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Geographic Correlation Between Large-Firm Commercial Spending and Medicare Spending

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Abstract

Objective—To investigate the correlation between geographic variation in inpatient days, total spending, and spending growth in traditional Medicare versus the large-firm commercial sector.

Study Design—Retrospective descriptive analysis.

Methods—Medicare spending data at the hospital referral region (HRR) level were obtained from the Dartmouth Atlas. Commercial claims data from large employers were obtained from Thomson Reuters MarketScan Database for 1996-2006 and aggregated to the HRR level. County-level data on inpatient days per capita and market characteristics were obtained from the Area Resource File. We computed correlations between Medicare and commercial spending and spending growth, as well as Medicare and non-Medicare inpatient days, and examined traits of high- and low-spending HRRs in both sectors.

Results—We found a positive correlation between inpatient days per capita across counties, but a small inverse correlation between measures of commercial and Medicare spending across HRRs. Spending growth was weakly positively correlated across HRRs. Markets in the upper third of commercial spending had more concentrated hospital markets than markets in the lower third of commercial spending. The reverse was true for Medicare spending.

Conclusions—The positive correlation in utilization and lack of correlation in spending implies an inverse correlation in prices. This is consistent with evidence that the differences appear to be, at least partially, related to aspects of the market structure. If private markets are to work better to

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reduce cost, stronger efforts are needed to reduce provider market concentration and promote competitive pricing for healthcare services.

Considerable research has documented variation in healthcare spending across geographic areas.[1,2] For example, Martin et al[3] reported striking geographic variation in health spending across the United States, with nearly a twofold difference in personal spending between the highest- and lowest-spending states in 2004; per capita personal healthcare spending in Massachusetts was $6683 while in Utah it was only $3792. Notably, in the Medicare program, areas with higher spending have not been found to have better healthcare. For example, Baicker and Chandra[4] found that spending and quality of care were inversely related for a national sample of Medicare beneficiaries.

This variation reflects substantial differences in practice patterns. For example, considerable geographic variation in the frequency of discretionary procedures such as hip, knee, and spine surgeries for Medicare beneficiaries has been reported.[5] Likewise, several studies have identified marked variation in the treatment of patients with acute myocardial infarctions (eg, use of noninvasive vs invasive management strategies).[6-8] Fisher et al[9] studied the quantity of care delivered to the chronically ill and found that the frequencies of hospitalization, diagnostic testing, and physician visits varied by geography and the healthcare system used by patients. The geographic variation was not explained by regional differences in illness levels or patient preference, suggesting that market factors such as local physician opinion and supply of medical resources may play a prominent role in defining regional practice patterns.

Research on variations in practice patterns has been very influential, but most of it has focused on Medicare spending.[1,10,11] Although Medicare is a large and important program, currently covering about 45 million beneficiaries, the majority of individuals in the United States are insured through commercial plans. Policy conclusions stemming from Medicare-based research often implicitly assume that per capita spending by Medicare and commercial insurers is strongly related.

Indeed, several factors suggest Medicare and commercial spending should be positively correlated across markets. For example, physicians are likely to have similar practice styles across age groups for the same disease.[12,13] In addition, to the extent that prices reflect common costs such as wages, prices should be positively correlated across different populations. Some existing empirical evidence at the hospital level suggests a positive correlation in utilization of inpatient care.[14]

yet there also are reasons why Medicare spending and spending growth may differ from commercial spending across areas. First, the prevalences of disease or conditions may differ, leading to differences in services delivered. For example, commercial payers pay for childbirth, which is not relevant for the over-65 Medicare population. In contrast, services such as home care are much less frequent in the commercial population than in the Medicare population. Even common diseases that afflict both populations (eg, heart disease) may be treated differently in an over-65 Medicare patient as opposed to an under-65 patient who is commercially insured because of differences in comorbidities and frailty. Further, benefit packages differ. Prior to 2006, Medicare did not cover orally administered drugs, whereas the vast majority of large firms did.

Second, reimbursement methods differ. For example, traditional Medicare relies on an administered price system with few administrative controls on use. In contrast, commercial insurers negotiate rates with providers. For this reason we would expect the effects of hospital and provider competition to vary between Medicare and traditional insurers. Finally, although long-term spending growth per capita across the commercial and Medicare

sectors has been similar, in any given year the picture may differ. If Medicare tightens reimbursement, hospitals in competitive markets may seek higher rates from commercial carriers to cover joint costs.[15]

This study documents geographic variation in healthcare spending by large firms (a subset of commercial spending) and compares large firm and Medicare spending across hospital referral regions (HRRs). For a number of reasons, such as differences in plan type and benefit generosity, data on commercial spending and Medicare spending are not strictly comparable.

It is also important to recognize that the factors associated with high levels of spending may not be the same factors that are associated with a high rate of spending growth.[16,17] For example, researchers examining the impact of health maintenance organizations (HMOs) and high-deductible health plans on spending have noted that these plans may lead to "one time" savings that reduce spending at a point in time, but may not substantially alter the trajectory of spending.[18-21]

DATA AND METHODS

We used several data sources for our analysis. Medicare spending data for beneficiaries who are at least age 65 years came from the Dartmouth Atlas, which provided per capita age-, sex-, and race-adjusted Part A and Part B reimbursements for each of 306 HRRs in the United States. However, we used only Medicare spending on hospital and physician services to improve comparability with services commonly used by the commercially insured population. We excluded spending on home health services, durable medical equipment, and skilled nursing facilities. We adjusted all values for inflation using the All Items Consumer Price Index and expressed results as 2005 dollars.

Data on commercial spending came from the Thomson Reuters (Medstat) MarketScan Commercial Claims and Encounters Database, which collects administrative data for large firms. We used this database to measure mean spending per member per month on medical services (inpatient and outpatient spending) in each HRR. Our Thomson Reuters data include all plan types (indemnity, preferred provider organization, point of service, and HMO), although we excluded spending data from capitated plans, which may not provide data on all encounters delivered under capitation (capitated plans are similarly excluded from the Medicare data). There remained some variation in plan type within our commercial data. We elected to retain all available non-capitated data to reduce issues of selection if workers nonrandomly choose certain plan types within firms and to maintain sample size. Similarly, like much of the geographic-variation literature, we did not adjust for benefit design (eg, plan generosity in commercial plans, presence of supplemental coverage in Medicare). These plan and benefit differences would have affected the analysis only to the degree that they vary system-atically across markets for Medicare differently than for our commercial sample.

We omitted spending on prescription drugs for comparability because this spending was not included in the Medicare spending measures we used. We included beneficiaries age 0 to 64 years who were not eligible for Medicare. Beneficiaries were assigned to HRRs based on their zip code of residence.

We created 2 samples of firms from the Thomson Reuters data. The first contained data from firms contributing at least 5 years of data between 1996 and 2006. The second contained firms contributing all years of data between 1996 and 2006, so that we could compare the same firms in 1996 and 2006.

The Thomson Reuters data have been widely used, but were imperfect for our task. Despite the Thomson Reuters data set containing between 16.9 million and 22.9 million observations per year, some HRRs in the smaller, 11-year subset of firms we used had fewer than 1500 member months for a given year. Therefore, estimates of mean spending for an HRR may have been materially affected by outliers. Moreover, the sample used in this study consisted of fewer than 60 large firms, and spending by employees of large firms may differ from that of employees of small firms. For example, benefit packages tend to be more generous in large firms.[22] Despite these imperfections, these data are among the best available for our purpose. Nonetheless, we recognize that the results may not generalize to other commercial populations, let alone the remainder of the under-65 population.

To provide a rough insight regarding the contribution of price and utilization to the aggregate spending correlations, we analyzed inpatient days per capita for Medicare and non-Medicare beneficiaries in 2004 from the 2006 Area Resource File (ARF). These data are at the county level and are based on the location of the hospital rather than the patient. Because inpatient days are a measure of utilization, they exclude price effects and spending on outpatient services, but they do include Medicaid beneficiaries, the uninsured, and commercially insured individuals from small firms in addition to the large-firm commercially insured population.

The ARF also provides data about area population and market infrastructure, including hospital and physician supply (hospital beds per capita, primary care physicians and specialists per capita). Our measures of physician supply followed those of Starfield et al,[23] who defined primary care physicians as all active patient care physicians in general practice, general family medicine, and general internal medicine. However, we do not include pediatrics in primary care. Other active patient care physicians were classified as specialists. Hospital infrastructure was measured as total hospital beds per capita.

We supplemented these measures of infrastructure with a measure of market concentration, the hospital Hirschman-Herfindahl Index (HHI), which is based on 2002 American Hospital Association admissions data at the metropolitan statistical area (MSA) level, and adjusted for system ownership, and applied to HRRs using a crosswalk between HRR and MSA. The MSA HHI data has been used in other research.[24]

Analysis

For each of our spending data sources (Medicare, Thomson Reuters), we computed annual spending per capita in 2006 and the change in spending from 1996 to 2006, as well as the coefficient of variation and interquartile range across HRRs for both the spending and growth measures. We calculated correlation coefficients for both spending levels and growth across the data sources, weighted by the number of member months in the Thomson Reuters data. When examining traits of HRRs with high or low spending, we used crosswalks to convert all county- or MSA-based data to the HRR level. Our analysis of inpatient days per capita was conducted at the county level because the ARF data are provided at that level. The correlation between Medicare and non-Medicare inpatient days per capita was weighted by the county population.

When considering the level of spending, we included all 306 HRRs and base commercial spending estimates on the 5-year sample of firms. Analysis involving change in spending over the 1996-2006 period used the sample of firms in the Thomson Reuters data set for all the years. Because of concerns about small sample sizes within some HRRs in this smaller sample of firms, we dropped HRRs with fewer than 1500 member months in the Thomson Reuters sample in either 1996 or 2006 for the growth analyses. These represented about 10% of HRRs.

RESULTS

Consistent with the existing literature, our data demonstrate substantial geographic variation in spending, with greater variation in the Thomson Reuters data than the Medicare data (Table 1). For example, the coefficient of variation in the commercial data was about 0.21 relative to about 0.16 in the Medicare data.

Our measure of utilization, inpatient days per capita, suggested some degree of commonality in practice patterns between sectors; we found the correlations between Medicare and non-Medicare inpatient days to be approximately 0.59 (Table 2). This positive correlation in utilization is consistent with other research.[14]

yet Medicare and commercial spending levels were not strongly correlated across HRRs (Table 2). In fact, the Thomson Reuters spending measure was negatively correlated with Medicare spending. Adjusting the Thomson Reuters data for age and sex differences did not substantively affect the findings, reducing the estimated correlation from −0.17 to between −0.13 and −0.15, depending on the method of adjustment. Focusing only on commercial beneficiaries in preferred provider organizations, or dropping HRRs in the upper quartile of capitated plan penetration, reduced the negative correlation to close to zero, which supports our main point that Medicare and commercial spending are not strongly related.

This pattern of results (positive correlation in use and zero correlation in spending) could be explained by many theories. Importantly, however, it is consistent with the straightforward explanation of differences in pricing across sectors.

Closer examination of the data identified differences between high-spending Medicare markets and high-spending markets in the Thomson Reuters data set (Tables 3A and 3B). Of the top 5 Medicare spending markets, 4 are large markets. The 5th, McAllen, Texas, has been a well-documented Medicare high-spending area.

In fact, systematically high-cost Medicare markets were larger, with less concentrated (more competitive) hospital markets than low-cost Medicare markets (Table 4). In contrast, high-cost commercial markets were smaller, with more concentrated (less competitive) hospital markets than low-cost commercial markets. This finding was robust to dropping HRRs in the top quartile of capitated plan penetration in our data and is consistent with the view that self-insured commercial payers are able to exploit hospital competition to obtain lower prices, but are charged more in markets with concentrated provider systems.

The correlation in spending growth between the commercial and Medicare populations was positive, although low (Table 5). Although technology generally may be driving up healthcare spending everywhere, different areas experienced very different annual rates of spending growth during the period we studied.

DISCUSSION

Research documenting geographic variation in Medicare spending has attracted considerable attention, generating calls for payment reform and focusing attention on differences across markets.[11,25] Our findings demonstrate that spending variation is present in the population insured by large commercial firms as well as the Medicare population. But the correlation between Medicare spending and spending by the commercially insured sample is weak to nonexistent.

Importantly, our work highlights the significance of understanding that variation in spending reflects variation in both price and utilization. Our analysis suggests a positive correlation in

utilization for the elderly and nonelderly, but a small negative correlation in spending. This implies a negative correlation in price (though we did not observe prices directly), which may reflect differences in pricing mechanisms.

The degree of provider competition in local markets should affect prices in commercial markets but not Medicare, which uses administered pricing. For example, significant hospital capacity or competition may allow commercial insurers to bargain successfully relative to Medicare, whereas markets with little provider competition may result in commercial payers being charged more relative to Medicare. Past empirical evidence supports this view.[26] Our descriptive statistics suggest price effects may be important as well.

Although our period of observation included passage of the Balanced Budget Act, which had the immediate effect of reducing Medicare spending but may have increased rates to commercial payers,[27] our analysis does not necessarily indicate cost shifting. The pattern of results we observed, particularly the association with market structure, may merely reflect differential market power as opposed to a causal relationship between prices in different sectors.

Our analysis has several limitations. The weak correlation may reflect data issues (including noise due to small sample sizes in some HRRs) or population differences. The Thomson Reuters data reflect the experiences only of large firms. We make no claim that our results are generalizable to other sectors of the commercially insured market (small firms) or to other segments of the under-65 population (eg, Medicaid, the uninsured).

Greater standardization of the commercial population, their plan types, and benefit generosity, as well as better standardization for the presence of supplemental coverage for Medicare beneficiaries, could also influence our findings, but the impact of those factors and their variation across HRRs would need to be substantial to alter the conclusion that commercial and Medicare spending are not highly correlated.

In fact, unreported analysis of retirees from the Thomson Reuters (Medstat) MarketScan Database suggests a positive but modest correlation with the more representative Dartmouth data, suggesting that differences between individuals insured by large firms and the overall Medicare population may be important. Our message is simply that correlation in spending across areas will be sensitive to the populations studied.

The low correlation we found between Medicare and non-Medicare spending across areas is consistent with recent work by Rettenmaier and Saving, who used much broader measures of non-Medicare spending.[28] However, our results suggest that the correlation in measures of utilization may be more positive than the correlation in spending, suggesting correlation in prices may be negative. To confirm this hypothesis, measures of utilization would be needed.

The restriction to hospital and physician services is another limitation. This focus recognizes that we did not have Medicare data on prescription drug spending and that spending on post–acute care services is much less important in commercial plans. There also were differences in the unit of observation. The inpatient data from the ARF are based on the county in which the hospital is located (for both Medicare and non-Medicare data), and the spending data are based on HRRs using the beneficiary's residence (for both Medicare and non-Medicare data). Moreover, county and MSA-level data are assigned to HRRs using crosswalks that may introduce some error.

Finally, we did not observe the relationship between spending variation and quality. Research suggests spending and utilization are not highly correlated with quality, but we cannot address that issue in this work.[4,9,29,30]

Despite these issues, the story surrounding geographic variation in medical care spending appears more complex than what might be suggested by variation in Medicare-only spending patterns. Market structure likely affects Medicare and commercial spending differently because commercial insurers can better exploit competition and are correspondingly more vulnerable to market concentration. This highlights the importance of understanding variation in pricing as well as in utilization.

The potential susceptibility of private payers to provide market power has important implications when assessing the merits of private markets or public markets in setting prices. Administrative price systems have many flaws, which are fundamentally related to the difficulty in determining the appropriate price when costs are heterogeneous, are not known very precisely, are changing over time, and may reflect discretionary provider behavior. MedPAC, in its role of advising Congress about Medicare reimbursement, struggles constantly with this issue. Moreover, administered prices can be subject to political manipulation. For example, over a third of hospitals use geographic adjustment indices that are exceptions to the standard adjustment estimates.[31] Some of these reclassifications may reflect legitimate concerns that adjustments do not appropriately reflect cost differences, which is a general problem in administered pricing systems. But others reflect ad hoc rules inserted simply to benefit particular providers or areas.

The concern is not limited to hospitals. There is widespread concern that the system for setting physician payment, which relies on the Relative Value Scale Update Committees, is biased against primary care services.[32,33] Finally, payment rates for services such as graduate medical education have been set above the rates suggested by statistical analysis.[34] These are just a subset of possible examples of where the political system could distort administrative prices.

yet despite all the concerns about administrative pricing, our analysis appears to suggest that administratively set prices seem to reduce purchaser vulnerability to provider market power. The challenge for policymakers interested in administered prices must be how to mitigate distortions in the price-setting process, although policymakers will never have enough information to establish perfect (economically efficient) prices (bundled or otherwise).

The analogous challenge for policymakers interested in market systems is how to avoid the pitfalls associated with provider market power. It is not clear whether concerns about market systems are more important or will be easier to mitigate than concerns about administered pricing. However, as the country moves forward with changing the healthcare system, these concerns will be paramount. Medicare, despite numerous inefficiencies in pricing, may be better able to avoid problems with market power in certain markets, suggesting that if private markets are to work better, strategies need to be developed to promote competition (or at least competitive pricing) for provider services. Descriptive analyses such as ours can only raise these issues. Analysis that does a better job of measuring prices and provides more detailed utilization patterns is needed to confirm these suspicions and inform potential policy solutions.

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Take-Away Points

This retrospective descriptive analysis investigated the correlation between geographic variation in inpatient days, total spending, and spending growth for traditional Medicare versus the large-firm commercial sector.

- Commercial and Medicare spending were not highly correlated, although there was a positive correlation in hospital utilization.
- Competition (or lack thereof) influences commercial spending differently than Medicare spending.
- If private markets are to work better to reduce cost, stronger efforts are needed to reduce provider market concentration and promote competitive pricing for healthcare services.

Table 1

Descriptive Statistics, Hospital Referral Region Level[a]

Spending Data Source	2006 Interquartile Range (75%/25%)	2006 Coefficient of Variation	1996-2006 Growth Interquartile Range (75%/25%)[b]	1996-2006 Growth Coefficient of Variation[b]
Medicare	1.22	0.16	1.50	0.34
Thomson Reuters	1.24[c]	0.21[c]	2.09	0.45

[a] Medicare results were weighted by Medicare 5% sample size in hospital referral region (HRR) in 2006; Thomson Reuters results were weighted by member months in the Thomson Reuters sample in HRR in 2006..

[b] Uses Thomson Reuters data for firms with data available for all years from 1996 to 2006; based on sample of 276 HRRs with at least 1500 member months of data in the Thomson Reuters data set in both 1996 and 2006. Data for Medicare are from the Dartmouth Atlas.

[c] Uses Thomson Reuters MarketScan Research Databases for firms with data available for at least 5 years from 1996 to 2006; based on sample of all 306 HRRs

Table 2

Correlations in Spending and Utilization[a]

Data	Correlation (*P*)			
	2006 Medicare Hospital and Physician Reimbursements	2006 Thomson Reuters Medical Spending per Member Month, Overall	2004 Non-Medicare Inpatient Days per Capita	2004 Medicare Inpatient Days per Capita
HRR level[a]				
2006 Medicare hospital and physician reimbursements	1			
2006 Thomson Reuters medical spending per member month, overall	−0.17 (.003)	1		
County level[b]				
2004 Non-Medicare inpatient days per capita			1	
2004 Medicare inpatient days per capita			0.59 (<.001)	1

HRR indicates hospital referral region.

[a]Medicare/Thomson correlations were weighted by member months in the Thomson Reuters MarketScan Research Database sample in 2006 and used Thomson Reuters data for firms with data available for at least 5 years from 1996 to 2006; based on sample of all 306 HRRs. Data for Medicare are from the Dartmouth Atlas.

[b]County-level Area Resource File correlations were weighted by total population of county in 2004.

Table 3A

Top 5 Medicare Spending Markets, 2006[a]

Medicare Rank	Thomson Reuters Rank	HRR	State
1	121	Miami	FL
2	237	Bronx	NY
3	142	Manhattan	NY
4	270	McAllen	TX
5	162	East Long Island	NY

HRR indicates hospital referral region.

[a]Rank is out of 306 HRRs included in the sample. Data for the commercially insured are from the Thomson Reuters MarketScan Research Database. Data for Medicare are from the Dartmouth Atlas.

Table 3B

Top 5 Thomson Reuters Spending Markets, 2006[a]

Thomson Reuters Rank	Medicare Rank	HRR	State
1	261	Marshfield	WI
2	239	Sioux City	IA
3	227	Cape Girardeau	MO
4	53	Tyler	TX
5	18	Panama City	FL

HRR indicates hospital referral region.

[a]Rank is out of 306 HRRs included in the sample. Data for the commercially insured are from the Thomson Reuters MarketScan Research Database. Data for Medicare are from the Dartmouth Atlas.

Table 4

Mean Traits of High-Spending and Low-Spending Markets[a]

Spending Markets	Population[b]	Hospital Beds per 1000 Population[c]	Hospital Concentration[d]	Primary Care Physicians per Capita[b]	Specialist Physicians per Capita[b]
Top Third Thomson Reuters, 2006	600,145	3.68	0.434	5.53	13.01
Bottom Third Thomson Reuters, 2006	1,081,223	3.41	0.312	5.27	13.43
Top Third Medicare, 2006	1,365,559	3.38	0.240	5.34	15.93
Bottom Third Medicare, 2006	603,580	3.87	0.464	5.72	12.42

[a] Data for the commercially insured are from the Thomson Reuters MarketScan Research Database. Data for Medicare are from the Dartmouth Atlas.

[b] Data are from 2005.

[c] Data are from 2004.

[d] Data are from 2002.

Table 5

Correlations in Spending Trajectory[a]

Data	% Change Correlations (*P*)			
	Medicare Hospital and Physician Reimbursements, 1996-2006	**Thomson Reuters Medical Spending per Member Month, Overall, 1996-2006**	**Non-Medicare Inpatient Days per Capita, 1996-2004**	**Medicare Inpatient Days per Capita, 1996-2004**
HRR level[a]				
Medicare hospital and physician reimbursements, 1996-2006	1			
Thomson Reuters medical spending per member month, overall, 1996-2006	0.20 (.001)	1		
County level[b]				
Non-Medicare inpatient days per capita, 1996-2004			1	
Medicare inpatient days per capita, 1996-2004			0.13 (<.001)	1

HRR indicates hospital referral region.

[a]Medicare/Thomson correlations were weighted by member months in Thomson sample in 1996 and use the Thomson Reuters MarketScan Research Database for firms with data available for all years from 1996 to 2006; based on sample of 276 HRRs with at least 1500 member months of data in the Thomson Reuters data set in both 1996 and 2006. Data for Medicare are from the Dartmouth Atlas.

[b]County-level Area Resource File correlations were weighted by total population of the county in 1996.