as compared to 2.9% in 1998 (Mathauer et al., 2009). The coverage expansion has imposed substantial pressure on program costs. Medical Aid health spending doubled from approximately 1.5 billion USD (1,702,895 million Won) in 2002 to 2.7 billion USD in 2006 with its annual growth rates greater than the inflation rates of overall health care costs (Mathauer et al., 2009).

Of particular interest among policy makers was the overuse of outpatient services for minor ailments. Per-enrollee outpatient visits in South Korea were roughly 12 in 2005, which were greater than in most OECD countries (Mathauer et al., 2009). The excess utilization of outpatient services was apparent particularly among Medical Aid Class 1 enrollees. In 2005, per-enrollee outpatient visits were approximately 34 days for Medical Aid Class 1 enrollees as compared to 14 days among NHI enrollees (Shin, 2007). Between 2001 and 2005 health spending for Class 1 enrollees on average increased annually 12.5 percent, 17 percent, and 18.6 percent for outpatient services, hospitalization and prescription drugs, respectively (Shin, 2007). The increase rates were approximately twice as high as those for NHI enrollees (Shin, 2007).

Before July, 2007, the Medical Aid Class 1 program was fully financed by the general revenues of the central and local governments. Thus, Class 1 enrollees did not have any financial responsibility when utilizing of services while those enrolled in the Class 2 program must bear cost-sharing requirements similar to those for NHI enrollees. Also, patients in Korea are usually free to see any doctor, and could visit

any health care facilities for any level of care without a referral. Consequently, Class 1 patients frequently sought health care for minor conditions and, at the same time, visited specialists in hospitals rather than primary care physicians in clinics (Mathauer et al., 2009).

Inefficient organization in health care delivery and lack of financial incentives that foster prudent use of health services have been recognized as main reasons for the recent trend in Medical Aid spending escalating particularly since 2004 (Shin, 2007). In addition, the Ministry of Health became more concerned about potentially adverse impact of excess health care service use on patient outcomes. With growing need for promoting appropriate use of health care services and thereby curving the growth rate of health spending, the Medical Aid program introduced two concurrent policy changes to the Class 1 program on July 1, 2007. No change was made for Class 2 beneficiaries who already were subject to cost sharing requirements similar to those for NHI enrollees. The first change involved "patient cost sharing". Effective July 1, 2007, Medical Aid Class 1 beneficiaries are liable for co-payments for outpatient treatments at either physician clinic or hospital, and also for covered medication. There was no change to inpatient utilization.

In order to provide some financial protection to beneficiaries, the cost sharing amount differs by the level of care. According to the 2007 cost-sharing schedule for outpatient visits, Class 1 patients must pay small flat amounts of 0.87 – 1.3 USD (or 1,000 – 1,500 Won) at clinics and 1.3 – 2.2 USD (1,500 – 2,500 Won) at secondary and tertiary hospitals. In addition, patients now must pay up to 0.78 USD (900 Won) per pharmacy visit. The copayments account for 3 to 6% of outpatient costs and approximately 1% of medication spending among all Medical Aid patients in 2010. Those who are less than 18 years of age, pregnant or nursing, or who have a rare and incurable disease (approximately 19 percent of Class 1 beneficiaries), are exempt from the cost sharing requirement (Mathauer et al., 2009). See Mathauer et al. (2009) for complete details on the cost-sharing policy.

Second, is exemption of cost sharing for patients who designate primary health

care providers (or gatekeepers). This is to enhance rationality in health care provision and reduce duplication of care. Class 1 patients can be exempt from cost sharing by using primary care physicians they choose as designated health providers when the number of outpatient visits reaches a ceiling. Designated health providers would then monitor and steer primary health care needs of their patients, and serve as gatekeepers to specialty services. In 2011 approximately 4.8% of Class1 enrollees(52,572 individuals) had designated primary healthcare providers.

Ⅲ. Methods

We analyze 32-quarter time-series-cross-section data on Medical Aid expenditures for all 16 different geographical regions (metropolitans and provinces) from January 2003 to December 2010. Our analytic file includes data for the entire Medical Aid Class 1 and Class 2 beneficiaries. We utilize the fact that the Medical Aid reform was introduced only to the Class 1 category. We employ a quasi-experimental design to evaluate the effect of the reform. The effect is estimated by calculating the difference between pre-post difference in outcomes for the policy group (i.e., Class 1 program) and pre-post difference in the outcomes for the reference group (i.e., Class 2 program). The approach – that is, a difference-in-differences model – is appropriate for this study because we can define straightforwardly the subgroups of Medical Aid beneficiaries who were affected by the reform and those who were not. Our empirical work minimizes bias in difference-in-differences estimates due to demand and supply-side confounders, both observed and unobserved, discussed below.

1. Data sources and variables

Data were obtained from the National Health Insurance Corporation (NHIC) – the implementing agency of Korean National Health Insurance Program – and Statistics Korea (or KOSTAT) – the central government organization for national statistics. NHIC provided us with quarterly data, by region and Medical Aid type, on health expenditures, demographic and diagnostic compositions of Medical Aid beneficiaries as well as profiles of health care providers from the first quarter of 2003 to the last quarter of 2010. The analytic file included per-quarter-per-region information for all 32 quarters and all 16 geographical regions (metropolitans and provinces), separately for the Class 1 and Class 2 programs (N=1,024).

We examine, from the perspective of the Medical Aid program, whether the Medical Aid reform led to changes in per-enrollee health spending as well as utilization and price of health services, separately for outpatient visit, hospitalization and medication. Effect on hospital cost and utilization outcomes are tested because a change in outpatient utilization might also influence hospital inpatient service use indirectly through, for example, referrals for hospital inpatient services. Providers might have an incentive to generate greater demand for enrollees who were not affected by the reform when it leads to reductions in provider visits among the affected. Thus, enrollees exempt from cost sharing are contained in the analysis. Health spending is inflated by the overall consumer price index, and is expressed in 2010 USD.

Table 1 reports definitions and averages (standard deviation) for variables used in this study. Per-enrollee Class 1 spending was always greater than per-enrollee Class 2 spending for all spending categories. Class 1 beneficiaries on average spent $326(374 thousand Won) per quarter on hospital inpatient services during the entire period, which was more than four times the $77(88 thousand Won) for Class 2 beneficiaries.

The frequency of health care use (i.e., outpatient visits, hospital days, and pharmacy visits) was greater for the Class 1 program. Also, Class 1 beneficiaries spent more per visit than Class 2 beneficiaries when they make outpatient and pharmacy visits.

However, spending per hospital day was greater among Class 2 patients who spent average $52(60 thousandWon) per quarter during the study period.

The key independent variable is Reform, which equals 1 if a quarter falls within the post-reform period and only if an observation is for Class 1 program, and zero otherwise. There are 18 and 14 quarterly counts of observations per region respectively for the pre and post-reform period.

As shown below, our analytic model controls for potential confounders that summarize both demand and supply-side changes that could affect health expenditure. Demand-side variables capture changes in demographic and major disease profiles including age compositions (with 0-20 age category serving as the reference), the percent of female beneficiaries, and the percent of beneficiaries with cancers, disabilities, chronic diseases, and mental disorders. As compared to Class 2 program, Class 1 had greater percentages of senior enrollee over 60, female, and those with cancers, disability, chronic illness, and mental illness. Supply-side factors include per-capita income, and per-capita tertiary hospitals, secondary hospitals, primary hospitals, clinics, pharmacies, doctors, and pharmacists.

Pre and post-reform comparison shows that health care utilization and spending in general increased after the reform for both Class 1 and Class 2 enrollees. As shown below, the general trend is directly specified in our empirical model, which otherwise may lead to biased estimates of the reform. The demand-side and supply-side characteristics differ by Medical Aid type and before and after the reform to varying degrees. This supports need of an empirical model controlling for enrollee heterogeneity, both unobserved and unobserved, to minimize bias in an estimated effect of the reform.

Table 1. Definitions and mean (standard deviation) of variables by Medical Aid program category before and after the reform

Variable	Definition	Class 1				Class 2			
		Entire period	Before reform A	After reform B	A–B	Entire period	Before reform A	After reform B	A–B
Outcomes									
Per-enrollee spending (measured in 2010 US dollars)									
Outpatient	Outpatient or physician spending per enrollee	197 (42.2)	174 (34.7)	226 (31.3)	52	77.1 (18.2)	65.7 (11.7)	91.7 (14.1)	26
Hospitalization	Hospital inpatient spending per enrollee	326 (112)	255 (64.6)	417 (93.0)	162	76.9 (26.2)	61.3 (19.2)	96.9 (19.6)	35.6
Medication	Medication spending per enrollee	123 (36.1)	98.3 (23.7)	154 (22.1)	55.7	56.8 (17.4)	46.2 (13.4)	70.6 (11.4)	24.4
Provider use									
Outpatient visits	Number of outpatient or physician visits per enrollee	9.24 (1.01)	9.23 (1.03)	9.25 (0.99)	0.02	5.45 (0.81)	5.24 (0.78)	5.72 (0.78)	0.48
Hospital days	Number of days of being hospitalized per enrollee	6.48 (1.91)	5.80 (1.64)	7.35 (1.87)	1.55	1.48 (0.44)	1.35 (0.41)	1.64 (0.44)	0.29
Pharmacy visits	Number of pharmacy visits per enrollee	4.92 (0.59)	4.94 (0.63)	4.90 (0.55)	-0.04	3.29 (0.55)	3.20 (0.55)	3.40 (0.53)	0.2
Per-visit spending (measured in 2010 US dollars)									
Outpatient	Outpatient or physician spending per visit	21.3 (3.85)	18.8 (2.83)	24.5 (2.30)	5.7	14.1 (2.13)	12.5 (1.05)	16.1 (1.37)	3.6
Hospitalization	Hospital inpatient spending per visit	50.4 (9.48)	44.8 (6.76)	57.6 (7.39)	12.8	52.2 (10.9)	45.5 (6.60)	60.7 (9.26)	15.2
Medication	Medication spending per visit	25.0 (6.89)	19.8 (3.99)	31.5 (3.33)	11.7	17.2 (4.13)	14.3 (2.70)	20.9 (2.23)	6.6
Main independent variable									

Variable	Definition	Class 1				Class 2			
		Entire period	Before reform A	After reform B	A–B	Entire period	Before reform A	After reform B	A–B
Reform	= 1 as of the start of cost sharing and gatekeeping (= 1 after July 1, 2007) for Medical Aid Class 1; 0 otherwise								
Demand-side covariates									
%Age20_40	Percent of 20 to 40-year-old individuals over the entire enrollees	0.11 (0.08)	0.12 (0.10)	0.10 (0.02)	-0.02	0.18 (0.07)	0.19 (0.09)	0.17 (0.02)	-0.02
%Age40_60	Percent of 40 to 60-year-old individuals over the entire enrollees	0.24 (0.13)	0.23 (0.17)	0.25 (0.02)	0.02	0.30 (0.10)	0.30 (0.13)	0.30 (0.04)	0
%Age60_	Percent of elderly 60 years or older over the entire enrollees	0.50 (0.59)	0.52 (0.79)	0.47 (0.04)	-0.05	0.11 (0.05)	0.11 (0.07)	0.10 (0.03)	-0.01
%Female	Percent of females over the entire enrollees	0.62 (0.97)	0.66 (1.29)	0.57 (0.01)	-0.09	0.57 (0.46)	0.59 (0.61)	0.55 (0.01)	-0.04
%Cancer	Percent of cancer patients over the entire enrollees	0.07 (0.01)	0.07 (0.01)	0.07 (0.01)	0	0.02 (0.01)	0.02 (0.00)	0.02 (0.01)	0
%Disabled	Percent of the disabled over the entire enrollees	0.25 (0.06)	0.21 (0.03)	0.32 (0.03)	0.11	0.08 (0.02)	0.07 (0.01)	0.10 (0.02)	0.03
%Chronic illness	Percent of chronically-ill patients (non-cancer) over the entire enrollees	0.48 (0.04)	0.45 (0.03)	0.51 (0.02)	0.06	0.23 (0.03)	0.21 (0.03)	0.25 (0.02)	0.04
%Mental illness	Percent of persons with mental disorders over the entire enrollees	0.20 (0.04)	0.18 (0.03)	0.23 (0.02)	0.05	0.08 (0.01)	0.07 (0.01)	0.09 (0.01)	0.02
Income	Average income per capita measured in 1,000 USD	8.96 (1.84)	7.78 (1.22)	10.48 (1.32)	2.7	8.96 (1.84)	7.78 (1.22)	10.48 (1.32)	2.7
Supply-side covariates									
Tertiary hospital	Number of general hospitals per 100,000 Korean population that provide the most complicated medical interventions for the most complex patients.	0.08 (0.06)	0.08 (0.06)	0.08 (0.06)	0	0.08 (0.06)	0.08 (0.06)	0.08 (0.06)	0

Variable	Definition	Class 1				Class 2			
		Entire period	Before reform A	After reform B	A–B	Entire period	Before reform A	After reform B	A–B
	These hospitals must have more than 20 specialty medical departments. There are 44 tertiary hospitals as of 2011.								
Secondary hospital	Number of general hospitals per 100,000 population that provider secondary medical interventions. These hospitals must have at least 100 beds. Hospitals with 100 to 300 beds and those with more than 300 beds are required to have specific seven and nine specialty medical departments, respectively.	0.63 (0.27)	0.60 (0.24)	0.68 (0.28)	0.08	0.63 (0.27)	0.60 (0.24)	0.68 (0.28)	0.08
Primary hospital	Number of primary hospitals and physician offices per 100,000 population including hospitals with 30 to 100 beds, oriental medicine hospitals, dental hospitals, and psychiatric hospitals as well as physician clinics	3.47 (1.57)	2.61 (1.04)	4.58 (1.44)	1.97	3.47 (1.57)	2.61 (1.04)	4.58 (1.44)	1.97
Physician office	Number of primary hospitals and physician offices per 100,000 population (including traditional medicine)	51.8 (7.22)	50.5 (6.81)	53.6 (7.37)	3.1	51.8 (7.22)	50.5 (6.81)	53.6 (7.37)	3.1
Doctor	Number of western and oriental medical doctors and dentists per 100,000 population	139 (32.7)	129 (28.6)	153 (32.9)	24	139 (32.7)	129 (28.6)	153 (32.9)	24
Pharmacy	Number of pharmacies per 100,000 population	41.2 (5.12)	40.3 (4.97)	42.4 (5.08)	2.1	41.2 (5.12)	40.3 (4.97)	42.4 (5.08)	2.1
Pharmacist	Number of pharmacists per 100,000 population	61.2 (8.52)	59.9 (8.39)	62.9 (8.40)	3	61.2 (8.52)	59.9 (8.39)	62.9 (8.40)	3

2. Econometric model

We estimate an empirical model of the following functional form to isolate the effect of the Medical Aid reform:

$$(1) \quad \ln(Y)_{ict} = \alpha \cdot Reform_{ct} + \beta \cdot \sum D_{ict} + \gamma \cdot \sum S_{it} + \mu_i + \tau_t + qtr + \mu_i \times t + \varepsilon_{ict}$$

where subscripts i, c and t respectively represent a region, Medical Aid category (Class 1 or Class 2), and time (1 – 32 quarters). ξ_{ict} is a random error component.

Y includes average per-enrollee Medical Aid spending measured in 2010 USD, separately for outpatient visit, hospitalization and medication. It also contains the mechanisms outcomes such as the frequency of health service use and per-visit spending. We take the natural logarithm, and estimate percent changes between the pre and post-reform period.

We calculate a difference-in-differences estimator of Medical Aid expenditure. Reform indicates the post-reform period for the Class 1 program. Therefore, coefficient α captures the magnitude of average changes in quarterly Medical Aid spending between the pre-reform and post-reform periods for the Class 1 program, compared to pre-post average changes in the outcomes for the Class 2 program.

The difference-in-differences model assumes that the pre-post outcome difference in the control group (i.e., Class 2) serves as a reasonable proxy for the pre-post outcome difference in the policy group (i.e., Class 1). Therefore, an estimated effect of the reform would be biased if the reform influenced the policy and control groups heterogeneously. Our empirical model minimizes this potential limitation as followings.

We include in the empirical model demand and supply-side determinants of Medical Aid expenditure – $\sum D$ and $\sum S$, respectively – to control for observed differences between Class 1 and Class 2 enrollees.

Unobserved factors are also specified in the empirical model. μ refers to region fixed-effects, and control for unobserved, consistent regional differences that may explain the outcomes. The model includes τ quarterly time fixed-effects, to control

for unspecified quarter-time-specific shocks that affect the outcomes and do not vary across regions. Therefore, our approach represents a more rigorous variant to a typical difference-in-differences model, in which binary indicators for policy group and post-reform period are included to control for unobserved group and time differences.

Further, we remove additional sources of bias by including 1/4 to 4/4-quarter dummy variables (qtr) that capture seasonable variations in expenditures. Including time trends specific to each region minimizes concern that a pre-post change in an outcome may not be attributed to the Medical Aid reform due to different time trends experienced by Class 1 and Class 2 enrollees. Therefore, to remove bias from all unobserved regional factors that linearly or non-linearly affect health spending and utilization over time, we tested region-specific time trends in spending ($\mu_i \times t$), where t is a time trend from 1st quarter to 32nd quarter. After preliminary checks, we include linear trends.

3. Estimation

We initially tested whether our data violate essential assumptions underlying the analysis of time-series cross-section (TSCS) data. We performed tests for panel heteroskedasticity (e.g., less populous regions have greater error variance), contemporaneous correlation (e.g., the errors are correlated across regions), and autocorrelation (e.g., the errors are time-dependent for a region). We calculated likelihood ratios, a procedure suggested by Wiggins & Poi (2003), as a test for panel heteroskedasticity, computed the Breusch-Pagan statistic as a test for contemporaneous correlation (Green, 2000), and implemented Wooldridge's test for autocorrelation (Wooldridge, 2002). Rejecting null hypotheses suggest deviation from independent errors in the context of TSCS data. As shown in Table 2, all the error violations were detected in our data, suggesting that if standard errors are not corrected properly, statistical inference drawn from the data would be jeopardized (Wooldridge, 2002).

We compute panel-corrected standard errors to make correct statistical inference under panel heteroskedasticity and contemporaneous error correlation (Beck & Katz,

1995, 1996). We follow Plümper et al. (2005) and carry out the Prais-Winsten transformation to adjust standard errors for a first-order autoregressive process. As we will show below, our main results are robust to different estimation techniques.

Table 2. Tests for error violations in time-series-cross-section data

	Types of Error Violation:		
	Panel heteroskedasticity	Contemporaneous correlation	Autocorrelation (AR (1))
	Detection tests:		
	Likelihood ratio test using iterated generalized least squares [20]	Breuch-Pagan LM test [21]	Wooldridge F test [22]
Per-capita spending			
Outpatient	LR χ^2 = 345 (p < 0.001)	χ^2 = 70.8 (p < 0.05)	F = 150 (p < 0.001)
Hospitalization	LR χ^2 = 528 (p < 0.001)	χ^2 = 46.9 (p < 0.001)	F = 114 (p < 0.001)
Medication	LR χ^2 = 406 (p < 0.001)	χ^2 = 121 (p < 0.001)	F = 160 (p < 0.001)
Provider use			
Outpatient visits	LR χ^2 = 408 (p < 0.001)	χ^2 = 62.3 (p < 0.01)	F = 168 (p < 0.001)
Hospital days	LR χ^2 = 683 (p < 0.001)	χ^2 = 38.7 (p = 0.192)	F = 157 (p < 0.001)
Pharmacy visits	LR χ^2 = 358 (p < 0.001)	χ^2 = 68.9 (p < 0.001)	F = 148 (p < 0.001)
Spending per visit and per capita			
Outpatient	LR χ^2 = 388 (p < 0.001)	χ^2 = 266 (p < 0.001)	F = 330 (p < 0.001)
Hospitalization	LR χ^2 = 362 (p < 0.001)	χ^2 = 1052 (p < 0.001)	F = 18.2 (p < 0.001)
Medication	LR χ^2 = 391 (p < 0.001)	χ^2 = 213 (p < 0.001)	F = 47.9 (p < 0.001)

Ⅳ. Results

1. Effect of the Medical Aid reform on per-enrollee spending

Table 3 provides coefficient estimates from Equation (1) that tests the effect of the Medical Aid reform during the 3½-year follow-up period. The first row of the table shows a significant decrease in per-enrollee spending for outpatient visits. The

estimate suggests that the reform led to a reduction in per-enrollee outpatient costs by 15.6% (= 100×[exp(0.169)-1]) quarterly. Considering that during the post-reform period, the average Medical Aid expenditures was 13.7 million USD (1.60 billion Won) per quarter, we estimate that without the financing and delivery changes, the per-capita average cost of Class 1 outpatient services would amount to 16.2 million USD per quarter (= 13.7 million USD / (1-0.156) = 1.86 billion Won). In contrast, we find no statistically significant change in per-enrollee spending on hospitalization and medication although the coefficients are negative. Incontrast, we find no statistically significant change in per-enrollee spending on hospitalization and medication although the coefficients are negative.

We briefly discuss coefficient estimates of the covariates. A greater representation of beneficiaries aged 20-40 is statistically significantly associated with lower medication spending while the relative size of persons aged 40-60 is significantly and positively associated with medication spending. The proportion of elderly beneficiaries aged 60 or older is negatively and significantly relates to hospitalization and medication costs. As shown in Table 1, the proportion of enrollees aged 20 – 40 and 60 – or – older somewhat decreased over the study period while there were increases in per-enrollee spending. Taken together, the identified association appears to capture the inverse trends between the age categories and per-enrollee spending. A larger percentage of female significantly predicts greater spending for hospitalization and medication categories. The proportion of beneficiaries with disabilities was significantly and negatively associated only with medication spending. No significant association is found for the proportion of enrollees with cancer. A greater representation of persons with chronic illness are significantly associated with increased spending for all the spending categories, and the magnitude of the association is large. The proportion of mentally-ill persons is positively associated only with hospitalization costs. No significant coefficient is found for per-capita income. The supply-side factors do not appear to significantly influence any of the spending categories except that per-capita doctors and pharmacies are positively and significantly associated with outpatient and medication spending, respectively.

Table 3. Effects of Medical Aid reform on per-capita spending by service category

	Outpatient	Hospitalization	Medication
Reform	-0.169***	-0.160	-0.027
	(0.051)	(0.085)	(0.053)
Covariates			
%Age20_40	0.029	-1.943	-2.009*
	(0.849)	(1.458)	(0.841)
%Age40_60	0.805	0.611	1.066*
	(0.436)	(0.773)	(0.438)
%Age60_	-0.097	-0.394*	-0.342***
	(0.093)	(0.155)	(0.093)
%Female	0.135	0.510**	0.404***
	(0.099)	(0.166)	(0.100)
%Disabled	-0.496	-1.599	-1.251*
	(0.545)	(0.932)	(0.568)
%Cancer	2.520	-0.473	0.935
	(1.910)	(3.153)	(1.943)
%Chronic illness	4.234***	4.964***	3.914***
	(0.431)	(0.746)	(0.437)
%Mental illness	0.117	5.035***	0.302
	(0.309)	(0.655)	(0.293)
Per-capita income	-0.003	-0.012	0.011
	(0.016)	(0.023)	(0.014)
Tertiary hospital	-0.371	0.366	
	(0.309)	(0.454)	
Secondary hospital	0.045	-0.033	
	(0.064)	(0.089)	
Primary hospital	0.020	0.028	
	(0.011)	(0.017)	
Physician office	0.003	-0.003	
	(0.003)	(0.004)	
Doctor	0.001*	0.000	
	(0.001)	(0.001)	
Pharmacy			0.004**
			(0.001)
Pharmacist			0.002
			(0.003)
N	1024	1024	1024
R2	0.984	0.979	0.983

All models control for region and quarter-time fixed effects, region-specific linear time trends, and 2nd-4th quarter dummy indicators. Full results are available from the authors upon request. Standard errors reported in parentheses are corrected for panel heteroskedasticity, contemporaneous correlation and AR(1) process.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4. Effects of the Medical Aid reform on per-enrollee provider visits and per-visit spending by service category

Variable	Average provider use			Spending per visit		
	Outpatient visit	Hospital days	Pharmacy visit	Outpatient	Hospitalization	Medication
Reform	-0.118***	-0.174	-0.076	-0.020	0.010	0.041*
	(0.049)	(0.091)	(0.050)	(0.024)	(0.017)	(0.021)
Covariates						
%Age20_40	-1.084	-1.807	-2.030**	0.242	-0.345	0.416
	(0.762)	(1.571)	(0.761)	(0.428)	(0.319)	(0.353)
%Age40_60	0.129	0.090	0.346	0.841***	0.723***	0.282
	(0.390)	(0.845)	(0.384)	(0.254)	(0.188)	(0.211)
%Age60_	-0.374***	-0.436**	-0.487***	0.183***	0.045	0.121**
	(0.085)	(0.168)	(0.085)	(0.048)	(0.033)	(0.040)
%Female	0.469***	0.601***	0.577***	-0.232***	-0.103**	-0.132**
	(0.091)	(0.180)	(0.091)	(0.055)	(0.035)	(0.046)
%Disabled	-0.785	-1.025	-0.970	0.063	-0.435*	-0.158
	(0.519)	(1.006)	(0.525)	(0.300)	(0.210)	(0.252)
%Cancer	1.713	-2.484	1.914	0.746	1.961**	-0.439
	(1.792)	(3.372)	(1.802)	(0.915)	(0.672)	(0.815)
%Chronic illness	2.611***	4.507***	2.056***	1.603***	0.461**	1.663***
	(0.401)	(0.812)	(0.403)	(0.246)	(0.178)	(0.218)
%Mental illness	0.436	6.106***	0.516	-0.205	-1.257***	-0.103
	(0.271)	(0.720)	(0.284)	(0.209)	(0.218)	(0.187)
Per-capita income	0.002	0.000	-0.001	-0.002	-0.015	0.005
	(0.014)	(0.023)	(0.015)	(0.007)	(0.013)	(0.009)
Tertiary hospital	-0.079	0.759*		-0.014	-0.372	
	(0.250)	(0.368)		(0.139)	(0.267)	
Secondary hospital	-0.016	-0.012		0.028	0.004	
	(0.059)	(0.086)		(0.024)	(0.038)	
Primary hospital	0.013	0.031*		-0.001	-0.001	
	(0.009)	(0.015)		(0.005)	(0.010)	
Physician office	0.001	-0.006		0.002	0.003	
	(0.002)	(0.004)		(0.001)	(0.002)	
Doctor	0.001	0.001		0.000	-0.001	
	(0.001)	(0.001)		(0.000)	(0.001)	
Pharmacy			0.004**			0.000
			(0.001)			(0.001)
Pharmacist			0.002			-0.004*
			(0.003)			(0.002)
N	1024	1024	1024	1024	1024	1024
R2	0.970	0.976	0.961	0.990	0.978	0.990

All models control for region and quarter-time fixed effects, region-specific linear time trends, and 2nd-4th quarter dummy indicators. Full results are available from the authors upon request. Standard errors reported in parentheses are corrected for panel heteroskedasticity, contemporaneous correlation and AR(1) process.

* $p < .05$; ** $p < .01$; *** $p < .001$.

2. Mechanisms: frequency of service use and per-visit spending

Table 4 presents results from the mechanism models. The reform is significantly associated with reductions in outpatient visits per enrollee. Although negative coefficients are found for hospital and pharmacy use days, there is no statistically significant change before and after the reform. We preserve a discussion on the covariates because they have implications similar to those reported in Table 3.

We find no significant change in per-visit outpatient and hospitalization spending. However, per-visit medication spending was greater for the post-reform period.

3. Robustness analysis

The robustness of our main findings is assessed in several ways. We explore potential over-specification of our empirical model by omitting the region-time interaction variables (i.e., region-specific time trends). As shown in the first row of Table 5, the coefficients on the reform variable is consistent with the main estimates from Tables 3 and 4, for per-enrollee outpatient spending and visits. However, significant coefficients are now found for hospital spending and hospital days. Also, the statistical significance for per-visit medication spending reported in Table 4 now disappears. To summarize, only results on the outpatient outcomes remain unaltered.

We re-estimate the empirical model of the same functional form using different estimation techniques. We employ the Beck-Katz approach to autocorrelation that includes a once-lagged outcome variable in the right-hand side of the empirical equation (Beck & Katz, 1995, 1996). As a reminder, we used the Prais-Winsten transformation (Plumper et al., 2005) to obtain the main coefficient estimates. Our main results for per-enrollee outpatient spending and per-enrollee visits and per-visit medication spending have the same interpretation. However, as with the prior robustness check, we find statistically significant negative coefficients for hospital spending and hospital days.

We test whether the main findings are sensitive to a function form of the dependent variable. Dependent variables in original metrics are regressed on the same independent variables. We find that the reform is significantly and negatively associated with per-enrollee outpatient spending, outpatient visits, and pharmacy visits, and is positively associated with per-enrollee hospital spending and per-visit medication spending.

Table 5. Robustness: Coefficients on the Medical Aid reform

	Per-capita spending			Average provider use			Spending per visit		
	Outpatient	Hospitalization	Medication	Outpatient visit	Hospital days	Pharmacy visit	Outpatient	Hospitalization	Medication
Drop region-time interactions	-0.186*** (0.051)	-0.191* (0.089)	-0.060 (0.055)	-0.121** (0.047)	-0.207* (0.095)	-0.090 (0.049)	-0.022 (0.025)	0.015 (0.017)	0.029 (0.021)
Beck-Katz approach to autocorrelation	-0.161*** (0.048)	-0.145* (0.072)	-0.022 (0.051)	-0.115* (0.047)	-0.161* (0.078)	-0.072 (0.048)	-0.020 (0.012)	0.007 (0.012)	0.023* (0.012)
Spending in original metric	-17.62* (7.585)	29.83* (12.57)	1.75 (5.538)	-0.990*** (0.272)	0.342 (0.177)	-0.432** (0.162)	0.502 (0.465)	0.142 (1.010)	1.611*** (0.445)

All models control for region and quarter-time fixed effects, region-specific linear time trends, and 2nd-4th quarter dummy indicators. Full results are available from the authors upon request. Standard errors reported in parentheses are corrected for panel heteroskedasticity, contemporaneous correlation and AR(1) process.

* $p < .05$; ** $p < .01$; *** $p < .001$.

V. Discussion

This study tested whether a change to the Medical Aid Class 1 Program in South Korea that concurrently implemented patient cost sharing and gatekeeping led to reductions in Medical Aid health care spending. Findings show that during the 3 1/2-year follow-up period, the Medical Aid reform led to significant reductions in per-enrollee outpatient spending. On average a 15.6% reductions in outpatient

spending per quarter appear to be attributable to the reform. Given that patient cost sharing amounts to 3–6% of outpatient costs in 2010, this finding suggests that even a small copayment, in combination with a gatekeeping arrangement, could lead to large savings on outpatient services in a government-funded health care assistance programs.

Robust evidence was not found that the reform led to reductions in per-enrollee hospitalization costs. In addition, we consistently show statistically insignificant coefficients for per-enrollee medication spending, which may not be very surprising when we consider that the copayment for pharmaceuticals approximately corresponds to only 1% of medication expenses in 2010. This finding supports the importance of proper levels of user fees for the purpose of cost containment.

In terms of the mechanisms, our results show a statistically significant decrease in per-enrollee outpatient visits after the reform, implying that the decrease in outpatient spending is likely due to the reduced use of outpatient providers. As with the result on per-enrollee hospitalization spending, findings for frequencies of hospitalization and pharmacy visits are not insensitive in relation to empirical model specification, different estimation method, and the metric of the outcome variables.

In addition, statistically insignificant associations are found for per-visit spending on outpatient and hospital use while results on per-visit medication costs are not robust. Therefore, we do not believe that providers changed their behaviors in such a way to reap greater reimbursement per visit. The findings also imply that cost sharing and gatekeeping combined do not always distort provider decisions even under reduced patient visits and also under the fee-for-service reimbursement scheme.

Given the structure of the data, we were not able to isolate the independent effect of cost sharing and gatekeeping. As noted earlier, there is some skepticism about the ability of gatekeeping arrangements as a cost-constraint instrument (Blumenthal, 2001; Forrest, 2003; Pati et al., 2003; Dourgnon & Naiditch, 2010). For example, primary care physicians or general practitioners who play a gatekeeping role make more referrals than non-gatekeepers in the US as well as in Europe (Forrest et al,.

1999; Gervas et al., 1994). In the US, there is no difference in specialty referral practice between physicians who act as gatekeepers to secondary care and those who do not (Forrest et al., 1999; Forrest et al., 2003). In 1995, organizational structure such as the gatekeeping system was not associated with any cost savings among US medical group practice clinics that provided services for a Blue Cross managed care program (Kralewski et al., 2000). On the other hand, cost sharing proves to be an effective cost-containment tool (Zweifel, 2000; Cutler & Zeckhauser, 2000; Van de Voorde et al., 2001). In addition, Lim (2010) did not find any statistically significant difference in health care utilization between Medical Aid Class 1 beneficiaries with designated health care providers and beneficiaries without those providers. Taken together, the current literature implies that patient cost sharing might dominate the joint effect reported here.

This study does not speak to changes in patient outcomes after the reform, which we did not intend to test. The potentially adverse health impact of patient cost sharing, especially for low-income individuals, is well reported (Ku, 2003; Ku et al., 2004; Kim et al., 2005). This should be an important agenda for future research.

Medical Aid is currently in the process of improving the gatekeeping (or case management) mechanism. Future researchers will be able to incorporate this additional policy element into the empirical model and assess whether the magnitude of change still lies with patient-cost sharing.

VI. Conclusion

In a government-funded health care program such as Medical Aid in South Korea, excess use of health care services for petty episodes and resulting costs could place limits on ensuring sustainable assistance for high-cost cases and severely-ill patients and also on expanding coverage. This study provides robust evidence that even a small copayment policy (in combination with a gatekeeping arrangement) could lead

to significant health care cost savings. However, we could not conclude whether the reduction in health spending was achieved because Medical Aid enrollees became more prudent in using health services after the cost-sharing and gatekeeping reform or because patients now had to delay or forgo necessary health services due to increased financial burden. Future research can benefit from investigating whether, and to what extent, the policy change in South Korea has influenced health outcomes especially among those who reduced health care utilization following the reform.

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본 연구는 2007년 수행된 「의료급여혁신 종합대책」이 의료급여 급여비 지출 감소에 영향을 미쳤는지를 실증적으로 분석해봄으로써 본인부담금제, 선택병의원제 도입과 같은 수급권자 측면의 제도개선이 의료비 지출 감소에 미치는 효과를 확인해 보고자 하였다. 이를 위해 국민건강보험공단의 의료급여통계연보를 사용하여 16개 시도 지역의 2003년 1/4분기부터 2010년 4/4분기까지 총 32분기 자료로 횡단면 자료와 시계열자료가 결합된 페널 데이터를 구축하였다. 그리고 「의료급여혁신 종합대책」이 실행된 2007년 3분기 시점을 제도변화 변수로 놓고, DID 분석을 통해 의료급여 수급자당 외래, 입원, 약국 진료비의 변화를 분석하였다. 분석 결과 「의료급여혁신 종합대책」도입 후, 도입 이전보다 분기 당 평균 15.6%의 의료비 지출이 감소하였으며, 이러한 의료비 지출 감소가 대부분 도입된 제도와 직접 관련 있는 외래 진료비 감소에 기인한 것을 확인하였다. 반면, 입원과 약국 진료비 지출 감소는 유의하지 않았다. 한편, 이러한 수요자 측면에서 의료이용을 제한하는 정책은 의료비 지출 감소에는 효과가 있지만, 의료수급권자의 의료 보장수준을 저해할 수 있는 만큼 향후, 의료급여 급여비 지출 뿐만 아니라 의료 접근성 및 건강결과에 미치는 영향까지 포함한 제도효과 분석 연구가 추가적으로 수행되어야 할 필요가 있겠다.

주요용어: 의료급여, 본인부담제, 선택병의원제, 의료비 지출