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ABSTRACT

Evidence of regional variation in health care utilization has been well-documented over the past 40 years. Yet uncertainty persists about whether this variation is primarily the result of supply-side or demand-side forces, and the difference matters for both theory and policy. In this article, we provide new evidence as to the cause of geographic variation in health care utilization. We do so by examining changes in health care use by the near-elderly as they transition from being uninsured into Medicare. Results provide support for a causal supply-side explanation of regional variation. Estimates indicate that gaining Medicare coverage in above-median spending regions increases the probability of at least one hospital visit by 36% and the probability of having more than five doctor visits by 25% relative to similar individuals in below-median spending regions.

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1. Introduction

Geographic variation in medical spending and utilization is one of the more widely documented characteristics of the U.S. health care system (Wennberg and Gitteslohn, 1973; Dartmouth Atlas of Health Care Working Group, 1996; Fisher et al., 2003a; Fisher et al., 2003b). For example, the average, per-capita difference in Medicare expenditures between the highest and lowest spending U.S. counties is greater than 100% (Skinner and Fisher, 2010; Cubanski et al., 2015). Despite extensive research, there remains a large degree of uncertainty surrounding the causes of geographic variation in health care spending and use (IOM, 2013). While the group associated with the Dartmouth Atlas of Health Care contend that the predominant source of the variation is supply-sensitive care driven by provider preferences with respect to treatment (Skinner and Fisher, 2010; Skinner, 2011), others have argued that differences in population health, income, and other socioeconomic factors explain much of the variation (Zuckerman et al., 2010; Reschovsky et al., 2013; Sheiner, 2014; Cubanski et al., 2015; Finkelstein et al., 2016).

Differentiating between supply- and demand-side explanations of geographic variation in health care spending and use has significant implications for both theory and health policy. If driven by demand-side factors, such as regional differences in health and socioeconomic status, then the observed variation is arguably clinically justified and, therefore, not necessarily indicative of inefficiency in the provision of care. On the other hand, if regional variation in spending results from provider preferences and the use of care that is not clinically motivated, then this is evidence of a market failure and justification for government policies aimed at improving the efficiency of care, such as the accountable care organizations that have been encouraged by the Affordable Care Act.

In this article, we provide new evidence on the source of geographic variation in Medicare spending. To do so, we exploit the shift in demand for health care that occurs when a person who is uninsured reaches age 65 and obtains insurance coverage through Medicare. Specifically, we examine whether the change in health care use associated with gaining insurance coverage depends on the level of Medicare spending in an individual's region of residence. An appealing feature of our research design is its reliance on an exogenous change in health insurance coverage to causally identify the role of supply-side factors in geographic variation in health care utilization. Furthermore, the intuition underlying our approach is consistent with a model of physician behavior, from which we derive testable empirical

predictions (McGuire, 2000). In that model, which we describe below, the previously uninsured who gain Medicare coverage experience larger increases in the use of health care services in markets where providers have greater market power (i.e., greater ability to induce demand). This suggests that if regional variation is caused by supply-side factors, then, for similar uninsured persons, the increase in health care use associated with obtaining Medicare will be larger for those living in high-spending areas compared to those living in low-spending areas. In other words, the availability of insurance allows for inducement of care by providers and this inducement will be larger in areas where supply-side influences are strong. Alternatively, if the variation in Medicare spending is mostly due to demand-side factors, then, for similar uninsured persons, the increase in health care use associated with aging-in to Medicare will be similar for those in high- and low-spending areas.

We test this model using data from the Health and Retirement Study (HRS) spanning the years from 1992 to 2014. The longitudinal nature of the data allows us to observe within-person changes in health care use associated with gaining Medicare eligibility at age 65. To determine the extent to which supply-side factors influence these changes, we compare previously-uninsured individuals living in hospital-referral regions (HRRs) with high levels of per-capita Medicare spending to those living in HRRs with low levels of per-capita Medicare spending.[1]

Our article is one of only a few studies to leverage a theoretically-driven research design that returns plausibly causal estimates of the source of geographic variation in health care use (others include Chandra and Staiger, 2007; Song et al., 2010; Finkelstein et al., 2016; Molitor 2018). Moreover, our identification strategy is novel, and avoids many of the potential concerns with previous studies. For example, the recent and widely cited work by Finkelstein et al., (2016) examined changes in the use of health care services for Medicare beneficiaries who moved across HRRs that varied in average spending levels. They concluded that supply- and demand-side factors contributed roughly equally to these changes. However, the "movers" approach has two important limitations. First, movers differ from non-movers in systematic ways, which may limit external validity. Second, the decision to move and the destination of the move may be related to changes in individual health, which could bias estimates. In contrast, we avoid these

[1] HRRs are defined by aggregating hospital service areas into groups that contain the primary referral hospital for major cardiovascular and neurological procedures. They are designed to represent approximately closed systems of medical care. For more detail, see http://www.dartmouthatlas.org/downloads/methods/geogappdx.pdf

concerns by employing an empirical strategy that relies on a change in an individual's' insurance coverage (turning 65 and becoming eligible for Medicare) that is clearly exogenous to individual health status.

We find that, for the previously uninsured, the increase in health care use associated with gaining Medicare coverage is significantly greater in high- versus low-spending HRRs; evidence that is consistent with a supply-side explanation of geographic variation. Our estimates indicate that gaining Medicare coverage in an HRR with above-median levels of Medicare spending increases the probability of a hospital visit in the past two years by 40%, the probability of having five or more doctor visits in the past two years by 26%, and the probability of having ten or more doctor visits in the past two years by 23% compared to gaining coverage in an HRR with below-median spending. If we assume that these differences in hospital and doctor visits by spending region are applicable to all types of health care services, then they can account for a large share of the difference in total Medicare spending between above-median spending and below-median spending HRRs. In addition, we estimate a variety of model specifications and falsification tests that lend support to the credibility of our research design and provide evidence that the relationship between regional spending and health care use is not a function of differences in the underlying health status of the uninsured or other demand-side factors.

2. We Still do not Know what Explains Regional Variation in Health Care Spending

There remains substantial uncertainty surrounding the causes of geographic variation in health care spending and use. Part of the explanation for this lack of consensus is undoubtedly the difficulty of the empirical problem. To differentiate between demand- and supply-side explanations of geographic variation requires addressing the empirical issue of reverse causality. For example, it is difficult to measure provider beliefs about the efficacy of treatment and, even if these beliefs were measured, it is difficult to identify the influence of these beliefs separately from potential differences in patient characteristics or other factors that influence the amount of services provided to patients. Next, we review some of the most important literature in this area.

2.a. Studies Examining Demand-Side Factors

Studies attempting to identify the role of demand-side factors typically follow an approach that is based on a regression analysis of Medicare spending that adjusts sequentially for covariates, such as race, income and health. Results from these studies suggest that between 35% and 85% of total spending variation is demand-driven (Sutherland et al., 2009; Zuckerman et al.,

2010; Rechovsky et al., 2013; Sheiner 2014). However, a limitation of this approach is the inclusion of measures of health among the covariates that are likely endogenous, meaning that the information reported in these studies is mainly descriptive and its usefulness in terms of explaining causal mechanisms is limited.

In contrast, Finkelstein et al., (2016) took a different approach to estimating the contributions of demand- and supply-side forces in explaining regional variations in health care use. They focused on Medicare patients who moved from lower-spending to higher-spending HRRs (and vice versa) and examined associated changes in utilization. Evidence of supply-side causes of variation would become apparent when an individual's average utilization conformed to that of the destination region. Results suggested that demand-side factors accounted for approximately half of the regional variation in utilization, which is broadly consistent with the conclusions from some of the studies noted above.

However, both the internal and external validity of the "movers" research design depend on relatively strong assumptions (Gallagher et al., 2018). First, the external validity of this approach relies on movers being representative of the broader population, but movers and non-movers differ in observable ways that are related to the demand for care. Finkelstein et al. (2016) noted that, among their sample constructed using Medicare claims data, "… movers are slightly more likely to be female, white, and older and more likely to live in initially the South or West, rather than the Midwest or Northeast" (pg. 1699). In the data used for this study, we confirm these findings and show that movers are also are more likely to have graduated college, less likely to be married, and less likely to be employed.[2] While baseline self-reported health between movers and non-movers appears to be similar, movers are more likely to have been admitted to the hospital in the past two years, to have had multiple hospital visits, to have reported a physician visit, and to have had at least five physician visits in the past two years. Finally, movers are more likely to have been diagnosed with a health condition in the period preceding their move than those who remained in the same HRR. All of these differences suggest that external validity of results obtained comparing movers to non-movers may be limited.

[2] We present differences in baseline characteristics, including health care use, for a sample of movers and non-movers taken from the Health and Retirement Study (HRS) in Appendix Table 1. Finkelstein et al. (2016) also compare a more limited set of characteristics of movers and non-movers using the HRS and report similar findings.

Perhaps more importantly, the internal validity of the movers approach depends on the timing of the move being unrelated to a change in health status, so that moves coinciding with a health shock would be problematic for research design.[3] To provide some evidence on the likelihood of this assumption holding, we selected a sample of movers and compared baseline charcateristics of movers experiencing a relatively large increase in average HRR Medicare spending between their origin and destination region to movers experiencing a relatively large decrease in average HRR Medicare spending between their origin and destination region. Results are presented in Appendix Table 2. Compared to those moving to lower spending regions, those moving to HRRs that are above median spending are younger, more likely to be white, and more likely to have graduated college. Movers to higher spending regions are also more likely to be in fair or poor health in the period before the move. These differences suggest that the type of move may be endogenous, which may bias estimates from this approach.

2.b. Studies Examining Supply-Side Factors

Chandra and Staiger (2007) proposed a novel supply-side explanation based on a model of comparative advantage in provider choice of treatment. In their model, specialization and productivity spillovers from treating patients with high-intensity care lead to greater use of such procedures due to both decreased costs of performing them and increased benefits among more appropriate patients. While the authors found evidence that provider specialization and productivity spillovers contributed to regional variation in health care use, the study focused on a single, relatively complex condition (AMI). In fact, geographic variation is widespread across even routine forms of care that have little scope for productivity differences (Krumholz et al., 1999). Therefore, the ability of the productivity spillover theory to explain the full extent of the observed variation in resource use appears limited.

Differences in financial incentives have also been cited as an explanation for geographic variation in spending and health care use. However, Medicare administers prices that are intended to be geographically uniform after adjustment for cost differences. While this fact may suggest that financial incentives do not seem a likely explanation in our context, cost adjustment that doesn't accurately reflect variation in provider costs may result in relative differences in the

[3] Finkelstein et al. (2016) include controls for years relative to the move, which can account for changes in health status leading up to a move. However, as the authors note, "we cannot allow for shocks to utilization that coincide exactly with the timing of the move and that are correlated with utilization in the origin and destination" (pg. 1692).

net profitability of different procedures and, thus, regional utilization differences (e.g., Clemens and Gottlieb 2014). It is unknown whether this explanation can explain much of the variation in utilization across regions, and this explanation does not explain significant differences within region.

In the seminal 1973 study “Small Area Variations in Health Care Delivery" Wennberg and Gittelsohn (1973) documented a strong correlation between the incidence of common diagnostic and surgical procedures and the number of relevant health care providers but a lack of correlation between this utilization and population-level health characteristics like age-adjusted mortality. This paper popularized the “supply-sensitive care" hypothesis, which posits that the use of resources is causally related to their relative abundance (e.g., Wennberg, 2005; Freedman 2016). Many additional analyses have confirmed this positive correlation, but it is not clear that these associations are causal (Fuchs and Kramer, 1972; Fuchs, 1978; Ginsburg and Koretz, 1983). Demand may be the cause of greater supply.

A related hypothesis is that regional variation in utilization is driven by differences in beliefs over the efficacy or appropriateness of treatment. Such differences in beliefs may explain the association that underlies the supply-sensitive care hypothesis. Molitor (2018) used cardiologist relocation across health care regions to identify the effect of place on physician practice. He estimated that the difference between a cardiologist’s two-day catheterization rate for AMI patients and the rate that prevails in the provider’s new region is reduced by two-thirds soon after a move, with no further convergence over time. While this study documented clear evidence of regional differences in treatment practices, these may still be related to differences in patient characteristics and, as this work uses a “movers” approach among providers, these results too may be affected by potentially endogenous provider moves.

Recent work by Agha, Frandsen, and Rebitzer (2017) is motivated by a model where differences in market power induce differing levels of "fragmented care" across markets, which generates utilization differences. They tested their hypothesis by regressing changes in utilization among Medicare movers (as in Finklestein, Gentzkow, and Williams, 2016) on a measure of ownership concentration at the Hospital Service Area level. They estimated that a one standard deviation increase in their fragmentation index is associated with a 10% increase in utilization, which they suggested can account for up to 30% of Medicare spending variation.

2.c. Summary

The upshot of this brief review is that we still do not definitively know what causes geographic variation in Medicare spending. In this article, we make progress on this issue by exploiting a plausibly exogenous change in the demand for health care to identify supply side influences on geographic variation. Specifically, we estimate differences in health care use for those aging into the Medicare program in both high- and low-spending regions. While we cannot identify the exact supply-side mechanism that influences the variation in care, our analysis provides credible evidence of its existence and potential importance.

3. A Model of Supply-Side Driven Geographic Variation in Health Care

As described above, researchers have documented substantial geographic variation in the use of services among Medicare beneficiaries. A plausible hypothesis is that observed geographic variation is due to differences in the extent of provider ability to induce demand across markets.

Our empirical analysis is motivated by the model of physician services described in McGuire (2000). According to this framework, differences in the extent of market power—which is the ability to induce demand—across geographic regions will lead to differences in the use of health care services. An appealing feature of this model is that it relies on relatively weak assumptions to generate supplier-induced demand: imperfect competition amongst providers, completely informed consumers, and the fact that health care services cannot be resold by the patient in a secondary market ("nonretradability"). Furthermore, the various supply-side explanations for regional variation in Medicare spending, for example, supply-sensitive care caused by physician disagreement over the health production function, fit into this model because they are sources of provider ability to induce demand, or what McGuire (2000) refers to as market power.

In the McGuire (2000) model, consumers value income (y) and medical care (x) and their utility (U) function is:

(1) $U = U[y + B(x)]$

In equation (1), *B(x)* is the total dollar value (surplus) of the true benefit of medical care (x), and $b(x) = \frac{\partial B}{\partial x} > 0$ is the marginal benefit of (i.e. willingness to pay for) additional services provided to the patient. The marginal benefit is positive, but declining in the amount of services received.

The provider's profit (π) is:

(2) $\pi = px - cx$

where *p* is the price of services and *c* is the unit cost of *x*, which is assumed to be constant. The provider also faces a market constraint, which is the patient's outside option of consumer surplus, denoted by *NB*. So long as the proposed treatment of the provider delivers consumer surplus greater than or equal to the surplus provided by the patient's outside option, the patient will accept the proposed treatment owing to the nonretradibility of the service. *NB* measures the extent of market power—a smaller *NB* indicates fewer outside options for the patient and, therefore, greater ability to induce demand for the provider. In our context, the hypothesis is that regional differences in the extent of provider market power are the source of variation in the quantity of services observed across geographic areas.

To derive our hypothesis, we begin by analyzing provider decisions with respect to consumers who are uninsured and under age 65 (i.e. not eligible for Medicare) denoted by the use of the subscript "y". For this group, the provider's objective is to choose price and quantity to maximize profits subject to the consumer's outside constraint. This problem is given by the following:

(3) $L = p_y x_y - c x_y + \lambda\left[B(x_y) - p_y x_y - NB_y\right]$

In equation (3), the provider's constraint is the difference between the total surplus generated from service provision, and the sum of the price paid by the consumer (*px*) and the patient's outside alternative (NB_y). The provider's choices are summarized by the following first order conditions:

(4) $L_p = x_y - \lambda x_y = 0, \quad \lambda = 1$

(5) $L_x = p_y - c + \lambda b(x_y) - \lambda p_y = 0$

(6) $L_\lambda = B(x_y) - p_y x_y - NB_y = 0$

(7) $b(x_y) = c$

As equation (7) indicates, the provider chooses the quantity of service provision so that the marginal benefit is equal to the marginal cost (in this case the competitive market equilibrium). Given this quantity, the provider then chooses a price to provide the consumer with at least the value of their outside option. Rearranging equation (6) provides the following expression for the provider's optimal price to the uninsured:

(8) $p_y = \frac{B(x_y) - NB_y}{x_y}$

Equation (8) shows that the provider selects price conditional on the optimal quantity of service provision and the extent of market power. Since health care services are nonretradable and the provider can choose both price and quantity, equation (8) suggests that the provider can set a price that extracts all consumer surplus subject to the patient's outside alternative (NB_y) Therefore, the patient is off their demand curve and is forced to pay a price above their willingness to pay. An important prediction of this model is that conditional on costs, the quantity of services does not differ across markets even when there are differences in market power. In other words, differences in market power affect only prices—not quantities. This prediction is broadly consistent with recent empirical work finding that price variation, not variation in utilization, is the primary driver of spending differences among the privately insured across HRRs (Newhouse et al., 2013; Cooper et al., 2015).

Next, we examine provider choices when a consumer is age 65 or older and has Medicare coverage. We use the subscript "m" to refer to this group. In this case, the consumer has health insurance, which we represent by a coinsurance rate ($\theta_m<1$), and the price is administratively set ($p>c$). Therefore, the provider's only choice is quantity and the objective function is given by:

(9) $L = p_m x_m - c x_m + \lambda[B(x_m) - \theta_m p_m x_m - NB_m]$

Maximization of equation (9) generates the following first order conditions:

(10) $L_x = p_m - c + \lambda[b(x) - \theta_m p_m] = 0$

(11) $L_\lambda = B(x) - \theta_m p_m x_m - NB_m = 0$

Rearranging equation (11) provides an expression for the provider's optimal quantity of service provision to Medicare patients:

(12) $x_m = \frac{B(x_m) - NB_m}{\theta_m p_m}$

Equation (12), allows for the possibility that the outside alternative for the patient may differ between the Medicare market and the private market. Given that the price and generosity of insurance are administratively set and that the provider must meet the consumer constraint, the only margin along which the provider may exercise market power is quantity. Note that the optimal quantity is always at a level where $b(x) < \theta_m p_m$ because $p>c$ and $\lambda > 0$. The provider makes a profit on each unit and will meet the consumer's outside option by increasing quantity. The consumer is off their benefit (demand) curve and consumer surplus is reduced by increasing quantity. As indicated in equation (12), the provider chooses quantity conditional on price,

generosity of insurance and the outside alternative. All else equal, a lower administrative price will increase quantity.

In this model, the quantity of services provided to Medicare patients will vary across markets only because of differences in market power (ability to induce demand) because Medicare prices (conditional on costs) and generosity do not vary across markets. Consider two regions (r = 1,2) that differ with respect to market power where providers in area 1 have greater ability to induce demand than providers in area 2 ($NB_{m1} < NB_{m2}$). The quantities chosen by providers in these two markets are:

(13) $$x_{m1} = \frac{B(x_{m1}) - NB_{m1}}{\theta_m p_m}$$

(14) $$x_{m2} = \frac{B(x_{m2}) - NB_{m2}}{\theta_m p_m}$$

Where $NB_{m1} < NB_{m2}$ and, therefore, $x_{m1} > x_{m2}$. As equations (13) and (14) indicate, the only way for the provider to exploit their influence and extract more surplus is to increase quantity. The result is increased treatment in areas where providers have greater ability to induce demand. This prediction of the model is consistent with the observed differences in treatment across Medicare markets (i.e., HRR). In our model, these differences are due to market power and the ability to induce demand, which is consistent with explanations of supply side causes of geographic variation.

Our empirical analysis, which we describe in detail below, is based on measuring the change in quantity as an uninsured person ages-in to Medicare coverage. We test the supply side explanation of geographic variation in utilization with a difference-in-differences (DD) approach that assesses whether this pre-to-post Medicare change in quantity is larger in areas where providers have greater ability to induce demand. In terms of our theoretical model, the DD expression is given by:

(15) $$\Delta_1 = x_{m1} - x_{y1}$$

$$\Delta_2 = x_{m2} - x_{y2}$$

$$\Delta_1 - \Delta_2 = (x_{m1} - x_{m2}) + (x_{y2} - x_{y1})$$

If we make the same assumption regarding differences in market power (i.e. $NB_{m1} < NB_{m2}$) then, from equations (13) and (14), the first term on the right-hand side of the DD expression in equation (15) is positive: utilization in Medicare is higher in regions with greater market power. From equation (3), we know that the second term on the right-hand side of DD expression is

expected to be zero because service quantities (conditional on cost) would be the same across markets among uninsured regardless of differences in market power.

However, differences in costs between markets could result in a non-zero value for this expression. Since we do not observe cost in the data, we include market (person)-specific fixed effects in our empirical analyses to account for these cost differences, which are assumed to be the same regardless of payer.[4] Thus we expect the DD estimate to be positive such that the change in service quantity for the uninsured who gain access to Medicare coverage will be larger in markets where providers have greater market power and ability to induce demand. This is the key prediction of the model and the basis for our empirical analysis.

It is instructive to repeat this exercise for those who were insured prior to age 65 (subscript "yi"). For this group, the provider's objective function is given by:

(16) $$L = p_{yi}x_{yi} - cx_{yi} + \lambda\left[B(x_{yi}) - \theta_{yi}p_{yi}x_{yi} - NB_{yi}\right]$$

and the first order conditions are as follows:

(17) $$L_p = x_{yi} - \lambda\theta_{yi}x_{yi} = 0, \lambda = \frac{1}{\theta_{yi}}$$

(18) $$L_x = p_{yi} - c + \lambda b(x_{yi}) - \lambda\theta_{yi}p_{yi} = 0$$

(19) $$b(x_{yi}) = \theta_{yi}c$$

The provider chooses quantity to equate the marginal benefit of care to the marginal cost, which is less than the actual cost since the patient is insured. In this case too, as the first order condition for *x* indicates, the quantity does not differ by the extent of market power, but only with differences in costs and insurance generosity. According to equation (18), for a given quantity of service provision, the provider chooses price to meet the patient's constraint:

(20) $$p_{yi} = \frac{B(x_{yi}) - NB_{yi}}{\theta_{yi}x_{yi}}$$

and the corresponding DD expression for those who were insured prior Medicare is as follows:

(21) $$\Delta_1 = x_{m1} - x_{yi1}$$
$$\Delta_2 = x_{m2} - x_{yi2}$$
$$\Delta_1 - \Delta_2 = (x_{m1} - x_{m2}) + \left(x_{yi2} - x_{yi1}\right)$$

[4] Note that our reference for differences by payer also has a time dimension, as changes in payer occur as a person ages, for example from 63 to 67.

Maintaining the assumption that providers in region 1 have greater market power than providers in region 2 (i.e. $NB_1 < NB_2$), then the first term on the right-hand side of the DD expression in equation (21) is positive and the second term on the right-hand side is zero (conditional on cost and insurance generosity). Therefore, the DD effect given by equation (21) is positive.

However, there are two considerations that make this prediction less certain than in the case of a person who was uninsured prior to age 65. First, not all people will switch from private insurance to Medicare pre-to-post age 65. Some people will retain private insurance and for those who do, the pre-to-post age 65 change in utilization is zero (except for any effect of ageing). In fact, approximately 20% of those insured at ages 63/64 have private insurance (primary payer) at ages 67/68.[5] This fact suggests that we are less likely to find that changes in utilization are positively correlated with HRR Medicare spending for those who were previously insured before aging in to Medicare coverage. Second, and more importantly, we do not observe cost and generosity of private insurance across markets. Earlier, we argued that it was reasonable to assume that service costs are the same regardless of payer (e.g., Medicare vs. uninsured) and that market (person)-specific fixed effects would account for cost differences. This is also the case for the sample that was insured prior to age 65—service costs are likely the same for Medicare and privately insured patients. A similar assumption is unlikely to hold for insurance generosity differences, however, because insurance generosity differs by payer (Medicare vs. private insurance). Market (person)-specific fixed effects will not eliminate this potential source of confounding and therefore, empirically, the sign of the DD estimate given by equation (21) is ambiguous. Only if the generosity of private insurance is uncorrelated with the extent of market power within a region will the DD estimate be positive. This ambiguity associated with those with insurance coverage prior to Medicare leads us to focus on those who were uninsured before age 65.

4. Empirical Strategy

If ability to induce demand was observable, then it would be straightforward to test the supply-side explanation of geographic variation in health care use. For example, we could use equations (13) and (14) to simply compare the quantity of care used by Medicare enrollees in regions with more, or less, market power. However, this approach is infeasible because such

[5] The 20% figure comes from data from 2002 onward, as information on primary payer was unavailable in HRS prior to this time.

market power is difficult to observe/measure, and so are cost differences across markets that would generate differences in service quantities among the uninsured prior to age 65.

Instead, we take an alternative approach in our estimation strategy. We assume that the supply-side explanation of geographic variation is correct and, thus, that the price-adjusted geographic variation in per-beneficiary Medicare spending observed across regions is a reasonable measure of market power, or more generally of the extent of supply-side influence on the use of health care services. If so, then an exogenous shift in demand—previously uninsured individuals obtaining health insurance through Medicare at age 65—will produce different quantity responses across markets with different levels of Medicare spending, or degrees of market power, as we showed above.[6] On the other hand, if the geographic variation in spending is due to demand-side influences, then gaining Medicare coverage will have the same effect in low- and high-spending areas as long as uninsured persons are similar in both regions.

These differential responses can be measured by the empirical analog of the DD expression given in equation (21), which we formulate as follows:

$$Y_{ijt} = \alpha_i + \delta_t + \beta_1 Medicare_{it} + \beta_2\left(Medicare_{it} \times HRR\_Spend_j\right) + X_{it}\lambda + \varepsilon_{ijt} \quad (22)$$

In equation (22), the health care use (Y_{ijt}) of person "*i*" in HRR "j" in year "*t*" depends on person-specific fixed effects (α_i); year fixed effects (δ_t); an indicator for gaining Medicare coverage (*Medicare*), which occurs at age 65; and interactions between gaining Medicare coverage and indicators for price-adjusted, Medicare Parts A and B spending in HRR "*j*" (*HRR_Spend*). We measure HRR Medicare spending using price-adjusted average Medicare Parts A and B expenditures in the baseline period (at age 63/64) for each individual "*i*" so that HRR spending is constant within person (i.e. it is fixed at the level of each individual's first observation at ages 63/64).[7] We also include time-varying individual and county-level characteristics including self-reported health, marital status, household income, household

[6] There is an existing empirical literature using Medicare eligibility as an exogenous change in insurance status within a DD framework (McWilliams et al 2003, McWilliams et al 2007, Decker et al 2012).

[7] Newhouse et al. (2013) find that there is considerable stability in HRR spending levels over time. "In other words, regions that were high- (or low-) cost in 1992 remained high- (or low-) cost in 2010." (Newhouse et al. 2013 pg. 6). We also estimated results that fixed HRR spending at 1992 levels. These results (available upon request) do not differ in any meaningful way from the analyses that hold spending groups fixed at the year of each individual's first observation.

wealth, and county-level unemployment rates and cluster our standard errors at the HRR-level.[8] We describe the data in more detail below, but note here that we limit the sample in our primary analysis to those without insurance coverage at ages 63 and 64 (prior to Medicare) whom we observe again at ages 67 or 68 (after gaining Medicare coverage).[9]

The key coefficients of interest in equation (22) are those on the interaction term(s) between gaining Medicare coverage and the level of price-adjusted HRR spending. The HRR spending measure is our proxy for supply-side influences (market power). Therefore, if the supply-side explanation is valid, we expect the coefficients on the interaction terms to be positive indicating that the previously uninsured who gain Medicare coverage in high-spending regions see a larger corresponding increase in health care use.

The identifying assumption of this approach is that in the absence of gaining Medicare (i.e., remaining uninsured), and conditional on the covariates, changes in health care use between ages 63/64 and 67/68 among uninsured persons would be the same in high- or low-spending HRRs. To bolster the plausibility of this assumption, we condition on person-specific fixed effects, which account for potential confounding of the DD estimate from unmeasured demand-side factors, such as differences in health [B(x)], and from unmeasured HRR factors including costs. We take additional steps to address the possibility that uninsured individuals in high- and low-spending areas may have different age profiles of health care use. Specifically, in our preferred specification, we interact covariates measured at ages 63/64 (gender, race/ethnicity, marital status, education, self-reported health, household income, household wealth) with an indicator for gaining Medicare coverage by ages 67/68, allowing this set of demographic and socioeconomic characteristics to affect utilization differentially before and after Medicare eligibility. Einav et al. (2013) provide evidence that willingness to pay for insurance reflects selection on moral hazard such that people living in regions with a high share of uninsured (low willingness to pay) may have relatively inelastic demands for care. If these regions corresponded with the low-spending HRRs in our analysis, then we risk conflating supply-side influences with

[8] We abuse notation slightly by omitting this county dimension from our subscripting, but these time-varying controls follow individuals, so for simplicity we consider them as part of the vector of controls for each person "*i*."

[9] Among the sample of uninsured, we observed the following transitions: 52% gained Medicare only coverage; 17% gained Medicare and Medicaid (dual eligible); 25% gained Medicare and some other type of private insurance; and 5% made another type of transition including 4% who reported remaining uninsured.

the fact that the demand for care among those gaining coverage at age 65 in low-spending regions is relatively inelastic leading to a smaller increase in care consumption compared to those gaining coverage in higher spending regions. To address this threat to validity, we estimate models that include an interaction term between the share of uninsured in an individual's HRR at baseline and an indicator for the post period.

Finally, to further assess the validity of our approach, we re-estimate the empirical model given by equation (22) using four groups that are plausibly unaffected by differences in regional supply-side influences (negative control samples). The first group is similar to the primary sample except for the fact that they were covered by health insurance at ages 63 to 64 and, therefore, are consistently insured between ages 63 to 64 and ages 67 to 68. Conditional on variation in health insurance generosity across regions, our theoretical model predicts no differential effects on utilization of gaining Medicare coverage for this sample. The second group consists of those who were uninsured at age 59 to 60 who we follow until they are ages 63 to 64. If our research design is valid, we expect the change in health care use over time for this group to be the same across HRRs regardless of Medicare spending. The third group is composed individuals first observed at ages 67 to 68 and then again four-years later at ages 71 to 72. This group was largely covered by Medicare in both waves in which they were observed and so we expect no differential change in their use of health care services by HRR spending.[10] The fourth group maintained private insurance as their primary source of coverage across the age threshold of Medicare eligibility (between ages 63 to 64 and ages 67 to 68) so we expect their utilization to be unaffected by Medicare spending differences. We view analyses using the second, third, and fourth groups as "placebo" or falsification exercises that test the validity of the DD research design.

5. Data

The data for our analysis come from the Health and Retirement Study (HRS). The HRS is a longitudinal survey sponsored by the National Institute on Aging and the Social Security Administration and administered by the Institute for Social Research at the University of Michigan. Since 1992, the HRS has been conducted on a biennial basis and focuses on the

[10] In this sample, approximately 68% experienced no change in the type of insurance coverage from ages 67/68 to 71/72. Of those who did see a change in coverage, 20% either added or dropped prive (e.g., emplioyer, Medigap) coverage in addition to Medicare coverage and approximately 10% experienced other types of changes, such as gaining or dropping Medicaid coverage.

population aged 50 and older. Our sample includes approximately 20,000 respondents in each wave and covers a variety of topics including health insurance coverage and health care use.

For our primary analysis, we use the 1992-2014 waves of the HRS to construct a balanced, 4-year (2 observations each) panel of individuals whom we match to their HRR of residence and that we observe at ages 63 or 64, which is prior to Medicare eligibility, and again at ages 67 to 68 after turning 65 and becoming eligible for Medicare coverage[11]. Following the methodology described above, the primary sample is restricted to those who are uninsured in the baseline period and who gain insurance when they turn 65 and qualify for Medicare coverage. Because medical care use in the HRS is measured from the prior wave (i.e. over the past two years) and thus has a two-year "look back" period, individuals' second appearance in our data occurs at age 67 or 68, which insures that the utilization measures refer to the period of time when those in the sample were Medicare-eligible. To minimize the potential for endogenous selection through migration, we drop a small number (77) of individuals who move between HRRs from their first to their second appearance in our sample. These restrictions result in a sample of approximately 1,000 people observed twice over a four-year period that we use to conduct our primary analysis.[12]

Respondents in the HRS are asked a variety of questions concerning their health and use of medical care over the past two years. We use these responses to construct dichotomous indicators for the following outcomes: one or more and two or more hospital visits; five or more and ten or more doctor visits; one or more outpatient surgeries; one or more prescription medications; and an indicator for the presence of one or more of the following health conditions: high blood pressure, diabetes, cancer, lung disease, heart disease, stroke, psychiatric illness, or arthritis. Because of the count nature of the data on doctor visits, we also include estimates from a Poisson model that uses a continuous measure of doctor visits as the dependent variable.

Our key independent variables are price-adjusted part A and part B Medicare spending at the HRR level. The data used to construct these spending measures come from the Dartmouth

[11] In 1993 and 1995, the HRS conducted an additional standalone survey called the Asset and Health Dynamics (AHEAD) study that focused on individuals aged 70 and above. This study was merged with the HRS cohort beginning in 1998. We exclude the standalone AHEAD surveys from our data. Additionally, the HRS sample expanded in 1998 by adding two new cohorts along with the AHEAD group and continues to add younger cohorts every six years.

[12] Due to missing responses to certain health care utilization questions, the sample size fluctuates between 1,870 and 2,008 observations.

Atlas of Health Care. We use HRR-level average spending from two different data series. Spending data for the years 1992-2003 are from the Continuous Medicare Health Survey (CMHS), a 5% sample of the fee-for-service Medicare universe. Spending data from 2003 to 2014 use claims-based data on the full fee-for-service Medicare universe. The older, CMHS-based data use aggregated parts A and B spending, while the claims-based data use more disaggregated categories. We construct parts A and B total spending from the claims-based data to match the aggregate measures from the CMHS. Part A is generated by combining hospital/skilled nursing facility reimbursements and hospice reimbursements. Part B is constructed by combining physician reimbursement, outpatient facility reimbursement, home health care reimbursement, and durable medical equipment reimbursements. The two data sets overlap for the years 2003-2007 and we tested the differences in these constructed measures across these years. During this period, the part A and part B constructed measures using the claims-based data differ from the CMHS measures by less than 5%.

Another measurement issue is that only the later claims-based data include price-adjusted spending, thus we must impute price adjustments for the CMHS-based spending measures. To do this, we divide raw spending by price-adjusted spending for the claims-based spending measures to recover the price-adjustment scalar used for each HRR in 2003 and apply it to years 1992-2002. Since the overall coefficients of variation on the price-adjustment scalars across parts A, B, and the sum of Parts A and B in the 12 years of claims-based spending data range between 0.002 and 0.005, price adjustment is approximately time-invariant. Based on this evidence, we consider the imputed price-adjustments to be sufficiently accurate. Figure 1 plots the distribution of price-adjusted HRR spending for all years of data in 2009 dollars. Spending appears to be largely normally distributed with a small number of HRR-year combinations exhibiting extreme values in excess of $12,000, on average, per fee-for-service Medicare enrollee.

The HRR-level spending data is merged to the Dartmouth group's HRR to zip code crosswalks. A crosswalk for the first year of our sample is unavailable, so we rely on crosswalks from 1993 and 1995 for linking the spending data from 1992. These spending data are then matched to HRS respondents by zip code and year. In addition to using continuous HRR Medicare spending, we construct two categorical spending measures: (1) a dichotomous division of spending using the median HRR spending level and (2) indicators for HRR spending terciles (bottom, middle, and top terciles of HRR spending).

Table 1 contains descriptive information for our primary sample of near-elderly uninsured by HRR spending tercile measured at ages 63 or 64 and spanning the years 1992 through 2014. The first row of Table 1 lists the sum of Parts A and B price-adjusted Medicare expenditures across the three HRR spending terciles. Average Medicare expenditures in low-, medium-, and high-spending HRRs are $5,477, $6,541, and $8,240 respectively.[13] Spending differences between medium- and low-spending HRRs and between high- and low-spending HRRs are statistically significant. With respect to demographic differences, persons living in low-spending HRRs are significantly more likely to be white and better educated. We see no statistically significant differences across HRR spending tercile in health conditions or health care use at baseline. We also find no statistically significant differences in baseline self-rated health across spending terciles, descriptive evidence suggesting that any observed differences in health care use upon gaining Medicare coverage are not driven by demand-side influences.

6. Results

6.a. Health Care Use among Medicare Beneficiaries is Greater in High-spending HRRs

As we have noted earlier, our proxy for the ability to induce demand is the price-adjusted level of annual per-beneficiary Medicare spending in an HRR. The assumption is that greater market power will lead to greater use of services, hence greater Medicare spending. While we have outlined a way to test whether market power is the cause of greater service use, it is worth descriptively verifying that greater Medicare spending in an HRR is associated with greater use of health care services in our sample. To do so, we regress each measure of health care use in our analysis on HRR spending, demographic controls (gender, age, race, education, marital status, self-reported health, household income, and household wealth), county-level unemployment rates, and HRS survey year fixed effects for those aged 65 and older.

The estimates, presented in Table 2, indicate that Medicare beneficiaries in high-spending areas are more likely to visit the hospital and have more physician visits than beneficiaries living in lower spending areas. For example, a Medicare beneficiary living in an HRR that is in the top tercile of spending is 7.6% (2.3 percentage points) more likely to have a hospital visit than a Medicare beneficiary living in an area in the lowest tercile of spending. Similarly, a Medicare beneficiary living in a HRR that is in the top tercile of spending is 9.9% (5.6 percentage points) more likely to have five or more physician visits than a Medicare beneficiary living in an area in

[13] These means are in 2009 dollars using a chained PCE health deflation index.

the lowest tercile of spending. Notably, we once again find little evidence of differences in health across HRR spending levels.

These positive associations between the use of health care services among Medicare beneficiaries and HRR spending levels are consistent with the hypothesis that HRR spending is a marker for supply-side influence on the use of care. However, these associations are somewhat mechanical given the construction of the HRR spending measures. We now turn to the difference-in-differences analysis examining the change in health care service use as a person gains Medicare, and whether that change in use is positively associated with the greater HRR spending. As we have described earlier, this is a plausible test of the hypothesis that the geographic variation in utilization observed in Medicare is due to supply-side influences.

6.b. Effect of Gaining Medicare by HRR Spending for those Uninsured Prior to Age 65

The primary results of our analysis are presented in Tables 3 through 5 (each table has a similar format). Table 3 presents results for hospital visits; Table 4 presents results for doctor visits; and Table 5 presents results for outpatient surgery, prescription drug use, and health conditions. For each dependent variable, we show estimates from nine model specifications that differ according to the definition of HRR Medicare spending (i.e. continuous, above/below median, terciles) and the set of covariates and fixed effects that are included. In the top panel of each table, we estimate a model using a de-meaned, continuous measure of the sum of Parts A and B Medicare spending at the HRR-level in thousands of dollars (indexed to 2009 dollars). In the second panel, we divide regions into "high-spending" and "low-spending" categories using the median of price-adjusted Medicare spending for Parts A and B, while in the third panel, regions are separated into spending terciles. For each outcome and classification of spending (linear, median, or terciles), we show estimates from three model specifications: a basic model that includes demographic controls, HRR fixed effects and survey wave fixed effects; a second model that replaces HRR fixed effects with individual fixed effects; and a third model that adds interactions between the value of baseline covariates (measured at age 63/64) and the indicator for gaining Medicare (being age 67 to 68), as well as an interaction between baseline HRR uninsurance rate and the indicator for gaining Medicare.

The first set of results we discuss are for hospitalizations, which are presented in Table 3. Estimates in the first column of Panel A in Table 3 indicate that gaining Medicare coverage (and getting older) increases the likelihood of experiencing at least one hospitalization in the past two

years and that this increase is larger for those living in higher spending HRRs. The coefficient on the interaction term between gaining Medicare and HRR spending suggests that each additional $1,000 in Medicare HRR spending increases the probability of reporting at least one hospital visit by 2 percentage points (a 14% relative increase). Moving to Column 2, we replace the HRR fixed effects with individual fixed effects and find a similar impact of increasing Medicare HRR spending on hospital use. Finally, Column 3 adds interactions between our demographic controls and the baseline HRR uninsurance rate with an indictor for the post-period. Estiamtes are largely unchanged and suggest that a $1,000 increase in HRR spending increases the probability of at least one hospital visit by 2.9 percentage points (20% increase).[14]

Estimates in Panel B of Table 3 make use of our dichotomous measure of Medicare HRR spending. In Column 1, the coefficient on the interaction term between gaining Medicare coverage and an indicator for living in an HRR where spending is above the median value suggests that gaining Medicare coverage in an above-median spending HRR increases in the likelihood of reporting at least one hospital visit by an additional 8.2 percentage points (47%) compared to those living in below-median spending HRRs. The estimate is somewhat attenuated when additional controls are added in Columns 2 and 3, but continues to support the notion that gaining Medicare in a higher-spending region leads to greater health care use for the previously uninsured.

Panel C of Table 3 contains our final set of specifiations that rely on terciles of Medicare HRR spending. Consistent with the prior two definitons of HRR spending, we again find that those living in higher spending regions experience an increased probability of reporting a hospital visit after gaining Medicare coverage. Compared to those in the lowest spending HRRs, those in the top spending tercile are approximately 11 percentage points (59%) more likely to have had at least one hospital visit in the past two years. Notably, estimates of the effect of HRR spending on the probability of having more than one hospital visit are quite stable across model specifications, which suggests that omitted, demand side factors are not a likely source of bias.

In Table 3, we also present estimates of the effect of gaining Medicare on the probability of having two or more hospital visits in the past two years. Though not all statistically

[14] Note that in the specification that adds interactions between baseline covariates and an indicator for gaining Medicare, the estimate associated with gaining Medicare (i.e., main effect) refers only to the reference group and is not informative of the average effect or comparable to estimates in the other two specifications.

significant, coefficient estimates indicate that the probability of two or more visits is higher in higher spending HRRs, with the largest effects typically associated with HRRs in the highest spending tercile. Column 6 in Panel C, which includes our preferred specification, suggests that gaining coverage in the highest spending tercile nearly doubles the likelihood of experiencing two or more hospital visits compared to those gaining coverage in the lowest spending tercile.

The next results we describe are related to physician visits and are presented in Table 4. We use three measures to characterize doctor visits: the total number of visits and dichotomous indicators of more than five or more than ten visits. For the continuous measures of visits, we obtain estimates using Poisson regression methods. Estimates in the third column of Panel A indicate that gaining Medicare (and becoming four years older) is associated with an approximately 7% increase in doctor visits for the previously uninsured. The coefficient on the interaction term between gaining Medicare and HRR spending is positive, though not statistically significant. However, for the previously uninsured living in HRRs with above median spending, gaining Medicare is associated with an additional 3.7% increase in the number of doctor visits compared to those in low-spending regions. Similar results are found when we divide regions into terciles of spending (Panel C of Table 4), with the majority of the effect coming from those living in HRRs in the highest spending tercile. It is also apparent that estimates related to the number of doctor visits are not particularly sensitive to model specification and the inclusion of person-specific fixed effects and interactions between baseline covariates and the indicator for gaining Medicare. So, in this case too, we believe the evidence suggests little likelihood of confounding from omitted demand side factors.

Estimates related to the dichotomous indicators of doctor visits are consistent with those just described for the continuous measure of visits. Estimates in Column 6 of Panel A, indicate that each additional $1,000 in HRR spending results in a 3.9 percentage point (11.3%) increase in the probability of reporting more than five physician visits in the past two years for the previously uninsured. Similarly, those gaining Medicare in HRRs with above-median spending are 8.1 percentage points (26.3%) more likely to report more than five physician visits compared to those in below-median spending HRRs. Estimates in Column 6 of Panel C suggest that the previously uninsured who gained Medicare and reside in HRRs in the middle tercile of Medicare Parts A and B spending have a significantly higher probability, 13.5 percentage points (42%), of visiting a physician more than five times in the past two years compared to those who gained

Medicare and reside in a region in the lowest tercile of spending, while those in the top tercile are 15.3 percentage points (48%) more likely to report at least six physician visits in the two years since gaining Medicare coverage. We find the same pattern of increasing treatment intensity by HRR spending for the newly insured when analyzing an indicator of having more than ten physician visits in the past two years. For example, gaining Medicare coverage is associated with a 9.4 percentage point (60%) increase in the probability of having more than ten doctor visits for those residing in HRRs in the top spending tercile compared to those in the bottom spending tercile according to Column 9 of Panel C.

We also examined the effect of gaining Medicare coverage on three other outcomes: the probability that a respondent reports at least one outpatient surgery in the past two years, the probability that the respondent is currently taking at least one prescription medication, and the probability that the respondent reports suffering from at least one chronic medical condition. Estimates for all three of these outcomes are reported in Table 5.

For each outcome, estimates in Table 5 generally indicate that gaining Medicare (and getting older) is associated with an increase in the outcome, which is consistent with the growing burden of disease as people age. Estimates of differential changes in outpatient surgeries by spending level in Columns 1 through 3 follow a similar pattern to the hospital and physician outcomes reported in Tables 3 and 4. For example, estimates in Column 3 of Panel C suggest that, for the previously uninsured, gaining coverage in an HRR in the top spending tercile increases the likelihood of an outpatient surgery by approximately 75% compared to those in the lowest spending tercile. However, because outpatient surgeries are a relatively rare outcome for this group, estimates are only marginally statistically significant. Table 5 indicates that gaining Medicare (and getting older) is associated with an approximately 12 percentage point increase in the probability of taking at least one prescription medication and a 20 percentage point increase in the probability of reporting a health condition. However, for both of these outcomes, we find no evidence of differential effects by HRR spending level.

Overall, the estimates in Tables 3 through 5 are consistent with a supply-side explanation of the observed geographic variations in Medicare expenditures and utilization. For the previously uninsured, the impact of gaining Medicare on hospitalization and physician visits differed significantly between low- and high-spending areas. Those living in relatively high-spending regions saw larger increases in the use of hospital and physician services than those

living in lower spending regions after gaining Medicare coverage. We find no differential effect by regional spending level for prescription medication use or diagnosis of a chronic condition; outcomes that are arguably less susceptible to physician influence and degree of market power. We also emphasize the fact that estimates in Tables 3 through 5 were largely unchanged across model specifications, including models that added interactions between baseline covariates (e.g., health, income, race) and the indicator for gaining Medicare and getting older, and models that controlled for differences in baseline HRR uninsurance rates. This finding suggests that that differences in demand-side factors between uninsured persons in low- and high-spending regions are unlikely to be a confounding influence.

Finally, to assess whether the results in Tables 3 through 5 were sensitive to the measure of HRR Medicare spending used to classify low- and high-spending regions, we re-estimated the models in these tables using Medicare Part B spending instead of total Medicare spending (Parts A and B). Results are presented in Appendix Table 3.[15] Estimates in Appendix Table 3 are largely similar in terms of signs, significance and magnitudes to those in Tables 3 through 5.

6.c. Effect of Gaining Medicare Eligibility by HRR Spending for those Insured Prior to Age 65

We turn next to estimates of the effect of transitioning to Medicare on health care use for those who were previously insured. This group was already insured before becoming age-eligible for Medicare and, therefore, rather than gaining coverage at age 65, they simply experienced a transition in coverage. As we noted earlier, it is unclear ex-ante whether we should expect the pre-to-post age 65 change in health care service use to be greater in high-spending HRRs for those with health insurance prior to age 65. The problem for this sample is the empirical difficulty of obtaining an unbiased estimate due to confounding from differences in health insurance generosity across regions that is not controlled for by the inclusion of person-specific fixed effects. Despite this ambiguity in predicted effects, we present estimates of the effect of gaining Medicare eligibility for those who were previously insured on the use of health care services by HRR spending level in Table 6.

[15] For the sake of brevity, we only present estimates from the specification that includes interactions between baseline covariates and HRR uninsurance rates and the indicator for gaining Medicare eligibility in Appendix Table 3. Estimates from the other two specifications are available upon request.

Estimates in Table 6 are from a specification that includes individual fixed effects and interactions between baseline covariates and HRR uninsurance rates and an indicator for gaining Medicare eligibility. These estimates reveal a consistent pattern across outcomes: becoming age-eligible for Medicare (and getting older), but without a change in health insurance status, is generally associated with increases in health service use for the previously insured living in low-spending regions, though not all estimates are statistically significant. In terms of magnitudes, Medicare eligibility is associated with approximately a 5 percentage point (25%) increase in probability of hospitalization; a 2% increase in the number of doctor visits; a 4 percentage point (8%) increase in the probability of reporting 5 or more physician visits; and a 5.7 percentage point (27%) increase in the probability of an outpatient surgery.[16] We also see that turning 65 and becoming eligible for Medicare is associated with increases in prescription drug use (6.3 percentage points) and the likelihood of reporting a health condition (19 percentage points). As everyone in this sample was insured prior to age 65, these increases in utilization reflect aging and any changes due to differences in the type/generosity of insurance.

However, with one exception, estimates in Table 6 provide no evidence that this increase in health care use associated with Medicare eligibility differs by Medicare spending levels across HRRs. For all outcomes other than outpatient surgery, estimates of the interaction term between gaining Medicare eligibility and HRR spending category are small in magnitude and not statistically significant. The only exception to this pattern of estimates is for outpatient surgery. In this case there is some evidence, although not particularly robust, that outpatient surgery is higher in higher spending Medicare regions. Appendix Table 4 presents estimates from identical models that use Medicare Part B spending to classify regions as low- and high-spending. These are largely similar to results in Table 6.

6.d. Falsification Analyses

The validity of our research design depends on the assumption that, absent a change in insurance status (i.e., gaining Medicare), changes in health care use among uninsured persons would be the same in low- versus high-Medicare spending regions. To assess the likely validity of this assumption, we re-estimated our empirical model for a sample of persons uninsured at age

[16] It is interesting to compare the means for the samples of persons uninsured and insured at ages 63 to 64. The insured sample has greater use of health care services. This is consistent with basic theory that those who are healthier and less likely to use care are more likely to be uninsured, and/or that insurance causes a person to use greater amounts of care.

59 to 60 who we follow until they are ages 63 to 64. If our research design is valid, we expect the health care use for this group to be the same across Medicare spending regions. In this case, the post-period is ages 63 to 64 instead of ages 67 to 68. One difference between this analysis and the main analysis of Tables 3 through 5 is that some of those who are uninsured at ages 59 to 60 gain insurance coverage by ages 63 to 64. Obtaining insurance will affect health care use and if the gain in insurance differs between low- and high-spending regions, then this would affect estimates of the effect of differential Medicare HRR spending on utilization. On the other hand, if the gain in insurance is roughly the same across regions, then the gain in insurance will not be relevant—i.e., a source of bias. To address this issue, we estimated models with and without controlling for whether a person gained insurance (endogenously) by ages 63 to 64. Whether we control for becoming insured does not matter despite insurance having the expected positive impact on health care use, which reflects the fact that the proportion of uninsured who gained insurance was roughly the same across regions. To conserve space, we only report estimates that control for becoming insured in Table 7, however estimates from a specification that omits the insurance control are available upon request.

Table 7 presents estimates for the sample of uninsured who we first observe at ages 59 to 60 and then again at ages 63 to 64. Focusing on the interactions between the indicator for being age 63 to 64 and the meausres of HRR Medicare spending, we find no evidence of a differential effect by HRR spending designation. Nor are estimates relatively large, particularly in relation to statistically significant estimates in Tables 3 through 5. In sum, estimates in Table 7 provide substantial evidence that the identifying assumption of our research design is plausible. Appendix Table 5 repeats the analysis using HRR Medicare Part B spending and the results are largely similar to those reported in Table 7.

For the second falsification analysis, we re-estimated our models using a sample of persons observed at ages 67 to 68 and again at ages 71 to 72. Because this group is covered by Medicare in both the pre- and post-periods, our theory predicts no differential use of health care services by HRR Medicare spending level over time. Ideally, we would limit this analysis to those who were uninsured at ages 63 or 64 (i.e. our sample in Tables 3 through 5), but because of attrition over time, the sample size for this same group at ages 67/68 and 71/72 is quite small.

Instead, we first focus on a sample of all HRS respondents aged 67/68 in the pre-period and 71/72 in the post- period, but also report results for the original sample in Appendix Table 6.[17] Table 8 presents the estimates for the full sample at ages 67/68 and 71/72. Here too, the pattern of results is clear. Getting older is associated with greater use of health care services, but this increase does not depend on HRR spending; estimates of the interaction terms between ageing and HRR spending categories are all small and not statistically significant. Appendix Table 6 repeats the analysis with those who were uninsured at ages 63/64. Observing the transition for this group from ages 67/68 to 71/72, we again find no differential change in utilization by HRR spending, further reinforcing the results in Table 8. Estimates for the full sample using Medicare Part B spending are reported in Appendix Table 7 and are consistent with the results from Table 8.

Finally, we re-estimate our model on a sample of individuals who were privately insured at ages 63/64 and maintained private coverage as their primary insurance at ages 67/68. These people became eligible for Medicare but (presumably optimally) maintained private insurance instead. If our effect of interest is truly the exogenous shock to insurance generosity associated with turning 65 and gaining Medicare coverage, we should see no effect on this group. Estimates for this sample using Parts A and B Medicare spending are presented in Table 9 while estimates using only Part B spending are reported in Appendix Table 8. In general, we find no pattern that indicates a differential effect on utilization by Medicare HRR spending for this group. In addition to supporting the plausibility of our mechanism of interest (gaining Medicare), these results also support the assumption of our theoretical model that, in a non-administered-price environment, surplus is not extracted by varying quantity. Furthermore, our findings are consistent with those of Cooper et al. (2015), which showed no strong within-region correlation between private payer and Medicare prices.

These three placebo results further bolster the validity of our research design by showing that changes in health care use as people age are no different between low- and high-spending regions. This is the maintained assumption of our research design, which given these results, seems plausible.

[17] These estimates are qualitatively similar to those in Table 8 and indicate that getting older (without change in insurance status) leads to increased use of health care services, but there is no evidence that this increase is systematically greater in high- versus low-Medicare spending regions.

7. Conclusion

In this paper, we contribute to the existing literature on supply-sensitive / supplier-induced care by presenting estimates of the effect of supply-side factors on the utilization levels of Medicare beneficiaries. We provide evidence that a substantial part of the documented geographic variation in Medicare spending is likely driven by market failures that allow health care providers to exercise influence over patients' use of health care services. Using above and below median regional Medicare spending measures, we generate estimates of utilization differences across our outcomes that range from around 20% to 50%. Between the highest and lowest spending terciles, these differences grow to a range of 35% to 70%. The gaps in overall price-adjusted, summed parts A and B Medicare spending are at the low end of these ranges (25% difference for above and below median spending HRRs and 38% for highest versus lowest tercile of spending by HRR).

The geographic variation in Medicare spending is one of the most salient aspects of the U.S. health care system. The causes and implications of this variation are especially important given their direct influence on health policy. For example, rates for Medicare Advantage (MA) plans are determined, in part, by county-level Medicare fee-for-service (FFS) spending, which results in large cross-county differences in MA reimbursement. More generally, the claim that 20% to 30% of the geographic variation in Medicare spending is wasteful has become conventional wisdom and has motivated a number of recent health care reforms, including many of the payment reforms in the Affordable Care Act.

Notably, however, the cause of the geographic variation in Medicare spending is still not well understood, as the following quote from a 2013 Institute of Medicine (IOM) report makes clear:

> *"The committee's empirical analysis revealed that after accounting for differences in age, sex, and health status, geographic variation is not further explained by other beneficiary demographic factors, insurance plan factors, or market-level characteristics. In fact, after controlling for all factors measurable within the data used for this analysis, a large amount of variation remains unexplained."*[18]

The report classifies uncertainty about the causes of the geographic variation by distinguishing between "acceptable" and "unacceptable" variation. Geographic variation in spending due to

[18] (Newhouse, et al. 2013)

age, health status and insurance plans are “acceptable” because they represent demand side factors, such as consumer preferences, income, and health, and therefore do not imply inefficient or wasteful care. On the other hand, “unacceptable” variation—the “large amount of variation” remaining unexplained in the quote above—is problematic, as it likely relates to provider preferences not directly related to patient need. In short, knowing the cause of the geographic variation in spending and health care use is essential to the debate over health care policy in the U.S. Results of our analysis suggest that a considerable portion of Medicare spending may be of low-value—“unacceptable” in the parlance of the IOM report. Our findings suggest that policies intended to incentivize adoption of evidence-based clinical standards, and other approaches intended to promote scrutiny of regional differences in utilization, may have an important role to play in shaping the future trajectory of health care spending and utilization in the public sector.

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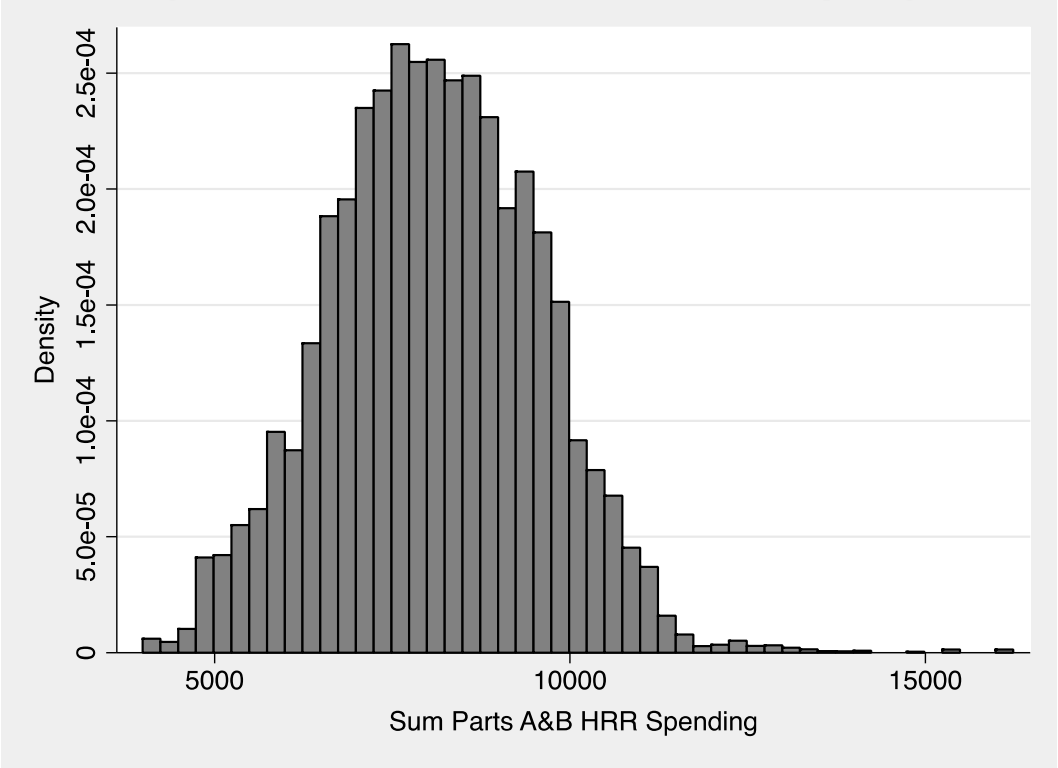
Figure 1 – Distribution of HRR Medicare Parts A and B Spending



Notes: HRR spending is price-adjusted and indexed to 2009 dollars using a chained PCE health infaliton index. Bin widths are set at $250.

Table 1:
Descriptive Statistics for HSR Respondents Aged 63 to 64 and Uninsured by Tercile of HRR Spending

	Lowest Tercile HRR Spending	Middle Tercile HRR Spending	Highest Tercile HRR Spending	p-value of Difference Tercile 2-1	p-value of Difference Tercile 3-1
	(1)	(2)	(3)	(4)	(5)
HRR Average Medicare Spending (price-adjusted)	$5,477.20	$6,540.58	$8,239.76	0.000	0.000
Independent variables					
Female	0.547	0.606	0.613	0.202	0.123
White	0.691	0.580	0.474	0.015	0.000
Black	0.127	0.301	0.202	0.000	0.026
Hispanic	0.144	0.099	0.305	0.139	0.000
Other	0.039	0.019	0.020	0.195	0.154
Married/Partnered	0.669	0.651	0.648	0.688	0.615
Separated/Divorced	0.127	0.135	0.151	0.812	0.438
Widowed	0.155	0.154	0.151	0.980	0.897
Never Married	0.039	0.035	0.023	0.846	0.283
Marital Status Missing	0.011	0.026	0.027	0.269	0.209
Less than High School	0.337	0.433	0.499	0.037	0.000
GED	0.072	0.045	0.063	0.206	0.667
High School	0.331	0.272	0.250	0.166	0.035
Some College	0.182	0.151	0.114	0.359	0.019
Bachelors or more	0.077	0.099	0.074	0.414	0.896
Self-Rated Health					
Excellent	0.144	0.115	0.110	0.363	0.224
Very Good	0.238	0.244	0.229	0.881	0.814
Good	0.337	0.337	0.297	0.991	0.323
Fair	0.215	0.228	0.282	0.757	0.082
Poor	0.066	0.077	0.082	0.663	0.494
Dependent Variables					
>0 Hosp Visits	0.193	0.120	0.142	0.027	0.104
>1 Hosp Visit	0.066	0.045	0.043	0.322	0.225
Doctor Visits	5.692	6.757	6.338	0.374	0.472
>5 Doc Visits	0.320	0.337	0.356	0.708	0.391
>10 Doc Visits	0.157	0.145	0.146	0.722	0.728
Current Prescription Use	0.541	0.646	0.615	0.022	0.084
Outpatient Surgery	0.094	0.080	0.072	0.635	0.366
Health Condition	0.768	0.814	0.771	0.220	0.933
Observations	181	312	511	-	-

Notes: Sample includes all respondents in the HRS from 1992 to 2014 who were uninsured at ages 63 or 64. All variables measured at baseline when respondents were ages 63 to 64. Spending measure sums HRR Medicare Parts A & B spending and is indexed to 2009 dollars.

Table 2:
Estimates of the Effect of HRR Medicare Spending on Use of Health Care Services among Medicare Beneficiaries

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
HRR Spending (thousands)	0.007***	0.004*	0.049***	0.019***	0.020***	-0.001	0.003**	-0.001
	(0.002)	(0.002)	(0.011)	(0.004)	(0.003)	(0.001)	(0.002)	(0.002)
Mean of Dependent Variable	0.319	0.133	10.792	0.601	0.325	0.209	0.864	0.907
Panel B:								
Above Median Spending HRR	0.016***	0.009***	0.093***	0.044***	0.041***	-0.002	0.007*	-0.000
	(0.005)	(0.003)	(0.027)	(0.010)	(0.009)	(0.004)	(0.004)	(0.004)
Mean of Dependent Variable in Below Median HRR	0.308	0.125	11.204	0.575	0.298	0.216	0.861	0.906
Panel C:								
Mid Tercile of HRR Sending	0.015**	0.011**	0.032	0.026**	0.026**	0.007	0.004	0.004
	(0.006)	(0.005)	(0.030)	(0.012)	(0.010)	(0.005)	(0.005)	(0.004)
Top Tercile of HRR Spending	0.023***	0.014***	0.146***	0.056***	0.057***	0.001	0.007	-0.003
	(0.006)	(0.005)	(0.034)	(0.014)	(0.012)	(0.005)	(0.005)	(0.005)
Mean of Dependent Variable Bottom Tercile HRR	0.301	0.118	9.946	0.565	0.286	0.213	0.856	0.901
Observations	111,438	111,438	111,438	111,438	111,438	109,812	110,774	111,438

Notes: Sample includes all HRS respondents aged 65 and older from 1992-2014. Dependent variable is indicator equal to 1 for condition in column heading. Regression models include age, gender, race, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, and HRS survey wave fixed effects. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Table 3:
Estimates of Effect of Turning 65 and Gaining Medicare on Hospital Visits by HRR Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Uninsured at ages 63/64

	>0 Hospital Visits			>1 Hospital Visit		
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A:						
Gain Medicare Eligibility	0.068***	0.040	0.055	0.041***	0.036*	0.044
	(0.020)	(0.029)	(0.064)	(0.014)	(0.019)	(0.040)
Gain Medicare x HRR Spending (thousands)	0.020**	0.023**	0.029**	0.006	0.006	0.010
	(0.009)	(0.009)	(0.011)	(0.006)	(0.006)	(0.006)
Mean Age 63/64	0.146	0.146	0.146	0.049	0.049	0.049
Panel B:						
Gain Medicare Eligibility	0.022	-0.012	-0.014	0.022	0.012	0.016
	(0.033)	(0.039)	(0.067)	(0.022)	(0.023)	(0.040)
Gain Medicare x Above Median HRR Spending	0.082**	0.071*	0.070*	0.032	0.025	0.027
	(0.038)	(0.037)	(0.038)	(0.024)	(0.024)	(0.025)
Mean Age 63/64 Below Med	0.174	0.174	0.174	0.063	0.063	0.063
Panel C:						
Gain Medicare Eligibility	-0.014	-0.055	-0.053	-0.006	-0.026	-0.020
	(0.050)	(0.049)	(0.076)	(0.028)	(0.030)	(0.046)
Gain Medicare x Mid Tercile of HRR Spending	0.109*	0.110**	0.094*	0.058	0.072*	0.060
	(0.061)	(0.052)	(0.052)	(0.036)	(0.038)	(0.039)
Gain Medicare x Top Tercile of HRR Spending	0.113**	0.112**	0.107**	0.061**	0.064**	0.062**
	(0.055)	(0.048)	(0.050)	(0.030)	(0.029)	(0.030)
Mean Age 63/64 Low Tercile	0.193	0.193	0.193	0.066	0.066	0.066
HRR Fixed Effects	Yes	N/A	N/A	Yes	N/A	N/A
Individual Fixed Effects	No	Yes	Yes	No	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls x Post	No	No	Yes	No	No	Yes
HRR Uninsurance x Post	No	No	Yes	No	No	Yes
Observations	1,990	1,990	1,990	1,990	1,990	1,990

Notes: Each column presents estimates from a separate regression. All regressions include HRS wave fixed effects, controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, and county-level unemployment rates. Sample for regressions include HRS respondents from 1992 to 2014 who are uninsured at ages 63/64. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Table 4:
Estimates of Effect of Turning 65 and Gaining Medicare on Physician Visits by HRR Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Uninsured at ages 63/64

	Number of Visits			>5 Doctor Visits			>10 Doctor Visits		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A:									
Gain Medicare Eligibility	0.307***	0.440***	0.733***	0.131***	0.137***	0.109	0.081***	0.108***	0.032
	(0.080)	(0.085)	(0.261)	(0.027)	(0.040)	(0.084)	(0.021)	(0.025)	(0.060)
Gain Medicare x HRR Spending (thousands)	0.020	0.050	0.038	0.027	0.037***	0.039***	0.017**	0.022***	0.027***
	(0.030)	(0.044)	(0.043)	(0.017)	(0.014)	(0.015)	(0.008)	(0.008)	(0.010)
Mean Ages 63/64	6.947	6.947	6.947	0.345	0.345	0.345	0.149	0.149	0.149
Panel B:									
Gain Medicare Eligibility	0.172	0.087	0.505*	0.089**	0.067	0.021	0.065**	0.067**	-0.026
	(0.129)	(0.113)	(0.286)	(0.038)	(0.052)	(0.088)	(0.028)	(0.029)	(0.061)
Gain Medicare x Above Median HRR Spending	0.250*	0.397***	0.370***	0.074*	0.081*	0.081*	0.034	0.054*	0.060*
	(0.140)	(0.120)	(0.113)	(0.044)	(0.046)	(0.047)	(0.032)	(0.029)	(0.031)
Mean Age 63/64 Below Med	6.833	6.833	6.833	0.308	0.308	0.308	0.148	0.148	0.148
Panel C:									
Gain Medicare Eligibility	0.196*	0.096	0.492	0.055	0.019	-0.043	0.031	0.040	-0.058
	(0.109)	(0.149)	(0.303)	(0.047)	(0.06)	(0.094)	(0.036)	(0.040)	(0.071)
Gain Medicare x Mid Tercile of HRR Spending	0.009	0.113	0.172	0.062	0.103*	0.135**	0.058	0.069	0.085*
	(0.158)	(0.173)	(0.168)	(0.054)	(0.062)	(0.068)	(0.040)	(0.042)	(0.046)
Gain Medicare x Top Tercile of HRR Spending	0.275**	0.421***	0.442***	0.136**	0.139**	0.153**	0.078*	0.081**	0.094**
	(0.134)	(0.153)	(0.148)	(0.057)	(0.057)	(0.059)	(0.041)	(0.038)	(0.043)
Mean Age 63/64 Low Tercile	6.615	6.615	6.615	0.320	0.320	0.320	0.157	0.157	0.157
HRR Fixed Effects	Yes	N/A	N/A	Yes	N/A	N/A	Yes	N/A	N/A
Individual Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls x Post	No	No	Yes	No	No	Yes	No	No	Yes
HRR Uninsurance x Post	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870	1,870

Notes: Each column presents estimates from a separate regression. All regressions include HRS wave fixed effects, controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, and county-level unemployment rates. Sample for regressions include HRS respondents from 1992 to 2014 who are uninsured at ages 63/64. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Table 5:
Estimates of Effect of Turning 65 and Gaining Medicare on Outpatient Surgery, Prescription Drug Use, and Health Conditions by HRR Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Uninsured at ages 63/64

	Outpatient Surgery			Current Rx			Health Condition		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A:									
Gain Medicare Eligibility	0.067***	0.059	-0.007	0.126***	0.152***	0.120*	0.049***	0.163***	0.197***
	(0.019)	(0.038)	(0.058)	(0.021)	(0.021)	(0.070)	(0.013)	(0.017)	(0.057)
Gain Medicare x HRR Spending (thousands)	0.002	0.008	0.006	-0.001	0.002	-0.008	0.012	0.008	0.009
	(0.008)	(0.009)	(0.011)	(0.012)	(0.011)	(0.012)	(0.008)	(0.008)	(0.008)
Mean Age 63/64	0.079	0.079	0.079	0.613	0.613	0.613	0.785	0.785	0.785
Panel B:									
Gain Medicare Eligibility	0.052*	0.038	-0.026	0.141***	0.150***	0.123*	0.045**	0.159***	0.182***
	(0.026)	(0.043)	(0.067)	(0.029)	(0.029)	(0.071)	(0.020)	(0.021)	(0.058)
Gain Medicare x Above Median HRR Spending	0.026	0.045	0.045	-0.024	-0.013	-0.025	0.015	0.013	0.015
	(0.030)	(0.029)	(0.031)	(0.035)	(0.032)	(0.031)	(0.022)	(0.020)	(0.021)
Mean Age 63/64 Below Med	0.086	0.086	0.086	0.585	0.585	0.585	0.796	0.796	0.796
Panel C:									
Gain Medicare Eligibility	0.017	0.021	-0.052	0.148***	0.159***	0.133*	0.065**	0.179***	0.204***
	(0.038)	(0.051)	(0.071)	(0.037)	(0.042)	(0.077)	(0.030)	(0.025)	(0.060)
Gain Medicare x Mid Tercile of HRR Spending	0.053	0.046	0.060	-0.056	-0.028	-0.029	-0.036	-0.033	-0.029
	(0.043)	(0.045)	(0.043)	(0.048)	(0.044)	(0.042)	(0.036)	(0.026)	(0.027)
Gain Medicare x Top Tercile of HRR Spending	0.070*	0.064	0.071*	-0.010	-0.017	-0.028	0.002	-0.002	0.001
	(0.041)	(0.041)	(0.041)	(0.043)	(0.043)	(0.042)	(0.032)	(0.024)	(0.027)
Mean Age 63/64 Low Tercile	0.094	0.094	0.094	0.541	0.545	0.541	0.768	0.768	0.768
HRR Fixed Effects	Yes	N/A	N/A	Yes	N/A	N/A	Yes	N/A	N/A
Individual Fixed Effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Demographic Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Demographic Controls x Post	No	No	Yes	No	No	Yes	No	No	Yes
HRR Uninsurance x Post	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,908	1,908	1,908	2,002	2,002	2,002	2,008	2,008	2,008

Notes: Each column presents estimates from a separate regression. All regressions include HRS wave fixed effects, controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, and county-level unemployment rates. Sample for regressions include HRS respondents from 1992 to 2014 who are uninsured at ages 63/64. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Table 6
Estimates of Effect of Turning 65 on Use of Health Care Services by HRR Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Insured at Ages 63/64

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Gain Medicare Eligibility	0.054	0.027	0.094	0.037	-0.009	0.068**	0.063**	0.194***
	(0.030)	(0.016)	(0.103)	(0.036)	(0.027)	(0.033)	(0.027)	(0.019)
Gain Medicare x HRR Spending (thousands)	0.000	0.000	-0.022	0.000	-0.001	0.012*	0.000	0.001
	(0.005)	(0.003)	(0.023)	(0.007)	(0.004)	(0.006)	(0.004)	(0.002)
Mean Age 63/64	0.213	0.068	9.295	0.517	0.227	0.200	0.777	0.814
Panel B:								
Gain Medicare Eligibility	0.051*	0.029*	0.169	0.038	-0.008	0.057	0.063**	0.187***
	(0.029)	(0.016)	(0.108)	(0.036)	(0.027)	(0.035)	(0.029)	(0.019)
Gain Medicare x Above Median HRR Spending	-0.001	-0.004	-0.046	0.001	-0.002	0.002	-0.003	0.003
	(0.013)	(0.009)	(0.049)	(0.015)	(0.013)	(0.015)	(0.010)	(0.007)
Mean Age 63/64 Below Med	0.208	0.062	8.670	0.494	0.211	0.208	0.775	0.804
Panel C:								
Gain Medicare Eligibility	0.050	0.030*	0.131	0.040	-0.011	0.030	0.065**	0.190***
	(0.030)	(0.017)	(0.112)	(0.036)	(0.027)	(0.036)	(0.028)	(0.020)
Gain Medicare x Mid Tercile of HRR Spending	0.002	-0.007	0.060	-0.002	0.008	0.046**	-0.004	-0.003
	(0.019)	(0.011)	(0.066)	(0.023)	(0.016)	(0.021)	(0.012)	(0.009)
Gain Medicare x Top Tercile of HRR Spending	-0.000	0.002	-0.021	-0.002	-0.002	0.035*	-0.007	0.001
	(0.017)	(0.011)	(0.065)	(0.021)	(0.015)	(0.020)	(0.012)	(0.009)
Mean Age 63/64 Low Tercile	0.209	0.058	8.823	0.487	0.205	0.212	0.765	0.790
Observations	13,698	13,698	13,028	13,028	13,028	12,932	13,766	13,778

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are insured at ages 63/64. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Table 7
Estimates of Effect of Turning 63/64 on Use of Health Care Services by HRR Medicare Spending
Sample of Persons Ages 59/60 to 63/64 who were Uninsured at Ages 59/60

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Age 63/64	-0.019	0.014	0.225	0.031	0.100*	0.053	-0.020	0.058
	(0.069)	(0.032)	(0.270)	(0.083)	(0.053)	(0.074)	(0.056)	(0.058)
Age 63/64 x HRR Spending (thousands)	-0.001	-0.004	0.006	-0.026**	0.003	-0.007	-0.005	-0.004
	(0.010)	(0.007)	(0.038)	(0.011)	(0.011)	(0.008)	(0.010)	(0.008)
Mean Age 59/60	0.162	0.047	7.196	0.355	0.158	0.082	0.568	0.712
Panel B:								
Age 63/64	-0.057	0.002	0.226	0.019	0.085	0.005	-0.037	0.043
	(0.070)	(0.036)	(0.264)	(0.077)	(0.057)	(0.068)	(0.062)	(0.054)
Age 63/64 x Above Median HRR Spending	0.006	-0.016	0.085	-0.019	0.027	-0.028	-0.002	0.006
	(0.034)	(0.020)	(0.123)	(0.037)	(0.034)	(0.029)	(0.030)	(0.021)
Mean Age 59/60 Below Med	0.147	0.038	7.065	0.330	0.156	0.068	0.558	0.723
Panel C:								
Age 63/64	-0.055	0.001	0.286	0.062	0.094	-0.000	-0.010	0.041
	(0.071)	(0.039)	(0.270)	(0.081)	(0.063)	(0.068)	(0.067)	(0.053)
Age 63/64 x Mid Tercile of HRR Spending	-0.002	-0.005	-0.063	-0.036	0.008	-0.023	-0.046	-0.012
	(0.050)	(0.031)	(0.175)	(0.054)	(0.049)	(0.045)	(0.043)	(0.034)
Age 63/64 x Top Tercile of HRR Spending	-0.003	-0.009	0.049	-0.069	0.020	-0.013	-0.045	0.012
	(0.042)	(0.029)	(0.163)	(0.049)	(0.042)	(0.041)	(0.042)	(0.029)
Mean Age 59/60 Low Tercile	0.127	0.036	6.804	0.316	0.141	0.068	0.483	0.690
Observations	2,024	2,024	1,942	1,942	1,942	1,730	2,050	2,062

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, interactions between baseline HRR uninsurance rate and an indicator for the post period, and an indicator for gaining insurance coverage in the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are uninsured at ages 59/60. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level. **p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Table 8
Estimates of Effect of Turning 71/72 on Use of Health Care Services by HRR Medicare Spending
Sample of Persons Ages 67/68 to 71/72 and Always Insured

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Age 71/72	0.027	0.035*	0.433***	0.083**	0.072***	0.013	0.117***	0.150***
	(0.032)	(0.018)	(0.112)	(0.036)	(0.024)	(0.034)	(0.024)	(0.021)
Age 71/72 x HRR Spending (thousands)	-0.000	-0.004	0.023	0.002	0.001	-0.002	0.002	0.001
	(0.005)	(0.003)	(0.019)	(0.006)	(0.005)	(0.005)	(0.004)	(0.002)
Mean Ages 67/68	0.239	0.078	9.391	0.536	0.241	0.201	0.817	0.867
Panel B:								
Age 71/72	0.027	0.041**	0.390***	0.086**	0.080***	0.014	0.111***	0.145***
	(0.032)	(0.017)	(0.107)	(0.035)	(0.024)	(0.033)	(0.023)	(0.021)
Age 71/72 x Above Median HRR Spending	-0.010	-0.007	0.030	-0.011	-0.017	-0.011	0.007	-0.000
	(0.015)	(0.009)	(0.047)	(0.017)	(0.015)	(0.014)	(0.010)	(0.006)
Mean Age 67/68 Below Med	0.232	0.070	8.631	0.508	0.220	0.206	0.814	0.866
Panel C:								
Age 71/72	0.020	0.043**	0.398***	0.084**	0.075***	0.025	0.111***	0.146***
	(0.032)	(0.018)	(0.111)	(0.036)	(0.025)	(0.035)	(0.024)	(0.021)
Age 71/72 x Mid Tercile of HRR Spending	0.004	-0.007	-0.036	-0.005	-0.008	-0.024	0.005	-0.001
	(0.021)	(0.013)	(0.058)	(0.020)	(0.018)	(0.021)	(0.012)	(0.009)
Age 71/72 x Top Tercile of HRR Spending	0.013	-0.012	0.094	0.007	0.011	-0.020	0.007	-0.001
	(0.017)	(0.011)	(0.061)	(0.022)	(0.017)	(0.019)	(0.013)	(0.008)
Mean Age 67/68 Low Tercile	0.233	0.061	8.485	0.497	0.216	0.199	0.809	0.859
Observations	12,908	12,908	12,170	12,170	12,170	12,674	12,980	12,990

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are consistently insured. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Table 9
Estimates of Effect of Turning 65 on Use of Health Care Services by HRR Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Always Privately Insured

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Gain Medicare Eligibility	0.021	0.046	0.241*	0.102*	-0.013	0.071	0.056	0.199***
	(0.050)	(0.028)	(0.144)	(0.060)	(0.089)	(0.059)	(0.043)	(0.031)
Gain Medicare x HRR Spending (thousands)	-0.001	-0.005	-0.026	-0.003	0.009	0.010	0.004	0.008*
	(0.010)	(0.005)	(0.039)	(0.010)	(0.011)	(0.011)	(0.006)	(0.005)
Mean Ages 63/64	0.192	0.055	8.803	0.518	0.205	0.216	0.772	0.794
Panel B:								
Gain Medicare Eligibility	0.027	0.056**	0.325**	0.096*	0.020	0.068	0.053	0.181***
	(0.046)	(0.027)	(0.158)	(0.058)	(0.045)	(0.056)	(0.045)	(0.030)
Gain Medicare x Above Median HRR Spending	-0.005	0.007	0.033	0.013	0.020	0.006	0.021	0.023**
	(0.023)	(0.016)	(0.072)	(0.025)	(0.022)	(0.027)	(0.014)	(0.012)
Mean Ages 63/64 Below Median	0.188	0.051	8.598	0.505	0.203	0.222	0.787	0.784
Panel C:								
Gain Medicare Eligibility	0.038	0.076***	0.322**	0.113*	0.032	0.054	0.065	0.179***
	(0.046)	(0.029)	(0.156)	(0.060)	(0.047)	(0.062)	(0.045)	(0.032)
Gain Medicare x Mid Tercile of HRR Spending	-0.021	-0.047***	0.044	-0.020	-0.014	-0.002	-0.013	0.012
	(0.029)	(0.018)	(0.083)	(0.036)	(0.026)	(0.037)	(0.018)	(0.016)
Gain Medicare x Top Tercile of HRR Spending	-0.023	-0.023	0.073	-0.008	0.007	0.039	0.001	0.028*
	(0.029)	(0.015)	(0.087)	(0.034)	(0.027)	(0.034)	(0.018)	(0.015)
Mean Ages 63/64 Low Tercile	0.191	0.047	8.658	0.498	0.196	0.213	0.772	0.779
Observations	5,136	5,136	4,946	4,946	4,946	4,798	5,142	5,144

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who report private insurance as their primary coverage at ages 63/64 and ages 67/68. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level. **p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Appendix Table 1: Differences in Baseline Characteristics for Movers and Non-Movers in the HRS

	Movers	Non-Movers	p-value of Difference
	(1)	(2)	(3)
Age in Months	909.80	902.81	0.000
Female	0.610	0.582	0.003
Non-White	0.148	0.222	0.000
At Least High School	0.747	0.676	0.000
College Grad	0.218	0.171	0.000
Married	0.571	0.605	0.000
Employed	0.161	0.181	0.005
Excellent or Very Good Health	0.385	0.376	0.304
Fair or Poor Health	0.299	0.293	0.453
Hospital Visit > 0	0.315	0.293	0.010
Hospital Visit > 1	0.128	0.113	0.010
Number of Hospital Visits	0.547	0.496	0.024
Doctor Visit > 0	0.959	0.945	0.002
Doctor Visit > 5	0.612	0.589	0.013
Doctor Visit > 10	0.306	0.301	0.565
Number of Doctor Visits	10.419	10.075	0.303
Current Rx	0.856	0.855	0.820
Outpatient Surgery	0.216	0.213	0.681
Health Condition	0.276	0.237	0.000
Observations	2,963	80,562	

Notes: Data are from the 1992-2014 waves of the Health and Retirement Study. Movers were defined as respondents whose reported HRR of residence in wave *t* differed from the same respondents reported HRR of residence in wave *t+1*.

Appendix Table 2: Differences in Baseline Characteristics between Movers from Above-to-Below Median Spending HRRs and Movers from Below-to-Above Median Spending HRRs

	Move from Below-Median to Above-Median	Move from Above-Median to Below-Median	p-value of Difference
	(1)	(2)	(3)
HRR Spending Difference	+$1,899.74	-$1,490.37	
Age in Months	902.16	915.75	0.009
Female	0.612	0.614	0.968
Non-White	0.109	0.150	0.044
At Least High School	0.766	0.758	0.788
College Grad	0.248	0.199	0.051
Married	0.624	0.583	0.169
Employed	0.161	0.165	0.859
Excellent or Very Good Health	0.407	0.404	0.929
Fair or Poor Health	0.238	0.297	0.030
Hospital Visit > 0	0.304	0.308	0.907
Hospital Visit > 1	0.110	0.132	0.273
Number of Hospital Visits	0.496	0.568	0.298
Doctor Visit > 0	0.957	0.948	0.478
Doctor Visit > 5	0.585	0.601	0.599
Doctor Visit > 10	0.279	0.318	0.160
Number of Doctor Visits	8.695	10.291	0.011
Current Rx	0.840	0.843	0.879
Outpatient Surgery	0.224	0.207	0.520
Health Condition	0.899	0.889	0.590
Observations	516	559	

Notes: Median HRR spending was calculated separately by year. Spending differences represent price-adjusted HRR spending indexed to 2009 dollars.

Appendix Table 3
Estimates of Effect of Turning 65 and Gaining Medicare on Use of Health Care Services by HRR Part B Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Uninsured at ages 63/64

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Gain Medicare Eligibility	0.064	0.049	0.830***	0.138*	0.058	-0.018	0.124*	0.209***
	(0.065)	(0.040)	(0.259)	(0.082)	(0.062)	(0.059)	(0.068)	(0.055)
Gain Medicare x HRR Spending (thousands)	0.042**	0.019*	0.066	0.077***	0.050***	-0.002	0.006	0.025*
	(0.018)	(0.011)	(0.068)	(0.022)	(0.018)	(0.016)	(0.020)	(0.014)
Mean Age 63/64	0.146	0.049	6.947	0.345	0.149	0.079	0.613	0.785
Panel B:								
Gain Medicare Eligibility	-0.042	0.004	0.609**	0.015	-0.032	-0.037	0.134*	0.197***
	(0.066)	(0.041)	(0.285)	(0.085)	(0.061)	(0.068)	(0.072)	(0.057)
Gain Medicare x Above Median HRR Spending	0.110***	0.042*	0.203*	0.087*	0.067*	0.057*	-0.038	-0.009
	(0.039)	(0.024)	(0.116)	(0.044)	(0.036)	(0.032)	(0.031)	(0.022)
Mean Age 63/64 Below Med	0.174	0.061	6.449	0.325	0.158	0.097	0.585	0.787
Panel C:								
Gain Medicare Eligibility	-0.053	0.020	0.531*	-0.025	-0.028	-0.033	0.142*	0.204***
	(0.072)	(0.044)	(0.301)	(0.092)	(0.069)	(0.070)	(0.079)	(0.060)
Gain Medicare x Mid Tercile of HRR Spending	0.079	-0.006	0.214	0.118*	0.014	0.032	-0.054	-0.038
	(0.053)	(0.038)	(0.178)	(0.062)	(0.049)	(0.046)	(0.045)	(0.028)
Gain Medicare x Top Tercile of HRR Spending	0.132***	0.033	0.342**	0.137**	0.086*	0.057	-0.045	-0.005
	(0.049)	(0.030)	(0.152)	(0.055)	(0.046)	(0.042)	(0.042)	(0.027)
Mean Age 63/64 Low Tercile	0.196	0.054	5.697	0.271	0.130	0.093	0.533	0.761
Observations	1,990	1,990	1,870	1,870	1,870	1,908	2,002	2,008

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are uninsured at ages 63/64. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Appendix Table 4
Estimates of Effect of Turning 65 on Use of Health Care Services by HRR Part B Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Insured at Ages 63/64

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Gain Medicare Eligibility	0.062**	0.030*	0.016	0.040	-0.019	0.069**	0.068**	0.200***
	(0.029)	(0.017)	(0.115)	(0.036)	(0.031)	(0.034)	(0.027)	(0.019)
Gain Medicare x HRR Spending (thousands)	0.001	-0.002	-0.055	-0.001	-0.000	0.018	0.003	0.003
	(0.008)	(0.005)	(0.043)	(0.016)	(0.008)	(0.011)	(0.006)	(0.005)
Mean Age 63/64	0.213	0.068	9.295	0.517	0.227	0.200	0.777	0.814
Panel B:								
Gain Medicare Eligibility	0.051*	0.028*	0.172	0.039	-0.011	0.055	0.063**	0.189***
	(0.030)	(0.016)	(0.107)	(0.036)	(0.027)	(0.035)	(0.029)	(0.019)
Gain Medicare x Above Median HRR Spending	0.000	-0.002	-0.049	0.000	0.008	0.005	-0.003	-0.001
	(0.014)	(0.009)	(0.051)	(0.016)	(0.013)	(0.015)	(0.010)	(0.007)
Mean Age 63/64 Below Med	0.214	0.067	8.904	0.488	0.211	0.204	0.773	0.805
Panel C:								
Gain Medicare Eligibility	0.049	0.028	0.152	0.033	-0.010	0.029	0.058**	0.186***
	(0.031)	(0.017)	(0.111)	(0.034)	(0.026)	(0.035)	(0.028)	(0.019)
Gain Medicare x Mid Tercile of HRR Spending	0.002	-0.000	0.031	0.007	0.001	0.066***	0.009	0.001
	(0.020)	(0.011)	(0.070)	(0.021)	(0.017)	(0.020)	(0.013)	(0.010)
Gain Medicare x Top Tercile of HRR Spending	0.002	-0.004	-0.057	0.016	0.005	0.021	-0.000	0.009
	(0.018)	(0.010)	(0.061)	(0.020)	(0.016)	(0.019)	(0.012)	(0.008)
Mean Age 63/64 Low Tercile	0.216	0.062	8.539	0.477	0.202	0.208	0.771	0.799
Observations	13,698	13,698	12,836	12,836	12,836	12,932	13,766	13,778

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are insured at ages 63/64. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Appendix Table 5
Estimates of Effect of Turning 63/64 on Use of Health Care Services by HRR Part B Medicare Spending
Sample of Persons Ages 59/60 to 63/64 who were Uninsured at Ages 59/60

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Age 63/64	-0.068	-0.008	0.199	-0.030	0.068	-0.023	-0.062	0.050
	(0.071)	(0.035)	(0.279)	(0.088)	(0.053)	(0.074)	(0.059)	(0.058)
Age 63/64 x HRR Spending (thousands)	-0.003	0.001	-0.011	-0.047**	-0.002	-0.014	-0.015	-0.007
	(0.013)	(0.007)	(0.066)	(0.018)	(0.018)	(0.011)	(0.016)	(0.014)
Mean Age 59/60	0.162	0.047	7.196	0.355	0.158	0.082	0.568	0.712
Panel B:								
Age 63/64	-0.068	0.003	0.312	0.028	0.081	0.004	-0.017	0.027
	(0.073)	(0.037)	(0.264)	(0.075)	(0.057)	(0.071)	(0.063)	(0.053)
Age 63/64 x Above Median HRR Spending	0.023	-0.012	-0.069	-0.033	0.024	-0.019	-0.037	0.030
	(0.031)	(0.021)	(0.122)	(0.039)	(0.034)	(0.029)	(0.035)	(0.026)
Mean Age 59/60 Below Med	0.163	0.041	7.196	0.310	0.150	0.067	0.520	0.712
Panel C:								
Age 63/64	-0.061	0.004	0.494*	0.049	0.134**	0.010	0.008	0.043
	(0.080)	(0.038)	(0.293)	(0.082)	(0.063)	(0.069)	(0.064)	(0.054)
Age 63/64 x Mid Tercile of HRR Spending	0.005	-0.012	-0.381**	-0.050	-0.088*	-0.022	-0.062	-0.002
	(0.050)	(0.025)	(0.188)	(0.056)	(0.045)	(0.049)	(0.046)	(0.031)
Age 63/64 x Top Tercile of HRR Spending	0.001	-0.012	-0.087	-0.050	-0.007	-0.023	-0.062	0.030
	(0.036)	(0.026)	(0.156)	(0.052)	(0.041)	(0.040)	(0.044)	(0.034)
Mean Age 59/60 Low Tercile	0.162	0.043	6.184	0.316	0.153	0.065	0.500	0.662
Observations	2,024	2,024	1,942	1,942	1,942	1,730	2,050	2,062

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are uninsured at ages 59/60. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Appendix Table 6
Estimates of Effect of Turning 71/72 on Use of Health Care Services by HRR Medicare Spending
Sample of Persons Uninsured at Ages 63/64 and Observed Between Ages 67/68 to 71/72

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Age 71/72	0.001	0.046	0.640**	0.118	0.209***	-0.059	0.186**	-0.033
	(0.111)	(0.057)	(0.311)	(0.127)	(0.076)	(0.097)	(0.077)	(0.075)
Age 71/72 x HRR Spending (thousands)	-0.007	-0.017	-0.007	-0.015	-0.026*	-0.008	0.020*	-0.002
	(0.021)	(0.012)	(0.044)	(0.019)	(0.015)	(0.022)	(0.012)	(0.007)
Mean Age 67/68	0.214	0.085	8.447	0.475	0.228	0.155	0.744	0.879
Panel B:								
Age 71/72	0.016	0.059	0.726**	0.147	0.257***	-0.001	0.163**	-0.037
	(0.101)	(0.060)	(0.327)	(0.124)	(0.080)	(0.102)	(0.076)	(0.075)
Age 71/72 x Above Median HRR Spending	-0.043	-0.024	-0.192	-0.049	-0.096**	-0.100**	0.021	0.007
	(0.066)	(0.039)	(0.131)	(0.057)	(0.042)	(0.048)	(0.037)	(0.022)
Mean Age 67/68 Below Med	0.218	0.097	7.936	0.422	0.222	0.130	0.745	0.894
Panel C:								
Age 71/72	-0.033	0.073	0.675**	0.124	0.284	0.010	0.196***	-0.015
	(0.116)	(0.068)	(0.340)	(0.119)	(0.090)	(0.113)	(0.073)	(0.076)
Age 71/72 x Mid Tercile of HRR Spending	0.079	-0.034	-0.050	0.008	-0.102	-0.047	-0.030	-0.028
	(0.093)	(0.052)	(0.175)	(0.068)	(0.065)	(0.069)	(0.042)	(0.034)
Age 71/72 x Top Tercile of HRR Spending	0.015	-0.055	-0.133	-0.005	-0.115**	-0.123*	0.005	-0.009
	(0.092)	(0.047)	(0.168)	(0.067)	(0.056)	(0.066)	(0.042)	(0.030)
Mean Age 67/68 Low Tercile	0.216	0.072	7.375	0.396	0.188	0.116	0.723	0.884
Observations	1,174	1,174	1,074	1,074	1,074	1,180	1,182	1,182

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are uninsured at ages 63/64. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Appendix Table 7
Estimates of Effect of Turning 71/72 on Use of Health Care Services by HRR Part B Medicare Spending
Sample of Persons Ages 67/68 to 71/72 and Always Insured

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Age 71/72	0.034	0.029	0.475***	0.079**	0.071***	0.014	0.116***	0.152***
	(0.031)	(0.019)	(0.119)	(0.037)	(0.026)	(0.034)	(0.023)	(0.021)
Age 71/72 x HRR Spending (thousands)	0.006	-0.007	0.062*	0.001	0.000	-0.001	-0.004	0.002
	(0.010)	(0.005)	(0.032)	(0.009)	(0.008)	(0.008)	(0.006)	(0.004)
Mean Age 67/68	0.239	0.078	9.391	0.536	0.241	0.201	0.817	0.867
Panel B:								
Age 71/72	0.017	0.038**	0.361***	0.081**	0.073***	0.016	0.111***	0.146***
	(0.032)	(0.018)	(0.106)	(0.035)	(0.024)	(0.033)	(0.023)	(0.021)
Age 71/72 x Above Median HRR Spending	0.012	-0.002	0.095**	0.006	0.002	-0.017	0.008	-0.001
	(0.016)	(0.009)	(0.048)	(0.018)	(0.015)	(0.014)	(0.010)	(0.007)
Mean Age 67/68 Below Med	0.242	0.073	8.731	0.506	0.216	0.199	0.820	0.870
Panel C:								
Age 71/72	0.028	0.041**	0.381***	0.086**	0.076***	0.019	0.116***	0.151***
	(0.032)	(0.018)	(0.108)	(0.037)	(0.025)	(0.034)	(0.024)	(0.021)
Age 71/72 x Mid Tercile of HRR Spending	-0.018	-0.005	-0.033	-0.010	-0.010	-0.016	-0.006	-0.016
	(0.020)	(0.014)	(0.058)	(0.020)	(0.018)	(0.019)	(0.014)	(0.009)
Age 71/72 x Top Tercile of HRR Spending	0.000	-0.008	0.117*	-0.001	0.006	-0.018	0.004	0.002
	(0.020)	(0.012)	(0.060)	(0.023)	(0.018)	(0.018)	(0.014)	(0.008)
Mean Age 67/68 Low Tercile	0.224	0.064	8.268	0.482	0.203	0.191	0.804	0.854
Observations	12,908	12,908	12,170	12,170	12,170	12,674	12,980	12,990

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who are consistently insured. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level.
**p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*

Appendix Table 8
Estimates of Effect of Turning 65 on Use of Health Care Services by HRR Part B Medicare Spending
Sample of Persons Ages 63/64 to 67/68 who were Always Privately Insured

	>0 Hospital Visits	>1 Hospital Visit	Number of Doc. Visits	>5 Doctor Visits	>10 Doctor Visits	Outpatient Surgery	Current Rx	Health Condition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:								
Gain Medicare Eligibility	0.028	0.045	0.162	0.135**	0.040	0.048	0.055	0.201***
	(0.051)	(0.030)	(0.172)	(0.061)	(0.071)	(0.062)	(0.044)	(0.034)
Gain Medicare x HRR Spending (thousands)	0.014	-0.005	-0.093	0.005	0.013	0.019	0.007	0.012
	(0.019)	(0.010)	(0.067)	(0.020)	(0.020)	(0.019)	(0.012)	(0.009)
Mean Ages 63/64	0.192	0.055	8.803	0.518	0.205	0.216	0.772	0.794
Panel B:								
Gain Medicare Eligibility	0.015	0.051*	0.368**	0.101*	0.020	0.070	0.058	0.180***
	(0.046)	(0.027)	(0.156)	(0.059)	(0.045)	(0.058)	(0.045)	(0.031)
Gain Medicare x Above Median HRR Spending	0.017	-0.004	-0.065	0.001	0.010	0.002	0.003	0.018
	(0.023)	(0.013)	(0.080)	(0.027)	(0.022)	(0.027)	(0.014)	(0.012)
Mean Ages 63/64 Below Median	0.188	0.051	8.598	0.505	0.203	0.222	0.787	0.784
Panel C:								
Gain Medicare Eligibility	0.015	0.058**	0.339**	0.114*	0.034	0.048	0.051	0.180***
	(0.047)	(0.027)	(0.167)	(0.059)	(0.047)	(0.056)	(0.043)	(0.031)
Gain Medicare x Mid Tercile of HRR Spending	0.007	-0.018	0.003	-0.032	-0.027	0.043	0.015	0.006
	(0.029)	(0.017)	(0.096)	(0.030)	(0.027)	(0.030)	(0.019)	(0.018)
Gain Medicare x Top Tercile of HRR Spending	0.020	-0.007	-0.049	0.006	0.007	0.035	0.010	0.027*
	(0.029)	(0.016)	(0.087)	(0.031)	(0.025)	(0.033)	(0.018)	(0.014)
Mean Ages 63/64 Low Tercile	0.191	0.047	8.658	0.498	0.196	0.213	0.772	0.779
Observations	5,136	5,136	4,946	4,946	4,946	4,798	5,142	5,144

Notes: Each column presents estimates from a separate regression. All regressions include controls for sex, race/ethnicity, marital status, education, self-reported health, quartiles of household income/wealth, county-level unemployment rates, HRS wave fixed effects, interactions between controls and an indicator for the post period, and interactions between baseline HRR uninsurance rate and an indicator for the post period. Sample for regressions include HRS respondents from 1992 to 2014 who report private insurance as their primary coverage at ages 63/64 and ages 67/68. HRR Medicare spending is in thousands of dollars (2009$). Standard errors are clustered at the HRR level. **p-value <=0.10, **p-value <=0.05, ***p-value <= 0.01*