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The Aggregate and Local Economic Effects of Government Financed Health Care*

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Abstract

Government-financed health care expenditures, through Medicare and Medicaid, have grown from roughly zero to over 7.6 percent of national personal income over the past 50 years. This paper investigates the stimulative effects of Medicare spending. Using an annual, state-level panel, we regress state income growth on own-state spending and spending in other states, instrumented by unanticipated shocks to aggregate Medicare spending, to estimate local and spillover effects. In our benchmark specification, the own-spending multiplier equals 1.3 and the spillover multiplier equals 0.4. The total Medicare spending multiplier (i.e., local plus spillover) is approximately 1.7.

1 Introduction

Government-financed health care, through Medicare and Medicaid, has grown from roughly zero to over 7.6 percent of national personal income from 1966 to 2015.¹ National defense, by comparison, equals 3.6 percent of national income. In 2015, 44 percent of all medical care was financed by the federal and state governments.² While many papers have studied the stimulative macroeconomic effects of defense spending changes,³ with only a few exceptions, little work has considered these effects for government-financed health care.⁴

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¹The importance of government-financed health care in particular states is even more striking: it amounts to nearly 12 percent of income in Mississippi, New Mexico and West Virginia.

²These statistics were calculated using data from the Bureau of Economic Analysis and the Centers for Medicare and Medicaid Services.

³See, for example, Hall (2009), Barro and Redlick (2011), Ramey (2011) and Ramey (2013).

⁴The Council of Economic Advisers (2014) found that one impact of the ACA Medicaid expansions would have been to increase employment by 520,000 job-years in 2014 and 2015 had every state chosen to expand its program.

This paper estimates the causal impact of shocks in Medicare spending. We focus solely on the Medicare component of government-financed health care because the other component, Medicaid, exhibits endogenous cyclicity: Medicaid rolls and expenditures tend to swell during recessions. In contrast, Medicare spending does not respond endogenously to the business cycle. At the same time, Medicare growth has experienced start-and-stop growth associated with other factors, such as changes in program generosity, enrollment requirements and the prices of various components of health care. Unanticipated Medicare spending shocks provide the variation we use to identify a causal effect. By leveraging both the cross-sectional and aggregate variation in a panel, we decompose the causal effect of Medicare transfers into: (i) a local (or direct) effect, and (ii) a spillover (or indirect) effect. Our benchmark results are stated as cumulative multipliers. The two-year cumulative local multiplier, for example, is the change in state income over two years caused by a cumulative increase in Medicare spending in that state (accumulated over the same horizon), holding fixed Medicare spending in other states. Our local benchmark local multiplier equals 1.31 (SE=0.37). A dollar increase in Medicare spending, holding fixed other states' spending, increases state income by \$1.31. The spillover multiplier is 0.41 (SE=0.10). The total multiplier, the sum of the local and spillover values, equals 1.73 (SE=0.33). Thus, Medicare spending increases income not only locally but also “spills over” into other states.

Medicare is a federally administered social insurance program for Americans age 65 or older as well as some younger people. Medicare spending represents a commitment by the government to provide a certain amount and quality of health care to a set of individuals, in contrast to unemployment insurance benefits, for example, which give specified dollar transfers. Because of the qualitative nature of this social contract, overall Medicare spending fluctuates for a number of reasons. For example, as technological innovations, such as open-heart surgery, become covered by Medicare, government expenditure increases.

Although Medicare is typically treated as a transfer program, we will argue that it is more closely related to government spending. Government spending is traditionally defined as the National Income and Product Accounts' government consumption and investment, whereas Medicare reimbursements are categorized as government transfers. Yet the distinction between government spending and transfers is notably blurred in this case. Payments are made by the government directly to medical care providers. While benefits are recorded as personal income in the form of transfer receipts, the Medicare spending is counted towards personal consumption expenditures.⁵ The stimulative effect of government spending may differ from that of pure transfer payments because transfers allow individuals to save a portion of the payments.⁶

Our research design allows us to compare the Medicare estimated effect using both aggregate

Weller and Gelzinis (2017) projected that the repeal of the ACA Medicaid expansions would result in a loss of 1.7 million jobs through 2022.

⁵See Mandel (2014) for greater detail.

⁶Romer and Romer (2016) study the macroeconomic effects of transfer payments by looking at changes in Social Security benefits. They find a positive response of consumption and no evidence of an employment response.

time series (which estimate the aggregate multiplier) versus regional cross-sectional data (which estimate the local multiplier). This question is interesting because a number of recent studies have used cross-sectional variation in fiscal policy to estimate the effect of policy on economic activity.⁷ There exists a line of research on the differences between local and aggregate multipliers.⁸ Dupor and Guerrero (2017) follow a similar strategy to the one taken in the current paper.

While looking at disaggregate (such as state-level) variation at first may seem to dominate an aggregate approach because it provides additional data points, importantly, it informs policymakers about the local effects of a policy across regions, but not necessarily the policy’s aggregate effect. Common monetary policy within a monetary union, for instance, provides a potential source of spillovers across regions. Government spending within one region may drive up inflation, which would lead an active central bank to raise real interest rates. This would induce a negative spillover onto other regions by raising the cost of consumption.⁹

Alternatively, this spillover might be positive. Suppose that government purchases in state X increase that state’s residents’ income. If, in turn, state- X residents use some of their additional income to purchase more state- Z goods, then this would induce a positive spillover. The resulting local-effects estimate would be an downwardly biased estimate of the aggregate multiplier.¹⁰

Papers that estimate local multipliers usually include a caveat that local multipliers cannot necessarily be interpreted as aggregate multipliers. In public policy discussions, commentators often disregard this caveat and interpret estimated local multipliers as evidence of the aggregate effects of fiscal policy.¹¹ Whether and/or when this leap is OK is an open research question. We address this question by using an identical data set to estimate both local multipliers and aggregate multipliers. A primary reason that this type of analysis has rarely been undertaken may be because, without sufficient time-series variation, it is unclear how one might identify the spillover (and therefore the full aggregate) effect of fiscal policy without bringing significantly more economic structure to the problem.¹²

⁷See, for example, Chodorow-Reich et al. (2012), Clemens and Miran (2012), Conley and Dupor (2013), Mian and Sufi (2012), Nakamura and Steinsson (2014), Shoag (2012) and Suárez Serrato and Wingender (2016). See Chodorow-Reich (2019) for a review of the research on local fiscal multipliers.

⁸See Cochrane (2012), Furth (2013), Nakamura and Steinsson (2014) and Ramey (2011).

⁹If, on the other hand, the central bank were passive (perhaps because the zero lower bound binds), then the spillover would be positive.

¹⁰The issue of local versus aggregate multipliers is related to the violation of the stable unit treatment value assumption in statistics. Cox (1958) states this as a requirement that “the [potential outcome] observation on one unit should be unaffected by the particular assignment of treatments to the other units.” We do not pursue that connection in the current paper.

¹¹See, for example, Boushey (2011), Greenstone and Looney (2012) and Romer (2012).

¹²Acemoglu and Restrepo (2017), in a study of the effect of robots on jobs, handle the distinction between local-versus-aggregate effects by augmenting a traditional cross-region comparison with an economic model that accounts for general equilibrium spillover effects.

2 Econometric Model

Preliminaries

For any variable $a_{i,t}$ with $i = 1, \dots, N$, define $a_t = \sum_i^N a_{i,t}$, i.e., the cross-sectional sum.

Let $\mathcal{I}_{i,t}$ and $P_{i,t}$ denote state-year real personal income and population.¹³ Population series are from the Current Population Survey (CPS) microdata. Personal income data are from the Bureau of Economic Analysis. Let $G_{i,t}$ denote real state-year Medicare spending. We use the core Consumer Price Index (CPI) to construct real values of their nominal counterparts. The Medicare spending data, from the Bureau of Economic Analysis, consist of payments from the Hospital Insurance (HI) trust fund (Medicare Part A) and the Supplementary Medical Insurance (SMI) trust fund (Medicare Parts B and D).

Endogenous Variable of Interest

Let $x_{i,t,\delta}$ be the cumulative increase in Medicare spending over a δ -year horizon relative to a year $t - 1$ baseline, scaled by national population:

$$x_{i,t,\delta} = \sum_{j=1}^{\delta} (G_{i,t+j-1} - G_{i,t-1}) / P_{t-1}$$

Dependent Variable

Next, define $y_{i,t,\delta}$ to be the cumulative increase in real income over a δ -year horizon relative to a year $t - 1$ baseline scaled by the national population level:

$$y_{i,t,\delta} = \left[\sum_{j=1}^{\delta} (\mathcal{I}_{i,t+j-1} - \mathcal{I}_{i,t-1}) / P_{t-1} \right]$$

Defining cumulative variables allows us to study the accumulated response of income to Medicare spending. Ramey and Zubairy (2018) argue compellingly that cumulative multipliers are more useful from a policy perspective than other (sometimes reported) statistics, such as peak multipliers and impact multipliers. Cumulative multipliers take into account both the full income increase and full cost of government spending across time.

Shock/Instrument

Our shock shall be the unforecastable change in national Medicare spending. We construct this by first running a state-level regression forecasting equation:

$$x_{i,t,1} = \theta_i + \alpha' s_{i,t} + \chi' p_{i,t-1} S_t + \lambda' \Gamma(L) x_{i,t-1,1} + v_{i,t}$$

¹³The Bureau of Economic Analysis (2019) defines personal income as income received as that from labor “in production, from owning a home or business, from the ownership of financial assets, and from government and business in the form of transfers [...], and alternatively and equivalently, “as the sum of wages and salaries, supplements to wages and salaries, proprietors’ income, dividends, interest, and rent, and personal current transfer receipts, less contributions for government social insurance.”

where $\Gamma(L) = \begin{bmatrix} 1, & \dots, & L^b \end{bmatrix}$. $s_{i,t}$ and $S_{i,t}$ are sets of controls we define presently. First, let $m_{i,t} = (\mathcal{I}_{i,t} - G_{i,t})/P_t$ and $q_{i,t} = G_{i,t}/P_t$.

Then $s_{i,t}$ is a $2b+1$ by 1 vector process given by lags of state i income and Medicare spending. In addition, we include $\mathcal{G}_t^i = \ln(e_{i,t+1}/e_{i,t-1})$, where, $e_{i,t}$ is the Medicare enrollment in state i . We include this final term to control for demographic changes.

$$s_{i,t} = \begin{bmatrix} \Gamma(L) m_{i,t} & \Gamma(L) q_{i,t-1} & \mathcal{G}_{t-1}^i \end{bmatrix}'$$

Next, S_t is the economy-wide analog of $s_{i,t}$, with the addition of the national debt-to-income ratio D_{t-1} .

$$S_t = \begin{bmatrix} \Gamma(L) m_t & \Gamma(L) q_{t-1} & \mathcal{G}_{t-1} & D_{t-1} \end{bmatrix}'$$

Our shock or instrument is $v_t = \sum_{i=1}^N \hat{v}_{i,t}$, the sum of the state-level Medicare spending shocks.

Estimation Equation

We use local projections, which is an alternative to a vector autoregression, to account for serial correlation in variables. As is typically done with a VAR, we condition on lags of the level version of the dependent variable and independent variables. Our baseline specification is:

$$y_{i,t,\delta} = \varphi_i + \beta x_{i,t,\delta} + \frac{\gamma}{(N-1)} \sum_{j \neq i} x_{j,t,\delta}^+ + \psi' s_{i,t} + \lambda' p_{i,t-1} S_t + \pi' \Gamma(L) v_{t-1} + \varepsilon_{i,t,\delta} \quad (2.1)$$

The coefficients in (2.1) are implicitly indexed by δ , which we drop to avoid clutter.

β is the effect of Medicare spending in a state on income in that state, holding fixed average national spending. γ is the effect of average Medicare spending on the state, holding fixed own spending. Both depend on the horizon of interest.

For conciseness, we rewrite (2.1) after concentrating out the conditioning variables:

$$y_{i,t,\delta}^+ = \beta x_{i,t,\delta}^+ + \frac{\gamma}{N-1} \sum_{j \neq i} x_{j,t,\delta}^+ + \varepsilon_{i,t,\delta} \quad (2.2)$$

where a $+$ superscript denotes a variable has been residualized by projecting on the conditioning variables.

We use the following moment conditions to achieve identification:

$$E(\varepsilon_{i,t,\delta} v_t) = 0 \quad (2.3)$$

for all i . Thus, we assume that the error term in (2.1) in each state is orthogonal to the national unanticipated one-year growth in Medicare spending. We estimate the model via GMM with the identity matrix used to weight moment conditions in our loss function.

Note that summing across i for all t , equation (2.2) becomes:

$$y_{t,\delta}^+ = (\beta + \gamma) x_{t,\delta}^+ + \varepsilon_{t,\delta}$$

Thus, $\mu = \beta + \gamma$ is the aggregate spending multiplier.

We also estimate a model with zero local effect, i.e. $\beta = 0$:

$$y_{i,t}^+ = \frac{\phi}{N} x_t^+ + u_t \quad (2.4)$$

Here ϕ is a second measure of the aggregate spending multiplier.

In estimation, we set $b = 1$ and $\delta = 2$.

2.1 Medicare Spending and the Exclusion Restriction

This section justifies the exclusion restriction in our estimation equations, which is that unanticipated national Medicare spending is orthogonal to the error term in each state. In particular, we discuss potential channels through which Medicare spending could violate the exclusion restriction and show that these are likely inconsequential. Appendix B provides background information regarding the composition of the Medicare program and its financing sources. The appendix also describes historical drivers of Medicare spending since its inception. The latter provides support for the case that Medicare spending changes have been caused mainly by factors that are plausibly exogenous to the business cycle.

Premiums and Enrollment

Some components of Medicare, such as Part B, require enrollee premiums. One might then be concerned that exogeneity could be violated according to the following reasoning. Suppose that, during an economic downturn, enrollees who cannot afford the premiums decide to drop Part B coverage. By this potential channel, macroeconomic conditions could cause a decrease in one component of government contributions to Medicare spending.

There is good reason, however, to think that this channel is not operative. First, the parts of Medicare that involve premiums are highly subsidized; thus, it is unlikely that many enrollees would give up the subsidy by unenrolling. Second, the majority of Medicare recipients are retirees and, as such, they have no labor earnings; thus, their income is somewhat insensitive to economic conditions. This is particularly true for low income individuals, who rarely hold equities and rely primarily on Social Security benefits (see Whitehouse (2009) and Munnell and Rutledge (2013)). As seen in Figure B.4 in the appendix, there is no systematic tendency for enrollments in any part to decline (or increase) during recessions in ways that differ from slow-moving trends.

Although economic downturns may not significantly affect Medicare enrollment, one may still be concerned that, because of out-of-pocket expenses, beneficiaries might cut back on their medical care usage. The majority of beneficiaries, however, have some form of supplemental insurance that lowers out-of-pocket expenses. Levine and Buntin (2013) estimate that, between 2008 and 2010,

the median out-of-pocket spending for a Medicare beneficiary (excluding premiums) was less than 5 percent of that individual’s income.

Health Status and Business Cycles

A strand of the health economics literature has focused on the impact of business cycles on health, health-related behaviors and mortality rates. If, for example, recessions worsened the health of Medicare beneficiaries, then this might drive up spending on the program. Alternatively, if the Medicare population engaged in healthier behavior during economic downturns, then this might result in reduced medical care usage, which in turn would decrease Medicare spending. Note that this would bias our results toward finding a stronger income response to Medicare spending.

Estimates on the impact of recessions on health, however, are inconclusive. Ruhm (2000) finds that total mortality is procyclical. He also reports that strong economic conditions are associated with an increase in smoking and obesity as well as a reduction in physical activity. Other studies find similar results regarding the procyclicality of mortality rates.¹⁴ In contrast, Sullivan and von Wachter (2009) and McInerney and Mellor (2012) report that joblessness is associated with an increase in mortality rates.

Even if business cycles do influence health outcomes, note that we are mainly concerned about whether this would translate into unanticipated changes in medical care usage by the Medicare population. Several studies that report procyclicality of mortality rates rule out increased medical care as the channel that links reduced mortality and recessions (McInerney and Mellor, 2012). Similarly, Levine and Buntin (2013) estimate the effects of changes in wealth and income on elderly Medicare beneficiaries’ use of health care services and found no significant relationship.

Medicare Spending and Supplier-Induced Demand

Another strand of the health economics literature focuses on supplier-induced demand, i.e., the demand in excess of what would exist if patients had the same information as providers. Note that if changes in Medicare spending were driven by supplier-induced demand, one would worry that this induced demand might be affected by the business cycle. In other words, physicians and health care institutions may attempt to offset the negative impact of recessions by overbilling patients.¹⁵ This would lead to a downwardly biased estimate of Medicare’s income effects.

We first note that research on the extent of supplier-induced demand in the health care sector is inconclusive. Although some studies (e.g., Delattre and Dormont (2003)) have found evidence of physician-induced demand, others (see, for example, Grytten and Sørensen (2001)) have found no such evidence. Moreover, even among studies that report supplier-induced demand in the health care sector, it is not clear whether this excess demand results from medical providers’ readiness to increase their revenue. Richardson and Peacock (2006), for instance, argue that physicians’ “asym-

¹⁴See, for example, Lin (2009), Miller et al. (2009) and Stevens et al. (2015).

¹⁵By overbilling, we mean several unlawful and unethical practices that range from recommending unnecessary medical procedures to billing for services or supplies that were not provided.

metrical ability and willingness to exercise judgement in the face of uncertainty” is an important driver of supplier-induced demand in health care (p. 1). Note that this channel is unlikely to be affected by business cycle conditions. Therefore, the presence of supplier-induced demand in the health care sector does not necessarily imply that Medicare spending would increase in response to an economic downturn.

As further evidence, Figure B.5 in the appendix plots the change in the number of health care providers excluded by the Office of Inspector General from receiving Federal government payments because of overbilling and other cases of malpractice. The figure shows there is no systematic tendency for exclusions to increase (or decrease) during recessions in ways that differ from slow-moving trends.

Medicare Participation through Disability

In addition to the elderly, individuals receiving SSDI are permitted to receive Medicare benefits. Besides the medical prerequisites, SSDI eligibility requires that participants must not engage in “substantial gainful activity,” which sets a ceiling on monthly earnings (\$1,170 in 2017). This could potentially introduce endogeneity to Medicare spending. The conceivable chain of events would be as follows. The economy enters into recession, and SSDI participation increases from younger individuals who lose their jobs or have poorer employment prospects. New SSDI recipients in turn join Medicare.

There are two reasons this channel is likely inconsequential for our results. First, the fraction of Medicare participants under age 65 is small (especially early in the sample). Cubanski, Neuman and Damico (2016) report that this share made up only 7 percent of Medicare in 1973 and 16 percent in 2016. Second, for almost all participants under age 65 there is a two-year waiting period between first receiving SSDI and the later Medicare coverage. Since we primarily examine the two-year cumulative multiplier, alternative shocks that drive the business cycle would not move Medicare spending through the SSDI channel until beyond our primary multiplier horizon.¹⁶

Dual Eligibility

Some Medicare enrollees are also eligible for enrollment in the means-tested Medicaid program. This group mostly consists of low-income elders, who may exhibit chronic conditions and require costly care above the average for non-dual-eligible individuals. In 2008, the dual eligible comprised 20 percent of Medicare enrollees but 31 percent of Medicare spending, and 15 percent of Medicaid enrollees but 39 percent of Medicaid spending (Jacobson, Neuman and Damico, 2012).

Some nuances regarding the dual-eligible population may pose a potential threat to exogeneity. Consider how Medicare spending would change if a Medicare beneficiary is suddenly eligible for Medicaid as a result of a drop in his or her income. First, one could worry that the newly available Medicaid coverage may act as a substitute for Medicare coverage; that is, a portion of this

¹⁶The two-year waiting period is, effectively, 29 months because there is a five-month waiting period between applying for and first receiving SSDI benefits.

individual’s medical care would now be covered under Medicaid, reducing Medicare spending. This scenario, however, would not occur because the Medicaid program is the payer of last resort, and so, for dual-eligible beneficiaries, Medicare pays first (Centers for Medicare and Medicaid Services, 2017).

Second, note that if a Medicare beneficiary becomes eligible for Medicaid, his or her health insurance coverage has effectively improved, potentially resulting in smaller co-payments and out-of-pocket expenses. This improved coverage could incentivize individuals to seek medical care that was previously unaffordable, leading to an increase in Medicare payments. This mechanism, nonetheless, is unlikely to be quantitatively meaningful because, as argued above, most Medicare beneficiaries are retirees, and thus their income is not strongly linked to the business cycle. In addition to the income test, Medicaid eligibility includes an asset test, and many retirees do hold assets whose prices are procyclical. However, this channel is only relevant for individuals that meet the income eligibility criteria and that are near the asset test eligibility threshold. Therefore, it is improbable that a substantial share of Medicare participants would enroll and disenroll in Medicaid in response to macroeconomic fluctuations.

2.2 Benchmark Results

The models outlined above are estimated using the generalized method of moments. Inference is conducted using Conley (1999) spatial-temporal HAC corrected standard errors. We measure closeness between states using geographic distance. We set the spatial distance threshold such that most states have between 10 and 30 neighbors. We set the temporal threshold, i.e. the maximum degree of autocorrelation in the error terms, to be three years. We then use Barlett kernels along both the spatial and temporal dimensions.

Column (1) of Table 1 reports the estimate of the local and spillover multiplier. The local multiplier equals 1.31 (SE=0.37). It implies that a one dollar increase in state Medicare spending, holding fixed Medicare spending in other states, results in \$1.31 of additional income in that state. The spillover multiplier equals 0.41 (SE=0.10). Thus, holding fixed own state spending, a one dollar increase in all other states’ Medicare spending causes own-state income to increase by 41 cents. This indicates a positive spillover of Medicare spending across states. This could be due to demand spillovers resulting from the purchases of government-financed health goods across state borders.

Column (2) contains the local multiplier estimate under a zero-spillover restriction. This coefficient equals 1.51 (SE=0.19). The local multiplier is greater than one and statistically different from zero; however, it suffers from an omitted variable bias because it omits the spillover effect. In particular, it understates the total effect of Medicare spending because it omits the spillover channel.

The zero-spillover specification estimates are interesting, not because they are necessarily infor-

Table 1: Two-year government spending multipliers, dollar increase in real income due to a one dollar increase in Medicare

	Local-Spillover (1)	Local (2)	Aggregate (3)
Own-spending	1.31*** (0.37)	1.51*** (0.19)	-
Spillover-spending	0.41*** (0.10)	-	-
Agg	1.73*** (0.33)	-	1.73*** (0.10)

Notes: Dependent variable=growth in state real income to national population.

mative about the aggregate effects of Medicare spending, but because they speak to the methodology used in other studies on the impact of fiscal policy. These studies attempt to use geographic variation either in a panel or a cross-section to infer the relative (or local) impact of government spending. In the presence of cross-border spillovers, using cross-sectional variation identifies the relative differences in outcomes across states rather than the aggregate outcomes.

Another way to estimate the aggregate effect is to use the national-average spending as the right-hand side variable, to continue using state income as the dependent variable and to omit a local spending variable. Using this approach, we aggregate both the local and spillover effects before doing estimation. This specification, in column (3), gives a coefficient of 1.73 (SE=0.10). By construction, the two point estimates of the aggregate multiplier in (1) and (3) are identical. Estimating the aggregate multiplier directly results in a smaller standard error than taking the sum of the own- and spillover spending coefficients.

3 Additional Results

Table 2 reports the multipliers for both the benchmark lag length for controls (equal to two) as well as a lag length of three. Columns (1) through (3) contain the benchmark multipliers. Column (4) contains the local-spillover decomposition with three lags. The own- and spillover-spending coefficients both remain positive, respectively, and are both statistically different from zero. Adding the lag decreases the aggregate multiplier somewhat, from 1.73 to 1.45. We did not consider longer lag specifications because our relatively short sample could lead to overfitting the model.

Recent research has suggested that the stimulative effects of government spending may be higher when there is slack in the labor market. For instance, Michailat (2014) develops a New Keynesian model in which the government spending multiplier doubles when the unemployment rate increases from 5 percent to 8 percent. Auerbach and Gorodnichenko (2012) and Nakamura and Steinsson

Table 2: Two-year government spending multipliers, dollar increase in real income due to a one dollar increase in Medicare, additional lag of controls

	Decomp-Bmark (1)	Agg-Bmark (2)	Local-Bmark (3)	Decomp (3-lag) (4)	Agg (3-lag) (5)	Local (3-lag) (6)
Own-spending	1.31*** (0.37)	-	1.51*** (0.19)	1.08*** (0.29)	-	1.26*** (0.45)
Spillover-spending	0.41*** (0.10)	-	-	0.36** (0.15)	-	-
Agg	1.73*** (0.33)	1.73*** (0.10)	-	1.45*** (0.22)	1.45*** (0.04)	-

Notes: Dependent variable=two year cumulative change in state real income to national population rate.

(2014) find evidence that multipliers tend to be substantially higher during periods of slack. On the other hand, Barro and Redlick (2011), Owyang, Ramey and Zubairy (2013) and Ramey and Zubairy (2018) find that spending multipliers are less than or close to 1 under both labor market conditions.

Table 3: Two-year government spending multipliers, dollar increase in real income due to a one dollar increase in Medicare, dependent on the state of the macroeconomy

	High unempl. (1)	Low unempl. (2)
Aggregate multiplier	1.40** (0.64)	1.71*** (0.34)
N	901	899

Notes: Dependent variable=two year cumulative change in state real income to national population rate. Standards errors are clustered by state.

One reason why government spending multipliers may depend upon the unemployment rate is that during times of high unemployment the government's demand for goods and services could be met with otherwise idle workers. Thus, additional public spending need not bid up wages significantly or crowd out private demand. Whether multipliers are contingent upon the state of the economy is particularly relevant because policymakers are most likely to call for spending stimulus when many are unemployed and vacancies are scarce.

We split the sample into state-year pairs according to whether the unemployment rate is above or below threshold of 5.68 percent.¹⁷ In this estimation, we assume the response to the conditioning

¹⁷This is the median unemployment in our sample.

variables do not depend on this state. We present only the aggregate multiplier. That is, we leave decomposing the local and spillover multipliers in a state-contingent manner to future work

Operationally, we regress state-level income on average national Medicare spending using national unanticipated Medicare spending as an instrument in two subsamples (defined by whether a state has a high or low unemployment rate at t). We report state-clustered standard errors. Columns (1) and (2) of Table 3 report the split-sample aggregate multipliers. The high unemployment rate multiplier equals 1.40 (SE=0.64), which is somewhat lower than in the low unemployment rate case. The low unemployment rate coefficient equals 1.71 (SE=0.34). In contrast to some existing work, the low unemployment rate multiplier is the higher of the two. Understanding the difference between these two cases merits future research.

4 Conclusion

We began by recognizing that government-financed health care has become a large part of government expenditures, currently more than double the amount spent on national defense. Yet, there has been almost no work on the macroeconomic effects of government-financed health care. This is partly due to the difficulty of finding an exogenous source of variation in government health care spending. This paper's first contribution is to overcome this challenge by exploiting unanticipated exogenous variation in national Medicare spending.

Next, we integrate a local and aggregate analysis of the fiscal multiplier. We find positive local and spillover multipliers. The sum of these two multipliers is the aggregate effect of Medicare spending. Our benchmark estimates imply a total multiplier of 1.73 with about one-quarter of the stimulative effect coming through the spillover channel.

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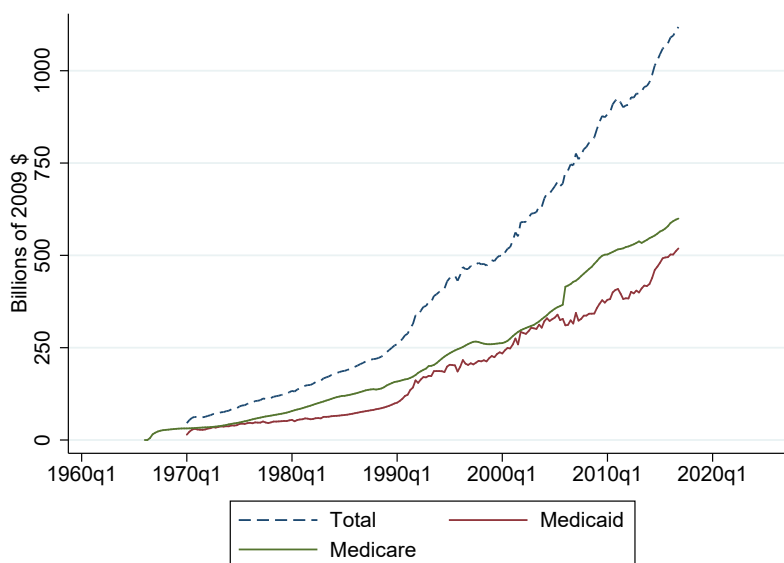
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A The Data

Our Medicare spending data are from Bureau of Economic Analysis (BEA) state personal income reports. The BEA obtains the data from the Centers for Medicare and Medicaid Services (CMS).¹⁸ Specifically, we use the state-level quarterly series from “Medicare benefits” report. Figure A.1 plots Medicare spending at the national level. We also include the series for Medicaid spending, obtained from the same source, to provide a complete picture of government-financed health care expenditures.

Figure A.1: Government-financed health care expenses over time



Notes: Annualized rate.

A.1 Medicare Benefits

The BEA series on Medicare benefits consists of federal government payments made directly or through intermediaries to vendors for care provided to individuals under the Medicare program (BEA, 2016). The state-level figures are estimated by the CMS. The BEA constructs quarterly estimates of Medicare benefits at the state level by extrapolating annual trends in state shares of the nation. Furthermore, due to lag in availability, the data for 2010 forward have been extrapolated by the BEA using Medicare enrollment.

These data cover all expenditures (with the exception of administrative expenses) from the Hospital Insurance trust fund and the Supplementary Medical Insurance trust fund. Hence, the

¹⁸We accessed the data via Haver Analytics.

data we use provide a comprehensive measure of the benefits provided by Parts A through D of the Medicare program.

The Medicare benefits panel is available at a quarterly frequency beginning in the third quarter of 1966, soon after the program was established. Our last observations correspond to the first quarter of 2017. Note that while Medicare Part A and Part B were instituted in 1966, Medicare Part C—which subsidizes privately managed plans—began operating in 1985. Similarly, Medicare Part D—which covered outpatient prescription drugs—started in 2006. The BEA allocated the national estimate for Part D benefits to states using the enrollment counts reported by the CMS (BEA, 2016).

Table A.1 decomposes national data for 2016 into the four parts that currently make up the Medicare program. In 2016, Parts A, B, and D represented, respectively, 41.9 percent, 43.2 percent, and 14.9 percent of the national Medicare data. Note that Part C beneficiaries must also be enrolled in Parts A and B, and payments are made in appropriate parts from the HI and SMI trust funds to the private health insurance plans. When considered separately, 28.2 percent of total benefits paid in 2016 consisted of subsidies to private plans via Medicare Part C.

Table A.1: Medicare data for calendar year 2016 (billions of USD)

	HI trust fund Part A	SMI trust fund Part B	Part D	Total
Total benefits	\$280.5	\$289.5	\$99.5	\$669.5
Part C	\$85.2	\$103.4	-	\$188.6
Other benefits	\$195.3	\$186.1	\$99.5	\$480.9

Source: Authors’ calculations based on the 2017 Boards of Trustees for Medicare Report.

It should be noted that the Medicare state panel we use reflects expenditures on benefits irrespective of the sources of financing of these expenses. As explained in Section B.1, the HI trust fund and the SMI trust fund receive their revenue from multiple sources, including payroll taxes, general revenue funds, premiums, and transfers from states.

B Background on the Medicare Program

B.1 Medicare Composition and Financing

The Medicare program originally consisted of only two subprograms: Medicare Part A and Medicare Part B. Part A, also known as Hospital Insurance, provides beneficiaries with coverage of inpatient hospital services, skilled nursing facility services, home-health visits and hospice services. Medicare Part A is available to almost everyone age 65 or older and is premium-free for most of those age eligible; a far smaller number of people under age 65 are covered (those having certain disabilities).

That is, enrollment in Part A of Medicare is largely determined by age and not by business cycle conditions.

Part B of Medicare, on the other hand, covers medical services, such as physician services, laboratory services, durable medical equipment, and outpatient hospital services. Though enrollment is voluntary and requires a monthly premium, most beneficiaries with Part A also enroll in Part B.¹⁹ In 2016, 92.3 percent of Part A beneficiaries were enrolled in Part B (The Boards of Trustees, 2017). The fact that Medicare Part B has a premium component could potentially result in enrollment (and spending) being procyclical. In Section 2.1 we argue this is not the case.

In an attempt to expand beneficiaries' choices of health insurance plans beyond traditional Medicare and to benefit from the efficiencies and cost saving of the private sector, private insurance plans were introduced into the Medicare program in 1985. This initiative, known as Part C or Medicare Advantage, provides private-plan options to individuals already enrolled in both Part A and Part B. In 2016, 32.4 percent of Medicare beneficiaries chose to obtain their benefits from a Medicare Advantage plan (The Boards of Trustees, 2017). Note that these individuals still get complete Part A and Part B coverage.

Finally, Medicare Part D began operating in 2006. This program finances outpatient prescription drugs. In 2016, 76.0 percent of all Medicare beneficiaries were enrolled in Medicare Part D (The Boards of Trustees, 2017).

Figure B.2 shows the national enrollment in each part of Medicare since the program's inception in 1966. It is important, for the purpose of this paper, to identify and understand the different parts that make up the Medicare program because each part is financed differently. As explained in Section 2.1, the source of financing may play a role in evaluating the exogeneity of Medicare spending.

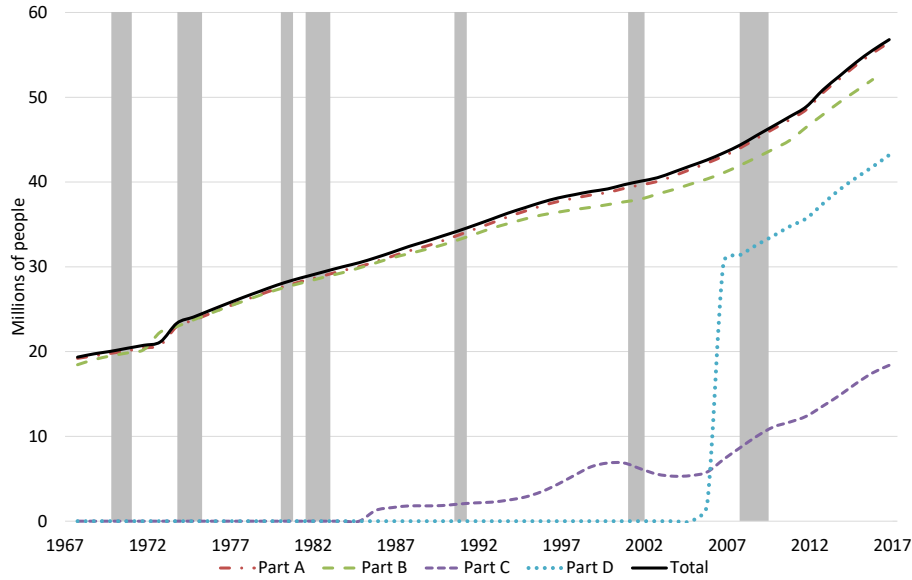
Direct government contributions to the Medicare program operate through two trust funds: the HI trust fund and the SMI trust fund. The Boards of Trustees for Medicare oversee the financial operations of these funds. The HI trust fund finances Medicare Part A, whereas the SMI trust fund finances Medicare Parts B and D. Before we discuss how Part C is financed, we describe the revenue sources of these two trust funds.

The HI trust fund is designed to be self-supporting, and its main source of revenue consists of payroll taxes paid by employees and employers. Specifically, each pays 1.45 percent of an employee's taxable earnings and self-employed individuals pay 2.9 percent (2017 rates). Additional revenue sources include a portion of the federal income taxes paid on Social Security benefits, interest on federal securities held by the trust fund, and premiums paid by voluntary enrollees who are not eligible for the premium-free Medicare Part A.

The SMI trust fund, on the other hand, is not self-supporting, and it is mainly financed by a combination of general revenues and monthly premiums. The SMI fund is divided in two accounts

¹⁹In 2017, the standard Part B monthly premium was \$134; starting in 2007, higher-income beneficiaries pay higher premiums.

Figure B.2: Medicare enrollment by parts



Notes: Shaded regions indicate NBER-dated recessions.

Source: Annual Reports of Trustees of the Federal Insurance Supplementary Medical Insurance Trust Fund; Medicare Managed Care Contract Plans Monthly Summary Report.

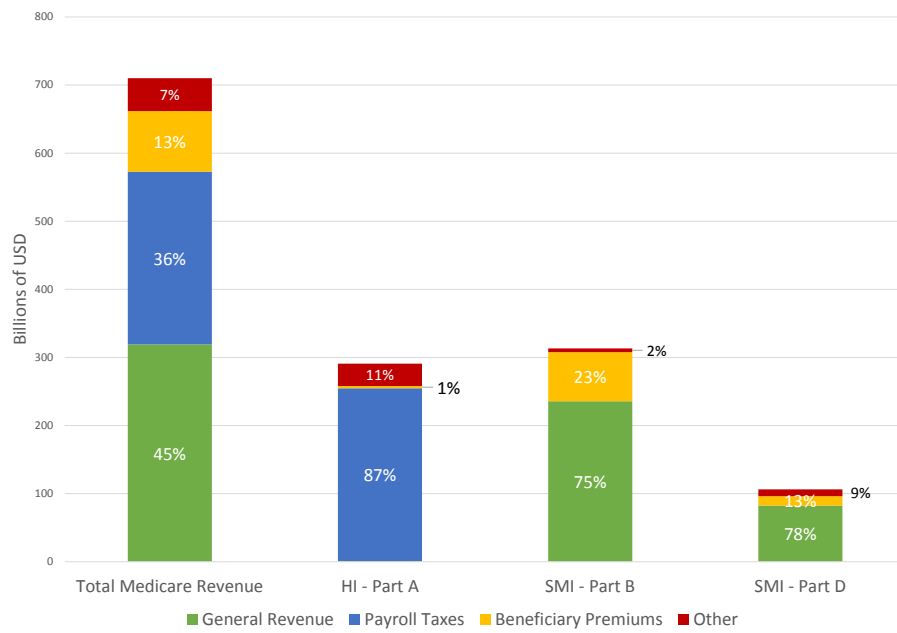
for Part B and Part D. The Part D account additionally receives payments from state governments. These payments represent a portion of the amounts states would have been expected to pay for drugs under Medicaid if drug coverage for individuals eligible for Medicare and Medicaid had not been transferred to Part D. As of 2011, high-income Part D beneficiaries are required to pay higher premiums.

Figure B.3 shows the revenue sources of the HI trust fund and the SMI trust fund.

Medicare Part C is provided privately and is financed as follows: private insurance plans receive a fixed, monthly, risk-adjusted subsidy per enrollee from the HI trust fund and the SMI trust fund in appropriate parts. This amount is specific to each county and is primarily determined by a benchmark/bidding process that uses that county's average per-beneficiary cost of Medicare Parts A and B. In addition, beneficiaries typically pay a premium to the private plans. Recall that Part C beneficiaries are enrolled in Parts A and B as well, so they are required to pay the Part B premium and the Part D premium, if enrolled in that plan.

Given that Medicare spending is partially financed with beneficiaries' premiums, one may wonder how much of our data is actual government spending. However, in 2016, only about 12.3 percent of Medicare spending was financed by premiums. For further detail on this concern, see Section

Figure B.3: Sources of Medicare revenue, 2016

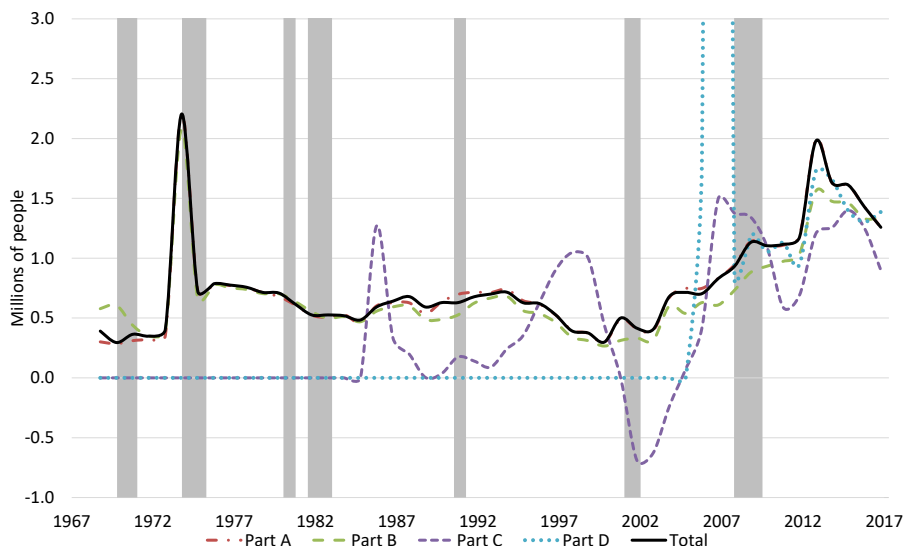


Notes: HI refers to the Hospital Insurance trust fund, and SMI refers to the Supplementary Medical Insurance trust fund.

Source: 2017 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds.

2.1.²⁰ Finally, note that there is a slowdown in total enrollment that coincides with the 1973-1975 recession. This is a product of the spike in new enrollees caused by the expansion in coverage to SSDI beneficiaries in 1973. As explained in the previous section, this policy was not motivated by business cycle conditions.

Figure B.4: Change in Medicare enrollment by parts

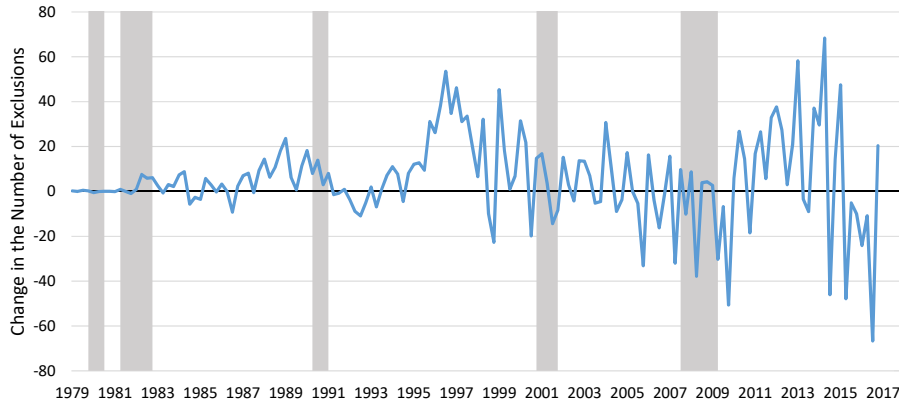


Notes: In 2006, Part D enrollment increased by 28.7 million. Shaded regions indicate NBER-dated recessions.
Sources: Annual Reports of Trustees of the Federal Insurance and Federal Supplementary Medical Insurance Trust Funds; Medicare Managed Care Contract Plans Monthly Summary Report.

Next, Figure B.5 provides evidence against the supplier-induced demand concern that might cause the exclusion restriction to be violated. The Office of Inspector General imposes exclusions under the authority of sections 1128 and 1156 of the Social Security Act for, among other related reasons, “claims for excessive charges or unnecessary services.’ If overbilling of Medicare patients were more pervasive during economic downturns (consistent with the supplier-induced demand argument), we would expect to observe an increase in exclusions during recessions. The figure, however, shows that there is no systematic tendency for exclusions to increase (or decrease) during recessions in ways that differ from slow-moving trends.

²⁰Figure B.4 in the appendix shows that there is no systematic tendency for enrollments in any part to decline (or increase) during recessions in ways that differ from slow-moving trends. There is one decline in enrollments in Part C around the 2001 recession. This resulted from *involuntary* unenrollments caused by the BBA. The more drastic aspects of that act were rescinded by later legislation.

Figure B.5: Exclusions from federally funded health care programs



Notes: We counted the number of exclusions in each quarter and then took a two-year moving average of this series. The figure shows the quarter-to-quarter change in the resulting series. Shaded regions indicate NBER-dated recessions.

Source: Office of Inspector General, U.S. Department of Health and Human Services.

B.2 Historical Drivers of Medicare Spending

We divide the history of Medicare into six periods, roughly following the demarcations used by Catlin and Cowan (2015) in their detailed history of health spending in the United States.²¹ Figure B.6 contains the time series for our Medicare spending variable: the eight-quarter accumulated change in Medicare spending between quarters $t - 1$ and $t + 7$ as a percentage of trend income at quarter $t - 1$.

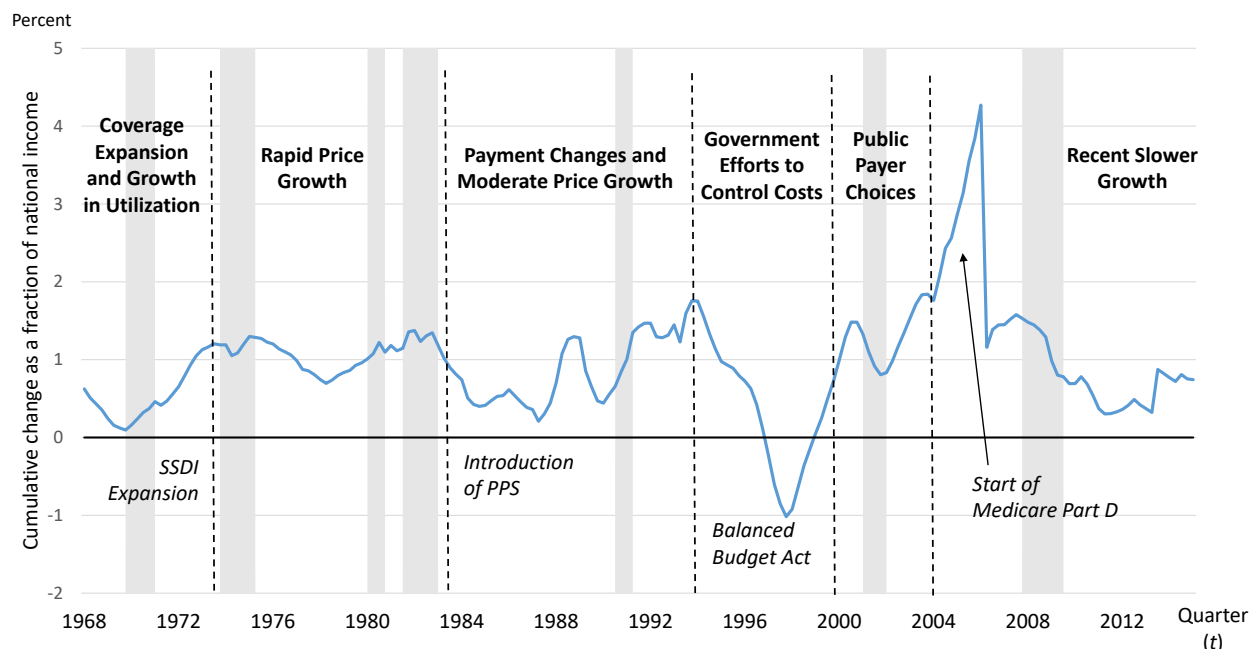
Coverage Expansion and Growth in Utilization (1966-1973)

The Medicare program, along with Medicaid, went into effect in July 1966. The passage of the enabling legislation was motivated by public concerns that a significant fraction of those over age 65 lacked health insurance. The lack of coverage for this age group in the pre-Medicare period was likely due to the high premiums private insurers charged this group. Since inception, Medicare covers these individuals without regard to medical history, income or health status. Nowhere in discussions of the beginning of Medicare did we find evidence that it was in response to an economic downturn or a way to increase employment.

For the years between 1966 and 1969, Catlin and Cowan (2015) cite increased utilization of services, increases in hospital costs and wider use of skilled nursing facilities as primary sources of the rapid growth in program spending. In the following three years, Medicare expenditures continued to increase at a great rate, particularly because of the cost of providing outpatient

²¹We do not use exactly those authors' period definitions because their divisions correspond to national health care spending rather than Medicare in particular.

Figure B.6: Accumulated two-year change in Medicare spending as a fraction of national income



Notes: The figure plots $Z_{t,8}^c$, the accumulated change in Medicare spending between quarters $t - 1$ and $t + 7$ as a fraction of trend national income. Shaded regions indicate NBER-dated recessions. As explained in Section ??, the cumulative variables are constructed by accumulating over quarters and should not be interpreted as annual growth rates. SSDI is Social Security Disability Insurance, and PPS is Prospective Payment System.

hospital services.

In 1973, Medicare was expanded to cover people with permanent disabilities who are younger than age 65. Through this expansion, Social Security Disability Insurance (SSDI) beneficiaries become eligible for Medicare coverage two years after they begin receiving SSDI payments.²²

Rapid Price Growth (1974-1982)

The CPI for medical care outpaced overall CPI for most of this period, which largely accounts for the Medicare spending growth over this period.²³ Besides medical care price growth, expanded coverage for the disabled (in late 1973) also caused increased Medicare spending, according to Catlin and Cowan (2015).

Non-price factors also contributed to growth of medical care spending in general. Regarding that era, Gibson (1980, p.4) writes that “increased concern over liability for malpractice has contributed to the number and complexity of diagnostic series performed, adding to the cost of physicians’

²²Eventually, exceptions to the two-year waiting rule were enacted for a few diseases: end-stage renal disease and amyotrophic lateral sclerosis (Cubanski, Neuman and Damico (2016)).

²³Because the data in Figure B.6 are detrended by the overall CPI, the high economy-wide inflation does not contribute to the Medicare spending growth exhibited in the figure.

services.” In addition, influenza epidemics between 1979 and 1981 along with a 1980 heat wave contributed to increased use of medical services.

Another factor contributing to fast Medicare spending growth was the relatively rapid increase in enrollment of disabled and end-stage renal disease patients, both intense users of health care.²⁴

Payment Changes and Moderate Price Growth (1983-1992)

Between 1966 and 1982, Medicare expenditures became a larger and larger fraction of federal government spending and of the economy overall. Gornick et al. (1985, p.16) cite a host of reasons for increased costs of health care during the first 20 years of Medicare: “the rise in wages and price levels in the health care industry; increases in the number of certain customary services such as laboratory tests; the development of new and costly medical technologies such as open-heart surgery; changes in the organization of care, such as the growth of intensive care units in hospitals and increases in personnel; and the growth of institutions for long-term care.”

Concern about this growth led to the Tax Equality and Fiscal Responsibility Act of 1982. One outcome of the legislation was the implementation of a new Medicare payment system (PPS) in which payments for services were made according to predetermined costs for treatment depending on specific diagnoses.²⁵ While the law’s passage was associated with an attempt to reduce spending growth, it was not undertaken in response to a recession or fluctuations in employment.

Davis and Burner (1995) explain that, before PPS, hospital payments from Medicare grew at over 18 percent per year. The effect of introducing PPS was dramatic. Inpatient hospital spending slowed to 5.7 percent per year in the six years that followed. The authors state that “These changes were prompted by concerns about trust fund solvency and about equity in compensation” (p. 233). Moreover, in the next section, we show that the changes in deficits and the debt are generally poor predictors of future values of our Medicare spending variable.

Between 1983 and 1985, there were temporary freezes on physician fees and changes in laboratory fee schedules to reimburse at 60 percent of prevailing charges.²⁶ Taken together, these policy shocks had a substantial effect on the rate of Medicare expansion in the mid-1980s.

Besides Medicare program changes, technological developments shifted treatments from more-expensive inpatient to outpatient procedures. These included new less-invasive procedures and improved diagnostic tools, such as MRIs. These changes are evident in our Medicare spending series, plotted in Figure B.6.

Government Efforts to Control Costs (1993-1999)

Figure B.6 shows a sharp decline in $Z_{t,8}^c$ starting at $t = 1997$. This is the only period when the variable becomes negative for a sustained number of quarters. The change was largely due to government cost-control efforts implemented through the Balanced Budget Act of 1997 (BBA). It

²⁴See Gibson and Fisher (1978).

²⁵Using around 400 diagnostic categories, Gibson et al. (1984, p.22) write that, beginning in 1983, “hospitals will be paid based on the diagnosis group into which a patient falls, regardless of services provided or of length of stay.”

²⁶See Gibson et al. (1984).

reduced or fixed payment amounts for most services, including a freeze on Medicare payments for inpatient hospital admissions (see Catlin and Cowan (2015)). Levit et al. (2003, p.160) explain that a “mandated conversion from a cost-based reimbursement system to a prospectively determined payment system precipitated a decline of \$19 billion in Medicare payments in 1999.” Note that the BBA was enacted at a time when neither federal deficits were abnormally high nor the economy was in a recession. Thus, it would be difficult to argue that this effectively negative spending shock was an endogenous response to macroeconomic conditions.

According to Savord (1999), efforts in the late 1990s to reduce fraud and abuse also contributed significantly to lower expenditure growth in the home-health category and inpatient hospital costs.²⁷

Public Payer Changes (2000-2002)

As discussed above, the BBA was intended to limit Medicare (and Medicaid) spending growth. The effect of the law was so severe that it led to changes in some of the law’s provisions through new legislation, passed in 1999 and 2000.²⁸ The laws stopped or delayed some of the BBA’s payment reductions. According to Catlin and Cowan (2015, p.21), the severity of parts of the BBA “coupled with expanding Federal budget surpluses, led to the passage of these two laws.”

Since this evidence suggests the possibility that this backlash period was in part due to expanding budget surpluses, and thus the state of the business cycle, we will investigate the influence of this period. We show that the addition of the deficit-income ratio as a control does not affect our qualitative results. Finally, even if there was a residual endogeneity bias, the direction of that bias would be that of a stronger stimulative response to a GFHC expansion. In other words, if there was such a bias, correcting for it would result in an even smaller employment response.

Recent Slower Growth (2003-2016)

Generally, Medicare spending growth slowed over this period. In part, this was due to slower increases in retail prescription drug expenditures as a larger percentage of dispensed drugs became generic and thus much less costly. Moreover, the number of new-product introductions (which tend to be expensive initially) slowed during these years. We contend that these features are exogenous to the business cycle.

One source of a dramatic expenditure increase that affected $Z_{t,8}^c$ is the implementation of Medicare Part D. The program, enabled by the Medicare Modernization Act of 2003, subsidized the cost of prescription drugs and prescription drug insurance premiums for most Medicare participants. Unlike the Medicaid program, there were no major changes in federal Medicare funding as a response to the 2007-2009 recession.

²⁷See also Foster (2000).

²⁸These were the Balanced Budget Refinement Act of 1999 and the Benefits Improvements and Protection Act of 2000.