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Medicare Spending Across the Map

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Executive Summary

Though talk of fundamentally reforming Medicare has been limited lately, the baby boomers' imminent retirement and the continued rise in health care costs will force Medicare back to the forefront of upcoming policy discussions.

The Medicare Trustees and the Congressional Budget Office both predict that Medicare spending as a percentage of gross domestic product (GDP) will double by 2030. Therefore, all possible means of making Medicare more efficient should be considered in light of its increasing importance to taxpayers. One possible avenue for reform is seen in the wide regional variations in Medicare spending that exist and have persisted through time. If Medicare reimbursements could be constrained to the levels existing in the lower cost areas, the program's costs could be reduced significantly.

But why do Medicare costs vary so dramatically from area to area? Why, for example, is average Medicare spending in Los Angeles almost 70 percent higher than in Green Bay, Wisconsin? The purpose of this study is to examine the county-by-county variation in Medicare spending, look for causes of this variation and suggest reforms that can narrow the variation that can't be explained by the causes we can observe. These reforms not only address the regional variation, but more importantly reduce the program's costs. Most previous studies have analyzed Medicare spending differences at the state or hospital referral region (HRR) level. Since there are just over 300 HRRs and over 3,100 counties, this study allows for closer examination and more precise analysis of the regional variation.

Among the regional variations in Medicare spending that were found:

- County-level Medicare spending is high states like New Jersey, with 95 percent of its counties in the top fifth of spending.
- Maryland, Louisiana, Massachusetts and Texas are also high cost areas, with all having more than half of their counties in the top fifth of spending.
- In contrast, average county-level Medicare spending is low in Vermont, Idaho, New Mexico, South Dakota, Oregon and Iowa, all with more than half of their counties in the bottom fifth of spending.

But perhaps the high-cost counties are high cost simply because they have higher risk Medicare populations, or possibly the retiree population's income or demographic characteristics are associated with higher spending. Additionally, the health care market's characteristics may be driving the higher costs. All of these causes are considered in explaining the average total Medicare spending in each county. The results indicate that:

- Higher Social Security benefits as well as more Supplemental Security Income imply higher spending.
- Higher percentages of Hispanics and Blacks are related to higher average Medicare spending in the counties.
- Higher percentages of female retirees in a county are positively related to spending, while higher percentages over age 85 are negatively related.
- Higher health care sector wages are associated with lower Medicare spending, but managed care penetration has a positive effect on spending.
- The most important factors are the health risks among a county's Medicare beneficiaries which are (as expected) associated with higher spending.

- The observable county characteristics along with a measure of the health care risks explains about 40 percent of the variation in average Medicare spending across the counties in the continental United States.

Does the regional variation observed in the raw county by county averages persist after removing the effects associated with the observable differences in county characteristics? The geographic concentration of high and low cost counties is lessened to some degree, but it is still true that many of the high cost counties remain in the high cost categories. Specifically:

- Of the six states that had more than half of their counties in the highest fifth of spending, four continued to have more than half of their counties in the top fifth of spending after adjusting for county characteristics.
- New Jersey was a notable exception in that only 24 percent of its counties remain in the top fifth of spending after accounting for the county characteristics. This indicates that the New Jersey counties' retired population's health risks, income, demographics and health care market explain much of the reason why they are high cost counties.
- At the other end of the distribution, two of the five states that had more than half of their counties in the lowest fifth of spending still have more than half in the bottom fifth after adjusting for county characteristics.

This persistence indicates that factors other than those controlled for cause some areas to be high or low cost. There are several possible reasons why some areas have higher than expected costs. Higher concentrations of uninsured individuals in a county may lead to cross subsidization from Medicare. The legal environment in some states may lead to more aggressive

use of protective medicine. Also, the practice of medicine may vary from area to area in a persistent way. Regardless of the cause, there are remedies that address the high cost areas leading to more efficient use of taxpayers' dollars.

The areas of the country that have high Medicare costs, after removing observable differences in the Medicare population and in the health care market, have been known for the last decade and have provoked several reform suggestions. We propose that rather than having the Centers for Medicare and Medicaid Services determine the reimbursements to fee-for-service providers or to Medicare Advantage insurer through risk-adjusted payments, both of which perpetuate regional cost variations, several market-based reforms will elicit provider responses. These include:

- Require competitive bidding from Medicare Advantage providers for types of beneficiaries based on the beneficiaries' risk profiles so that providers reveal their true cost of care.
- Provide incentives for the beneficiaries to shop for care and seek lower cost providers by funding individual health savings accounts with catastrophic insurance coverage.

Introduction

Medicare spending per retiree varies dramatically across the United States. Some of the variation is due to particular attributes of the Medicare beneficiaries in the different areas and some is due to regional health care markets. However, it has been noted that even after all of these factors have been quantified, a good bit of variation remains unexplained, and that this unexplained variation is persistent through time. Some observers have suggested that Medicare spending might be reduced if health care practices common in low-cost areas were applied to regions where spending is higher.

This paper examines geographic variation in Medicare spending at the county level. It examines possible causes of the county-level variation and quantifies the persistence in average spending differences. Like previous studies of geographic variation based on state-level data or hospital referral region data, the analysis shows that even after identifying possible causes of geographic variation, the high-spending counties are clustered in similar locations. This clustering indicates that other factors, other than those statistically controlled for are at play. This paper suggests reforms that allow market forces to address some of the higher cost areas. .

Exploring all avenues for reform is necessary as the country looks to the future and braces for the baby boomers' retirement. Taxpayers fund retirees' Social Security and Medicare benefits as well as Medicaid benefits for eligible retirees. Social Security benefits are a predictable function of a retiree's past earnings, but the growth of Medicare and Medicaid health care costs are expected to far outpace Social Security's growth and are subject to great uncertainty.

Consider, for example, the different forecasts offered by Medicare's Trustees and the Congressional Budget Office. Based on the 2007 Medicare Trustees Report, the program is predicted to double from its present size of 3.2 percent of gross domestic product (GDP) by 2030, growing to 11.3 percent of GDP by 2080. The Congressional Budget Office (CBO) has recently made its own predictions of Medicare's future, with a projected spending path for Medicare similar to the Trustees' predicted path until about 2040. After this point, the two predictions diverge. The CBO predicts Medicare will eventually rise to 17 percent of GDP, over 50 percent higher than the Trustees' ultimate prediction.

The two projections illustrate the uncertain nature of future health care spending, but both point to a rapid escalation in costs associated with Medicare, and both predictions are similar for at least the next 30 years. The implication of these rising costs is substantially higher taxes on future workers if the current funding arrangement remains in place.

Medicare has been around for more than four decades and many lessons have been learned along the way. Many observers have come to the same conclusions that the incentives in the current payment mechanism produce rising expenditures. Because their potential consumers have the resources to pay, providers have the incentives to pursue expensive technological advances. Likewise, consumers have no incentives to shop for care or to monitor their expenditures, given that most have first-dollar coverage through insurance, either public or private, that fills in the gaps in Medicare's coverage.

Reform proposals aimed at the rising health care costs associated with Medicare are far ranging and mainly target the payment mechanism. Past reforms have constrained payments to providers or constrained beneficiaries' consumption by encouraging enrollment in managed care

programs. Other reforms are aimed at making health care delivery more efficient. This examination of average Medicare spending across the counties in the United States will show that there are lessons to be learned from the areas where Medicare spending is low, and that reforms can be tailored toward bringing market competition to the higher cost areas.

County-Level Variation in Medicare Spending

Nationwide, Medicare spending per capita grew almost 45 percent from $5,547 in 1998 to $8,027 in 2005. This translates into an annual growth rate of 5.4 percent. Over the same time period, general prices as measured by the consumer price index grew at an annual rate of 2.6 percent. Thus, Medicare spending per capita outpaced general price growth at an annual clip of about 2.8 percent. However, the growth rate in average Medicare spending over this time period varied quite a bit at the county level. Furthermore, average Medicare spending varies substantially from county to county each year.

Table I summarizes the variation in average Medicare spending between counties in the continental United States. The statistics are based on county-level average fee-for-service reimbursements for Medicare beneficiaries who are 65 and above with data available from 1998 to 2005.[1] See the data description in the Appendix for more details. The top panel in the table reports the summary measures when each county has an equal weight. Each county and its most populous city is listed. The columns report per capita spending in 2005 at several points in the distribution, as well as the average. Nobles County, Minn., for example, had average spending

[1] The county by county average fee for service Medicare spending data from the Centers for Medicare and Medicaid Services begins in 1998 and extends to 2006. Part A spending on indirect and graduate medical education and disproportionate share adjustments has been excluded from the present analysis. Due to the availability of other data elements, the endpoint of the time frame is limited to 2005. The data are available at http://ww.cms.hhs.gov/MedicareAdvtgSpecRateStats/05_FFS_Data.asp#TopOfPage.

of $5,182, placing it at the 5th percentile in the distribution. The average spending in Butte County,Calif., of $6,566 placed it at the median while the $8,578 average spending in Rice County, Kan., placed it at the 95th percentile. Spending at the 95th percentile was $3,396, or 66 percent, higher than at the 5th percentile, while spending at the 75th percentile was 23 percent higher than at the 25th percentile. As a point of comparison, per capita Social Security benefits at the 95th percentile only exceeded average benefits at the 5th percentile by 32 percent. The overall average per capita spending by county was $6,693 in 2005. This average is not weighted by the beneficiary population, is limited to the 65 and above population, does not include managed care participants, and does not include payments for indirect or graduate medical education or disproportionate share adjustments. These are some of the reasons why this average is 13 percent less than the Medicare population average in 2005 of $8,027 reported in the 2007 Trustees Report.

The bottom panel of Table I takes into account the fact that population varies dramatically by county. The results in this panel are weighted by Part A enrollment. Because higher population counties generally have higher Medicare spending per capita,it is clear that spending at all points in the distribution rises, as does the average spending. The average of $7,208 based on the weighted county data is much closer to the Medicare population average of $8,027, about 10 percent less, but again it differs for the reasons mentioned above. The 95th percentile, in Los Angeles County, is 68 percent higher than the 5th percentile in Brown County, Wis.

While Table I reports the dispersion in spending in 2005, the persistence in Medicare spending through time can be seen in the transition matrix presented in Table II. This table

compares the distribution of Parts A and B spending for 3,102U.S. counties in 1998 to the distribution in 2005. The counties are divided into quintiles with the movements between quintiles over the seven-year period identified in the 25 possible cells in the table. The first row tracks the 1998 movements of the 620 counties in the lowest 20 percent of the spending distribution. Of these 620 counties, 352 or 56.77 percent were also found in the lowest 20 percent of the spending distribution seven years later. By 2005, another 169 or 27.26 percent moved up to the second quintile. . Thus over 84 percent of the counties in the lowest 20 percent remained below the 40th percentile in the distribution in 2005. At the top of the distribution, or the fifth quintile, in 1998, 427 of the counties, or almost 69 percent, were again classified in the top quintile in 2005. Another 22.54 percent of the counties in the top quintile in 1998 moved to the fourth quintile by 2005. These observations indicate that there is a good deal of persistence in a county's ranking in the Medicare spending distribution through time. Another way to summarize persistence from Table II is to add up the number of counties that remain in the same quintile in both periods. Adding the numbers down the diagonal of the transition matrix indicates that 47 percent of the counties remained in the same quintile after seven years. Notably, over 87 percent of the counties remain within one quintile of their original location.

The correlation coefficients between the counties' ranks in 1998 and 2005 are a final means of summarizing persistence in the spending distribution through time. The county based rank correlation coefficient for combined Part A and B spending between 1998 and 2005 is 0.7647. The coefficient for Part A only is 0.6824, and for Part B it is 0.7638. All three numbers indicate that persistence in relative ranks is a characteristic of Medicare's reimbursements.

In addition to this persistence in the distribution of Medicare spending through time, another observation of regional variation is an apparent compression in the distribution through time. In a study of Medicare spending at the state level over the period from 1974 to 2003, Rettenmaier and Wang note a 20 percent decline in coefficient of variation.[2] They also note that more rapid growth at the bottom end of the distribution has contributed to this observed compression to a greater degree than slower growth at the upper end of the distribution. This pattern also holds over the much shorter period for which county-by-county fee for service average spending data is available. Figure I shows the nominal average growth rates in per capita Medicare spending between 1998 and 2005 at the 5th, 25th, 50th, 75th and 95th percentile for combined Parts A&B, and for Parts A and B by themselves. In each case, growth at the lower end of the per capita spending distribution outpaced growth at the upper end. Total per capita Medicare spending grew at an annual rate of 7.0 percent at the 5th percentile and 5.0 percent at the 95th percentile. Growth in Part A was more moderate, but again, the annual growth rate of 5.3 percent at the 5th percentile outpaced the 3.8 percent annual growth rate at the 95th percentile. In contrast to the growth in Part A spending, Part B spending at all points in the distribution has grown at an annual rate of at least 6.9 percent. As before, the growth below the median is in excess of the growth above the median. These different growth rates have compressed the distribution, with the ratio of spending for the county at the 95th to the county at the 5th percentile falling from 1.89 in 1998 to 1.66 in 2005, a 12 percent decline. For Part A, the 95th/5th percentile ratio fell from 2.07 to 1.86, and for Part B it fell from 1.83 to 1.63.

[2] Andrew J. Rettenmaier and Zijun Wang, "State to State Variation in Medicare Spending and Utilization through Time," PERC Working Paper No. 0806, 2008.

Why Does Medicare Spending Vary from County to County?

The previous section established the degree to which Medicare spending varies across counties at a point in time and how it varies through time. Not only did spending vary in both dimensions, there is substantial persistence in a county's location within the spending distribution through time. It is also noted that some compression exists in the county by county spending distribution, and that this compression is characterized by higher spending growth at the lower end of the distribution than at the upper end of the distribution. The current section examines some of the reasons spending would be expected to vary at the county level.

To demonstrate the geographic distribution of Medicare spending, Figure II maps each county's average spending for Parts A and B. The counties are divided into five quintiles. The counties in the lowest 20 percent of the spending distribution are shown in red while those in the top 20 percent of spending are shown in dark blue. The map indicates that the high spending counties are found throughout the country, but that there are noticeable concentrations in the Northeast urban areas, Florida, the Ohio Valley, the South, particularly Texas and Louisiana, some Plains State counties, and counties in California and Nevada, as well as a few other urban areas. At the lower end of the spending distribution are areas of Virginia, the Upper Midwest, the Northeast and the West.

Several studies have examined regional variation in Medicare spending in detail. To explain regional variations in spending, these studies isolate the effects on each area of demand factors like demographics, economic status, and underlying health of the elderly population, as

well as supply factors, like the availability and types of health providers. One of the best known of these studies is Skinner and Fisher.[3] They use the *Dartmouth Atlas of Health Care* to gather data on the 306 hospital referral regions (HRRs) in the United States in order to address this issue. Along with adjustments made for age, sex, and race, the *Atlas* prevents any bias that large research hospitals might create by allocating costs to the individual's home HRR instead of their treatment HRR. The authors also correct for price differences and regional health status. Even after accounting for all of these differences, spending variation across regions is still quite large. High spending areas include most of Texas, Louisiana, Florida and Southern California, while the Pacific Northwest, Iowa, North Carolina and Virginia experience low spending levels. This geographic distribution is quite similar to the distribution shown in Figure II. Writing in 1997, these authors noted that if all regions cut their spending levels to that of Richmond, Va. (in the lowest quintile), savings of 20 percent and a reversal of the declining trust fund balance would be possible.[4]

Another paper that examines regional variations in spending was authored by Cutler and Sheiner.[5] Like Skinner and Fisher, "Regional Disparities in Medicare Expenditures: An Opportunity for Reform," they examined the substantial difference in Medicare spending across geographic regions, and point to potential savings of up to 30 percent if all spending levels were consistent with that of the 10th percentile of a ranking of metropolitan statistical areas (MSAs).

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[3] Jonathan Skinner and Elliott Fisher, "Regional Disparities in Medical Expenditures: An Opportunity for Reform," *National Tax Journal*, Vol. 50, No. 3, 1997, pages 413-425.

[4] Daniel Feenberg and Jonathan Skinner, "Federal Medicare Transfers Across States: Winners and Losers," *National Tax Journal*, 2000, vol. 53, no. 3,, pages 713-732. Feenberg and Skinner look at the Medicare geography question from a different point of view by determining the total transfer amount received by each state. They look at the difference between total Medicare benefits received and total Medicare taxes paid by each state to determine which states receive more or less in benefits than they pay out in taxes. After accounting for migration at retirement, price levels, and regional health status, wide regional differences persist, with states in the South and Northeast receiving significantly higher net transfers than those in the Northwest and Midwest.

[5] David M. Cutler and Louise Sheiner, "The Geography of Medicare," *American Economic Review*, Vol. 89, No. 2, 1999, pages 228-233.

The authors use data from the 1998 *Dartmouth Atlas of Health Care* to test whether the observed variations in Medicare spending are a source of inefficiency that could be improved to help lower costs. The *Atlas* contains Medicare data adjusted for age, sex, race and price level for 212 hospital referral regions.

Cutler and Shiner examine three sets of factors that may explain the regional differences in spending. These include the differences in the underlying distribution of illness in an area, the demand for medical care (associated with insurance rates and demographic characteristics such as race, sex, income, and education), and the composition of medical-care markets, such as number and type of physicians. They first consider the distribution of illnesses and find that 66 percent of the variation in spending can be explained by these controls. Adding the demographic factors to the set of control variables increases the explanatory power, or R^2 of the regression to 70 percent. And adding the controls for supply side factors related to HMO coverage in an area along with the percentage of beds in for-profit institutions, the percentage of specialist physicians, and the number of beds and physicians per capita raises the overall R^2 of the regression to 80 percent.

Variation in Average Total Medicare Spending

While Cutler and Sheiner, in "The Geography of Medicare" — and Skinner and Fisher, in "Regional Disparities in Medicare Expenditures: An Opportunity for Reform" — analyzed a one-year snapshot of regional variation in Medicare spending at the level of hospital referral regions, this paper analyzes the county-by-county variation in spending through time. This expands the number of observations to 3,102 per year and examines spending over a four-year period between 2002 and 2005. The analysis is limited to those years when control variables are

added, due to the availability of the different data series used. A description of the data and the data sources can be found in the appendix.

Like the two studies cited, this analysis examines how the demographic characteristics of the retired population, retirees' incomes, supply factors, and the underlying health risks affect Medicare spending. Table III presents the results of four alternative regressions. The dependent variable is average total Medicare spending in the fee-for-service sector in a county among beneficiaries who are 65 and above. This variable is the sum of Parts A and B where Part A spending has been adjusted for indirect medical education, graduate medical education, and disproportionate share in each county. As a proxy of income, the analysis includes average Social Security benefits for beneficiaries 65 and above. This measure of income suffers from the fact that although Social Security benefits rise with lifetime earnings, they rise at a decreasing rate due to the redistributive nature of the benefit formula. As a result, Social Security benefits reflect a decreasing portion of available income as income rises. This effect is further compounded given that higher income workers save more and thus have higher other income in retirement.The analysis also includes a variable for the average SSI benefit in each county to control for low-income retirees. All dollar values are converted to 2005 dollars using the CPI-U price index.

The retired population's demographic makeup is controlled for with variables reflecting the percentage of individuals 65 and above in each county who are Hispanic, Black, and Other, with White serving as the excluded category. Additional demographic controls include variables for the percent of the population 65 and above who are female and the percentage who are 85 and above.

The demographic and income variables identify potential demand side factors; to control for possible supply side factors, three variables that summarize the structure of the health care sector in the county are included. The first is a control for the percentage of the Medicare population that participates in a managed care plan. The second variable is the percentage of private earnings in the counties paid to workers in the health care and social assistance sector. This variable measures the relative size of the health care sector in the counties. The third supply-side variable is the average income earned in the heath care sector by county.

A final control variable is an adjusted risk factor score. The county-by-county Medicare data includes an average health risk score for beneficiaries in each county in 2004 and 2005. In 2005 the county average risk scores ranged from 0.69 to 1.31 with a mean of 0.95. The risk scores are used to determine risk-adjusted reimbursements to Medicare Advantage providers for each of their potential enrollees. The risk score takes into account the institutional status, disability status, age, sex, and Medicaid eligibility of the beneficiary, along with his or her health status. Because the analysis separately controls for age, sex and SSI per capita, it derives an adjusted risk score that attempts to take out the part of the risk score not attributable to health status.[6]

Given the panel nature of the data (3,102 counties over a four-year period), Table III presents four specifications that identify the effects of the variables across counties and through time within counties. The "pooled" model simply runs the regression across all counties over the

[6] The adjusted risk score in each county is the residual from a regression in which the dependent variable is the average risk score and the explanatory variables are the percent of all Social Security beneficiaries who are eligible through the disability program, the percent of the retired population that is female and that is 85 and above, SSI benefits as a percent of OASDI benefits, and the percentage of the income among the nonretired population that comes from transfer payments. These controls explain about 30 percent of the variation in the county average risk scores in both 2004 and 2005.

four years. In this model, the coefficients' sizes, signs, and significance are instructive, but the results suffer from the effects of repeated observations from the same county. The second set of coefficients is based on a model that includes fixed county effects. This model is often referred to as the "within" model because it isolates the effects of the variables on changes within the counties. The "between" model is most similar to the models used by Cutler and Sheiner, "The Geography of Medicare," and by Skinner and Fisher, "Regional Disparities in Medicare Expenditures: An Opportunity for Reform," in that it is a regression that uses the averages of the variables across the four years within each county. Finally, the last regression includes the control for the adjusted risk score as described above but is restricted to the last two years of data due to the limited availability of the risk score. The last regression is also run as a between county regression. Ultimately, the between regression that includes the adjusted risk scores is used to identify the portion of Medicare spending in the counties that is not due to underlying differences in the demographic characteristics, income and health status of the retirees, or to supply factors.

In general, the pooled regression, the between regression and the between regression with adjusted risk factors all produce statistically significant coefficients with the same signs. The coefficients presented for the two between models provide the best insights into each variable's impact on average Medicare spending. The coefficients' signs and significance are in most cases the same. Higher Social Security benefit income is associated with higher spending as is higher SSI income per person age 65 and above. The first result is expected, but the positive relationship between SSI income and Medicare spending, which may appear to be counterintuitive, is likely picking up the higher relative spending effect often found with Medicaid patients.

Higher Medicare spending is also associated with higher percentages of Hispanics and Blacks in a county, while spending is negatively related to the percentage of retirees of races other than White, Hispanic or Black. However, in the last regression that includes the adjusted risk score, the negative relationship between the percentage of the population of Other races and spending becomes marginally insignificant. Cutler and Sheiner, "The Geography of Medicare," find that Medicare spending rises as the Hispanic percentage of the population rises, but falls as the percentage that is Black rises, though the latter effect is only significant in one of their specifications.

Cutler and Sheiner find that the female percentage is negatively associated with Medicare spending, while this paper's results indicate that it is positively related. This may be due to the separate control of the percent of the elderly population who are over 85, who are mostly female. This coefficient is negative. While Medicare spending actually rises with age up to the late 80s, it falls at later ages, so the negative effect of this variable is likely a result of the underlying shape of the age spending profile.

The three variables used to capture supply effects produce mixed results. Higher average wages in the health care sector, or higher prices for health care labor, are negatively associated with average Medicare spending. This result may reflect the natural consequence of higher prices leading to reduced expenditures, but without a quantity measure this effect is difficult to isolate. The size of total earnings in the health care sector relative to all earnings does not produce a significant coefficient in either of the between regressions. Higher penetration of managed care is associated with higher fee-for-service spending. Recall that the dependent variable is average combined Parts A (adjusted) and B spending on behalf of fee-for-service

Medicare beneficiaries in a county who are 65 and above. The positive relationship may reflect a greater willingness on the part of managed care providers to enter markets with higher Medicare reimbursement structures. It may also reflect the possible sorting of lower risk (cost) patients to managed care plans leaving higher risk (cost) patients in the fee-for-service sector. Further, with the inclusion of the adjusted risk score in the last regression, the coefficient on the managed care penetration variable is cut in half. When the between regression with no risk score variable is limited to the last two years of the data, the coefficient is smaller at 16.9, but the reduction associated with including the risk score indicates that the managed care variable was picking up some of the underlying risk scores of the enrollee populations.

The adjusted health risk factor, which proxies for the underlying health of the retired population, is, as expected, positively and significantly associated with Medicare spending. Adding the adjusted risk factor to the regression increases the R^2 to 0.3888. This compares to an $R^2$of 0.1583 for an identical regression also limited to 2004 and 2005 data, but without the adjusted risk factor. Thus the inclusion of this single factor summarizing the underlying health care risks in a county more than doubles the explanatory power of the regression.

Before discussing the effects of controlling for these observable characteristics on the geographic distribution of spending, it is instructive to also consider the fixed effect model. The fixed effects regression shows how the different factors impact spending within the counties over the four years considered. While some of the coefficients are consistent with the other models, the R^2 reported at the bottom of the table explains little of the overall variation in spending, but does explain 37 percent of the within county variation. Consistent with the other specifications, rising Social Security benefits, a rising Hispanic percentage and rising managed care penetration

are associated with benefit growth within counties. However, in contrast to the other specifications, rising SSI benefits and a rising percentage of females are negatively, rather than positively, related to per capita spending. These effects, along with the positive effect of a rising share of the older retirees who are above 85, are not surprising. However, because of the persistence in spending observed on the transition matrix in Table II, and the low explanatory value of this model, it appears that the more important aspect of variation in Medicare spending is from variation across counties rather than across time within counties.

The last model, summarized in Table III, is used to identify the distribution in spending that is not attributable to any of the observed factors in the regression. The geographic distribution of the county individual effect residuals from the last regression are depicted in Figure III.[7] This figure thus shows the distribution of the persistent portion of county-by-county average spending that cannot be traced to differences in the retired population's demographics, income, or health status or to the three health market variables identified.

Comparing this figure to Figure II, the analysis shows that many high cost counties remain in the top quintile of spending even after controlling for observable differences. Many of the high cost counties in Texas and Louisiana remain in the top spending quintile, as do several counties in the Southwest, Florida, the East Coast, West Virginia, the Chicago area and some counties in the Plains States. A few urban areas, previously in lower quintiles, do not move to higher cost quintiles after the adjustment. The low cost areas, adjusted for observable differences, now show increased concentrations in upstate New York, Virginia, a pocket in southwest Georgia and much of New Mexico. Some of the border counties in Texas as well as

[7] The error term from the between regression includes a state level effect and a random effect. This paper uses the individual state effect by itself in preparing Figure III.

some of the counties in Florida moved to lower quintiles after adjusting for observable factors. The general distribution of adjusted Medicare spending depicted in Figure III is quite similar to the distribution of adjusted spending as presented in Skinner and Fisher based on data from their 1997 paper. This indicates that regional differences are quite persistent even after adjusting for any changes in observable characteristics of the population.

Variation in Average Part A Medicare Spending

This section repeats the analysis above for Part A alone, and the next section will repeat the analysis for Part B. Figure IV provides the unadjusted geographic distribution of average Part A, or hospital insurance, spending in 2005. The geographic distribution is similar to the unadjusted distribution for average Parts A and B spending as shown in Figure II. Not surprisingly, the correlation between average Part A and average total spending across the counties in the continental United States during 2005 was 0.94. Several areas of the upper Midwest moved to higher quintiles relative to their positions in the total spending distribution, while more than a dozen Texas counties moved down in the distribution based on Part A spending.

Table IV presents the regression results when county average Part A spending serves as the dependent variable. Comparing the last regression results in Table IV to the final regression results in Table III shows the diminished importance of Social Security benefits in explaining Part A spending. (By construction of the dependent variables, the coefficients in this regression and the final regression from Table V will sum to the coefficients previously reported in Table III.) Also, the Hispanic percentage in a county is negatively and significantly associated with

average Part A spending whereas it was positively associated with total average spending. Further the other two controls for race are not significant in explaining Part A spending. Overall the model explains 32 percent of the variation in spending.

Mapping the individual county residuals from the regression shows the now familiar pattern. However, controlling for the observable population, risk and market characteristics reveals that many of the Florida counties move to lower quintiles, as do some of the border counties in Texas. The figure also shows that more of the counties in the Mountain West and Upper Midwest move up in the spending distribution.

Variation in Average Part B Medicare Spending

The geographic distribution of Part B, or Supplementary Medical Insurance, provides interesting insights into some unique patterns of spending. The correlation between average Part B and average total spending across the counties during 2005 was 0.88, while the correlation between average Part B and average Part A spending was only 0.66. The unadjusted Part B spending distribution is more geographically concentrated in some areas of the country than observed in Figures II and IV. For example, about 72 percent of the Florida counties are in the upper quintile of the Part B spending distribution, as are 68 percent of the Texas counties. In contrast, 19 percent of the counties in Florida and 37 percent of the counties in Texas were in the highest quintile in the Part A spending distribution. The lower end of the Part B spending distribution shows high geographic concentrations in Minnesota, Iowa, and Wisconsin.

Table V reports the regression results when average Part B spending is the dependent variable. Again the analysis focuses on the estimates from the last regression. In this

regressionthe importance of the race controls for Hispanics and Blacks becomes clear, both being positive and significant. Recall that in the Part A regression the Hispanic percentage was negatively related to spending. However, the control for managed care penetration is insignificantly related to Part B spending in contrast to the positive and significant relationships in the previous two regressions. This insignificant relationship between managed care penetration and Part B spending is consistent with the positive relationship in Part A if the sorting story holds primarily for high-risk patients requiring hospitalizations.

Figure VII shows the distribution of the individual county residuals from the final regression in Table V. The correlation between these residuals and those from the Part A regression is only 0.52. A comparison of Figures VI and VII shows that some of the clustering of high cost areas based on the unadjusted Part B spending is diminished. This is particularly true in Florida, some the border counties of Texas, and the Northeast. The concentration of low cost counties in the Upper Midwest is also lessened, after controlling for the observable differences.

Summary Results

This paper has identified the geographic distribution in fee-for-service average Medicare spending at the county level across the continental United States. The distribution of county level spending is characterized by several traits. There is a good deal of persistence in a county's relative rankings in the spending distribution through time. This study also found that the spending distribution has narrowed through time. That is, the gap between the highest spending and lowest spending counties narrowed between 1998 and 2005. By 2005 the ratio of spending

for the county at the 95th to the county at the 5th percentile fell 12 percent and much of the decline in this ratio is attributable to relatively faster growth at the lower end of the spending distribution.

This paper goes on to examine the possible cause of the geographic distribution of Medicare spending. Controls were established for the demographic, income, and risk profile of the counties' Medicare population as well as for several characteristics of the health care markets. Even with these controls, a consistent geographic pattern of high- and low-cost counties emerges. Table VI summarizes how the pattern of high- and low-cost counties changes before and after controlling for the observable county characteristics. The high-cost states are the 10 states with the highest percentage of their counties in the top fifth of average total Medicare spending and the low-cost states are the 10 states with the highest percentage of counties in the lowest fifth of average total Medicare spending. The table summarizes the pairs of unadjusted and adjusted maps for Parts A&B spending, Part A spending, and Part B spending. Consider the first row of the table for New Jersey, a state with 95 percent of its counties, 20 of 21, in the highest fifth of spending nationwide. After adjusting for observable differences, only 23.8 percent of the counties remain in the top fifth. This indicates that part of the reason New Jersey is a high spending state is due to the high cost characteristics of the retiree population and the health care market. Observation of the other high-cost states shows that that after adjusting for the county characteristics, some states have a much lower percentage of counties that show up in the top fifth. However, in Oklahoma and Kansas the percentage of counties in the top fifth actually increases while in Louisiana, Texas and Mississippi, the difference is modest.

The low-cost states in the bottom half of the table also shows interesting changes in the percentage of bottom-fifth counties after adjusting for county characteristics. For example, in the case of Part A&B spending, Idaho, South Dakota, Oregon, North Dakota, Utah and Wyoming, the percentage of counties in the lowest fifth after adjusting for county characteristics declined quite a bit. This indicates that the underlying population and health care markets in the affected counties are relatively low cost.

Table VII identifies the top five high- and low-cost states as determined by the percentages of the counties in the states in the top or bottom 20 percent of total spending after adjusting for observable county differences. All five of the high-cost states in the adjusted ranking were in the top ten states reported in Table VI from the unadjusted ranking. Of the 64 counties in Louisiana, 44 were ranked in the top 20 percent nationwide. Across all the counties in Louisiana, annual spending on Medicare Parts A and B exceeded expected spending based on the observable characteristics of the counties by $1,350 on average. This excess spending is equal to over 20 percent of the national county level average spending. About 61 percent of Maryland's counties are in the top fifth in the adjusted spending distribution and the statewide average excess spending is 10 percent of the national average. Oklahoma, Texas and Kansas round out states with the top spending with average excess spending of 9.7, 8.4 and 8.9 percent above the national average.

The table's bottom panel shows the low-cost states based on the adjusted distribution. New York, which was not in the group of lowest spending states based on unadjusted Medicare spending, leads the way with 72.6 percent of its counties in the bottom quintile based on the adjusted ranking. On average, county level spending in New York was $697 less than would be

expected based on its counties' observable characteristics. The other four states with the highest percentage of counties in the lowest spending tier are Vermont, New Mexico, Virginia and Iowa and all were also in the lowest tier based on the unadjusted rankings.

Table VIII presents five high- and low-cost states based on a different ranking criterion than used in Table VII. Whereas Table VII ranked the states by the percentage of the counties in the top or bottom tiers of spending, here the states are ranked by the average county excess or savings weighted by the counties' Medicare populations. This means that populous counties now have higher weights than smaller counties. Thus, Oklahoma and Kansas drop out of the top five states in terms of excess spending and are replaced by Nevada and Connecticut. New York drops out of the low-cost states due to the heavy weight of some metropolitan counties that had spending in excess of expected spending based on their retired populations' and health sectors' characteristics.

Louisiana continues to rank as the highest cost state using this ranking procedure. The average excess spending is now $1,102 when the counties' excess spending of savings are weighted by their respective Medicare population. Overall, the spending in excess of the expected amount comes to $468.3 million in Louisiana or 12.8 percent above expected. Average per capita excess spending in Texas is $677 and totals $1,316 million across all the counties in the state. This spending is 8.8 percent higher than the spending that is expected.

An example county from each of the states reported in Table VIII is summarized in Table IX. The counties are selected by their size and whether they have excess spending or savings per capita. Consider Harris County, the home of Houston, Texas. Excess spending was identified as $1,199 per capita based on the model reported in the last column of Table III. Summing across

the 231,309 Medicare beneficiaries in the county indicates that spending is $277.3 million above the expected amount or 16.8 percent higher than is expected.

Policy Options

The regional variation in Medicare spending and its persistence have led to several suggestions on ways to capitalize on the cost savings found in the low-cost areas. Skinner and Fisher, in "Regional Disparities in Medicare Expenditures: An Opportunity for Reform," cite a proposal by Welch and Miller as a one-way move toward the outcomes in the lower cost region.[8] This proposal would cut back reimbursement amounts for medical staffs that go beyond a specified limit of expenditures per enrollee, conditional on the type of medical care provided. They also suggest adopting a reform plan similar to one practiced in parts of Canada. This option would require that each physician have a Unique Physician Identification Number (UPIN) in order to collect Medicare reimbursements. All current physicians would be able to retain their UPINs, but the Health Care Financing Administration (now CMS) would be able to buy UPIN numbers in over-served areas in order to give physicians incentive to retire or move to regions with a shortage of medical staff. Also, new physicians would have to pay a much higher amount to obtain a UPIN in areas with excess supply, while underserved areas might offer free UPINs.

There are several potential problems with this option, including physicians in underserved areas consulting with patients in over-served areas, an increase in the monopoly power of managed care corporations in rural areas and the differences in physician practices,

[8] W. Pete Welch and Mark E. Miller, "Proposals to Control High-Cost Hospital Medical Staffs," *Health Affairs*, Vol. 13, No. 4, fall 1994, pages 42-57.

limiting the potential impact of the conversion. However, they suggest that keeping track of the supply of physicians in various locations could prove helpful in eliminating some of the regional variation in Medicare spending.

Another policy option would place counties on a watch list. Such a policy would assign "probationary status" to counties considered high cost after controlling for observable differences. The probation would restrict Medicare funding in a targeted county. There would be difficult implementation issues in enforcing the county maximum given that total fee for service Medicare spending is a function of the interaction between suppliers and demanders of health care. These implementation issues are byproducts of the single-payer system and could be overcome through market-based alternatives.

The persistence observed in past studies as well as the present study, both over time and after controlling for observable differences in the counties, is most likely a remnant of the way in which reimbursements to providers have been determined historically. Reforms that require competitive bidding for types of beneficiaries based on their risk profiles will cause providers to reveal their true cost of care. Similarly, a proposal that gives the demanders of health care– the retirees–the incentives to seek out lower cost providers, can also affect the observed clusters of high-cost providers. These incentives could work through a restructured insurance package that puts more discretion in spending in the hands of retirees. For example, Health Savings Accounts combined with higher deductible insurance in which the deductible is uniform across the retiree population would give these individuals the incentive to shop for care within their region, and apply pressure to high cost providers to more competitively price their services. Such uniformity in the deductible threshold could also induce retirees to move to lower cost regions.

Another lesson learned from the persistence in the geographic distribution of spending is that practice patterns matter. This point was made by Daniel Feenberg and Jonathan Skinner.[9] They note that intensity of spending may not necessarily lead to better health outcomes. Again, changing the incentives of demanders of health care through a reformed insurance package will provoke changes on both the demand and supply side of the market and will cause the most efficient means of delivering care to emerge regardless of the region.

[9] Daniel Feenberg and Jonathan Skinner, "Federal Medicare Transfers Across States: Winners and Losers."

About the Authors

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Table I

Average Per Capita Fee for Services Medicare Spending
Based on the Counties in the Continental United States
Beneficiaries Who Are 65 Years of Age and Above

Per Capita Spending in 2005
(not weighted by county Medicare Enrollment)

Percentile	County	State	Most Populous City	Amount
5th	Nobles	MN	Worthington	$5,182
25th	Abbeville	SC	Abbeville	5,951
50th	Butte	CA	Chico	6,566
75th	Knox	IN	Vincennes	7,299
95th	Rice	KS	Lyons	8,578
Average				6,693

Per Capita Spending in 2005
(weighted by county Medicare Enrollment)

Percentile	County	State	Most Populous City	Amount
5th	Brown	WI	Green Bay	$5,561
25th	Iron	MO	Ironton	6,303
50th	Lake	FL	Leesburg	7,077
75th	Denton	TX	Denton	7,991
95th	Los Angeles	CA	Los Angeles	9,391
Average				7,208

Table II
Comparing County by County Average Medicare Spending in 1998 to 2005
(number of counties in each cell and the percentage of counties in each row in 1998 in each quintile in 2005)

	Quintile in 2005					
Quintile in 1998	First	Second	Third	Fourth	Fifth	Total
First	352	169	66	26	7	620
	56.77	27.26	10.65	4.19	1.13	100
Second	187	218	151	53	11	620
	30.16	35.16	24.35	8.55	1.77	100
Third	60	162	204	151	43	620
	9.68	26.13	32.90	24.35	6.94	100
Fourth	15	57	166	250	133	621
	2.42	9.18	26.73	40.26	21.42	100
Fifth	6	14	34	140	427	621
	0.97	2.25	5.48	22.54	68.76	100
Total	620	620	621	620	621	3,102
	19.99	19.99	20.02	19.99	20.02	100

Table III
Dependent Variable Is County Average Total Medicare

	Pooled		Fixed county effects		Between		Between with Risk Factors	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
Social Security benefit per retiree	0.219	15.96	1.246	43.36	0.122	4.70	0.082	3.63
SSI benefit per retiree	4.021	24.13	−2.296	−2.81	3.304	10.80	3.380	12.53
Percent Hispanic	12.364	11.80	183.235	11.56	10.397	5.51	3.503	2.10
Percent Black	9.809	9.68	23.278	1.34	6.355	3.45	3.014	1.85
Percent Other	−9.158	−4.41	37.052	1.43	−9.717	−2.60	−5.370	−1.64
Percent Female	58.467	13.58	−26.240	−2.88	84.154	10.46	91.851	13.18
Percent 85 +	−30.400	−7.88	44.562	7.19	−54.774	−7.49	−59.979	−10.05
Average earnings in health care and social assistance	−0.014	−9.03	−0.003	−1.41	−0.012	−4.01	−0.017	−6.79
Health care and social assistance earnings as a percent of all earnings	4.170	1.93	19.967	6.78	0.873	0.21	−2.107	−0.61
Managed Care % of market	18.677	15.50	19.570	6.96	18.834	8.54	9.423	4.95
Adjusted Risk Factor							9935.285	38.44
Constant	896.333	3.66	−6932.440	−10.13	854.868	1.91	1443.076	3.66
Observations	12,408		12,408		12,408		6,204	
R^2 within				0.3678		0.0000		0.0067
R^2 between				0.0043		0.1956		0.4393
R^2 overall		0.1672		0.0092		0.1605		0.3888

Table IV
Dependent Variable Is County Average Medicare Part A

	Pooled		Fixed county effects		Between		Between with Risk Factors	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
Social Security benefit per retiree	0.087	10.14	0.450	21.38	0.052	3.25	0.025	1.68
SSI benefit per retiree	2.396	22.99	−1.406	−2.35	2.140	11.23	2.180	12.21
Percent Hispanic	1.265	1.93	48.574	4.18	0.579	0.49	−4.138	−3.74
Percent Black	2.598	4.10	3.966	0.31	1.180	1.03	0.159	0.15
Percent Other	−5.074	−3.90	−22.923	−1.21	−5.161	−2.21	−2.999	−1.38
Percent Female	52.185	19.39	−7.707	−1.15	63.128	12.59	67.621	14.66
Percent 85 +	−19.444	−8.06	13.046	2.87	−28.949	−6.35	−33.496	−8.48
Average earnings in health care and social assistance	−0.010	−10.22	−0.002	−1.36	−0.010	−5.16	−0.012	−7.51
Health care and social assistance earnings as a percent of all earnings	2.735	2.03	13.401	6.21	0.938	0.37	−0.314	−0.14
Managed Care % of market	12.889	17.10	15.955	7.74	12.907	9.40	8.255	6.55
Adjusted Risk Factor							5394.140	31.53
Constant	−251.122	−1.64	−1319.006	−2.63	−339.301	−1.22	−4.396	−0.02
Observations	12,408		12,408		12,408		6,204	
R^2 within				0.1275		0.0006		0.0084
R^2 between				0.0025		0.1915		0.3749
R^2 overall		0.1578		0.0005		0.1552		0.3234

Table V
Dependent Variable Is County Average Medicare Part B

	Pooled		Fixed county effects		Between		Between with Risk Factors	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
Social Security benefit per retiree	0.132	20.19	0.795	64.11	0.069	5.71	0.057	5.24
SSI benefit per retiree	1.625	20.48	−0.891	−2.53	1.164	8.11	1.200	9.27
Percent Hispanic	11.099	22.25	134.660	19.67	9.817	11.08	7.641	9.53
Percent Black	7.211	14.93	19.312	2.58	5.175	5.99	2.855	3.66
Percent Other	−4.083	−4.12	59.974	5.37	−4.556	−2.60	−2.371	−1.51
Percent Female	6.282	3.06	−18.534	−4.71	21.026	5.57	24.230	7.24
Percent 85 +	−10.956	−5.96	31.517	11.78	−25.825	−7.52	−26.483	−9.24
Average earnings in health care and social assistance	−0.004	−5.54	−0.001	−0.96	−0.002	−1.69	−0.005	−3.78
Health care and social assistance earnings as a percent of all earnings	1.435	1.40	6.566	5.16	−0.065	−0.03	−1.793	−1.07
Managed Care % of market	5.787	10.08	3.614	2.98	5.927	5.73	1.168	1.28
Adjusted Risk Factor							4541.145	36.59
Constant	1147.455	9.85	−5613.434	−18.99	1194.169	5.68	1447.472	7.65
Observations	12,408		12,408		12,408		6,204	
R^2 within				0.5619		0.0245		0.0012
R^2 between				0.0350		0.1739		0.4047
R^2 overall		0.1544		0.0444		0.1431		0.3683

Table VI
Percentage of Counties in the Top and Bottom Quintiles of Spending
Before and After Adjusting for Observable County Differences

	Parts A&B		Part A		Part B		County
High-Cost States	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Number
New Jersey	95.2	23.8	76.2	23.8	100.0	33.3	21
Maryland	87.0	60.9	73.9	56.5	87.0	47.8	23
Louisiana	82.8	68.8	75.0	64.1	84.4	78.1	64
Massachusetts	64.3	42.9	57.1	35.7	64.3	21.4	14
Texas	55.5	51.6	37.4	44.5	68.1	53.5	254
Mississippi	47.6	45.1	53.7	47.6	28.0	35.4	82
Florida	46.3	17.9	19.4	1.5	71.6	47.8	67
Oklahoma	45.5	55.8	44.2	55.8	32.5	35.1	77
Connecticut	37.5	25.0	37.5	37.5	50.0	25.0	8
Kansas	35.2	45.7	29.5	40.0	34.3	40.0	105

	Parts A&B		Part A		Part B		County
Low-Cost States	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Number
Vermont	78.6	71.4	92.9	71.4	42.9	0.0	14
Idaho	61.4	22.7	68.2	27.3	50.0	13.6	44
New Mexico	60.6	66.7	66.7	69.7	57.6	66.7	33
South Dakota	59.1	25.8	50.0	25.8	60.6	15.2	66
Oregon	55.6	33.3	50.0	36.1	44.4	19.4	36
Iowa	55.6	44.4	54.5	49.5	48.5	24.2	99
North Dakota	47.2	17.0	47.2	24.5	41.5	17.0	53
Virginia	46.6	61.1	48.1	49.6	48.1	59.5	131
Utah	44.8	13.8	55.2	17.2	34.5	10.3	29
Wyoming	43.5	4.3	47.8	17.4	26.1	13.0	23

Table VII
Summary of High- and Low-Cost States
After Adjusting for Observable County Differences

High-Cost States	% of Counties in the Top Quintile	State Average Excess across All Counties*	State Average Excess Spending as a % of the National Average
Louisiana	68.8	1,350	20.2
Maryland	60.9	675	10.1
Oklahoma	55.8	648	9.7
Texas	51.6	564	8.4
Kansas	45.7	596	8.1

Low-Cost States	% of Counties in the Bottom Quintile	State Average Savings across All Counties*	State Average Savings as a % of the National Average
New York	72.6	697	10.4
Vermont	71.4	682	10.2
New Mexico	66.7	892	13.3
Virginia	61.1	619	9.3
Iowa	44.4	493	7.4

*The adjusted ranks are based on the individual component of the error term from the last regression reported in Table III. The state average excess or savings is equal to $\sum \mu_{ij}/N_j$ where μ_{ij} is the individual component of the error term for county *i* in state *j* and N_j is the number of counties in the state.

Table VIII
Summary of High- and Low-Cost States
After Adjusting for Observable County Differences

High- and low-cost states determined by the state's weighted average excess or savings across all counties in the state

High-Cost States	Weighted State Average Excess across All Counties*	Total State Excess across All Counties	Total State Excess Spending as a % of Expected State Spending
Louisiana	$1,102	$468.3 mil	12.8
Maryland	952	471.8 mil	11.6
Nevada	921	152.0 mil	12.5
Texas	677	1,316.8 mil	8.8
Connecticut	627	265.9 mil	8.1

Low-Cost States	Weighted State Average Savings across All Counties*	Total State Savings across All Counties	Total State Savings as a % of Expected State Spending
New Mexico	$928	$164.0 mil	16.6
Vermont	636	50.4 mil	11.5
Rhode Island	597	51.9 mil	8.2
Iowa	594	238.6 mil	10.3
Virginia	574	449.2 mil	9.5

* The adjusted ranks are based on the individual component of the error term from the last regression reported in Table III. The state average excess or savings is equal to $\sum \mu_{ij} * n_{ij} / \sum n_{ij}$ where μ_{ij} is the individual component of the error term for county *i* in state *j* and n_{ij} is the number beneficiaries in county *i* in state *j*.

Table IX
Example Counties in High- and Low-Cost States
After Adjusting for Observable County Differences

High- and low-cost states determined by the state's weighted average excess or savings across all counties in the state

High-Cost States	Example Large County and City with Excess Spending	Per Capita Excess Spending	County Excess Spending	Excess Spending as a % of Expected County Spending	Medicare Population
Louisiana	Caddo – Shreveport	$1,197	$38.4 mil	17.0	32,047
Maryland	Baltimore – Baltimore	1,440	141.7 mil	19.2	98,444
Nevada	Clark – Las Vegas	1,194	122.6 mil	17.5	102,665
Texas	Harris – Houston	1,199	277.3 mil	16.8	231,309
Connecticut	New Haven – New Haven	1,071	20.6 mil	14.6	114,792

Low-Cost States	Example Large County and City with Savings	Per Capita Savings	County Savings	Savings as a % of Expected County Spending	Medicare Population
New Mexico	Bernalillo – Albuquerque	$1,015	$39.4 mil	16.1	38,822
Vermont	Chittenden – Burlington	891	13.4 mil	14.9	15,043
Rhode Island	Providence – Providence	566	26.3 mil	7.2	46,620
Iowa	Polk – Des Moines	1,026	41.7 mil	15.7	40,646
Virginia	Virginia Beach City – Virginia Beach	794	30.8 mil	11.2	38,786

Data Appendix

The data used in this paper come from a combination of sources, including the Centers for Medicare and Medicaid Services (CMS), the Social Security Administration, the Bureau of Economic Analysis (BEA) and the Census Bureau. Data from CMS is available for the years 1998-2005, Social Security data is available from 1999-2006 (excluding year 2001), BEA data is available from 2001-2005, and Census data is available from 1990-2006. Therefore, after integrating these three sources, the time period for the combined data set spans the years 1999-2000 and 2002-2005. The analysis in this paper uses data solely at the county level, and is focused on the continental United States due to the relatively small amount of data available in Alaska and Hawaii. Medicare enrollment and reimbursement figures, Social Security benefits, and population estimates are included for each county over the specified time period.

Medicare fee-for-service data, obtained through CMS, contains hospital and supplementary medical insurance data for all people age 65 or above. This includes per capita reimbursement figures and total enrollment and reimbursement records by county for both Part A and Part B. This information was used to create county-level maps detailing the total per capita Medicare benefits received and the percentage change in per capita spending between 1998 and 2005.

Per capita Social Security benefits at the county level were calculated using data from *OASDI Beneficiaries by State and County*, a resource published annually by the Social Security Administration. These benefits were determined using the amount of benefits and the number of beneficiaries reported for men and women aged 65 or above. Total reimbursements received by the elderly, including both Medicare and Social Security benefits, were then calculated.

County population estimates and demographic characteristics were acquired using the Census Bureau's Population Estimates Program data for the years 2000-2006. Each county's population is broken down into 5-year increments until age 85, when the total over that age is reported, allowing for specific population estimates to be obtained within varying age groups. The data also includes figures for sex, racial composition and Hispanic origin by age group, providing a control for demographic characteristics in each county.

State- and county-level earnings by industry for 2001-2005 were obtained using the Bureau of Economic Analysis Regional Accounts data. Since a few counties had missing values, state level earnings were used to impute these missing figures. The health care industry totals include data on ambulatory services, hospitals, nursing and residential care facilities and social assistance, categories that are based on the North American Industry Classification System (NAICS).

Figure I
Nominal Growth Rates between 1998 and 2005 at Different Points in the Distribution

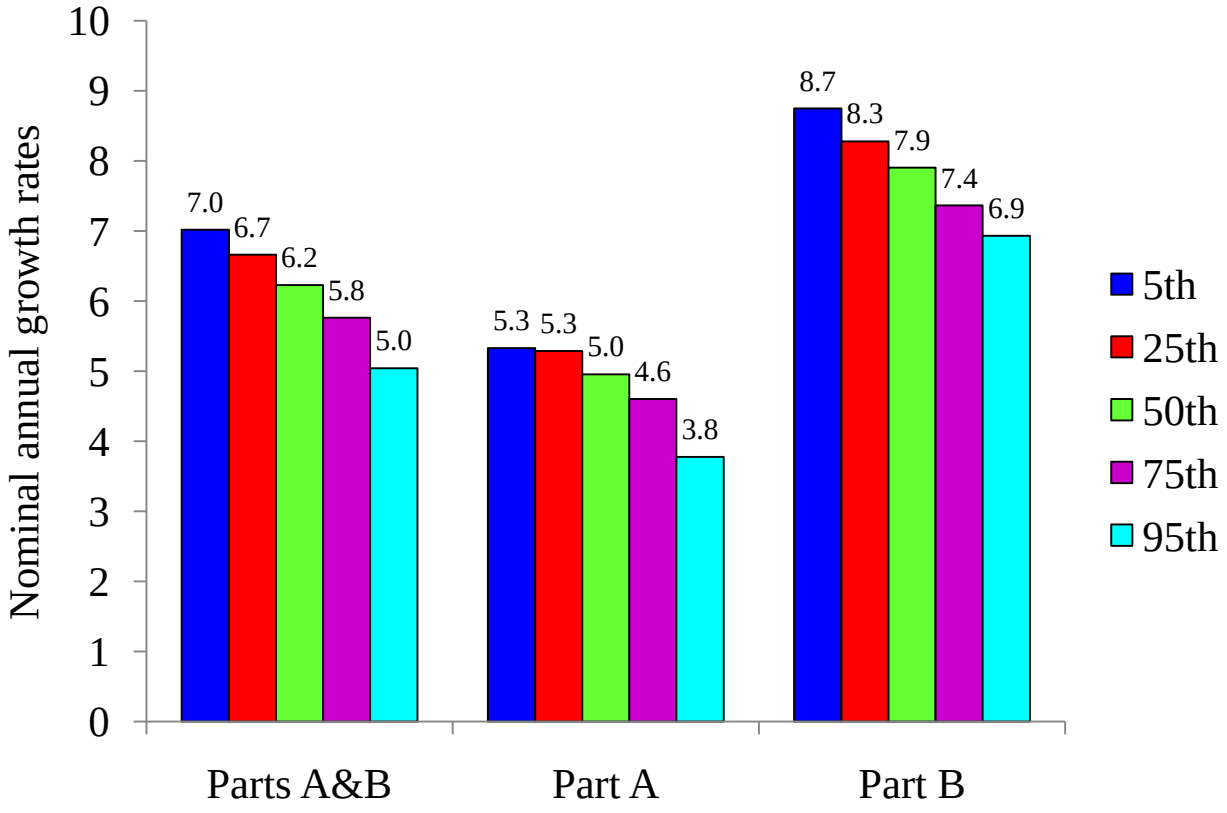

Figure II
Average Medicare Parts A&B Spending in 2005

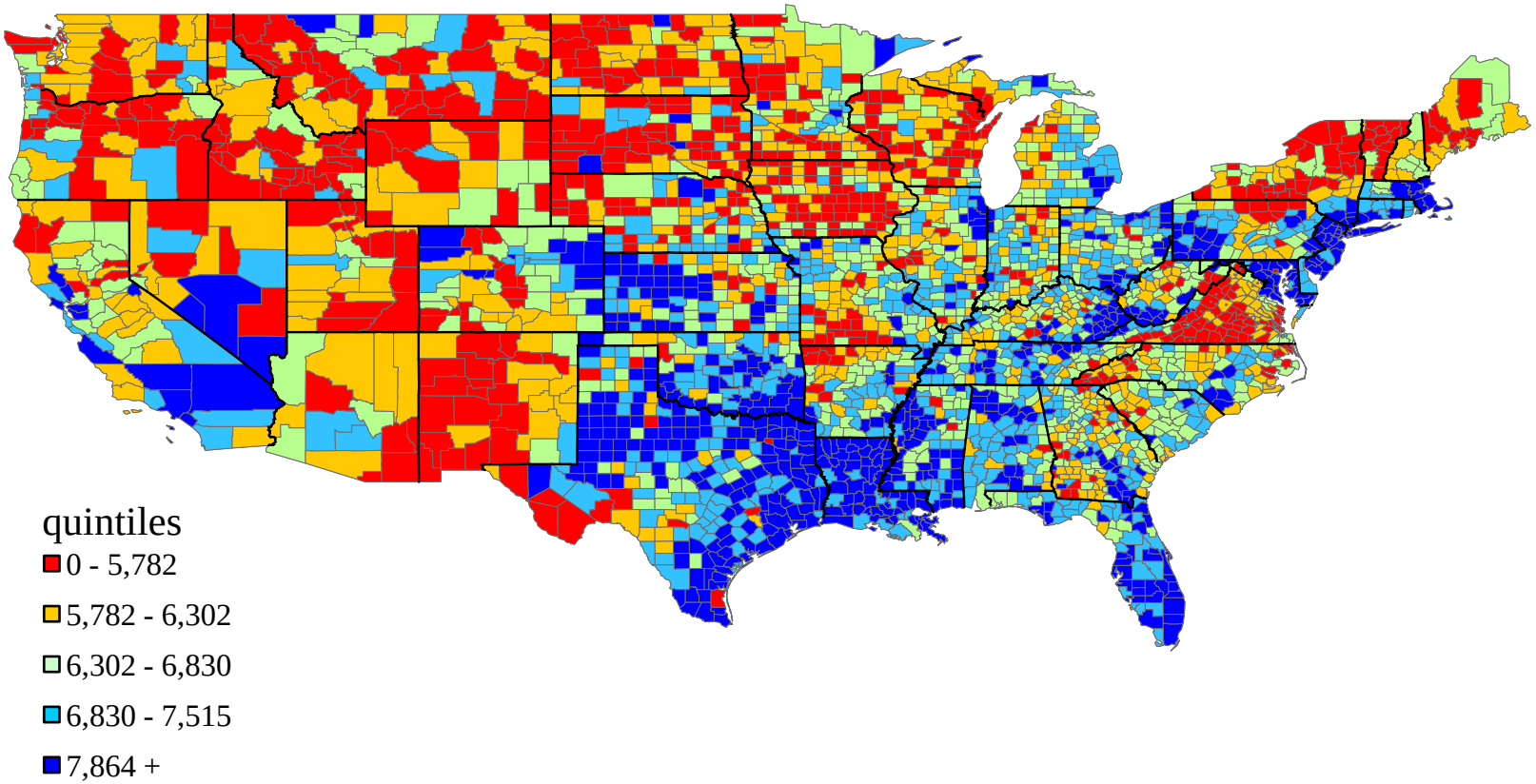

Figure III
Distribution in Parts A&B Spending Not Attributable to Observed Factors in 2005

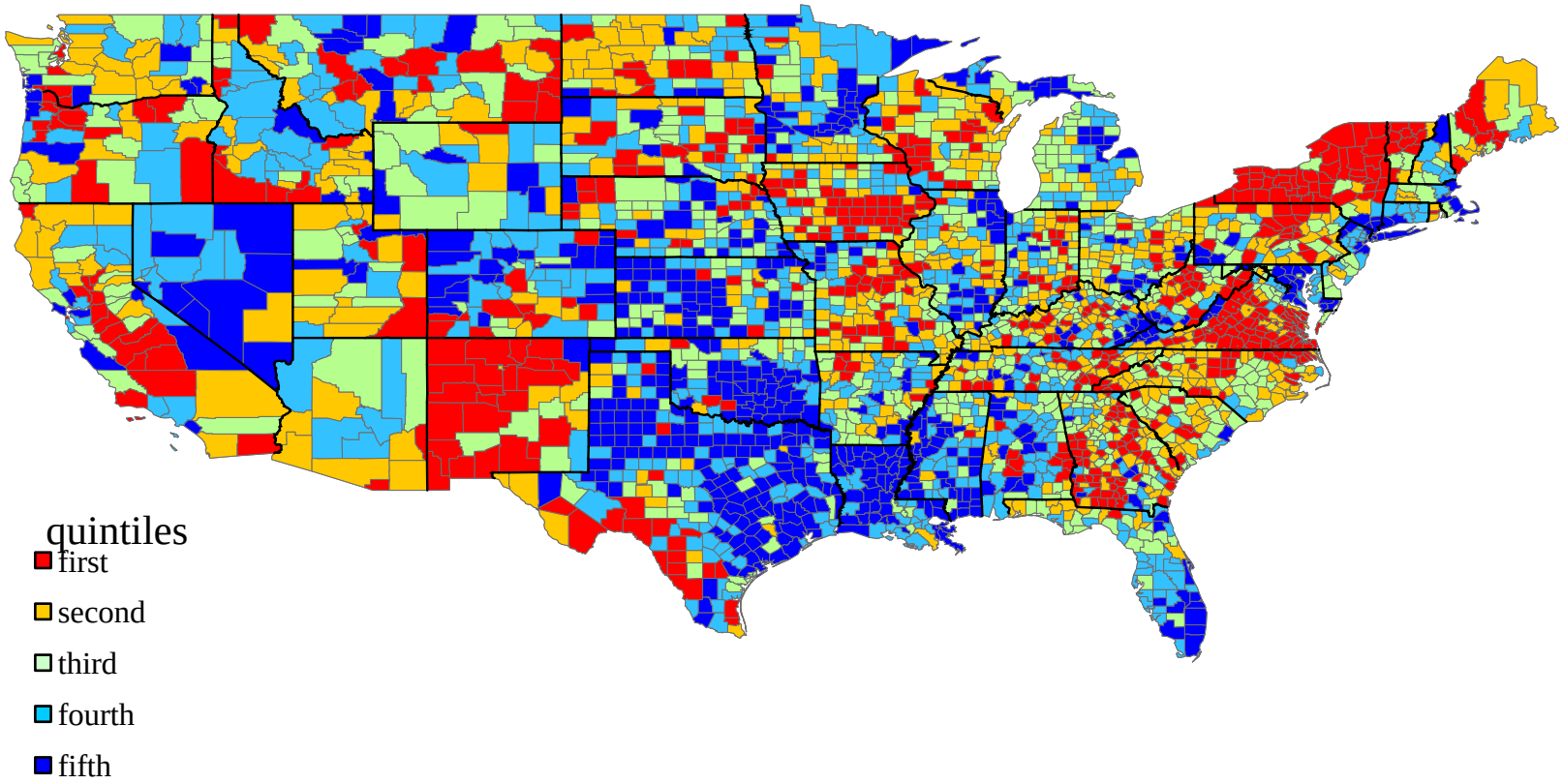

Figure IV
Average Medicare Part A Spending in 2005

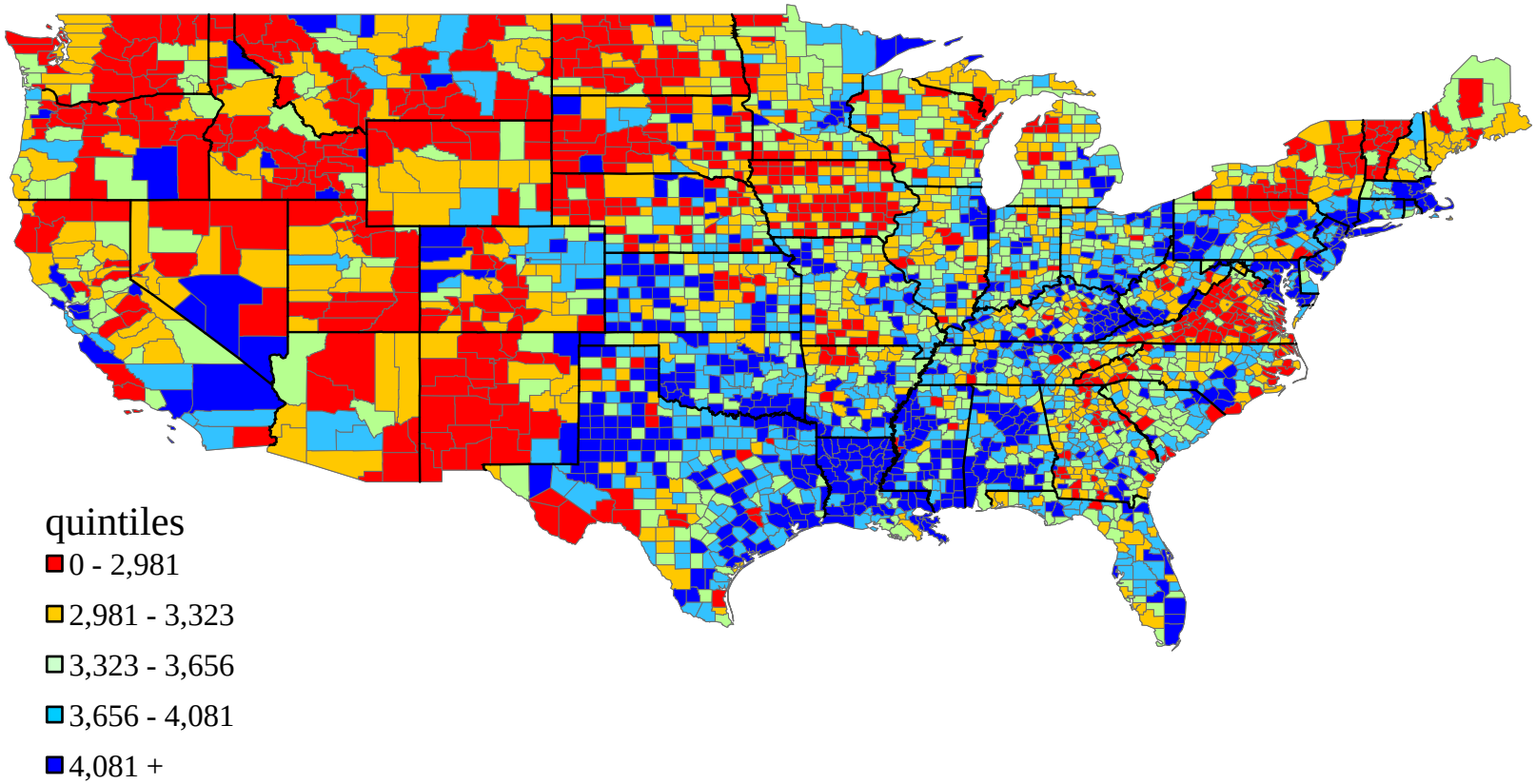

Figure V
Distribution in Part A Spending Not Attributable to Observed Factors in 2005

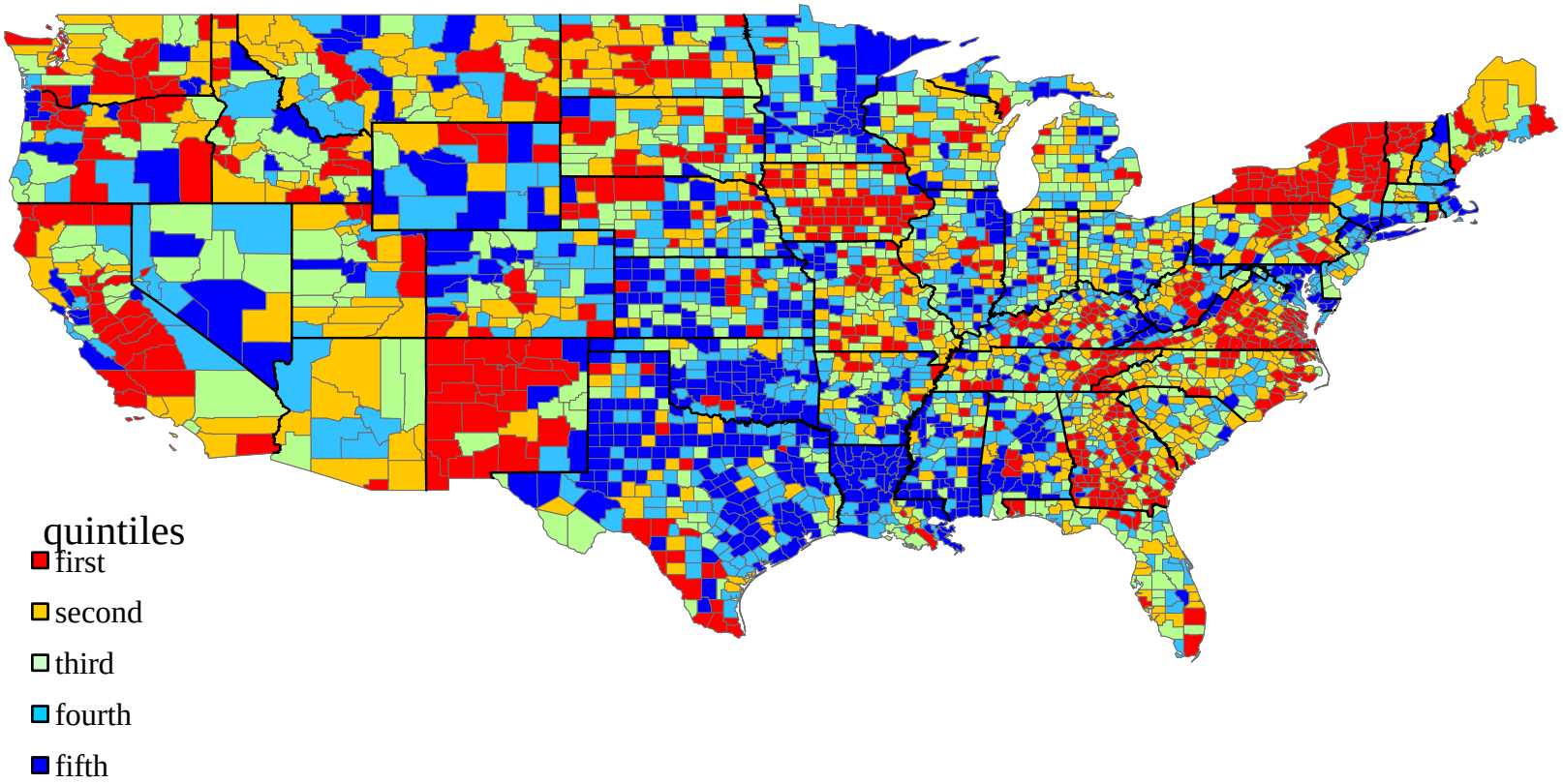

Figure VI
Average Medicare Part B Spending in 2005

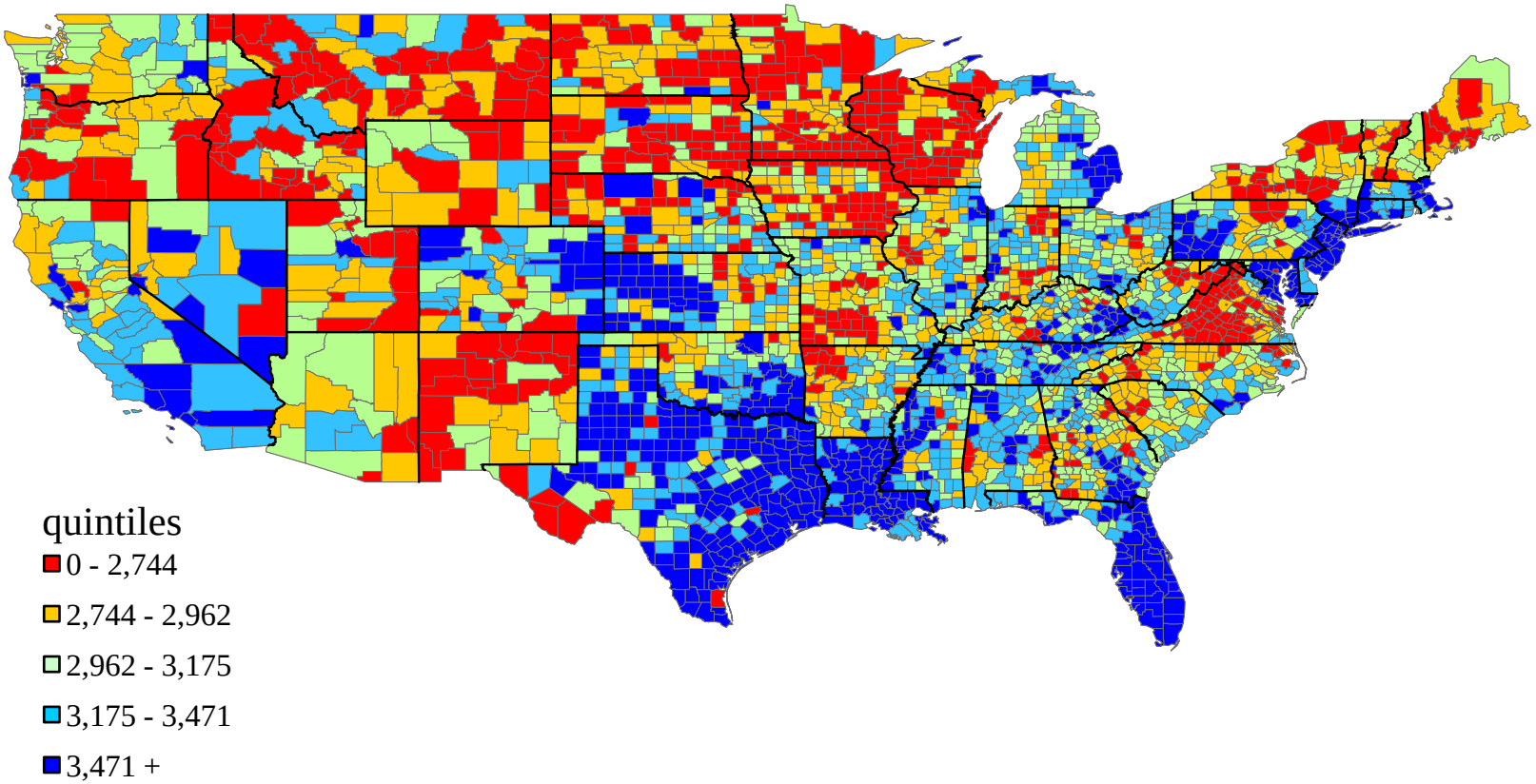

Figure VII
Distribution in Part B Spending
Not Attributable to Observed Factors in 2005