# Online Appendix for "The Impact of Insurance Expansions on the Already Insured: The Affordable Care Act and Medicare"

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## A. Comparisons to Existing Literature

As described in Section I, the two existing papers most closely related to our study are McInerney et al. (2017) and Glied and Hong (2018). Both of these studies find significant evidence of negative spillovers among Medicare beneficiaries as a result of pre-ACA state Medicaid expansions for low-income adults. In Table A.1, we present the estimates from these studies for the outcome variables that are comparable to the ones we study. These outcomes include total expenditures, physician service expenditures, and number of physician services. We also provide details on the calculations used to extrapolate from these estimates the implied changes in utilization for Medicare beneficiaries under the ACA Medicaid expansions. Finally, we report our estimates and the lower bound estimates from our 95% level confidence intervals. In all cases, we are able to rule out changes of the magnitude expected from the estimates reported in these previous studies.

There are a few differences in the measures used in these papers and those in our study, as well as in the population of Medicare beneficiaries studied. McInerney et al. (2017) focus on a measure of total spending constructed from the Medicare Current Beneficiary Survey Cost and Use files, which rely on self-reports and administrative records to report spending on all medical services, including services not covered by Medicare. These files also report spending for both fee-for-service beneficiaries and Medicare Advantage enrollees. Our data only include services covered by Medicare, and we are limited to fee-for-service beneficiaries. However, we would not expect for these differences to lead to noticeable deviations in proportionate changes in total spending in response to the Medicaid expansions. In addition, McInerney et al. (2017) find their effects are driven by the Medicare portion of total spending, and our null results persist when we restrict our attention to the Medicare portion of total spending for fee-for-service beneficiaries. Glied and Hong (2018) rely on data on Part B spending for fee-for-service beneficiaries from the Dartmouth Atlas that only include the Medicare portion of spending, and do not include any cost-sharing amounts. However, ignoring the small deductible for office-based care (adjusted each year for inflation, equal to $110 in 2010), our measure of physician service (Part B) spending is simply 1.25 times the Medicare portion since cost-sharing is 20% for these services.

The estimates presented in Glied and Hong (2018) are easier to extrapolate to our context since the authors estimate changes in outcomes resulting from changes in insurance coverage using an IV approach. We, therefore, are able to apply our estimated changes in insurance coverage under the ACA Medicaid expansions (reported in Table 1) to scale their estimates accordingly. We should note that Glied and Hong (2018) use several different strategies to estimate the effects of expanded insurance coverage, both under

Medicaid parent expansions and through employer-sponsored insurance, on the utilization of Medicare beneficiaries. The estimates we use are those from specifications that focus on coverage changes associated with expanded Medicaid only. In addition, we draw our estimates from specifications that use the authors' preferred parameterization of the Medicaid expansions, which is an indicator variable for states experiencing a large scale expansion of Medicaid for parents during the 1995-2006 period, defined as sustained expansion of more than 5 percentage points over a previous standard and to a level that includes over 20% of a simulated national sample.

Calculating the implied changes in Medicare utilization from the estimates presented in McInerney et al. (2017) is a little less straightforward since the authors examine changes in Medicare utilization resulting from changes in Medicaid eligibility. To extrapolate to our context, we construct an estimate of the change in Medicaid eligibility under the ACA Medicaid expansions by assuming that there was a 70% take-up rate among the newly eligible. This is an estimate of take-up among the newly eligible in the Medicaid expansion states based on enrollment information and simulated eligibility data from Buettgens and Kenney (2016). Applying this, our estimate presented in Table 1 indicating that there was a 4.2 percentage point increase in Medicaid coverage suggests that the total change in eligibility was 6 percentage points (=4.2/.7). Appendix Table A.1 walks through each calculation based on the estimates presented in both papers.

## B. Synthetic Control Results

In our main analysis, we find that the pre-period trends were different in expansion and non-expansion states prior to the ACA expansions for total expenditures and visits with non-MDs. To address this issue, we conduct a separate analysis using the synthetic control method described in Abadie et al. (2010). This approach forms a control unit by weighting the non-expansion states to closely resemble the expansion states in the pre-period, and then attributes any divergence in outcomes after implementation to the impact of the expansions. Following Hu et al. (2018), we restrict our analysis to the 21 states that expanded in April of 2014 in order for treated and comparison units to have a common pre-intervention period. Also following Hu et al. (2018), we construct confidence intervals via a permutation test. This test assigns the status of expansion state to 21 states selected at random and re-estimates the synthetic control model as if the randomly selected states had actually expanded Medicaid.[1] This provides us with a distribution of null effects. We center this distribution at our estimated effect and report the 97.5th and 2.5th empirical quantiles as the end points of our confidence interval.

Figure A.1 demonstrates the observed trends in the expansion states and the synthetic control unit in the number of primary care RVUs each year, with Figure A.2 and A.3 plotting similar trends for the number of PCP visits and new patient visits, respectively. For all three outcomes, the synthetic control unit tracks very closely with the expansion states prior to the implementation of the ACA expansions and continues to do so in 2014 and 2015, after the expansions are implemented. The post-expansion difference between the expansion and non-expansion states is very close to zero.

[1] We select 21 states to form the placebo treatment group to mirror the 21 expansion states that form the true treatment group.

## Table A.1—: Comparison of Our Estimates to Previously Published Estimates

| Paper | Population | Outcome | Source | ITT | LATE | Notes | Implied Effect for ACA | Our Estimate |
|---|---|---|---|---|---|---|---|---|
| Glied and Hong | All Medicare beneficiaries | Log Medicare B Spending (comparable to "physician service expenditures") | Table 3 | -0.032 (0.010) | 0.026 (0.011) | LATE gives effect of a one pp increase in uninsurance induced by Medicaid expansion | -6.5% decrease in physician service spending based on our estimate of a 2.5pp decrease in uninsurance (Table 2) associated with the expansions | 0.8% increase in physician service spending, with a lower bound estimate on our 95% CI of -1.6% (Table 3) |
| McInerney et al. | All Medicare beneficiaries | All payments, all service types (comparable to "overall expenditures") | Table 1 | -86.858 (34.23) | – | ITT gives effect of a one pp increase in Medicaid eligibility; with mean spending of $11,372, represents a 0.7% decrease | -4.2% decrease in expenditures based based on our estimate of a 4.2pp increase in Medicaid coverage (Table 2) and assuming 70% take-up | 0.7% increase in expenditures, with a lower bound estimate on our 95% CI of -1.1% (Table A.3*) |
| | All Medicare beneficiaries | Number of medical provider events (comparable to "number of physician services") | Table 3 | -0.004 (0.002) | – | ITT gives effect of a one pp increase in Medicaid eligibility as a proportionate change (Poisson regression model) | -2.4% decrease in number of physician services based on our estimate of a 4.2pp increase in Medicaid coverage (Table 2) and assuming 70% take-up | 1.16% increase in number of physician services with a lower bound estimate on our 95% CI of -1.4% (Table 3) |
| | Dually eligible Medicare beneficiaries | All payments, all service types (comparable to "overall expenditures") | Table 1 | -476.602 (82.82) | – | ITT gives effect of a one pp increase in Medicaid eligibility; with mean spending of $14,652, represents a 3.3% decrease | -19.8% decrease in expenditures based based on our estimate of a 4.2pp increase in Medicaid coverage (Table 2) and assuming 70% take-up | 0.3% increase in expenditures, with a lower bound estimate on our 95% CI of -3.3% (Table A.3*) |
| | Dually eligible Medicare beneficiaries | Number of medical provider events (comparable to "number of physician services") | Table 3 | -0.031 (0.007) | – | ITT gives effect of a one pp increase in Medicaid eligibility as a proportionate change (Poisson regression model) | -18.6% decrease in number of physician services based on our estimate of a 4.2pp increase in Medicaid coverage (Table 2) and assuming 70% take-up | -0.37% decrease in number of physician services with a lower bound estimate on our 95% CI of -2.7% (Table 3) |

*Note:* * Denotes that synthetic control estimate is used in calculation rather than difference-in-differences estimate due to presence of differential pre-treatment trends in the DID setup for that particular outcome.

Table A.2 presents the synthetic control estimates of the effects of the expansions with the associated confidence intervals. Panel A shows the results for primary care RVUs. Consistent with the visual evidence presented in Figure A.1, we find no effect of the ACA Medicaid expansions on Medicare beneficiaries' use of primary care and our point estimates are very small. For all Medicare beneficiaries, our point estimate indicates a change in primary care RVUs of 0.011 per year, less than a tenth of a percent of the sample mean; our confidence intervals allow us to reject a decrease in primary care RVUs of more than 0.264, only 1.7% of the sample mean. Although our precision varies across the different subgroups, for all subgroups we estimate a change in RVUs that is less than 3% of the sample mean, and our confidence intervals are such that we can reject a decrease in primary care RVUs of more than 0.68 for the dually eligible, or about 3% relative to the sample mean. This confirms the results from the DID model discussed in the main text.

Panels B and C of Table A.2 present the results for other measures of primary care use: the number of primary care visits and the number of new patient visits. Consistent with results from the previous section, we find no change in either of these outcomes either overall and for any of the subgroups we examine. There does not appear to be any evidence of an effect of the Medicaid expansions on the use of primary care services by Medicare beneficiaries.

Table A.3 presents the synthetic control estimates for other outcomes derived from the claims data. We first discuss the two outcomes for which we did not calculate difference-in-differences coefficients due to non-parallel pretrends: the number of services with non-physician providers (Panel A) and overall expenditures (Panel B). The estimated coefficients for the use of non-physician providers are all negative, and a null effect is rejected only for the case of Medicare beneficiaries in HPSA counties. This reduction in non-MD visits appears to be driven by a relative increase in non-MD visits among beneficiaries in the non-expansion states (reported in Figure A.4). Although the effect is statistically significant, it is quite small, indicating a reduction in services with non-MD providers of about 0.1 visits per year. We also note that there appears to be some differences between the treated group and the synthetic control even in the pre-expansion period. We find no change in the total number of physician services for this subsample (and the coefficient is positively signed, see Panel D); the negative effect on non-MD services for this subgroup therefore suggests a shift towards more physician-delivered care.

Across all subgroups, we find no evidence of a decrease in overall medical expenditures associated with expansion (Panel B and Figure A.5). The estimated coefficients for models of total expenditures are not statistically significant and suggest, if anything, a small increase in expenditures. We are able to reject decreases larger than $88 for all beneficiaries, approximately 1% of the sample mean. The largest lower bound we observe across the subgroups is a decrease of $381 among the dually eligible, approximately 3% of average expenditures for this subsample. In contrast, as discussed earlier, results from McInerney et al. (2017) predict a decrease in spending of 4.2% overall and of almost 20% among the dually eligible.[2]

The results for physician service expenditures (Panel C and Figure A.6) are similar. We

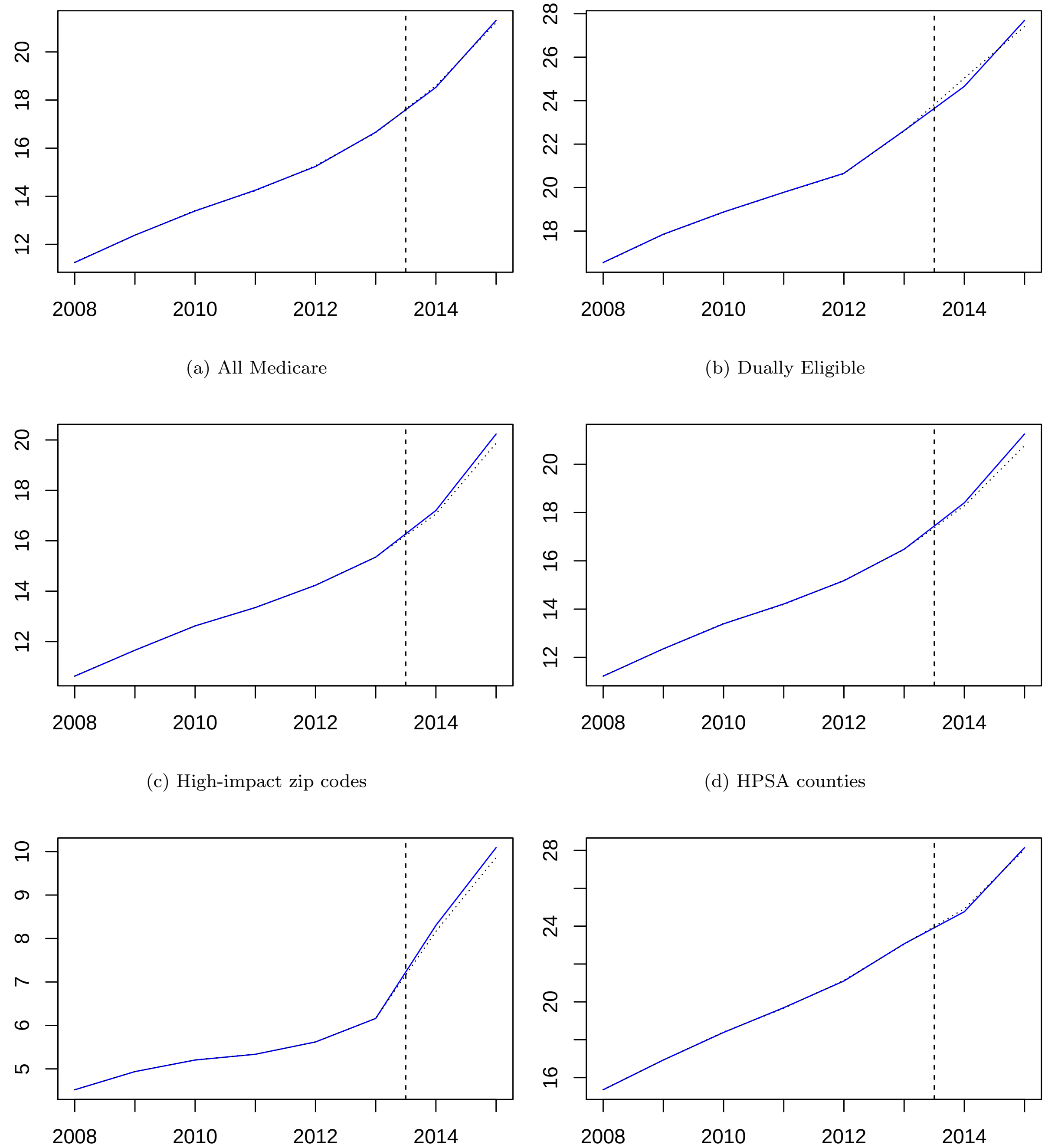
[2]See Appendix Section A and Appendix Table A.1 for additional details.

find no statistically significant effect of the Medicaid expansions on spending on physician services for any subgroup, and our point estimates are quite small. For the entire sample, we estimate an average decrease of $38, about 1.2 percent of the sample mean, and across all subgroups we can reject decreases in spending larger or equal to 4% of the sample means.

Finally, the synthetic control analysis suggests no negative spillovers when we consider the number of physician services (Panel D and Appendix Figure A.7) and the days between such services (Panel E and Figure A.8). We report a statistically significant *decrease* in the days between services for the healthy subgroup of beneficiaries, those with a Charlson score of 0 or 1. Our point estimate indicates a decrease in the length between services of 0.6 days, or a 1.9% decline over the mean of 30.5 days. Across all subgroups, there is no significant evidence of a negative spillover of the form of an increase in days between services. The largest increase included in our 95% confidence intervals is still less than a one day increase (0.9 days, or 3.8% of the mean) for beneficiaries in high-impact zipcodes.

Overall, the results are consistent with those reported in the main text. In particular, we do not find compelling evidence that the utilization of care among Medicare beneficiaries was affected by the Medicaid expansions, either overall or for any of the subgroups we examine. Our confidence intervals allow us to rule out changes larger than 5 percent in size for most outcomes.

Figure A.1. : Primary Care RVUs in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015




(a) All Medicare

(b) Dually Eligible

(c) High-impact zip codes

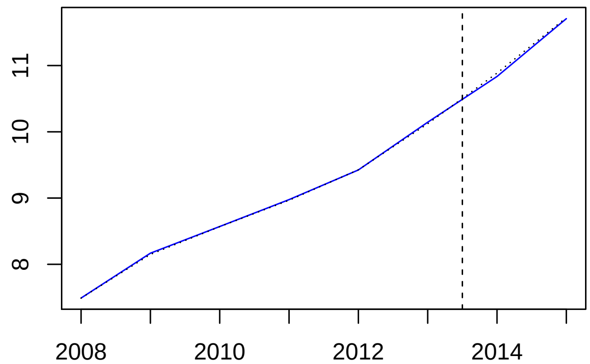
(d) HPSA counties

(e) Charlson score of 0 or 1

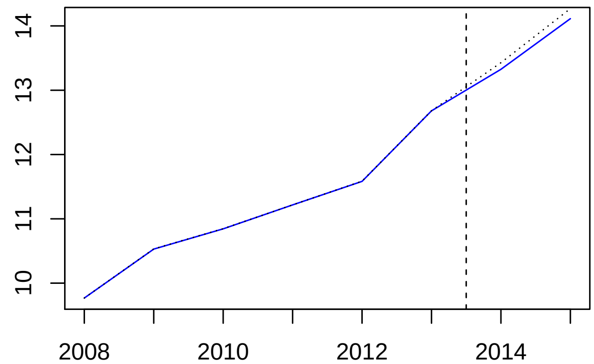
(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of primary care RVUs. See the text for more details.

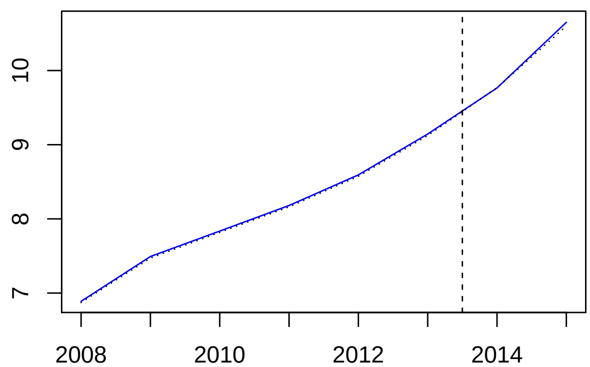
Figure A.2. : Trends in PCP Visits in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015



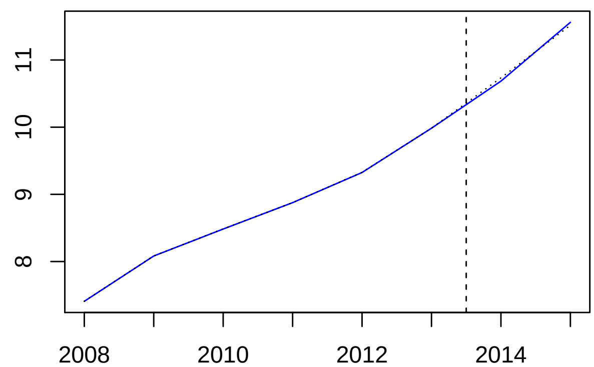

(a) All Medicare



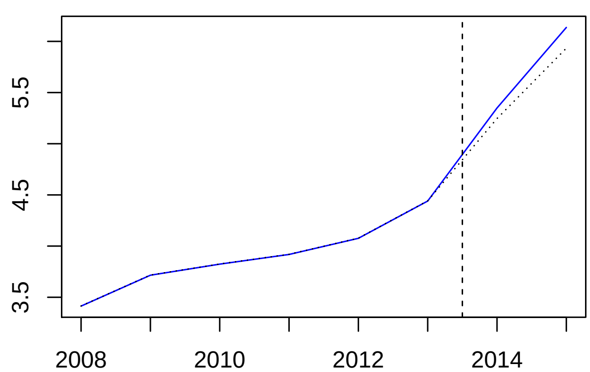

(b) Dually Eligible



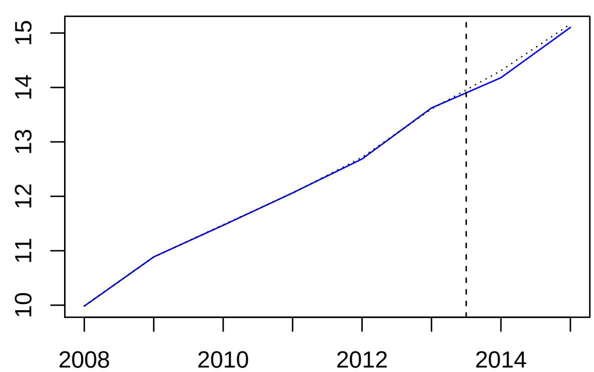

(c) High impact zip codes




(d) HPSA counties



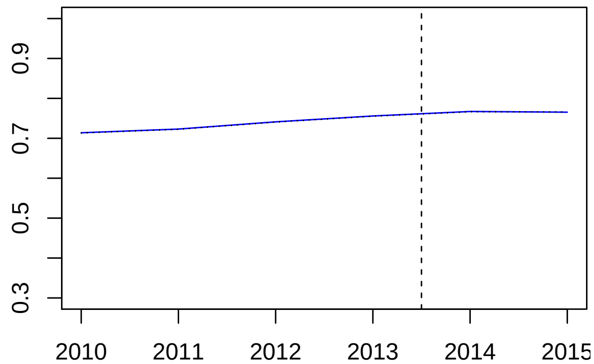

(e) Charlson score of 0 or 1



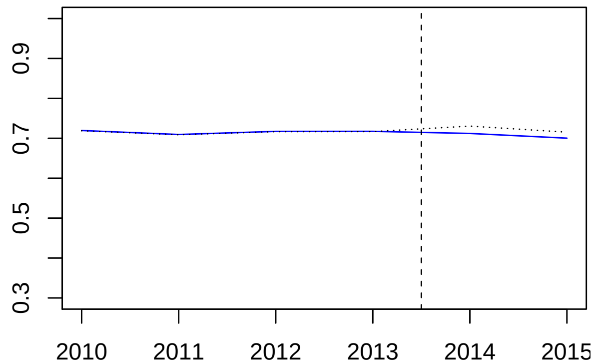

(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of number of primary care visits. See the text for more details.

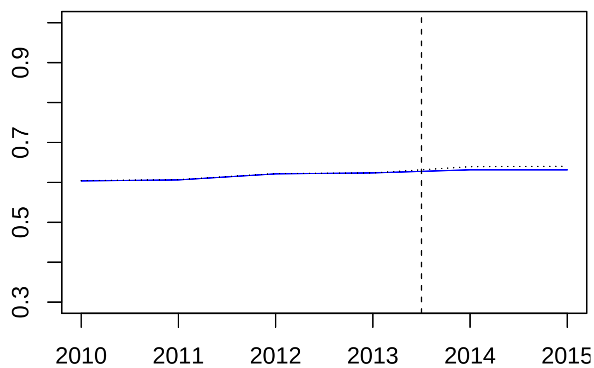
Figure A.3. : New Patient Visits in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015



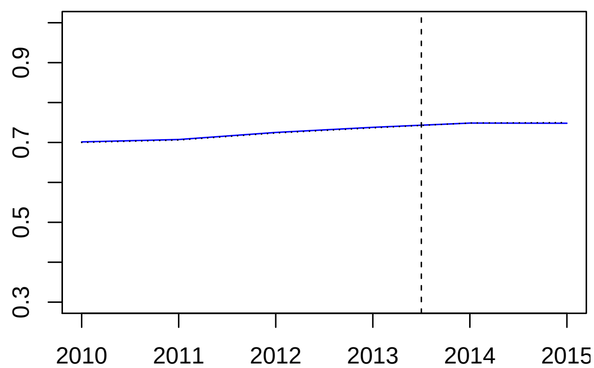

(a) All Medicare



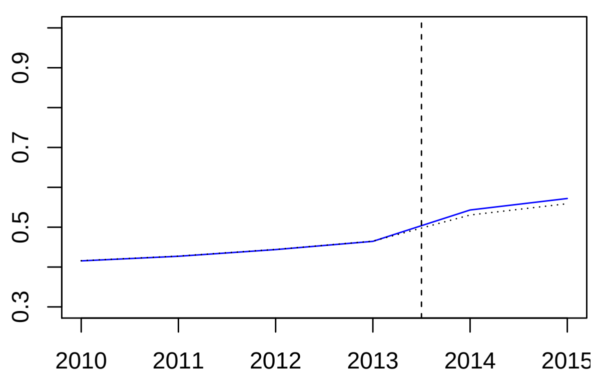

(b) Dually Eligible



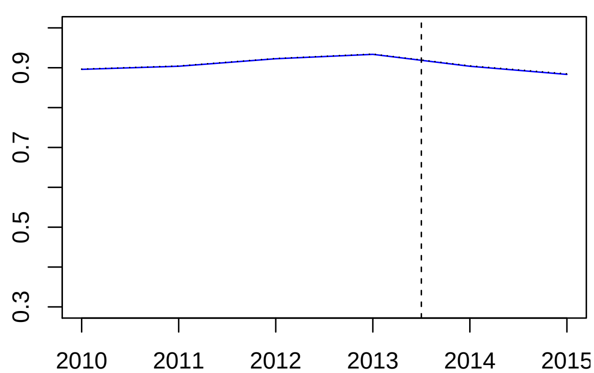

(c) High-impact zip codes




(d) HPSA counties



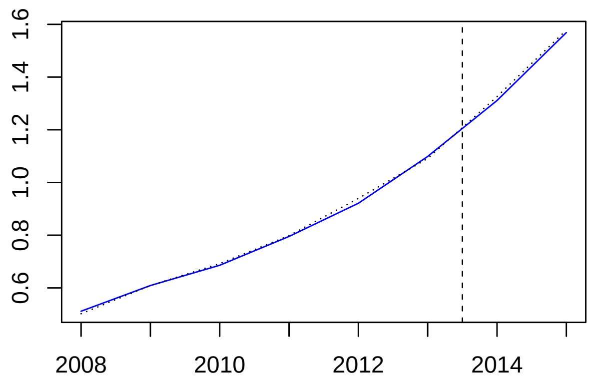

(e) Charlson score of 0 or 1



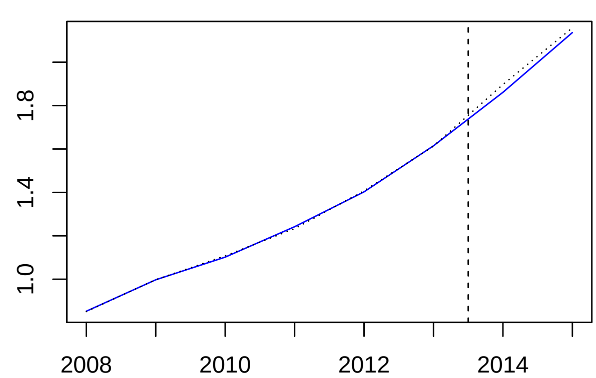

(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of new patient visits. See the text for more details.

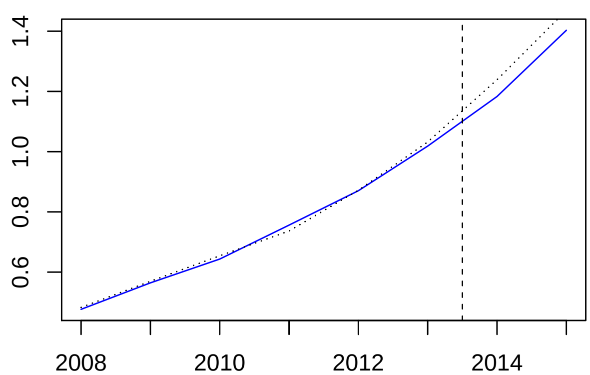
Figure A.4. : Trends in Non-MD Services in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015



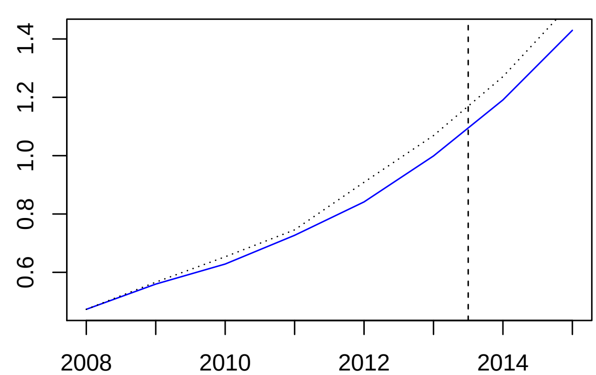

(a) All Medicare



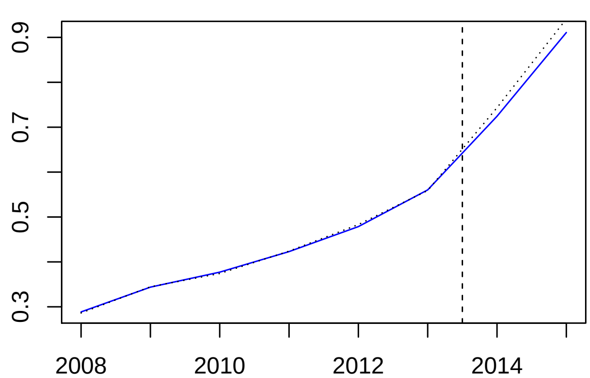

(b) Dually Eligible



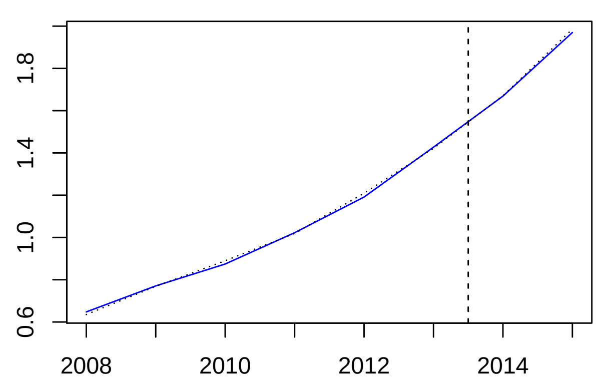

(c) High-impact zip codes




(d) HPSA counties



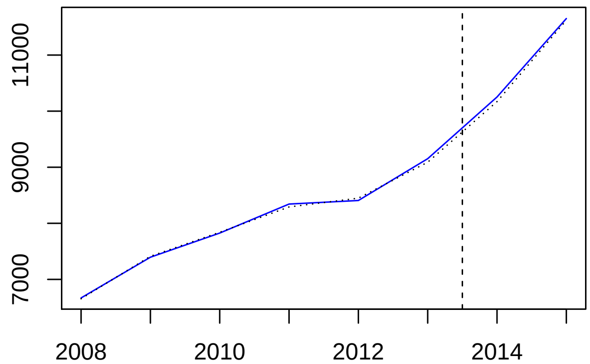

(e) Charlson score of 0 or 1



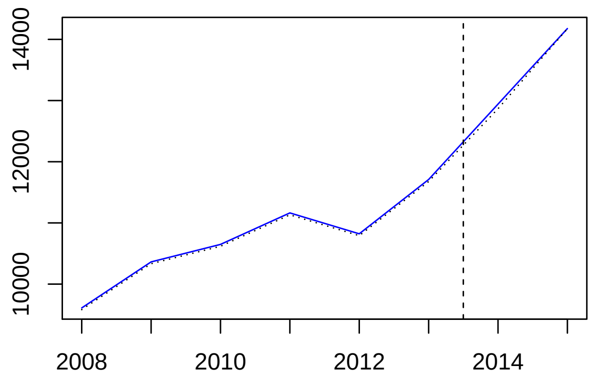

(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of number of non-MD services. See the text for more details.

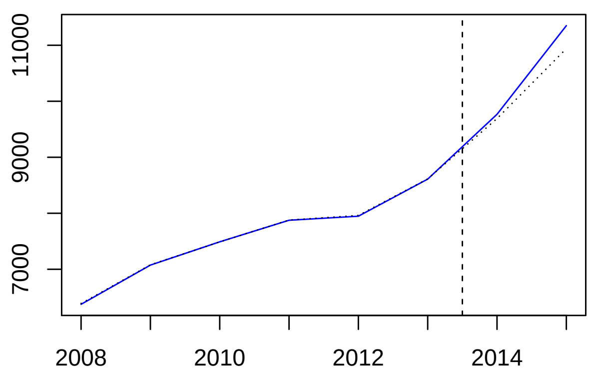
Figure A.5. : Overall Expenditures in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015



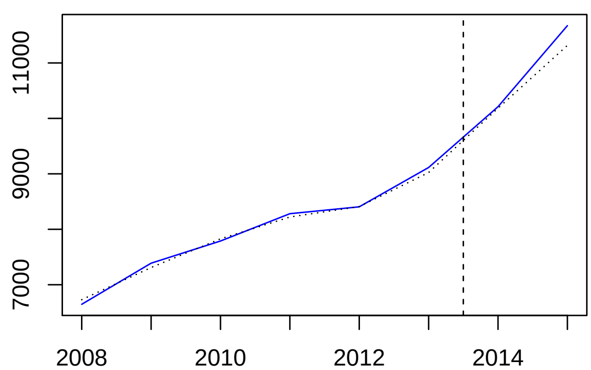
(a) All Medicare



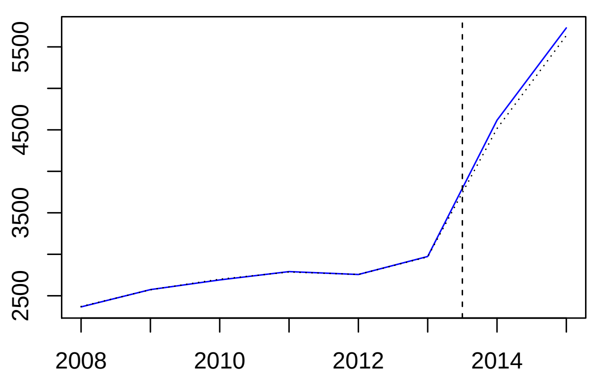
(b) Dually Eligible



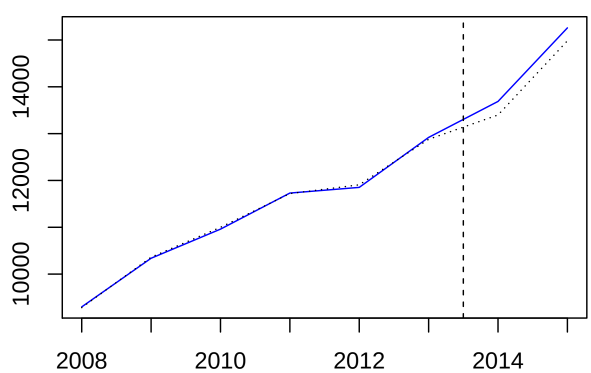
(c) High-impact zip codes



(d) HPSA counties



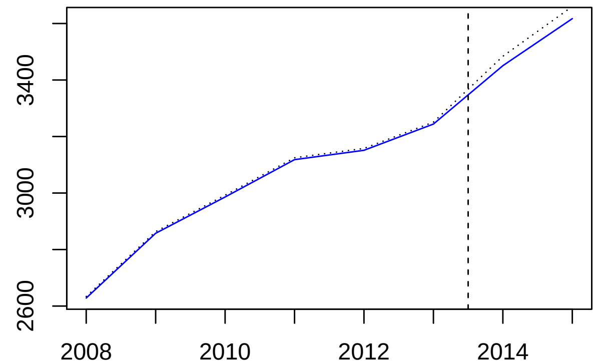
(e) Charlson score of 0 or 1



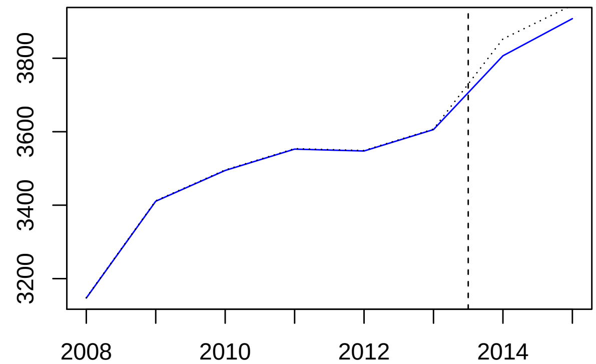
(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of total expenditures. See the text for more details.

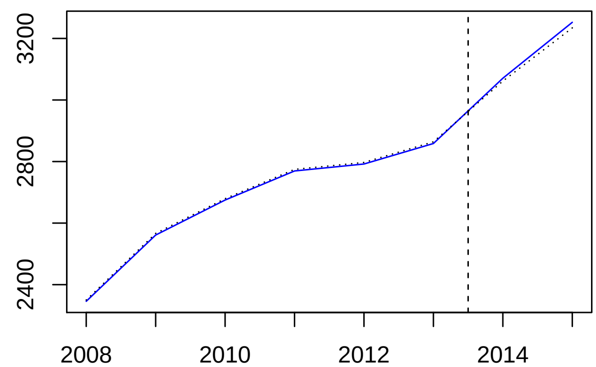
Figure A.6. : Physician Service Expenditures in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015



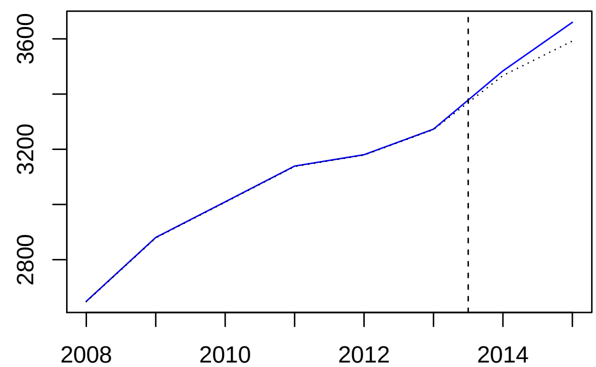

(a) All Medicare



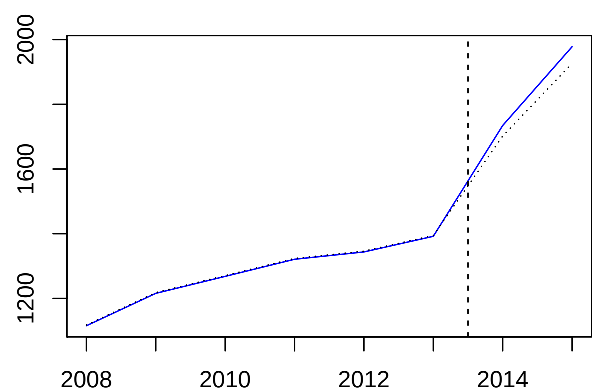

(b) Dually Eligible



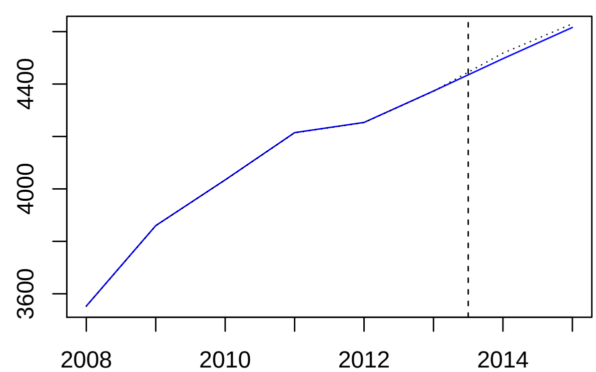

(c) High-impact zip codes




(d) HPSA counties



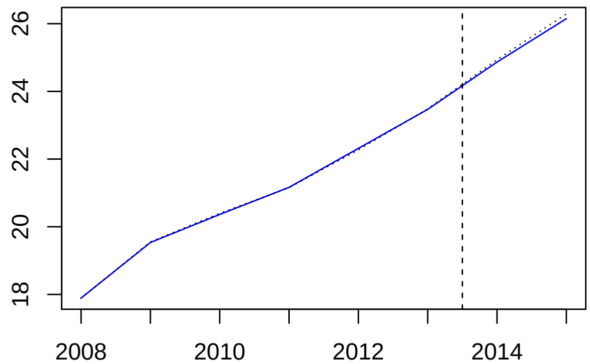

(e) Charlson score of 0 or 1



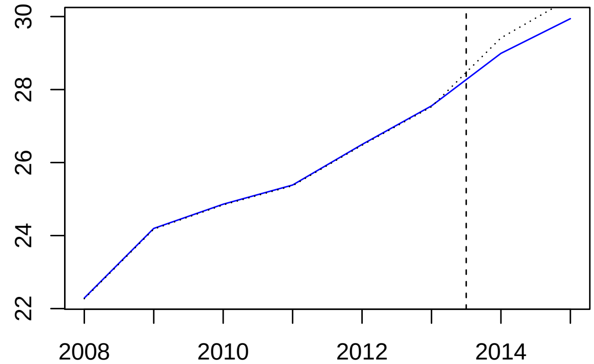

(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of physician service expenditures. See the text for more details.

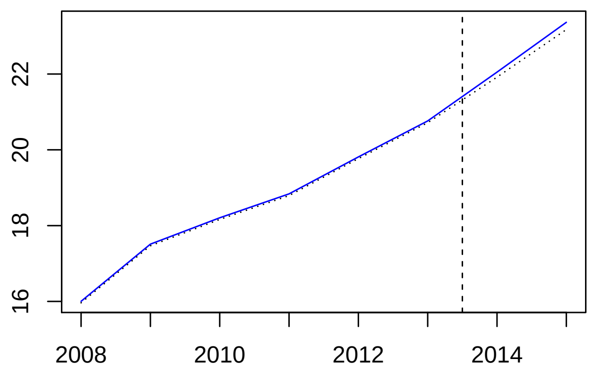
Figure A.7. : Number of Physician Services in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015



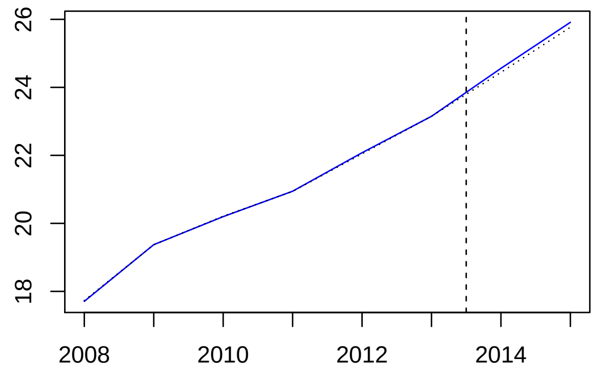

(a) All Medicare



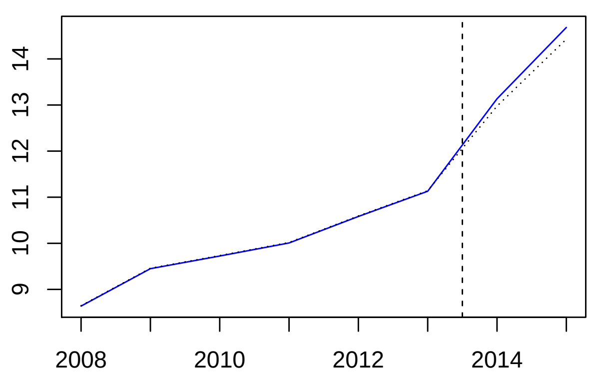

(b) Dually Eligible



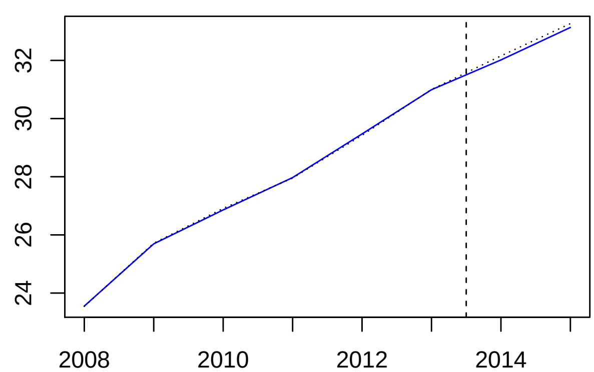

(c) High-impact zip codes




(d) HPSA counties



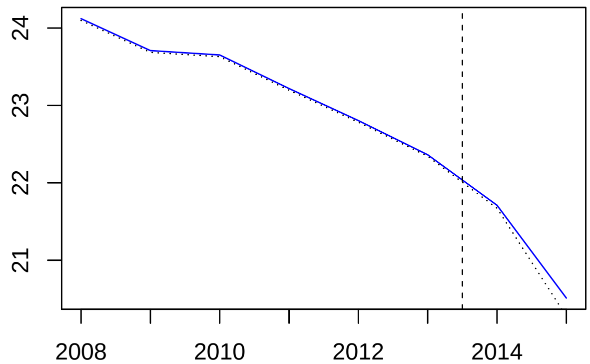

(e) Charlson score of 0 or 1



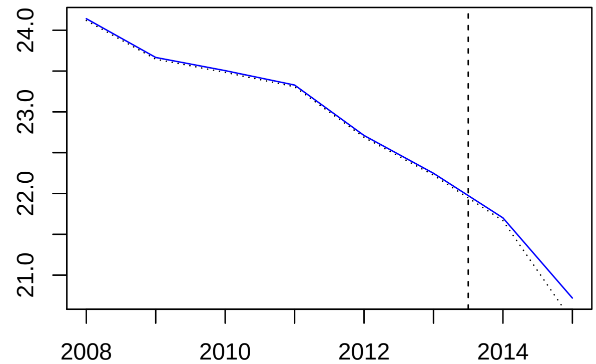

(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of number of physician services. See the text for more details.

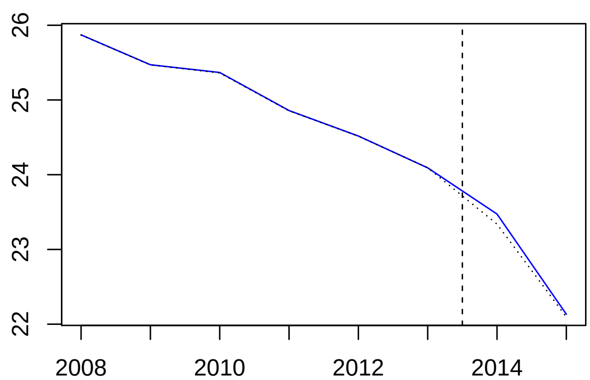
Figure A.8. : Days Between Physician Services in Expansion States (solid) vs. Synthetic Control (dotted), 2008-2015



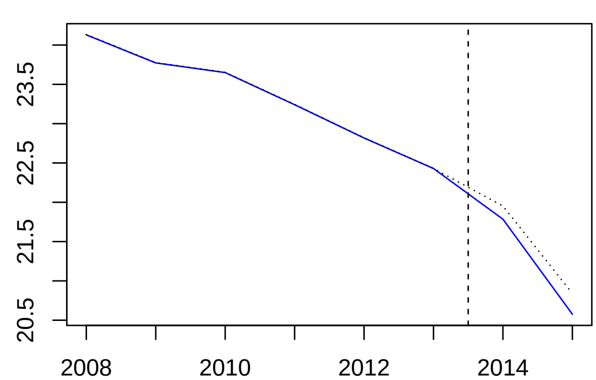

(a) All Medicare



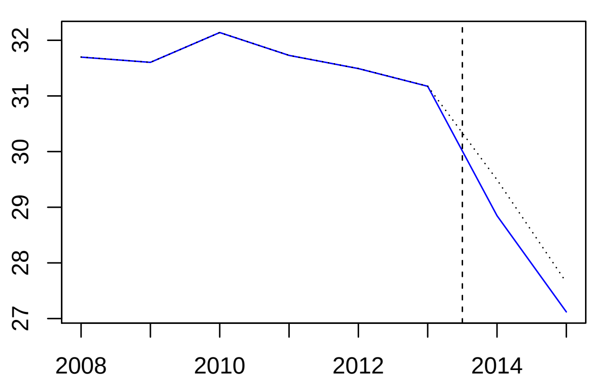

(b) Dually Eligible



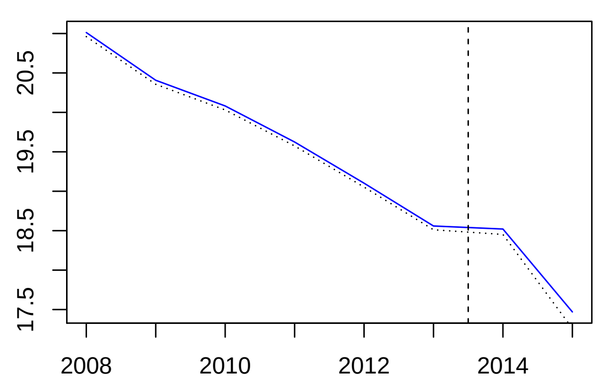

(c) High-impact zip codes




(d) HPSA counties




(e) Charlson score of 0 or 1




(f) Charlson score of 2 or more

*Note:* These figures report trends from 2008 to 2015 in the outcome variable in the expansion states relative to a synthetic control unit created by weighting the non-expansion states for the outcome of days between physician services. See the text for more details.

Table A.2—: Synthetic Control Estimates: Primary Care Services

| Subsample: | All | Dually Eligible | High-Impact Zip Codes | HPSA Counties | 0 or 1 Charlson Score | 2+ Charlson Score |
|---|---|---|---|---|---|---|
| *Panel A: Primary Care RVUs* | | | | | | |
| Estimate | 0.011 | -0.047 | 0.253 | 0.304 | 0.183 | -0.028 |
| Confidence Interval: | [-0.264, 0.263] | [-0.68, 0.66] | [-0.47, 0.775] | [-0.061, 0.681] | [-0.172, 0.487] | [-0.372, 0.302] |
| outcome mean | 15.09 | 20.86 | 14.77 | 14.87 | 6.240 | 20.61 |
| % of mean | 0.07 | 0.23 | 1.71 | 2.05 | 2.93 | -0.14 |
| *Panel B: Number of Primary Care Visits* | | | | | | |
| Estimate | -0.033 | -0.130 | 0.024 | -0.002 | 0.153 | -0.095 |
| Confidence Interval: | [-0.151, 0.085] | [-0.431, 0.225] | [-0.275, 0.417] | [-0.169, 0.189] | [-0.009, 0.292] | [-0.248, 0.054] |
| outcome mean | 9.39 | 11.76 | 9.08 | 9.16 | 4.39 | 12.51 |
| % of mean | -0.35 | -1.1 | 0.26 | -0.02 | 3.5 | -0.76 |
| *Panel C: New Patient Visits* | | | | | | |
| Estimate | 0.00005 | -0.017 | -0.008 | -0.001 | 0.013 | -0.001 |
| Confidence Interval: | [-0.013, 0.013] | [-0.037, 0.003] | [-0.034, 0.039] | [-0.014, 0.012] | [-0.001, 0.025] | [-0.018, 0.014] |
| outcome mean | 0.748 | 0.714 | 0.679 | 0.718 | 0.479 | 0.916 |
| % of mean | 0.006 | 2.3 | -1.2 | -0.13 | 2.7 | 0.15 |

*Note:* This table presents estimates comparing states that expanded Medicaid eligibility in 2014 to a synthetic control unit. 95 percent confidence intervals are reported under the estimate.

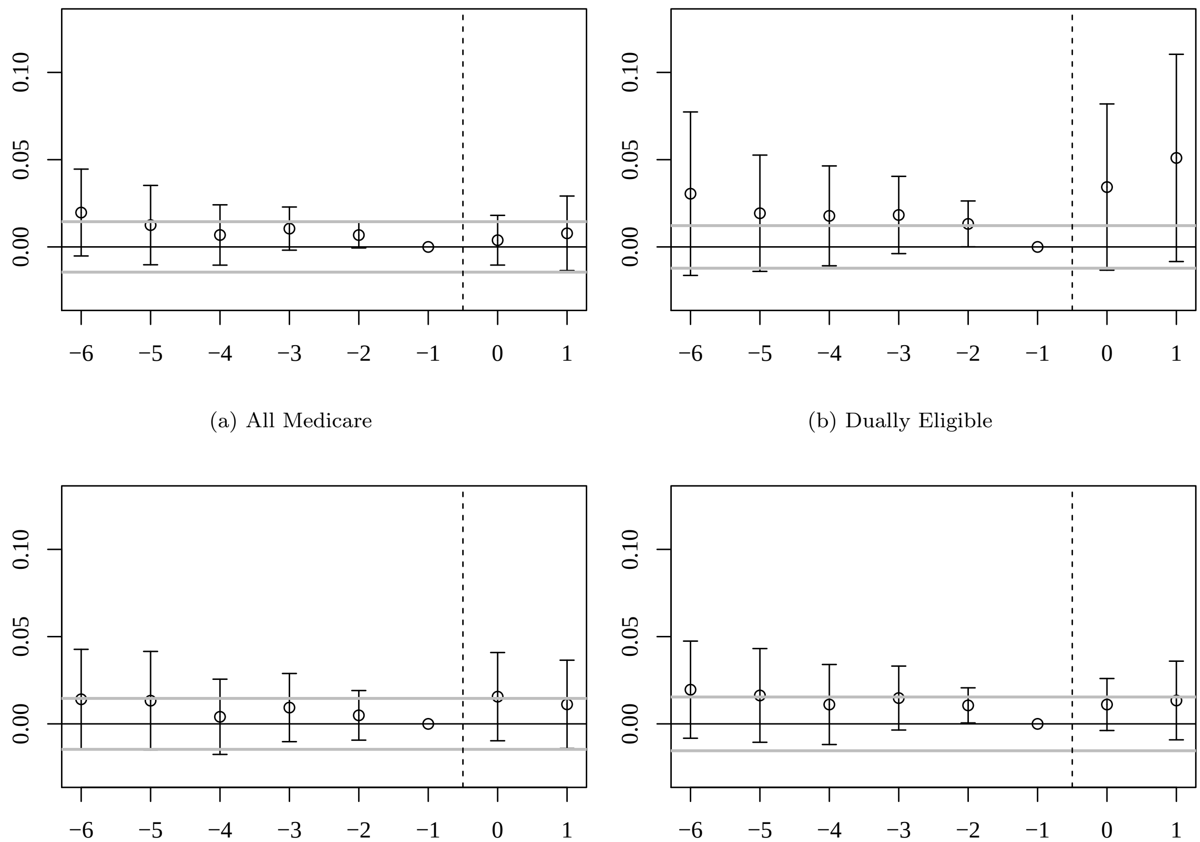
Table A.3—: Synthetic Control Estimates: Other Services

| Subsample: | All | Dually Eligible | High-Impact Zip Codes | HPSA Counties | 0 or 1 Charlson Score | 2+ Charlson Score |
|---|---|---|---|---|---|---|
| *Panel A: Number of Non-MD Services* | | | | | | |
| Estimate | -0.012 | -0.029 | -0.061 | -0.097 | -0.025 | -0.009 |
| Confidence Interval | [-0.075, 0.061] | [-0.155, 0.12] | [-0.226, 0.096] | [-0.178, -0.016] | [-0.077, 0.031] | [-0.083, 0.08] |
| outcome mean | 1.689 | 1.051 | 1.051 | 0.964 | 0.577 | 1.362 |
| % of mean | -7.2 | -2.3 | -5.8 | -10.0 | -4.3 | -0.65 |
| *Panel B: Overall Expenditures* | | | | | | |
| Estimate | 56.12 | 38.71 | 242.98 | 191.55 | 96.36 | 282.83 |
| Confidence Interval | [-88.81, 214.73] | [-380.77, 365.10] | [-121.11, 641.15] | [-31.01, 418.80] | [-58.91, 265.07] | [-10.38, 573.01] |
| outcome mean | 8449 | 11390 | 8375 | 8520 | 3206 | 11721 |
| % of mean | 0.7 | 0.3 | 2.9 | 2.2 | 3.0 | 2.4 |
| *Panel C: Physician Service Expenditures* | | | | | | |
| Estimate | -38.30 | -41.38 | 13.67 | 42.36 | 42.07 | -17.67 |
| Confidence Interval | [-45.61, 54.73] | [-99.40, 96.58] | [-96.33, 89.49] | [-54.20, 74.32] | [-54.99, 58.70] | [-63.35, 71.96] |
| outcome mean | 3076 | 3459 | 2963 | 3041 | 1398 | 4124 |
| % of mean | -1.2 | -1.2 | 0.5 | 1.4 | 3.0 | -0.4 |
| *Panel D: Number of Physician Services* | | | | | | |
| Estimate | -0.106 | -0.490 | 0.162 | 0.148 | 0.206 | -0.136 |
| Confidence Interval | [-0.484, 0.179] | [-1.16, 0.109] | [-0.822, 0.872] | [-0.225, 0.694] | [-0.257, 0.528] | [-0.551, 0.201] |
| outcome mean | 21.89 | 26.24 | 20.96 | 21.41 | 10.91 | 28.75 |
| % of mean | -0.48 | -1.9 | 0.77 | 0.69 | 1.9 | -0.47 |
| *Panel E: Days Between Physician Services* | | | | | | |
| Estimate | 0.137 | 0.158 | 0.086 | -0.165 | -0.588 | 0.139 |
| Confidence Interval | [-0.165, 0.403] | [-0.28, 0.602] | [-1.305, 0.871] | [-0.848, 0.282] | [-1.058, -0.127] | [-0.132, 0.351] |
| outcome mean | 22.61 | 22.78 | 23.53 | 23.15 | 30.45 | 19.19 |
| % of mean | 0.60 | 0.69 | 0.37 | -0.71 | -1.9 | 0.73 |

*Note:* This table presents estimates comparing states that expanded Medicaid eligibility in 2014 to a synthetic control unit. 95 percent confidence intervals are reported under the estimate.

## C. Additional Analyses

Figure A.9. : Trends in Medicare Advantage Enrollment in Expansion vs. Non-Expansion States, 2008-2015




(a) All Medicare

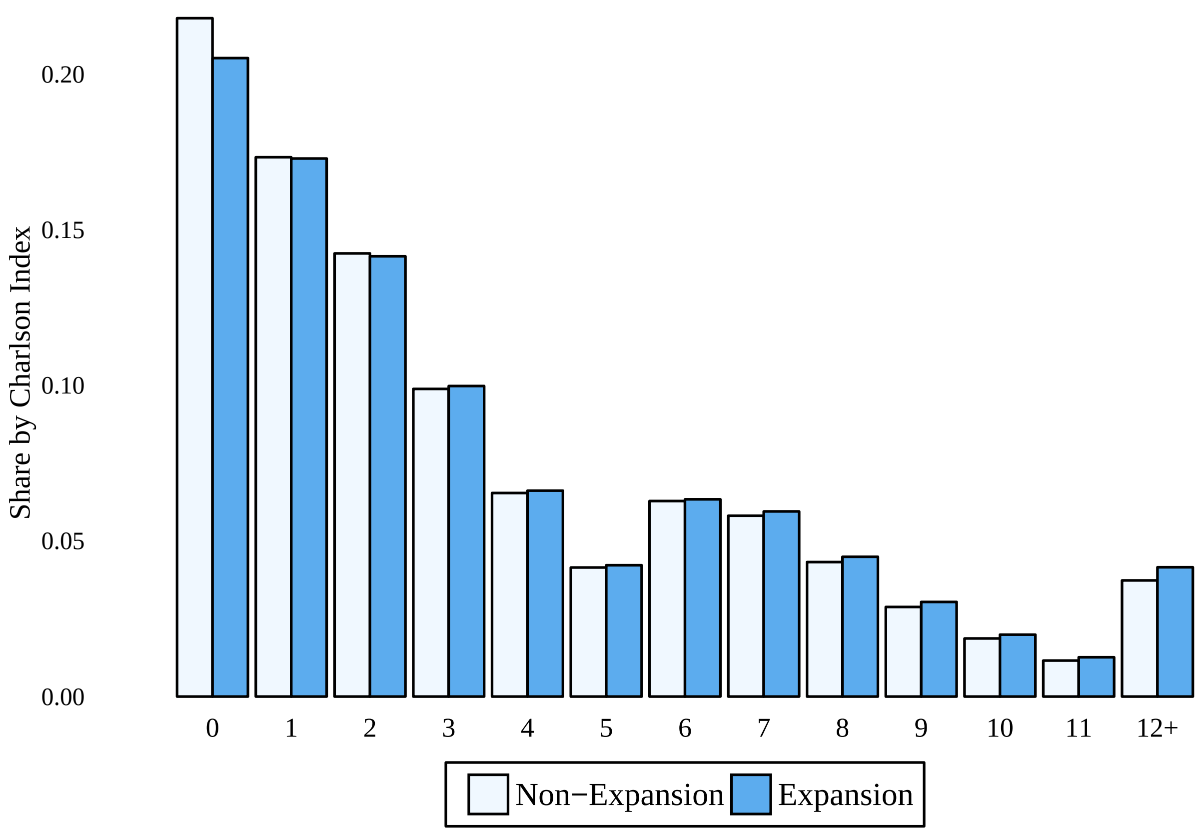
(b) Dually Eligible

(c) High-impact zip codes

(d) HPSA counties

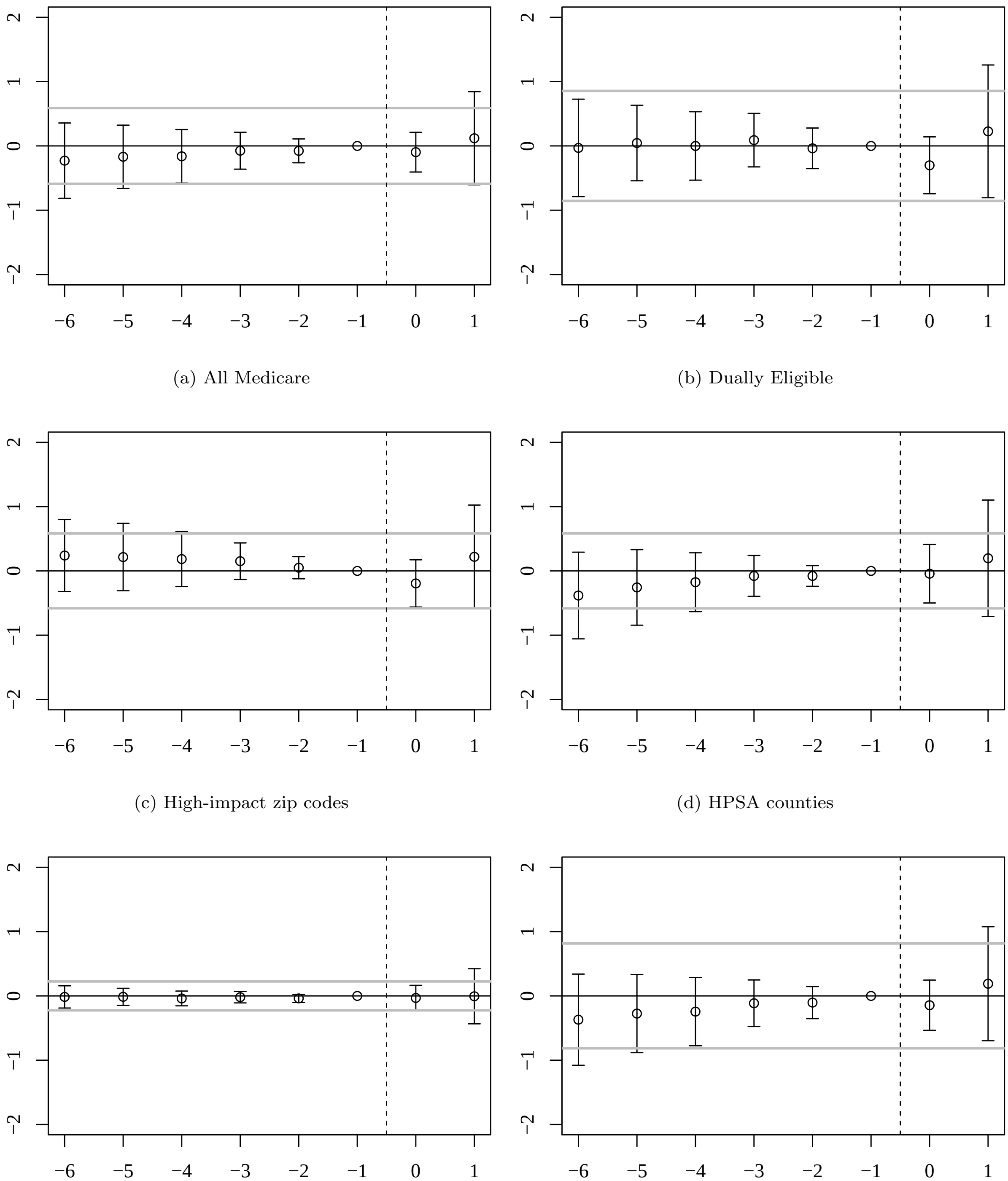
*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome Medicare Advantage enrollment, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the outcome in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample. In contrast to all other analyses, these samples are not limited to fee-for-service enrollees.

Figure A.10. : Distribution of the Pre-Period Charlson Index in Expansion and Non-Expansion States




*Note:* This figure reports the distribution of the Charlson Index for individuals in the pre-period for expansion and non-expansion states. We use the highest value of the Charlson Index observed for each individual during the pre-period.

Figure A.11. : Trends in Number of Primary Care RVUs Supplied by Qualified Providers in Expansion vs. Non-Expansion States, 2008-2015



(a) All Medicare

(b) Dually Eligible

(c) High-impact zip codes

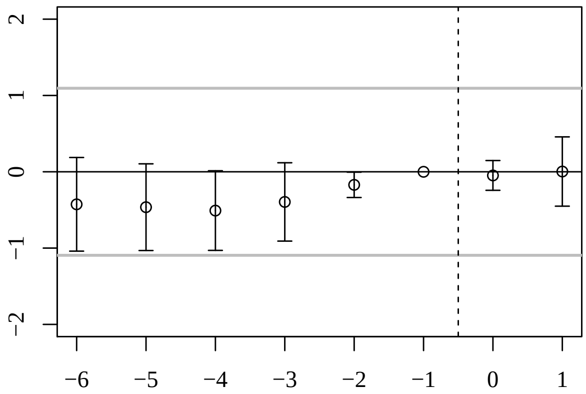
(d) HPSA counties

(e) Charlson score of 0 or 1

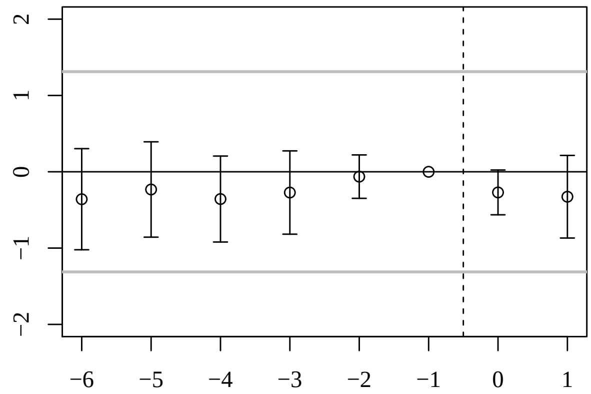
(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of primary care RVUs provided by qualified providers, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample. We define providers as "qualifying" for increased Medicaid reimbursements for primary care services if (1) they have a specialty designation listed in the rule CMS 2370-F: family, general internal, pediatrics, and related subspecialties; (2) the affected codes account for 60% of their *Medicare* reimbursements (although in fact the rule relates to Medicaid reimbursements); or (3) they are a nurse practitioner or physician assistant practicing in a tax unit with at least one provider who qualifies via specialty.

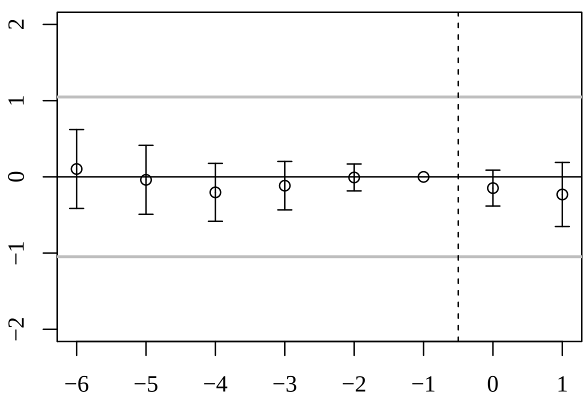
Figure A.12. : Trends in Number of Physician Services in Expansion vs. Non-Expansion States, 2008-2015



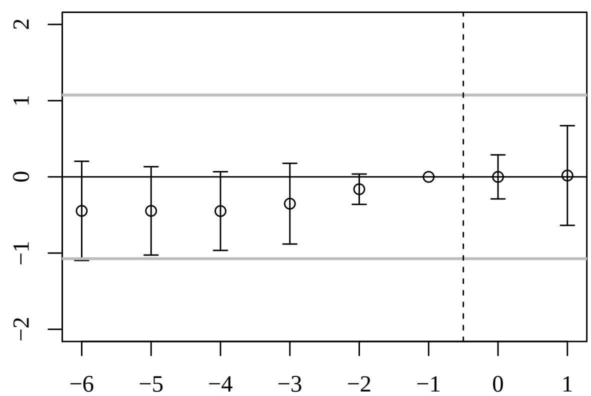

(a) All Medicare



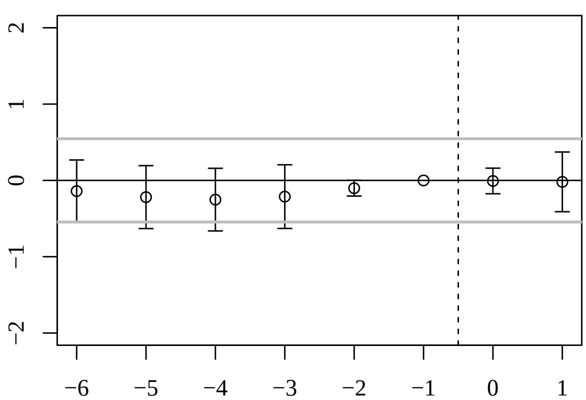

(b) Dually Eligible



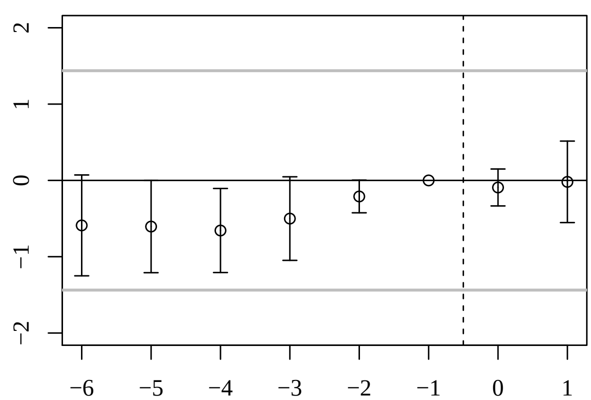

(c) High-impact zip codes




(d) HPSA counties



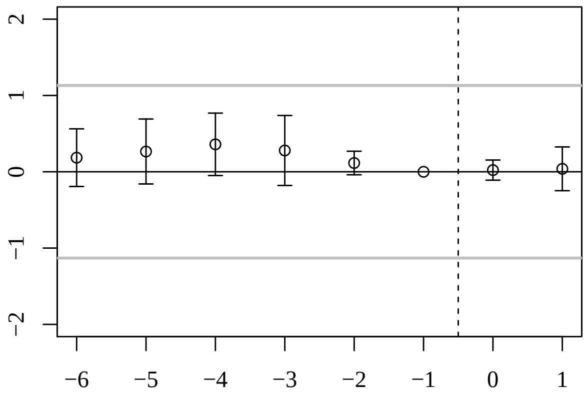

(e) Charlson score of 0 or 1



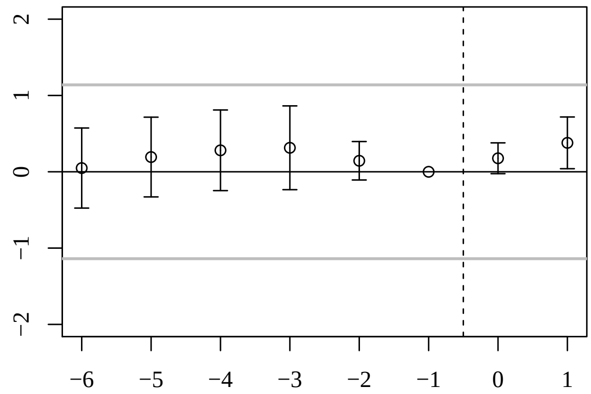

(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of number of office visits, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample.

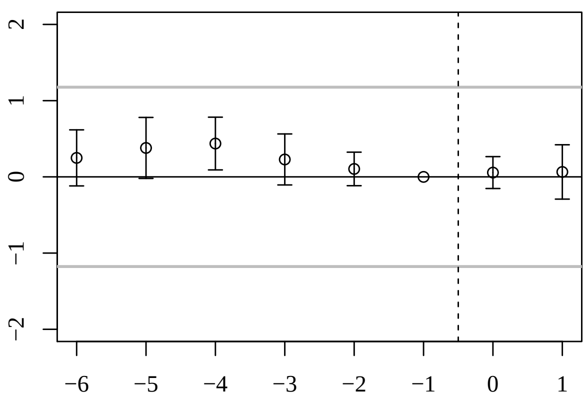
Figure A.13. : Trends in Days Between Physician Services in Expansion vs. Non-Expansion States, 2008-2015



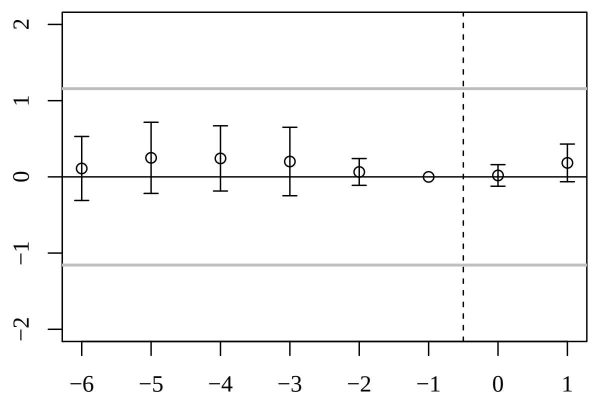

(a) All Medicare



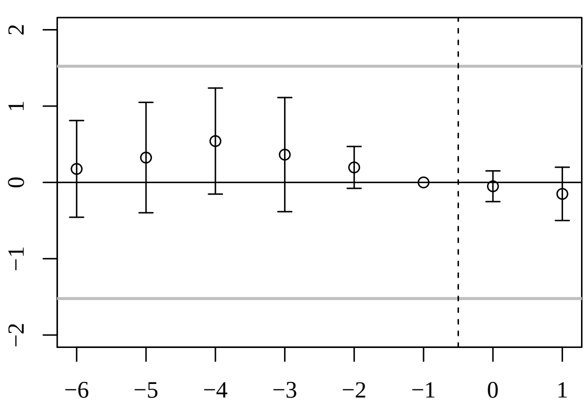

(b) Dually Eligible



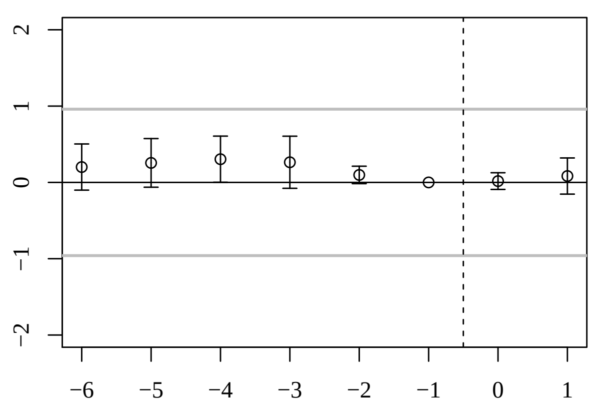

(c) High-impact zip codes




(d) HPSA counties



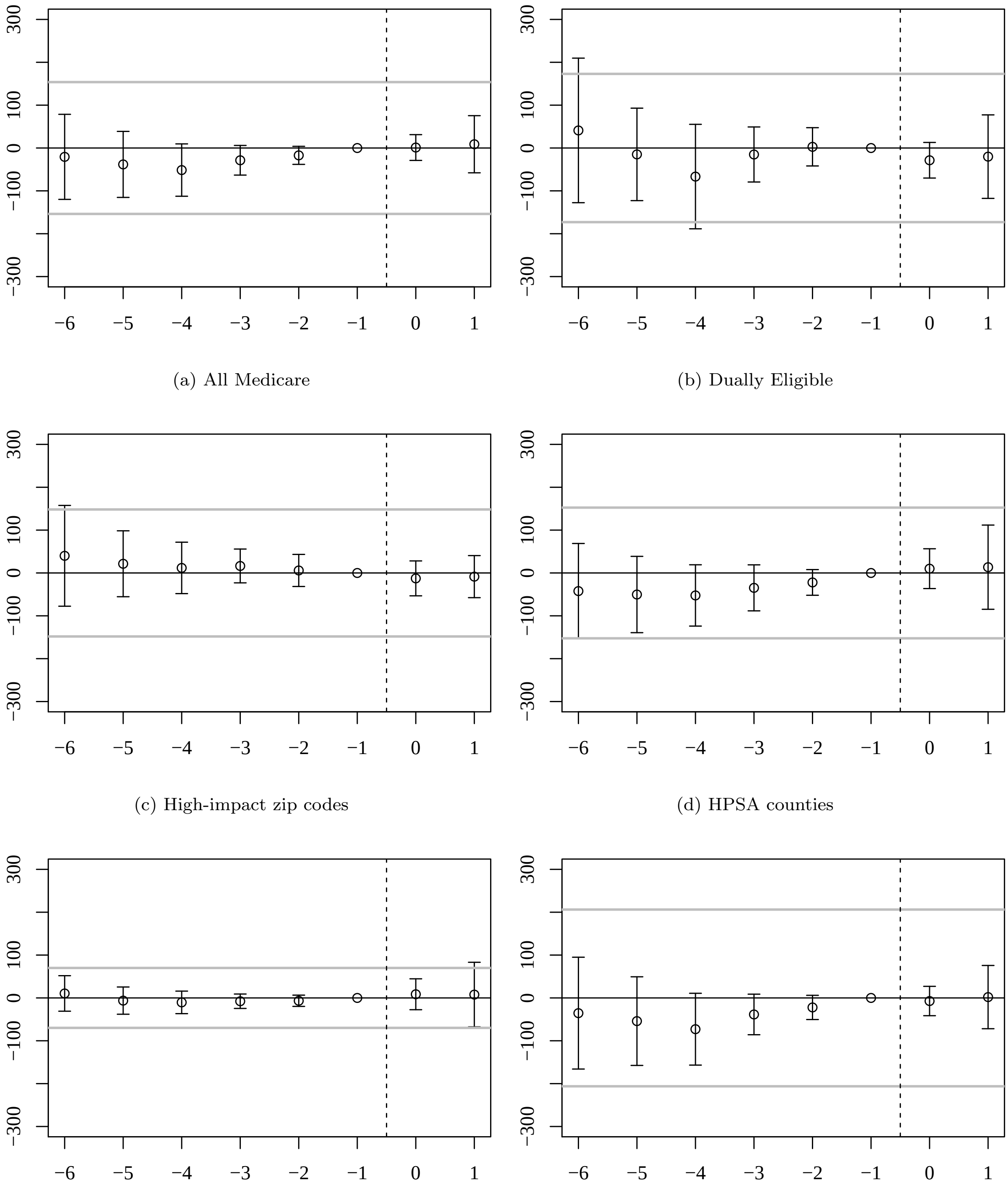

(e) Charlson score of 0 or 1




(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of days between physician services, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample.

Figure A.14. : Trends in Physician Service Expenditures in Expansion vs. Non-Expansion States, 2008-2015




(a) All Medicare

(b) Dually Eligible

(c) High-impact zip codes

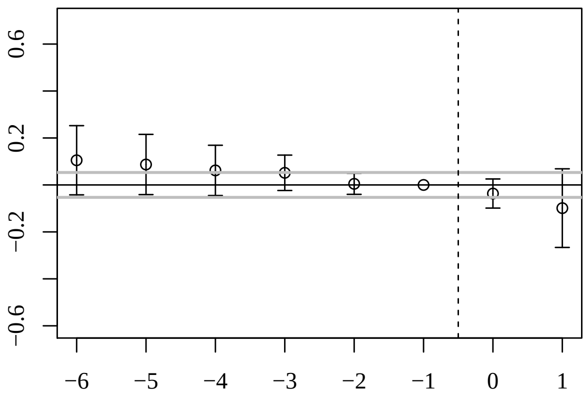
(d) HPSA counties

(e) Charlson score of 0 or 1

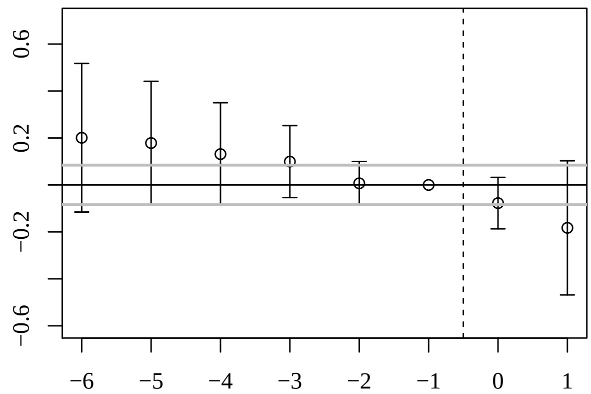
(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of physician service (Carrier) expenditures, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample.

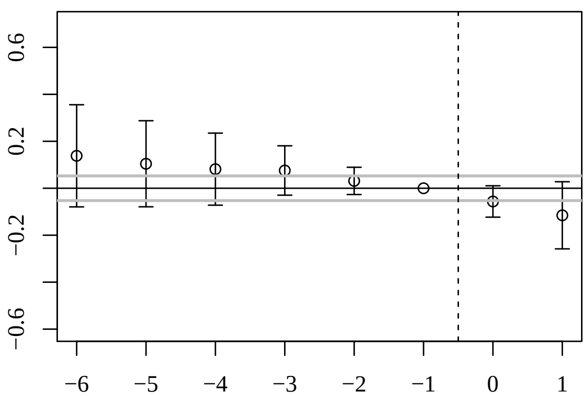
Figure A.15. : Trends in Non-MD Services in Expansion vs. Non-Expansion States, 2008-2015



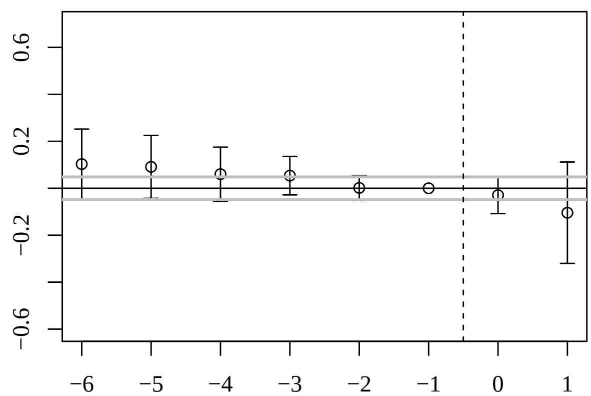

(a) All Medicare



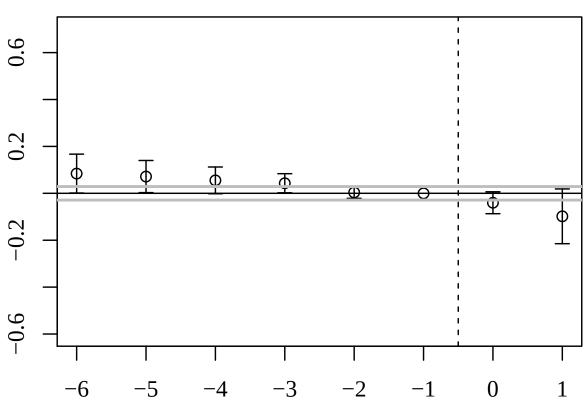

(b) Dually Eligible



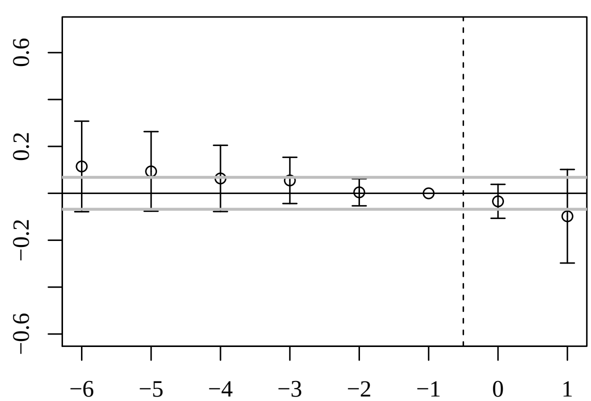

(c) High-impact zip codes




(d) HPSA counties



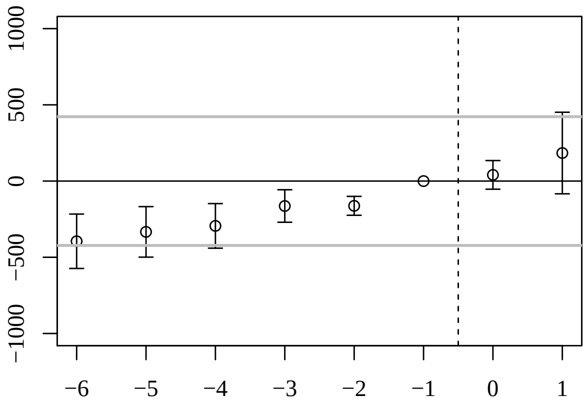

(e) Charlson score of 0 or 1



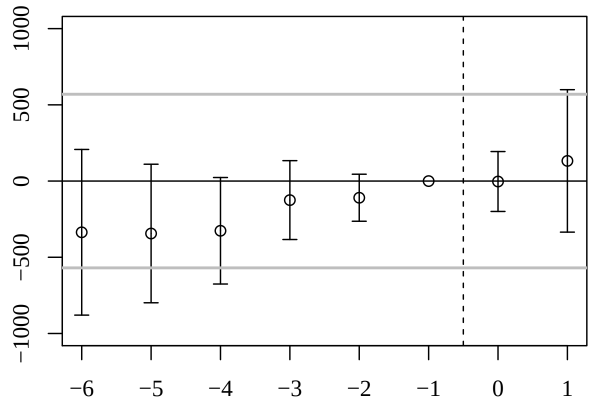

(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of number of services from a non-MD (mid-level) provider, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample.

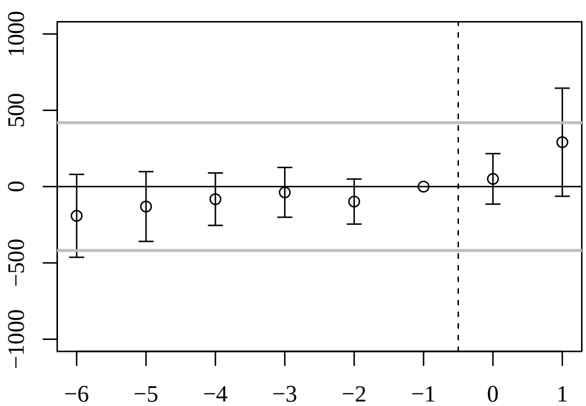
Figure A.16. : Trends in Overall Expenditures in Expansion vs. Non-Expansion States, 2008-2015



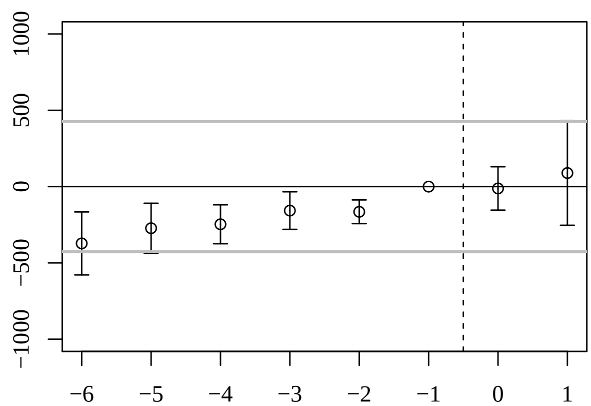

(a) All Medicare



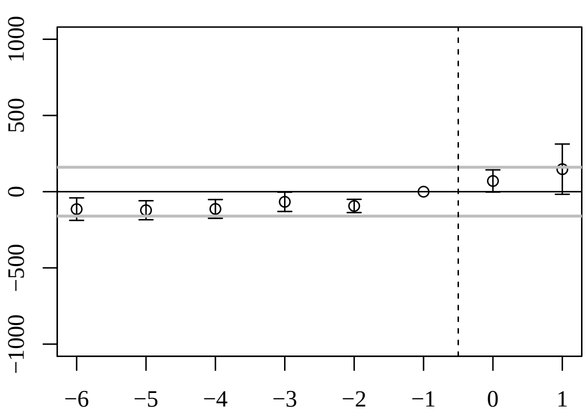

(b) Dually Eligible



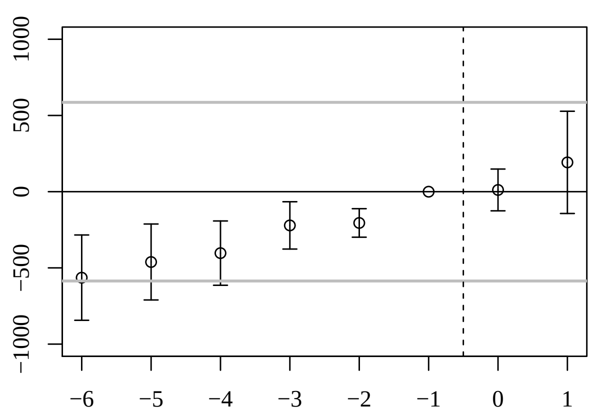

(c) High-impact zip codes




(d) HPSA counties




(e) Charlson score of 0 or 1




(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of overall expenditures, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample.

Table A.4—: Difference-in-Differences Results: Primary Care Services, Excluding 2015

| Subsample: | All | Dually Eligible | Low-Income Zip Codes | HPSA Counties | 0 or 1 Charlson Score | 2+ Charlson Score |
|---|---|---|---|---|---|---|
| Panel A: Primary Care RVUs | | | | | | |
| expansion×post | -0.0551 | -0.317 | -0.358 | 0.0853 | -0.0692 | -0.0447 |
| | [-0.71,0.60] | [-1.07,0.43] | [-1.01,0.29] | [-0.66,0.83] | [-0.37,0.23] | [-0.83,0.74] |
| outcome mean | 14.26 | 19.92 | 13.92 | 14.07 | 5.710 | 19.60 |
| % of mean | -0.4 | -1.6 | -2.6 | 0.6 | -1.2 | -0.2 |
| Panel B: Number of Primary Care Visits | | | | | | |
| expansion×post | -0.0189 | -0.185 | -0.196 | 0.00120 | -0.0286 | -0.0175 |
| | [-0.29,0.25] | [-0.53,0.16] | [-0.44,0.05] | [-0.31,0.31] | [-0.17,0.11] | [-0.35,0.31] |
| outcome mean | 9.066 | 11.41 | 8.770 | 8.859 | 4.143 | 12.14 |
| % of mean | -0.2 | -1.6 | -2.2 | 0.0 | -0.7 | -0.1 |
| Panel C: New Patient Visits | | | | | | |
| expansion×post | 0.00234 | -0.00356 | -0.00337 | 0.000774 | 0.00332 | 0.000114 |
| | [-0.008,0.013] | [-0.025,0.017] | [-0.016,0.009] | [-0.010,0.011] | [-0.010,0.016] | [-0.011,0.011] |
| outcome mean | 0.744 | 0.716 | 0.676 | 0.716 | 0.461 | 0.921 |
| % of mean | 0.3 | -0.5 | -0.5 | 0.1 | 0.7 | 0.0 |
| N | 25,159,206 | 3,355,654 | 4,802,437 | 9,165,128 | 9,408,713 | 15,750,493 |

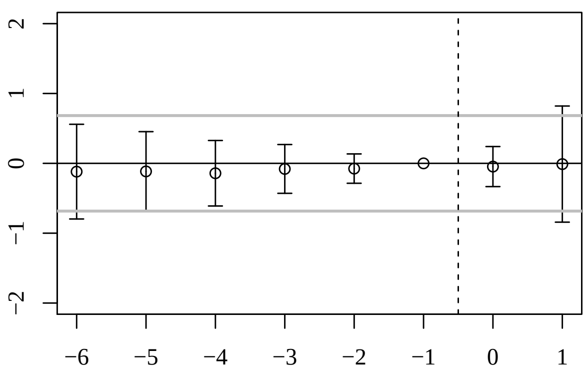
*Note:* This table reports difference-in-differences estimates comparing expansion and non-expansion states 2008 to 2014. Each column represents a different sample and each panel a different outcome. Because of data availability as described in the text, the analysis that uses new patient visits excludes 2008 and 2009, thus reducing the number of observations for those regressions by approximately 40%. 95% confidence intervals, in brackets, from standard errors clustered at the state level. This table differs from Table 2 by excluding 2015.

Table A.5—: Difference-in-Differences Results: Primary Care Services, Large Expansions

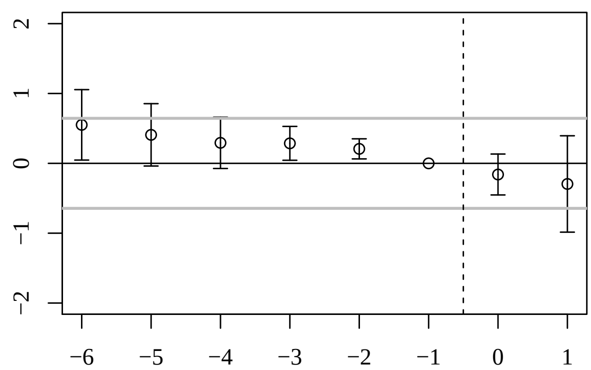
| Subsample: | All | Dually Eligible | High Impact Zip Codes | HPSA Counties | 0 or 1 Charlson Score | 2+ Charlson Score |
|---|---|---|---|---|---|---|
| Panel A: Primary Care RVUs | | | | | | |
| expansion×post | 0.241 | -0.353 | -0.222 | 0.387 | 0.0684 | 0.330 |
| | [-0.73,1.21] | [-1.49,0.79] | [-1.31,0.86] | [-0.72,1.49] | [-0.38,0.51] | [-0.83,1.49] |
| outcome mean | 15.14 | 20.95 | 14.71 | 14.83 | 6.244 | 20.67 |
| % of mean | 1.6 | -1.7 | -1.5 | 2.6 | 1.1 | 1.6 |
| Panel B: Number of Primary Care Visits | | | | | | |
| expansion×post | 0.116 | -0.0879 | -0.122 | 0.151 | 0.0214 | 0.160 |
| | [-0.25,0.48] | [-0.49,0.31] | [-0.49,0.24] | [-0.24,0.54] | [-0.19,0.23] | [-0.27,0.59] |
| outcome mean | 9.416 | 11.79 | 9.083 | 9.118 | 4.393 | 12.54 |
| % of mean | 1.2 | -0.7 | -1.3 | 1.7 | 0.5 | 1.3 |
| Panel C: New Patient Visits | | | | | | |
| expansion×post | 0.00291 | 0.00715 | 0.000504 | 0.00245 | 0.000692 | 0.00299 |
| | [-0.009,0.015] | [-0.017,0.031] | [-0.014,0.015] | [-0.009,0.014] | [-0.015,0.016] | [-0.009,0.015] |
| outcome mean | 0.755 | 0.714 | 0.685 | 0.724 | 0.484 | 0.923 |
| % of mean | 0.4 | 1.0 | 0.1 | 0.3 | 0.1 | 0.3 |
| N | 22,655,029 | 2,838,571 | 4,966,233 | 7,304,538 | 8,385,456 | 14,269,573 |

*Note:* This table reports difference-in-differences estimates comparing expansion and non-expansion states 2008 to 2015. Each column represents a different sample and each panel a different outcome. Because of data availability as described in the text, the analysis that uses new patient visits excludes 2008 and 2009, thus reducing the number of observations for those regressions by approximately 40%. 95% confidence intervals, in brackets, from standard errors clustered at the state level. This table differs from Table 2 because it includes only states that had eligibility expansions of at least 10 percentage points in the treatment group, and excludes Wisconsin from the control group.

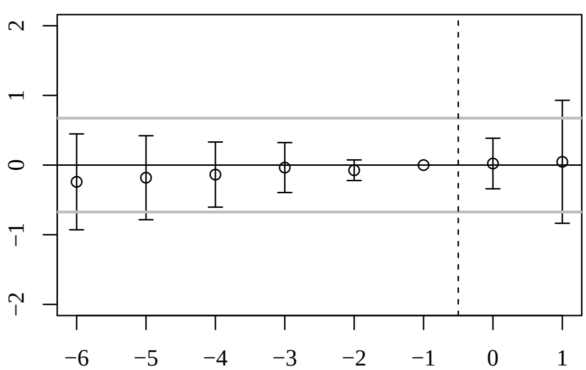
Figure A.17. : Trends in Primary Care RVUs in Expansion vs. Non-Expansion States Excluding Dually Eligible, 2008-2015



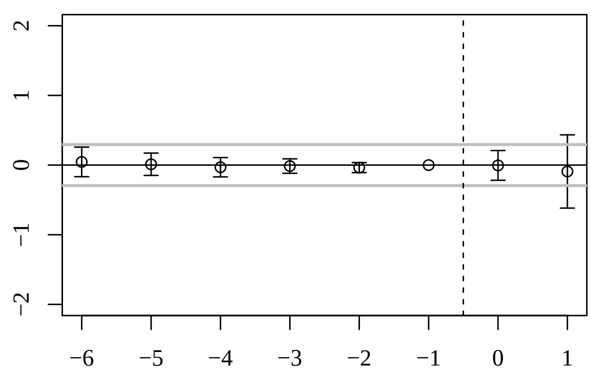

(a) All Non-duals



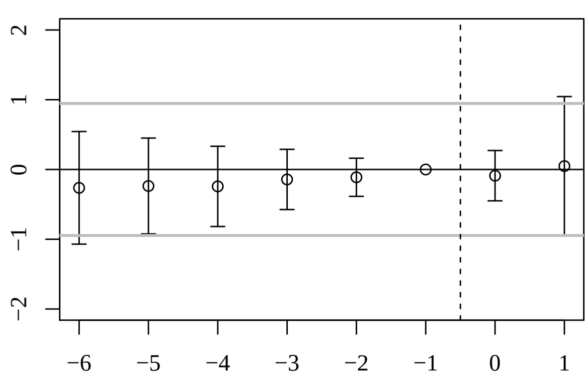

(b) Non-duals in High-impact zip codes




(c) Non-duals in HPSA counties



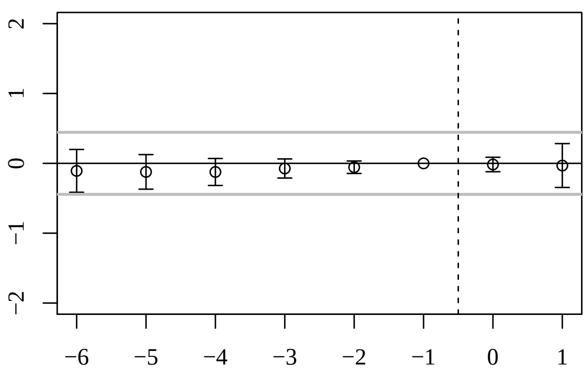

(d) Non-duals with Charlson score of 0 or 1



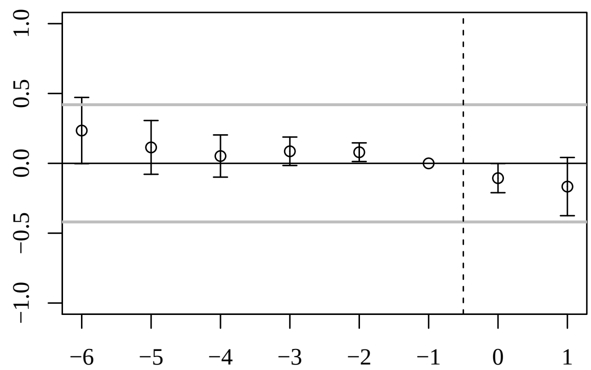

(e) Non-duals with Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of primary care RVUs, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample. This figure differs from Figure 4 in that it excludes the dually eligible.

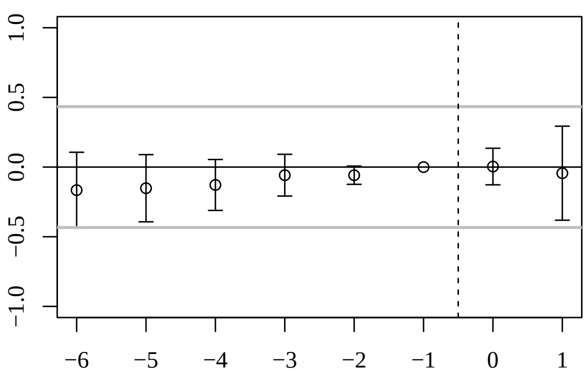
Figure A.18. : Trends in Primary Care Visits in Expansion vs. Non-Expansion States Excluding Dually Eligible, 2008-2015



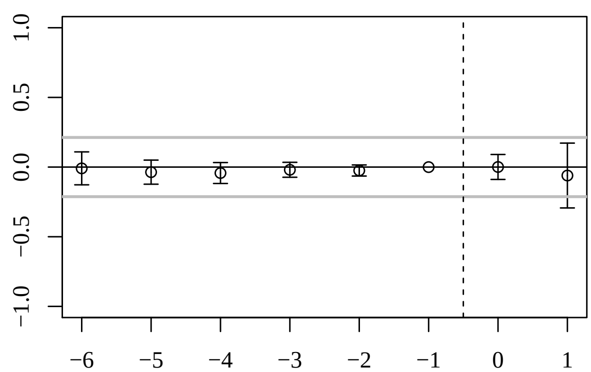

(a) All Non-duals



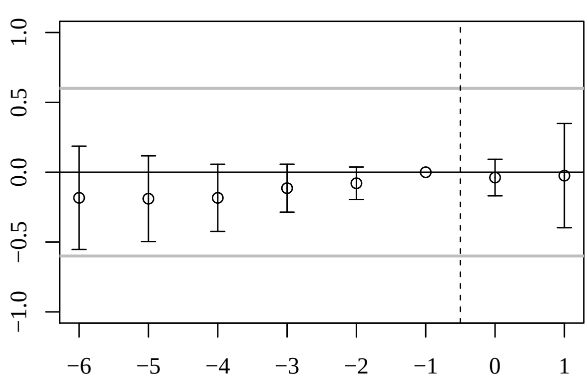

(b) Non-duals in high impact zip codes




(c) Non-duals in HPSA counties



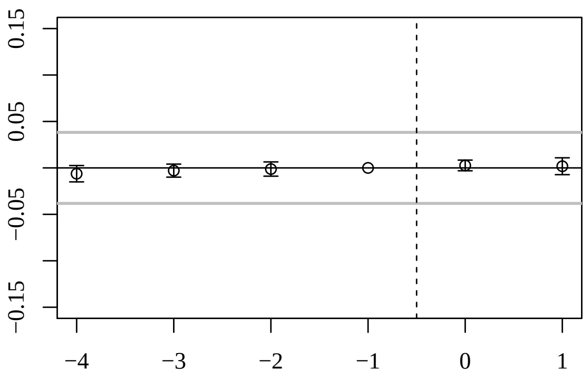

(d) Non-duals with Charlson score of 0 or 1



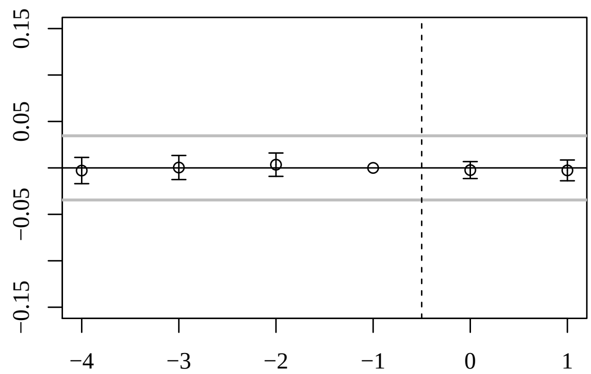

(e) Non-duals with Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of primary care visits, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the six years before and two years after expansion. The gray lines denote 5% of the mean for this subsample. This figure differs from Figure 5 in that it excludes the dually eligible.

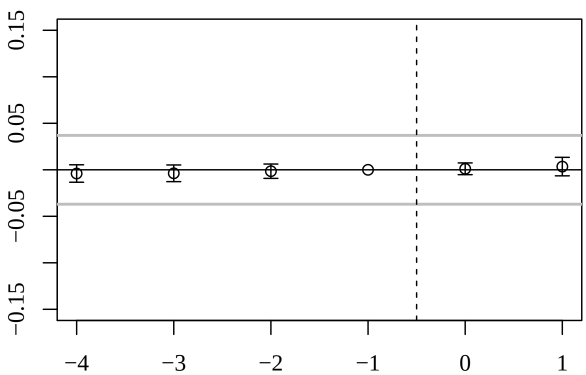
Figure A.19. : Trends in New Patient Visits in Expansion vs. Non-Expansion States Excluding Dually Eligible, 2008-2015



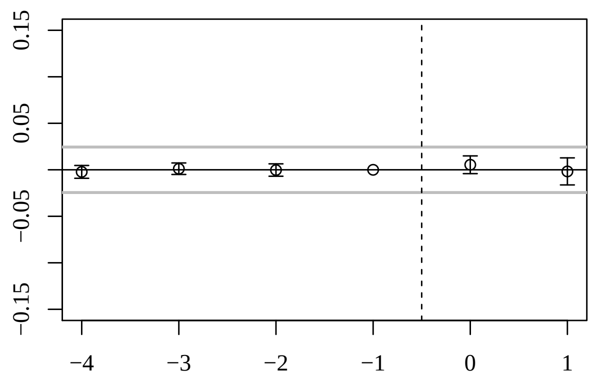

(a) All Non-duals



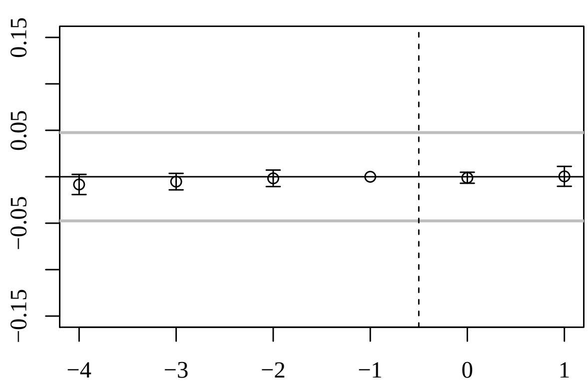

(b) Non-duals in High-impact zip codes




(c) Non-duals in HPSA counties



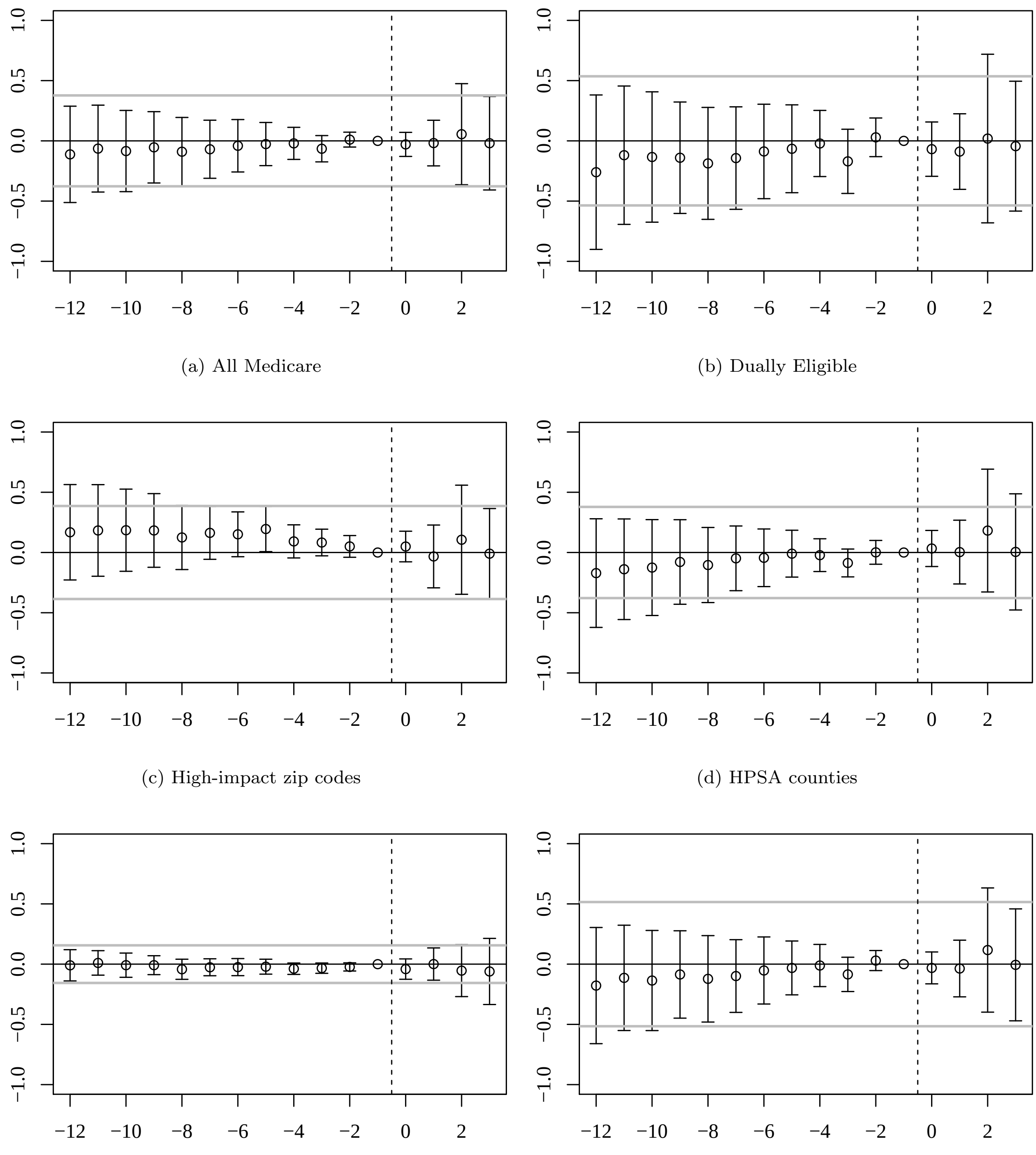

(d) Non-duals with Charlson score of 0 or 1




(e) Non-duals with Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of Equation 1 for the outcome of new patient visits, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the four years before and two years after expansion. The gray lines denote 5% of the mean for this subsample. This figure differs from Figure 6 in that it excludes the dually eligible.

Figure A.20. : Trends in Primary Care RVUs in Expansion vs. Non-Expansion States by Halfyears, 2008-2015




(a) All Medicare

(b) Dually Eligible

(c) High-impact zip codes

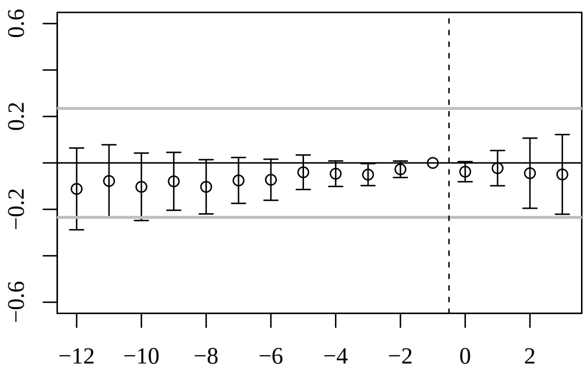
(d) HPSA counties

(e) Charlson score of 0 or 1

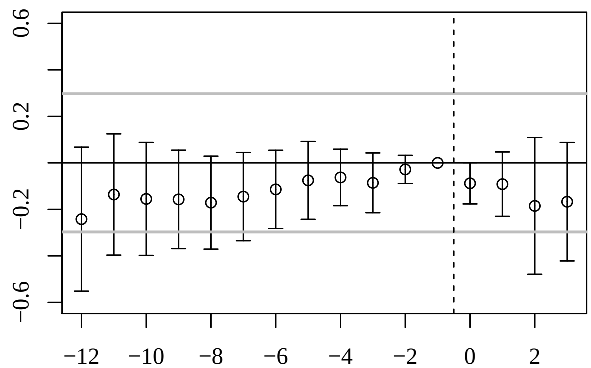
(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of a version of Equation 1 where $t$ is a halfyear for the outcome of primary care RVUs, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the twelve halfyears before and four halfyears after expansion. The gray lines denote 5% of the mean for this subsample.

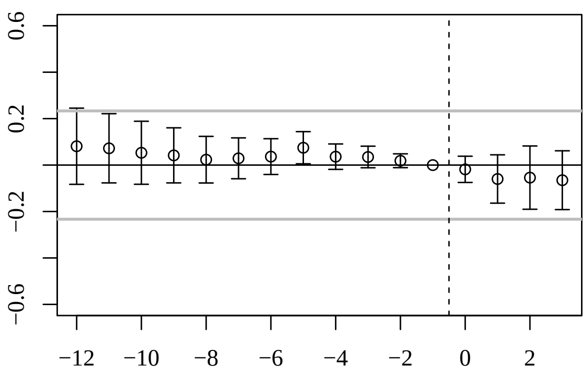
Figure A.21. : Trends in Primary Care Services in Expansion vs. Non-Expansion States by Halfyears, 2008-2015



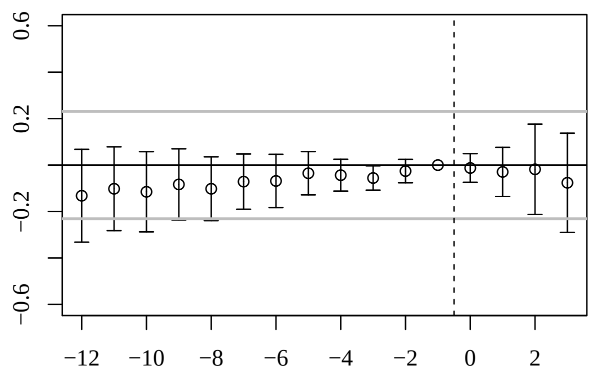

(a) All Medicare



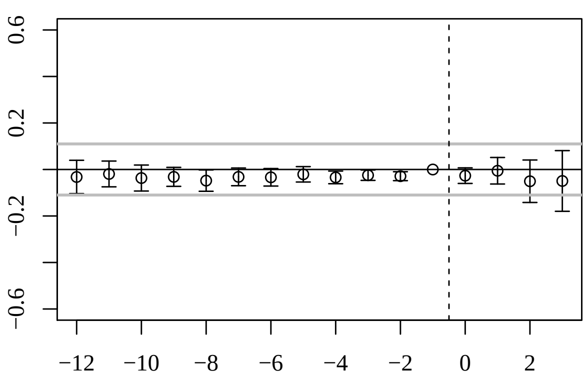

(b) Dually Eligible



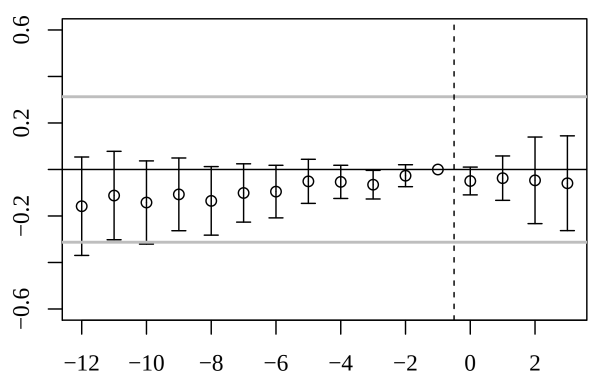

(c) High-impact zip codes




(d) HPSA counties



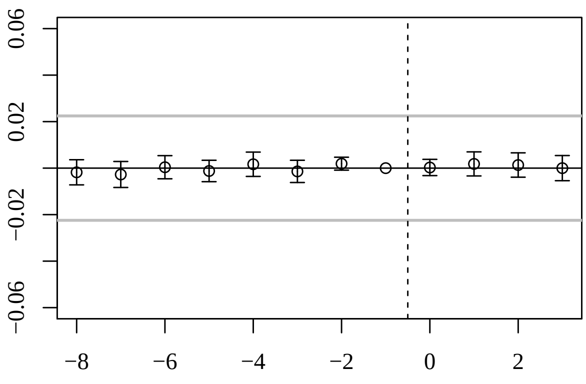

(e) Charlson score of 0 or 1



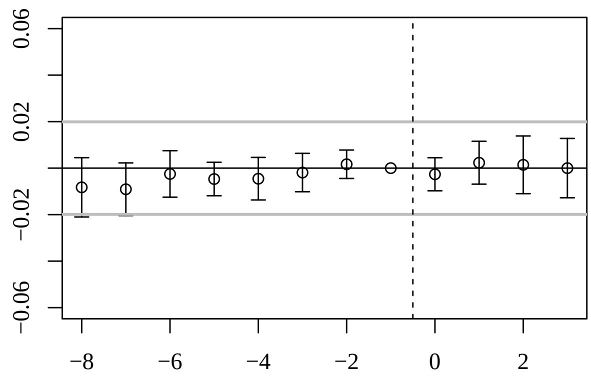

(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of a version of Equation 1 where $t$ is a halfyear for the outcome of primary care services, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the twelve halfyears before and four halfyears after expansion. The gray lines denote 5% of the mean for this subsample.

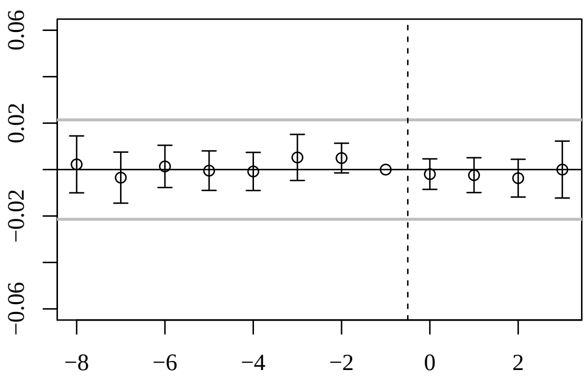
Figure A.22. : Trends in New Patient Visits in Expansion vs. Non-Expansion States by Halfyears, 2008-2015



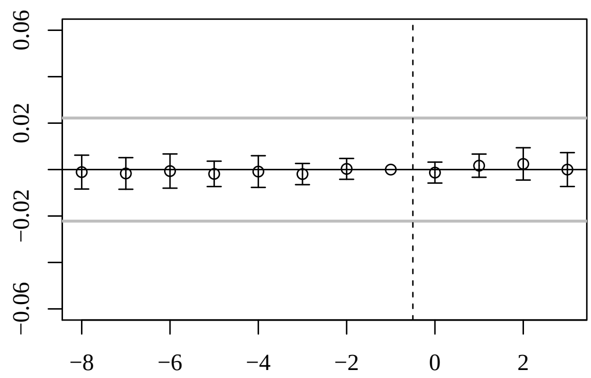

(a) All Medicare



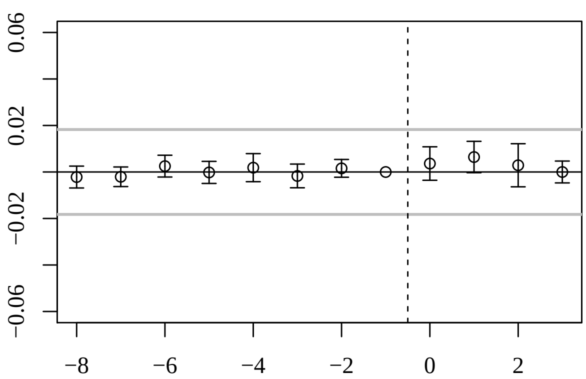

(b) Dually Eligible



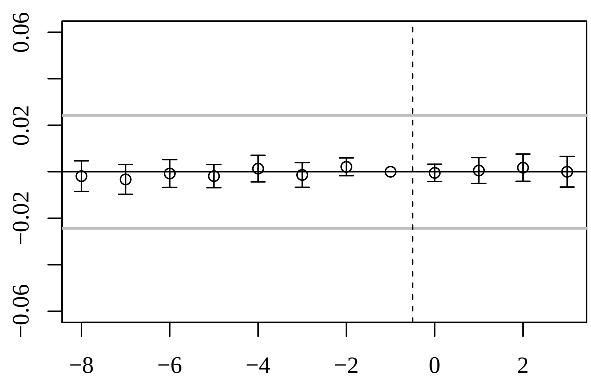

(c) High-impact zip codes




(d) HPSA counties




(e) Charlson score of 0 or 1




(f) Charlson score of 2 or more

*Note:* These figures report coefficients from the estimation of a version of Equation 1 where $t$ is a halfyear for the outcome of new patient visits, with the coefficients representing the deviation from the mean difference between expansion and non-expansion states in the twelve halfyears before and four halfyears after expansion. The gray lines denote 5% of the mean for this subsample.

## D. Difference-in-Differences with Different Treatment Timing

Goodman-Bacon (2018) shows that the two-way fixed effects DD estimator is a weighted average of all possible 2 x 2 DD estimators. In this section, we discuss what this means for DD in our context. We have 21 states that expanded in 2014 (early expansion), 3 states that expanded in 2015 (late expansion), and 22 nonexpansion states included in our analyses. Therefore, we have four 2 x 2 comparisons: both the early and late expansion groups are compared to the untreated group; the late expansion states serve as controls during their pre-period for the early expansion states; and, the earlier expansion states serve as controls during their post-period for the late expansion states. As demonstrated by the decomposition in Goodman-Bacon (2018), the weights on each of these 2 x 2 comparisons are determined by the sample share for each group and the treatment variance. In general, weights tend to be higher for timing groups with larger sample shares and with treatment times closer to the middle of the panel studied. In Table A.6, we report the calculated weights for each of the 3 types of 2 x 2 comparisons for our main estimates that were reported in Table 2.

Goodman-Bacon discusses two important implications of this decomposition. First, if treatment effects vary across groups but not over time, the DD estimator effectively weights the average treatment effects for each group by a function of sample shares and treatment variance, rather than by sample shares. In this way, this variance-weighted average treatment effect on the treated (VWATT) does not equal the "sample-weighted" ATT. This weighting is not ideal if the sample-weighted ATT is the parameter of interest. To better understand how the two compare, he recommends comparing the weights for the ATT for each treatment group in the VWATT to their sample share. As may be seen in Table A.6, the weights for each of the two treatment groups (early and later expanders) are very similar to their sample share among the expansion states. The paper indicates this is likely when there is little variation in treatment timing, the untreated group is large, and if some timing groups are larger than others. All three of these scenarios are true in our context. Not surprisingly, when we use the sample shares to calculate a SWATT (column 6), it is extremely similar to the VWATT (i.e. two-way fixed effects DD estimate).

The second implication of the DD decomposition is that, in the presence of time-varying treatment effects, the use of earlier treated units as a control group for later treated units can introduce bias in the estimated 2 x 2 treatment effect. The extent to which this type of bias affects the overall DD estimate depends on the size of the weights on this particular comparison in the decomposition. In our context, however, we clearly see very little evidence of time-varying treatment effects in the event study specifications (Figures 4-6). Nonetheless, even if there were changing trends in outcomes in the 2014 expander states in 2015 due to treatment, the extent to which this bias could affect the overall DD estimates is extremely small. This is due to both the smaller number of states (expansion states only) and the short period of time (one year) involved in this comparison. As may be seen in column (9) of Table A.6, we calculate that the 2 x 2 comparison of later to earlier expansion states as controls receives less than a 2 percent weight in the two-way fixed effects DD estimator in all of the specifications. The overwhelming majority of the weight is placed instead on the comparison between the non-expansion and expansion states. Following the procedure outlined in Goodman-Bacon, we can also subtract these components out of the DD estimates using their calculated weights to summarize treatment effects without this potential source of bias. Given the small size of the weights for this particular 2 x 2 comparison, the resulting estimates are nearly identical to the DD estimate that includes them (see column 10).

## Table A.6—: Goodman-Bacon (2019) DD Decomposition

| | Weight in VWATT | | VWATT | Sample Weight | | SWATT | Weights in DD Decomposition | | | DD Net Late Treatment vs. Early Control |
|---|---|---|---|---|---|---|---|---|---|---|
| | Early Early Expander | Late Late Expander | | Early Early Expander | Late Late Expander | | Expansion vs. Non-Expansion | Early Treatment vs. Late Control | Late Treatment vs. Early Control | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) |
| Panel A: Primary Care RVUs | | | | | | | | | | |
| All | 0.91 | 0.09 | 0.0600 | 0.85 | 0.15 | 0.1193 | 0.92 | 0.07 | 0.01 | 0.0616 |
| Dually Eligible | 0.92 | 0.08 | -0.1360 | 0.88 | 0.12 | -0.0905 | 0.93 | 0.06 | 0.01 | -0.1301 |
| High-Impact Zip Codes | 1.00 | 0.00 | -0.2670 | 1.00 | 0.00 | -0.2681 | 1.00 | 0.00 | 0.00 | -0.2669 |
| HPSA Counties | 0.92 | 0.13 | 0.2340 | 0.89 | 0.11 | 0.3421 | 0.94 | 0.09 | 0.02 | 0.2358 |
| 0 or 1 Charlson Score | 0.91 | 0.09 | -0.0596 | 0.86 | 0.14 | -0.0254 | 0.92 | 0.07 | 0.01 | -0.0603 |
| 2+ Charlson Score | 0.90 | 0.09 | 0.1380 | 0.85 | 0.15 | 0.2088 | 0.92 | 0.07 | 0.01 | 0.1414 |
| Panel B: Number of Primary Care Visits | | | | | | | | | | |
| All | 0.91 | 0.09 | 0.0393 | 0.85 | 0.15 | 0.0797 | 0.92 | 0.07 | 0.01 | 0.0386 |
| Dually Eligible | 0.92 | 0.08 | -0.1110 | 0.88 | 0.12 | -0.0570 | 0.93 | 0.06 | 0.01 | -0.1113 |
| High-Impact Zip Codes | 1.00 | 0.00 | -0.2000 | 1.00 | 0.00 | -0.2008 | 1.00 | 0.00 | 0.00 | -0.2000 |
| HPSA Counties | 0.92 | 0.13 | 0.0718 | 0.89 | 0.11 | 0.1364 | 0.94 | 0.09 | 0.02 | 0.0700 |
| 0 or 1 Charlson Score | 0.91 | 0.09 | -0.0176 | 0.86 | 0.14 | 0.0053 | 0.92 | 0.07 | 0.01 | -0.0188 |
| 2+ Charlson Score | 0.90 | 0.09 | 0.0669 | 0.85 | 0.15 | 0.1156 | 0.92 | 0.07 | 0.01 | 0.0666 |
| Panel C: New Patient Visits | | | | | | | | | | |
| All | 0.89 | 0.10 | 0.0047 | 0.85 | 0.15 | 0.0066 | 0.91 | 0.07 | 0.02 | 0.0047 |
| Dually Eligible | 0.91 | 0.09 | 0.0035 | 0.88 | 0.12 | 0.0070 | 0.93 | 0.06 | 0.02 | 0.0036 |
| High-Impact Zip Codes | 1.00 | 0.00 | -0.0026 | 1.00 | 0.00 | -0.0026 | 1.00 | 0.00 | 0.00 | -0.0026 |
| HPSA Counties | 0.91 | 0.14 | 0.0025 | 0.89 | 0.11 | 0.0041 | 0.93 | 0.09 | 0.02 | 0.0025 |
| 0 or 1 Charlson Score | 0.90 | 0.10 | 0.0028 | 0.86 | 0.14 | 0.0041 | 0.91 | 0.07 | 0.02 | 0.0026 |
| 2+ Charlson Score | 0.89 | 0.11 | 0.0035 | 0.85 | 0.15 | 0.0056 | 0.91 | 0.07 | 0.02 | 0.0036 |

*Note:* Weight in VWATT for each treatment group calculated using equation (13) in Goodman-Bacon (2018) under the assumption of constant treatment effects over time. Also, SWATT calculated based on 2 x 2 group comparisons to non-expansion states only following method used to apply Goodman-Bacon robustness checks by Hill et al. (2019).