

Employed for Higher Pay?
How Medicare Payment Rules Affect Hospital Employment of Physicians
David Dranove and Christopher Ody
(Online Appendix)

Appendix 1: Data Appendix on Measuring VI

Appendix 1 proceeds in two steps. First, we provide a more detailed explanation of how we assign each physician to a single TIN. Next, we provide additional details about how we incorporate data from SK&A. Capps, Dranove, Ody (2017 and 2018) use an identical measure of VI and therefore we copy portions of this data appendix from those papers.¹

To assign each physician to a single TIN, we determine the share of each physician's RVUs billed to each TIN.² If a majority of a physician's RVUs are billed with hospital TINs or if the highest RVU TIN that the physician bills with is a hospital's TIN, then we consider the physician to be VI. We take a number of steps to avoid spurious changes in VI status. In particular, for a physician satisfying this definition of VI, we define the physician to be VI in any prior years in which the physician bills in part under a hospital TIN. Similarly, once a physician satisfies this definition of VI, we define the physician to be VI in any subsequent years in which the physician bills in part under a hospital TIN. Finally, we exclude a small share of physicians who integrated and then unintegrated, as well as physicians who begin billing partially using VI TINs but with a low enough frequency as to not meet our definition of VI.

These decisions cleanly separate physicians into ones that bill under hospital TINs and ones that do not. Capps, Dranove, Ody (2018) present evidence that there is little loss from abstracting away from multiple TINs and VI statuses per physician to a single binary VI status per physician. In particular, by one year after VI (as defined), a physician bills for 98 percent of RVUs with hospital TINs. This number rises to greater than 99 percent in later years.

¹ Those papers use data from states containing roughly 12 percent of the U.S. population, whereas this paper restricts analyses to states for which we have data for each year from 2007 through 2013 and which cover roughly 8 percent of the U.S. population. Numbers in this appendix refer to the broader sample.

² The paper's central analyses examine a subset of procedures, but we perform all calculations described in Appendix 1 on all of a physician's claims.

We take a number of steps to aggregate TINs that are a part of the same larger organization. First, we aggregate different hospital TINs into systems with guidance from the American Hospital Association data. Second, we map different physician TINs into systems with guidance from the SK&A data. The SK&A data contain physician National Provider Identifier (NPI) numbers, practice name, hospital owner, and system owner.³

We merge the SK&A data with the private claims data on NPI. Match rates between the private claims data and the SK&A data are relatively low—matched providers account for about one-third of private claims revenues. By filling in ownership information for NPIs that do not match to the SK&A data but have a TIN that does match, we increase the match rate to about 55 percent. When we eliminate group practice NPIs, nonphysician NPIs (i.e., nurses, suppliers, etc.), and very small physician groups (TINs that have five or fewer NPIs in them), the match rate rises to 78 percent.

To create master organizations from SK&A, we assign TINs in the private claims data to a “main” system based on the SK&A data.⁴ We do not aggregate a TIN into a larger system unless the majority of the TIN’s RVUs are for a single system in the SK&A data. If two TINs in the private claims data share the same “main” system based on the SK&A data, then we aggregate them into a single system (i.e., assign them the same TIN). We manually check larger ownership changes, changes in ownership when roughly one-half of physicians report system ownership, and TINs with vacillating VI status. Finally, market experts from the data provider validated the structure of the largest organizations and the largest cases of ownership changes.

Appendix 2: Simplified Methodology for Robustness Checks to Physician VI Results

The paper’s central analysis graphically examines whether there is a break from trend in the relationship between physician $\Delta relprice^{2010}$ and physician VI in the 2009 to 2013 time period (i.e., the post period) relative to the 2007 to 2009 time period (i.e., the pre-period). This Appendix introduces a simpler alternative specification for performing and presenting robustness checks for the effect of physician $\Delta relprice^{2010}$ on physician

³ We clean the SK&A data to increase internal consistency. For example, we edit the system ownership data to ensure that if a physician reports a hospital owner and that hospital is a part of a system, then the correct system is filled in.

⁴ We also aggregate TINs that are not hospital or system-owned into group practices based on the SK&A practice name.

VI. In particular, we break the sample into two time periods $p \in \{pre, post\}$. We define $New VI_{ip}$, which is an indicator variable for whether physician i integrates during time period p . We rely upon the same sample as in the main analyses, except that we restrict the sample in the second period to only those physicians that had not integrated by 2009. We run a linear probability regression:

$$(A.1) \quad New VI_{ip} = \alpha_p + \sum_{y \in \{2007, 2010\}} \beta_p^y * \Delta relprice_i^y.$$

Our central estimate of the effect of the 2010 price shock on physician VI is β_{post}^{2010} . To ensure that any effect is not a continuation of trend, we also present β_{pre}^{2010} and the difference between β_{post}^{2010} and β_{pre}^{2010} . Unless otherwise noted, we follow the same conventions regarding weighting and the treatment of outliers as in the paper's main analyses.

Appendix 2, Table 1 presents our baseline results in this format. Column 1 illustrates that $\Delta relprice^{2010}$ has a large effect on the probability that a physician becomes VI. The coefficient of 0.46 is similar to the difference of 0.42 between the coefficient for 2009 and the coefficient for 2013 in Figure 5 in the main paper. The coefficient on $\Delta relprice^{2010}$ for 2007 to 2009, presented in column (2), is more than an order of magnitude smaller, and the difference presented in column (3) is therefore large and statistically significant. The coefficient on $\Delta relprice^{2007}$ is near zero in the early years and becomes negative in the later period.

Appendix 3: Additional Details on the 2007 Price Shock

As we note in the text, Medicare began a four-year phase-in of another fee schedule change in 2007. This appendix provides additional details on that shock, which we will refer to as the 2007 price shock. We proceed in four steps. First, we provide additional institutional details on the 2007 price shock. Second, we re-present many of our central analyses for the 2007 price shock. Third, we present a series of robustness checks to show that neither excluding controls for the 2007 price shock, nor adding more granular controls for the 2007 price shock, substantively affects our results. Finally, we

highlight a number of differences between the 2010 price shock and the 2007 price shock that might explain why physicians responded to one but not the other.⁵

From 2007 to 2010, Medicare phased in a change in its methodology for calculating direct practice expense. Direct practice expense is the variable component of non-physician work associated with a procedure, and has three components: clinical staff, equipment and supplies. Prior to 2007, Medicare allocated total direct practice expense for each specialty to specific procedures using a “top-down” approach. To do this, Medicare collected specialty-level survey data on total direct practice expenses. Medicare allocated these specialty-level total direct practice expenses to specific procedures using second specialty-procedure level dataset of direct practice expenses. Thus, the procedure-specialty-level data allocated total direct practice expenses for each specialty to different procedures, but did not determine specialty-level direct practice expenses.

The Balanced Budget Act of 1997 mandated that Medicare calculate direct practice expense using a “resource-based” (i.e., “bottom up”) approach. Medicare proposed the details of the bottom up methodology in 2005 and adopted it in 2007.⁶ The bottom up methodology differs from the top down methodology in two pertinent ways. First, Medicare updated the amounts of the three direct practice expense components for each procedure. Medicare stated that from 1999 until March of 2004, committees “reviewed the original ... [direct PE] inputs and provided us with recommendations for refining these direct PE inputs for existing CPT codes.... [These committees] provided recommendations, which we have reviewed and accepted, for over 7,600 codes. As a result, the current ... inputs differ markedly from those originally recommended...” (Federal Register, 2005). Medicare argued that these updated procedure-level measures of direct practice expense were more accurate than the specialty-level survey estimates of total direct practice expense. Therefore, Medicare discontinued the specialty-level total direct practice expense survey and determined each procedure’s direct practice expense

⁵ As a point of comparison, we also provide some additional information on the 2010 price shock. Appendix 8, Figures 1 and 2 present excerpts from the Federal Register proposed rule on the specialty-level updates to both direct percent and PE/HR and the methodology for calculating procedure-level practice expenses for 2010, respectively.

⁶ Source: <https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2005-Fact-sheets-items/2005-11-026.html>

based upon the amounts of the three direct practice expense components. Ultimately, the 2007 price shock led to less cross-specialty redistribution than the 2010 price shock.⁷

Appendix 3, Figure 1 presents a histogram of $\Delta relprice^{2007}$ across procedures.⁸ For procedures, $\Delta relprice^{2007}$ is more dispersed than $\Delta relprice^{2010}$. The two shocks differ in whether they made a facility or non-facility more attractive: the 2007 price shock made 41 percent of procedures more attractive to perform in a facility, whereas for the 2010 price shock made 65 percent of procedures more attractive to perform in a facility. Appendix 3, Figure 2 illustrates that the 2007 price shock did not affect PFS reimbursements in the facility, and as a result led to roughly dollar for dollar changes in the gap between PFS reimbursements in a facility and non-facility.

Before examining the effect of $\Delta relprice^{2007}$, we note that we lack data from prior to 2007 and therefore cannot evaluate whether $\Delta relprice^{2007}$ is correlated with changes in prices or quantities that occurred prior to 2007. Appendix 3, Figure 3 illustrates that for 2007 to 2013, $\Delta relprice^{2007}$ had the anticipated effect on Medicare *relprice*. There is no economically meaningful relationship between physician $\Delta relprice^{2007}$ and physician VI (Appendix 3, Figure 4) or between procedure $\Delta relprice^{2007}$ and procedure Medicare facility share (Appendix 3, Figure 5).⁹

Appendix 3, Figure 6 illustrates that at the procedure-level, $\Delta relprice^{2007}$ and $\Delta relprice^{2010}$ have a weighted correlation of 0.32. This correlation does not persist at

⁷ For example, based on Medicare's estimates, the (weighted) cross-specialty standard deviation of the 2007 price shock on specialty-level reimbursements is 3.6 percent, whereas the standard deviation for the 2010 price shock on specialty-level reimbursements is 6.9 percent. Relatedly, Medicare estimated that other reimbursement changes adopted in 2007 would also lead to meaningful changes across specialties, whereas the 2010 price shock is the only meaningful change to specialty-level reimbursements that Medicare adopted in 2010. For example, some suggested that Medicare should delay the implementation of the 2007 price shock "because of the other issues that are affecting PFS payments this year (such as, the effect of imaging payment provisions in the Deficit Reduction Act (DRA), the impact of the negative update, and the uncertainty regarding the impact of the 5-Year Review of work RVUs)." (Federal Register, 2005). Each of these other changes was immediately adopted in 2007 so does not affect prices during our sample period. Medicare estimates of the impact of the 5-Year Review of work RVUs suggest it should have led to more redistribution across specialties than the change in calculations of direct practice expense, having a cross-specialty weighted standard deviation of 3.8 percent. The two changes had a small and statistically insignificant negative relationship at the specialty-level.

⁸ Appendix 3, Figures 1 through 3 are analogs to Figures 1 through 3 in the main text, except that they are for the 2007 price shock rather than the 2010 price shock. Appendix 3, Figure 4 is the analog to Figure 5, and Appendix 3, Figure 5 is the analog to Figure 7.

⁹ There is less of a clear relationship between $\Delta relprice^{2010}$ and procedure private facility share than between $\Delta relprice^{2010}$ and procedure Medicare facility share. Therefore, in a number of checks in the appendices, we only report results using the latter dependent variable.

the physician-level; the correlation at the physician-level is 0.00 (Appendix 3, Figure 7). This is unsurprising because the 2007 price shock affected the prices of specific procedures, but led to little cross-specialty redistribution, whereas the 2010 price shock led to substantial cross-specialty redistribution.

Next, we illustrate that the effect of $\Delta relprice^{2010}$ on physician VI and procedure facility share is not sensitive to how we control for the 2007 price shock. Appendix 3, Figure 8 re-estimates the regression underlying Figure 5, but no longer controls for the interaction between the year and $\Delta relprice^{2007}$. Reassuringly, the effect of $\Delta relprice^{2010}$ on physician VI does not change. Presenting similar information in a different format, Appendix 3, Table 1 repeats the analysis in Appendix 2, Table 1 but does not control for $\Delta relprice^{2007}$. The effect of $\Delta relprice^{2010}$ on physician VI remains unchanged. Appendix 3, Table 2 repeats the analysis in Appendix 3, Table 1 but controls discrete quintile bins of $\Delta relprice^{2007}$. The results remain similar. Replacing the quintile bins of $\Delta relprice^{2007}$ with vintile bins reduces the coefficient on $\Delta relprice^{2010}$ by roughly 15 percent (Appendix 3, Table 3). Appendix 3, Table 4 and Appendix 3, Table 5 replace the discrete quintile and vintile bins with interactions between $\Delta relprice^{2007}$ and these bins. The coefficient on $\Delta relprice^{2010}$ changes little from Appendix 3, Table 3. Given this pattern of results, we conclude that it is unlikely that the effect of $\Delta relprice^{2010}$ on VI is being driven by the decision about how to control for $\Delta relprice^{2007}$.

Appendix 3, Table 6 re-examines the effect of procedure-level $\Delta relprice^{2010}$ on Medicare procedure facility share, but experiments with alternative controls for $\Delta relprice^{2007}$. Column (1) of Appendix 3, Table 6 copies column (1) of Table 3. Columns (2) through (7) of Appendix 3, Table 6 include varying controls for the 2007 price shock. The coefficient on $\Delta relprice^{2010}$ does not substantively change across these specifications.

A final question is why the 2007 and 2010 price shocks have different effects. Medicare announced the 2007 price shock in 2005 and began phasing it in in 2007, the first year for which we have data. Therefore, our data are not well suited to detecting any effect of the 2007 price shock. As we discuss above, Medicare adopted a number of other changes to the physician fee schedule in 2007, which may be correlated with the

2007 price shock. That confounds our ability to measure any effect of the 2007 price shock and may make the particular shock to practice expenses less pertinent to physician practices.

Another potential explanation is that the 2010 price shock made VI more attractive for many physicians, whereas the 2007 price shock made VI less attractive for many physicians. The effect of positive and negative price shocks may not be symmetric because integration is effectively an absorbing state for physicians, and because not all patients that physicians treat in facilities can be appropriately treated in non-facilities.¹⁰ More concretely, the patient who might switch site because of the 2010 price shock was treated by an office-based physician prior to the 2010 price shock, and could be safely treated in an office or outpatient department after the 2010 price shock. By contrast, the patient who might switch site because of the 2007 price shock may have medical reasons for receiving treatment in a hospital outpatient department and therefore be less willing to switch to an office. After all, the phenomenon where patients treated in “facility” settings are in fact treated in a VI physician’s office is a relatively recent one. Relatedly, the 2010 price shock was more highly correlated with observable characteristics of physicians, such as the physician’s specialty and the amount of overhead involved in procedures the physician performs. This may make it easier for the econometrician, for physicians, and for hospitals to assess the impact of the 2010 price shock than the impact of the 2007 price shock. This may allow us to better measure the impact of the 2010 price shock and may reduce frictions in the market for ownership. Overall, the differences in response to the 2007 price shock and the 2010 price shock suggests some limits to the external generalizability of our analysis of the 2010 price shock. However, the 2007 price shock does not appear to confound our analyses of the effects of the 2010 price shock.

Appendix 4: Relationship between Private Claims data and Medicare Claims data

We measure physician $\Delta relprice^{2010}$ with private claims data. If physicians perform different procedures on Medicare patients and private patients, then measuring physician $\Delta relprice^{2010}$ with private claims data might introduce measurement error and

¹⁰The earlier tables in this Appendix, as well as Appendix 5, Figure 6; Appendix 6, Figure 9; and Appendix 6, Figure 10 examine the effects of quantiles of $\Delta relprice^{2007}$ and $\Delta relprice^{2010}$. Lacking data from prior to the 2007 price shock, we are uncertain of how to interpret any comparisons.

attenuation bias. To investigate this possibility, we create Medicare physician $\Delta relprice^{2010}$ with Medicare's 2012 Physician Public Use File (which we will refer to as "the Medicare PUF"), the first year of publicly available Medicare physician claims.¹¹ Appendix 4, Figure 1 plots the relationship between private physician $\Delta relprice^{2010}$ and Medicare physician $\Delta relprice^{2010}$. Appendix 4, Figure 1 excludes physicians that are present in the private claims sample, but are not present in the Medicare PUF. Excluded physicians are disproportionately OBGYNs and pediatricians. Appendix 4, Figure 1 also plots a regression estimate and a confidence interval of the relationship.¹² The weighted correlation between the two measures of $\Delta relprice^{2010}$ is 0.84.¹³ Appendix 4, Table 1 illustrates that the effect of Medicare physician $\Delta relprice^{2010}$ on VI is statistically significant and is similar in magnitude to the effect of private physician $\Delta relprice^{2010}$ on VI.

Next, we explore two exercises to separate the effect of Medicare physician $\Delta relprice^{2010}$ and private physician $\Delta relprice^{2010}$ on VI. When both measures are included (Appendix 4, Table 2), the standard errors on the parameter estimates roughly double. The coefficient on private physician $\Delta relprice^{2010}$ remains similar in magnitude and highly statistically significant, whereas the coefficient on Medicare physician $\Delta relprice^{2010}$ becomes small and statistically insignificant. If private payers did not adopt the 2010 price shock, then Medicare physician $\Delta relprice^{2010}$ would remain predictive and private physician $\Delta relprice^{2010}$ would not. Given the high level of correlation between the two variables, there is limited variation to separate their effects. Appendix 4, Table 3 illustrates that the effect of private physician $\Delta relprice^{2010}$

¹¹ The Medicare PUF enumerates how many times each physician performed each procedure by facility/non-facility site. Source of Medicare's Physician and Other Supplier PUF : <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/Medicare-Provider-Charge-Data/Physician-and-Other-Supplier.html>

¹² When plotting procedure-level data, we vary the size of dots in scatter plots based upon the procedure's RVUs. When plotting physician-level data, we represent each physician with a small dot because plots containing variable sized dots were incomprehensible. When plotting physician-level data, we report the least squares lines based on regressions where we weigh each physician by the average of the physician's in-sample private and in-sample Medicare spending. We rescale the in-sample private spending so that the total weight from the private sample and from the Medicare sample are the same. These decisions do not substantively affect this Figure.

¹³ The price measure covers roughly 24 percent of a physician's RVUs for in-sample physicians in the private claims dataset. For in-sample physicians with the 2012 Medicare claims data, 30 percent of physician RVUs are for in-sample procedures. Note that this is higher than the 17.5 percent of procedures that are in sample because a subset of physicians performs any of the relevant procedures.

on VI is weaker among physicians without in-sample claims in the Medicare PUF. If private payers did not adopt the 2010 price shock (or did not adopt it for physicians that do not see Medicare patients), then the 2010 price shock would have less of an effect on these physicians.

Finally, we illustrate that facility share is correlated for Medicare claims and private claims. Private physician facility share and Medicare physician facility share have a weighted correlation of 0.81 (Appendix 4, Figure 2).¹⁴ Appendix 4, Figure 3 illustrates that private procedure facility share and Medicare procedure facility share are highly correlated, with one interesting exception. In the private claims sample, the facility shares are near zero for evaluation and management visits. Conversations with the data provider confirmed this fact. MedPAC (2013) flags evaluation and management visits because outpatient billing by VI physicians is increasingly prevalent and there are likely to be few cost differences, despite Medicare's price differential. The fact that some private insurers will not reimburse for these fees is consistent with other research documenting that private insurers deviate from Medicare's pricing when Medicare's prices are a poor approximation to marginal costs and the amount of money at stake is large (Clemens, Gottlieb, Molnár et al. 2017).

Appendix 5: Further details on whether the 2010 price shock affected private prices

This Appendix presents additional evidence on how the 2010 price shock affected private prices. Appendix 5, Figure 1 illustrates that procedure ΔPFS^{2010} had the anticipated effect on Medicare's non-facility prices. ΔPFS^{2010} also affected private non-facility prices, with a post-period coefficient of 0.5 (Appendix 5, Figure 2).¹⁵ There is no clear relationship between $\Delta relprice^{2010}$ and private facility prices, although the estimates are very imprecise (Appendix 5, Figure 3). While we cannot rule out the

¹⁴ Despite the high level of correlation, the relationship is not visually striking because a large share of observations are in the upper right or lower left corners of the figure.

¹⁵ As private prices are roughly twice as high as Medicare prices, this estimate is similar to the ones in Clemens and Gottlieb (2017). Interestingly, private prices respond immediately to Medicare's 2010 price shock, even though Medicare's 2010 price shock takes four years to phase in. If the primary mechanism through which Medicare prices affected private prices was through changing a physician's outside option, then the private price changes should have phased in gradually. By contrast, if the mechanism is more heuristic, with insurers and providers using Medicare's pricing to roughly approximate marginal costs, then an informational shock to what marginal costs are would transmit through to prices immediately. Therefore, we see this pattern as more in the spirit of Clemens, Gottlieb and Molnár (2017) than in the spirit of Clemens and Gottlieb (2017).

possibility that the 2010 price shock was transmitted to private facility prices, we do not believe this is the most natural interpretation of the results. Our sampling criteria eliminate procedures with high facility shares, and private facility shares are lower than Medicare facility shares. As a result, facility share is only about 10 percent for in-sample private procedures, and we are only able to calculate private *relprice* for about half of in-sample procedures.¹⁶ When combined with wide variation in private facility fees, private *relprice* is very noisily measured.

One obvious follow-up question is whether private insurers are more likely to deviate from Medicare's prices for procedures that physicians perform less frequently on Medicare patients than private patients. The effect of that ΔPFS^{2010} on private non-facility prices is similar across terciles of how often physicians perform the procedure for Medicare patients relative to private patients (Appendix 5, Table 1).

One concern with the relationship between the 2010 price shock and private prices is that market power may affect private prices. In particular, the 2010 price shock caused VI. VI may increase market power and market power may increase prices. This would bias our estimates of the effect of the 2010 price shock on private prices.

To evaluate the empirical relevance of this concern, we first determine how much the 2010 price shock might have increased the size of VI practices. From Table 2, a $\Delta relprice^{2010}$ of one increases VI by 27.5 percent, although because not all of these physicians are going to work at the same hospital, the effect of $\Delta relprice^{2010}$ on the market share of the average VI physician is much smaller.¹⁷

To determine how much these increase in the size of VI practices might impact prices, we rely upon a number of analyses in a companion paper, Capps, Dranove, and Ody (2018). First, we note that while VI practices have higher prices than non-VI practices, this does not cause bias in any of our estimates. Second, we note that if market power raise prices for all physicians within a market, then our estimates of both the effect of $\Delta relprice^{2010}$ on facility prices and the effect of $\Delta relprice^{2010}$ on non-facility prices

¹⁶ We observe private non-facility prices for roughly three fourths of in-sample procedures.

¹⁷ By comparing our data in 2007 and 2013, we create a ratio of the average increase in the share of physicians owned by an average hospital system and the share of physicians acquired. These numbers suggest that if 10 percent of physicians integrate, then the average hospital system's share of physicians increases by 0.5 percent. This number is small because markets have multiple systems and some of these systems are newly acquiring physicians. If 10 percent of physicians integrate, then the average practice size of physicians that were already integrated in 2007 increases by roughly 3 percent.

will be biased upward, although our estimate of the effect of $\Delta relprice^{2010}$ on $relprice$ will not. However, the magnitude of that bias is small.¹⁸ Third, we note that VI physician practices and non-VI physician practices may differ in their ability to extract rents when they gain additional market power, although our estimate of the empirical relevance of this bias is again small.¹⁹

Appendix 6: The Effect of the 2010 Price Shock on Physician VI (Additional Robustness Checks)

i. Sensitivity of Results to Measuring 2010 Price Shock and VI at Physician Rather than Practice Level

If practices rather than physicians decide to integrate, then we will introduce measurement error by studying the 2010 price shock and VI at the physician level. This appendix examines two related questions. First, do physicians within the same practices undergo the same changes in ownership? Second, how does the effect of $\Delta relprice^{2010}$ on VI change if we measure the 2010 price shock and VI at the practice level?

To determine whether physicians in the same practice tend to switch practices together, we asked the following question: for a physician practice in 2007, what share of physicians still work together in 2013? To answer that question, we eliminate physicians that are in solo practice in 2007 because the physician and practice measures of the 2010 price shock are identical for these physicians. Next, we restrict the sample to a balanced panel of physicians (i.e., only those physicians present in all years from 2007-2013). We then take a practice of physicians working together in 2007, and determine the largest share of these physicians that work together in every year from 2007-2013. On average, 91 percent of physicians remain together in the same main group in every year from 2007-2013. While this might suggest that physicians switch practices together, for most

¹⁸ Monopolist physician practices have prices roughly 10 percent higher than those in perfectly competitive markets, so the upper bound of the effect of a 100 percent increase in relative prices is that it would increase both facility and non-facility prices by perhaps 2.75 percent.

¹⁹ In our companion paper, we find a positive correlation between increases in practice size and higher prices for non-VI practices. Such an effect is much weaker for VI practices. If VI shrinks non-VI practices and increases the size of VI physician practices, then this would bias downward our estimated effect of the relationship between of $\Delta relprice^{2010}$ and non-facility prices, and to a lesser extent bias upwards our effect of the relationship between of $\Delta relprice^{2010}$ and facility prices. The latter effect is exceedingly small, however. A hospital owning all physicians would have prices for physician services less than 18 percent higher than a hospital owning no physicians. This suggests that the feedback for a 100 percent relative price change would be about .014 or 1.4 percent (i.e., $.1 \times .005 \times .275$).

physician practices, there are no ownership changes. For example, roughly 83 percent of physicians are in the same practice (i.e., bill using the same TIN) in 2007 and in 2013. Thus, when physicians do switch practices, they often do not travel with their existing practice. This introduces some ambiguity in how to create practice-level measures of the 2010 price shock and of VI.

We aggregate physicians into pseudo-practices, where we define pseudo-practices as groups of physicians that are in the same practice in each year. Appendix 6, Table 1 presents an analysis similar to the one in Appendix 2, Table 1, except using the pseudo-practice as the unit of observation. The point estimate is roughly 22 percent larger, which is consistent with some measurement error in the central analyses. As the process of placing physicians into pseudo-practices based in part on ex-post information about which physicians are in practices together introduces some endogeneity concerns, the physician-level estimates remain our preferred ones.

ii. Sensitivity of Results to Weighting, Physician Sample and Measurement of VI

This section checks whether the effect of the 2010 price shock on physician VI is sensitive to weighting, the restrictions on which physicians are in the analysis, or the measurement of VI.

Appendix 6, Figure 1 illustrates how weighting and sampling restrictions affect the time series pattern of physician VI. Appendix 6, Table 2 presents an unweighted analysis that is analogous to the results in Appendix 2, Table 1. The point estimate for the effect of the 2010 price shock on physician VI is slightly larger in the unweighted analysis and remains statistically significant.

Appendix 6, Figure 2 presents alternative versions of the counterfactual analysis of eliminating the 2010 price shock.²⁰ Panels A and B illustrate that the results remain similar regardless of whether the physicians are weighted or not. Panels A and C illustrate that the level of VI and percentage point change in VI resulting from the 2010

²⁰ The level and trend in VI differ somewhat between this paper and Capps, Dranove, and Ody (CDO; 2018). The two most important reasons for the difference are that CDO examines physicians that practice in inpatient and outpatient sites, whereas our analyses exclude physicians practicing exclusively in an inpatient site, physicians that are disproportionately likely to be VI. Second, for simplicity, this paper focuses on a subsample of markets for which we have data from 2007 through 2013, whereas CDO includes additional markets. The level of VI and the increase in VI over time are both somewhat higher in the additional markets in our other paper.

price shock are sensitive to the steps we took to clean the physician ownership data. Without the data cleaning, the 2010 price shock has a smaller absolute effect on VI (0.3 percent), but still explains a large share of VI over time (roughly 37 percent of VI from 2009 to 2013).

iii. Sensitivity of Results to Choice of Sample Procedures

We construct $\Delta relprice^{2010}$ with a sample of procedures that includes roughly 24 percent of in-sample physician RVUs. This raises questions about whether our results are robust to alternative samples of procedures. We restrict our sample to procedures with simple Medicare reimbursement rules.²¹ Introducing additional procedures with more complex reimbursement rules could either mitigate or exacerbate measurement error.²² We further restrict our sample to procedures for which site of service might be sensitive to reimbursement rules. While this restriction may introduce measurement error or limit our ability to extrapolate, including a broader set of procedures that may not be subject to the same incentives could introduce additional measurement error.

Despite these caveats, we construct two alternative versions of $\Delta relprice^{2010}$ using different sampling restrictions. First, we calculate $\Delta relprice^{2010}$ using the narrower subset of procedures that MedPAC (2013) identifies as appropriate for site-neutral or modified site-neutral reimbursement. These procedures cover 16 percent of RVUs of in-sample physicians. The correlation between the baseline version of $\Delta relprice^{2010}$ and the alternative version based on a narrower procedure sample is 0.90. Second, we calculated $\Delta relprice^{2010}$ based upon a broader sample of all major and separately billable procedures. These procedures cover 43 percent of RVUs of in-sample physicians. The correlation between the baseline version of $\Delta relprice^{2010}$ and the alternative version based on a broader procedure sample is 0.81. Appendix 6, Table 3

²¹ In particular, all samples are restricted to procedures in OPPS with a “status indicator” of S (“Significant Procedure, Not Discounted When Multiple”), T (“Significant Procedure, Multiple Reduction Applies”), or X (“Ancillary Services”) because these procedures are not typically bundled under OPPS.

²² We do correct our coding for one important complication in Medicare reimbursement rules. For some procedures (predominantly imaging), Medicare breaks prices into two components: a technical component and a professional component. These can be identified by the presence of CPT modifiers TC and 26. In a facility, the physician will only bill for the professional component. We adjust prices and quantities for these types of procedures to account for the fact that physicians bill for both of the components in a non-facility, but only the code with the 26 modifier in a facility.

illustrates that the effect of $\Delta relprice^{2010}$ on VI is similar across the three samples of procedures.

If the procedures that we exclude from our main sample were less affected by the 2010 price shock, then the effect of $\Delta relprice^{2010}$ would be stronger among physicians for whom a larger share of the care was “in-sample.” We therefore divide physicians based upon whether the physician had an above or below average share of RVUs from in-sample procedures. Appendix 6, Table 4 illustrates that there is no evidence that $\Delta relprice^{2010}$ had a larger effect on physicians for whom a larger share of RVUs were for in-sample procedures. This is consistent with the 2010 price shock for in-sample procedures being a good proxy for the effect of the 2010 price shock for out-of-sample procedures.

iv. Other physician-level robustness checks

This section describes a number of additional physician-level robustness checks.

Appendix 6, Figure 3 plots the relationship between $\Delta relprice^{2010}$ and exit. The solid black lines represent the point estimates for the probability of exit over each one-year period for physicians who are in sample in the indicated earlier year. For example, for physicians who are in sample in 2007, $\Delta relprice^{2010}$ has a slightly positive but statistically insignificant effect on the probability of exit. The 95 percent confidence intervals around these coefficients are large relative to the year-over-year movements in the coefficients. An obvious question is whether physician exit contributes to the shift from non-facilities to facilities. These numbers do not provide dispositive evidence. Note that the point estimates are below zero in most years, suggesting that physicians with high $\Delta relprice^{2010}$ were less likely to be exiting. On the other hand, the coefficients decrease until 2010 and then increase afterwards. This is consistent with increased exit among those physicians faced with lower non-facility prices because of the 2010 price shock. We are unable to rule out the possibility that changes in exit patterns were responsible for the full effect of procedure $\Delta relprice^{2010}$ on procedure facility share.²³

²³ The point estimates for the 2010 to 2013 period are around roughly 0.05 higher than from 2009 to 2010. Thus, the change in the effect of $\Delta relprice^{2010}$ on the probability of exit from 2010 to 2013 is roughly $1 - 0.95^3 = 0.14$. This is larger than our estimate of procedure $\Delta relprice^{2010}$ on Medicare procedure facility share.

Next, we present evidence that suggests that VI increases facility charges because of changes in billing conventions, rather than changes in practice patterns. We calculate an RVU-weighted average of the 2007 Medicare procedure facility share for each physician/year. We run the regression that results from substituting this dependent variable into equation (10), and plot the results in Appendix 6, Figure 4. If the shift towards facilities was entirely driven by increases in physicians seeing patients who – based on their procedure - should be treated in facilities, then the point estimates would be identical to those in Figure 8. The point estimates are near zero both before and after integration. This is suggestive evidence that VI is affecting billing conventions rather than practice patterns.

Appendix 6, Table 5 estimates the effect of $\Delta relprice^{2010}$ on VI using a Cox proportional hazard model. The Cox model estimates the extent to which $\Delta relprice^{2010}$ permanently and proportionally increases the odds of VI for those physicians that have not yet integrated. Column (1) presents year over year estimates for the extent to which physicians with higher $\Delta relprice^{2010}$ are more likely to be acquired over the course of a year. The coefficient on $\Delta relprice^{2010}$ interacted with year ranges from 5 or 7 in all years except for 2010 and 2012. In 2010 and 2012 the coefficient is substantially higher, meaning that in those years $\Delta relprice^{2010}$ had a larger effect on the odds of VI. Note that this is the anticipated pattern of coefficients, given that Figure 5 illustrates large increases in the relationship between $\Delta relprice^{2010}$ and VI from 2009 to 2010 and from 2011 to 2012, and less of a relationship between $\Delta relprice^{2010}$ and changes in VI from 2007 to 2009, from 2010 to 2011, and from 2012 to 2013. When pooled in column (2), $\Delta relprice^{2010}$ led to a marginally statistically significant increase in the odds of integrating in 2010 or later.

One question raised in the main text is whether physician VI explains increases in procedure facility share. If physicians induced to integrate by the 2010 price shock were more likely to increase facility share in response to integration, then the effect of $\Delta relprice^{2010}$ on physician facility share might be larger than the combination of the effect of $\Delta relprice^{2010}$ on physician VI and of physician VI on facility share (i.e., roughly 0.015). Appendix 6, Figure 5 and Appendix 6, Table 6 present estimates of the effect of physician $\Delta relprice^{2010}$ on physician *facility share* directly. The year-by-year

coefficients show a sharp drop in 2009 and relatively stable coefficients in all other years. The pattern of these point estimates and the difference in the point estimate for 2009 compared to later years is similar to effect of procedure $\Delta relprice^{2010}$ on private procedure *facility share* directly. However, the pooled estimate is small and statistically insignificant. We lack the power to detect an effect of roughly 0.015, and therefore cannot rule out the possibility that physicians that integrated in response to the 2010 price shock had a similar likelihood to increase facility share in response to integration as other integrating physicians

Appendix 6, Figure 6 presents the time varying effect of quintiles of physician $\Delta relprice^{2010}$ on physician VI. The increase in VI is largest (i.e., 7.2 percentage points) for the largest quintile of $\Delta relprice^{2010}$, intermediate (i.e., 3.7 to 4.2 percentage points) for the three intermediate quintiles of $\Delta relprice^{2010}$, and smallest (i.e., 2.2 percentage points) for the smallest quintile of $\Delta relprice^{2010}$. Consistent with the fact that our estimates are not fully explaining the change in trend in 2010, VI increases even for physicians for whom $\Delta relprice^{2010}$ is negative

Appendix 7: Further Analyses related to the Procedure Level Quantity Responses

The 2010 price shock increased procedure facility share, but procedure facility share could increase for a number of reasons. First, it could increase because of substitution between facilities and non-facilities within the same procedure. Second, it could increase because of substitution to related procedures. Third, it could increase due to absolute changes in quantity (i.e., increases in non-facility quantity or decreases in facility quantity that are not offset elsewhere). The first part of this Appendix presents additional analyses to distinguish between these possible explanations.

First, we examine the relationship between procedure $\Delta relprice^{2010}$ and procedure quantity directly. Appendix 7, Figure 1 illustrates that Medicare facility quantity for procedures with large values of $\Delta relprice^{2010}$ fell prior to 2010. In 2010, the downward trend ends. Medicare non-facility quantity for the same procedures increases before 2010, and then falls sharply beginning in 2010. Appendix 7, Figure 2 illustrates that Medicare quantity (facility and non-facility combined) decreases for

procedures with larger values of $\Delta relprice^{2010}$ following the 2010 price shock, suggesting against full substitution from non-facilities to facilities.

In unreported results, we examined results from a pooled specification analog to Appendix 7, Figure 1; the specification is identical to the specification that allows for pre-trends in Figure 3, except substitutes in Medicare facility and non-facility quantities as dependent variables. There is a statistically significant decrease in non-facility quantities, and a statistically insignificant increase in facility quantities that is roughly 40 percent as large. Because the dependent variables in these regressions are in logs and more care is provided in non-facilities, the implied level of cross-site substitution is in fact lower. A back of the envelope calculation suggests that just under 20 percent of the change in *facility share* is driven by cross-site substitution, whereas 80 percent is driven by decreases in quantities in a non-facility setting. Thus, if we incorporate the effect of the quantity decrease into spending projections, we find that the 2010 price shock in fact lowered spending for in sample procedures by 0.4 percent.

Appendix 7, Figures 3 and 4 present results from analogous specifications for privately insured patients. In particular, Appendix 7, Figure 3 illustrates that private facility quantity decreased prior to 2010, but then the trend reversed and private facility quantity increased after 2010. Prior to 2010, private non-facility quantity grew for procedures with higher values of $\Delta relprice^{2010}$. This trend halts in 2010. Appendix 7, Figure 4 illustrates that total private quantities for more affected procedures grew prior to the 2010 price shock and shows no break from trend after the 2010 price shock. Overall, it is unclear whether the 2010 price shock affected private quantities and, if it did, whether it led to cross-site substitution or procedure-level quantity changes.

One explanation that fits the pre-trend in both the Medicare and private facility quantity analyses is that the 2010 price changes corrected for changes in costs that had slowly built up between the years of the old and new surveys. According to this explanation, the costs of procedures with large values of $\Delta relprice^{2010}$ had decreased in non-facilities relative to facilities, which led to a shift in quantity towards non-facilities. The 2010 price shock “corrected” prices so that they better reflected costs and reversed the pre-2010 trend. In the process, however, the 2010 price shock may have moved

procedures to the more costly site. We lack the true cost data necessary to investigate this hypothesis directly.

Next, we pursue a second test to measure the extent to which the 2010 price shock decreased quantity for procedures with larger price decreases. If the 2010 price shock did not affect site of service, then the effect of the 2010 price shock on procedure level prices would be a weighted average of the effect of the 2010 price shock on facility prices and on non-facility prices. With this intuition in mind, we create a new 2010 procedure-level price shock:

$$(A.2) \frac{(PFS_{fp2010}^{new} - PFS_{fp2010}^{old}) * (facility\ share_{p2007}) - (PFS_{op2010}^{new} - PFS_{op2010}^{old}) * (1 - facility\ share_{p2007})}{PFS_{op2010}^{old}}.$$

Because facility prices were generally unaffected by the price shocks, this is similar to an interaction between the non-facility price shock and the procedure's 2007 non-facility share. Thus, the shock has more "bite" for procedures that were performed almost exclusively in non-facilities than for procedures that were often performed in facilities.

Appendix 7, Figures 5 and 6 present the time varying effect of this new measure of the 2010 price shock on Medicare and private total procedure level quantity, respectively. For Medicare quantity, there is a noticeable break from trend. The (marginally statistically significant) pooled effect implies that a 1 percent decrease in prices would decrease total quantity by 0.34 percent. If physicians did not respond to the 2010 price shock by substituting across sites, then the new treatment measure should be a more accurate and impactful measure of the procedure-level decrease from the 2010 price shock. The pattern is almost a perfect mirror image of the effect of $\Delta relprice^{2010}$ on Medicare quantities that we presented in Appendix 7, Figure 2. As both are measured with substantial imprecision, we do not attempt to interpret the differences between the two. Instead, we note that both analyses suggest that not all changes in facility share are driven by cross-site substitution.

To examine whether substitution across procedures contributed to the increases in facility share, we test for heterogeneity in the effect of the 2010 price shock on facility share based upon whether a procedure has close substitutes. First, we group procedures based upon whether they are classified as having comparable clinical features and comparable anticipated treatment costs under Medicare's OPPS. Next, we use the 2012

Medicare PUF to determine whether procedures within a procedure group are performed by the same physician. To do this, we calculate a Herfindahl-Hirschman index (HHI) of each physician's procedure choices within each procedure group. If within one procedure group, a physician bills for only a single procedure, then the HHI would be 1. If a physician generates similar numbers of bills for many procedures in a given procedure group, then the HHI would be near 0. We then average the procedure group-physician HHIs across physicians, to create an HHI for each procedure group. Physicians are less likely to substitute across procedures for procedure groups with higher HHIs. Low substitutability procedures are also more likely to make up a meaningful share of a physician's income for the physicians performing them. To see why, note that if the physicians performing that procedure do not perform many other procedures, then the procedure will not have close substitutes.²⁴

Appendix 7, Figure 7 and 8 examine the effect of $\Delta relprice^{2010}$ on Medicare procedure facility share, and Medicare procedure logged total quantity, respectively, breaking procedures into terciles of HHI, where the highest HHI procedures have the lowest substitutability within physician.²⁵ The effect of $\Delta relprice^{2010}$ on facility share in 2013 relative to 2009 is statistically significant for both the top and bottom tercile of procedures by HHI. Due to a combination of a larger effect, differences in pre-trends, and differences in the lag structure with which the effect occurs, the pooled estimate in Appendix 7, Table 1 is only statistically significantly different from zero for those procedures with the lowest substitutability within physician. Appendix 7, Figure 7 and Appendix 7, Table 2 illustrate that the negative relationship between $\Delta relprice^{2010}$ and total Medicare procedure quantity is driven entirely by those procedures with the lowest substitutability within physician. These results are consistent with X-side measurement error and attenuation bias in the effect of the 2010 price shock on facility share. They

²⁴ The effect of the 2010 price shock could be larger or smaller for procedures with high substitutability. On the one hand, holding site constant, if a physician can substitute between two closely related procedures, then the physician's procedure choice will be more responsive for more substitutable procedures. This would lead to bigger effects for more substitutable procedures. On the other hand, considering a physician's site decision, procedure-level price shocks are a noisier measure of physician-level price shocks for high substitutability procedures. This would lead to X-side measurement error and smaller effects for more substitutable procedures.

²⁵ Given the less clear relationship between $\Delta relprice^{2010}$ and private quantities, we perform this analysis only for Medicare procedure quantities.

suggest that within site substitution across related procedures is not driving increases in facility share or decreases in quantity. Instead, increased facility share and decreased quantities result from both cross-site substitution and decreased overall labor supply by physicians that had larger $\Delta relprice^{2010}$.

Overall, the pattern of results in this Appendix suggest that physicians decreased quantity for those procedures that saw larger price decreases as a result of the 2010 price shock. We do not find evidence that this effect is stronger for procedures with closer substitutes. Given pre-trends in some analyses, it is ambiguous whether the 2010 price shock led to cross-site substitution.

Finally, Appendix 7, Figures 9 and 10 examine the effect of quintiles of procedure $\Delta relprice^{2010}$ on Medicare procedure facility share and private procedure facility share, respectively. For both series, facility shares decreases for the upper quintile of $\Delta relprice^{2010}$ until 2009 with the pattern reversing for 2010 onward. There is some evidence of increases in Medicare procedure facility share for the second highest quintile of $\Delta relprice^{2010}$. The time series pattern is similar across the bottom three quintiles for both series and shows no break from trend. This suggests it may take a relatively large shock to move care into facilities, and is consistent with the idea that even negative shocks may not push care back to non-facilities.

Appendix Bibliography

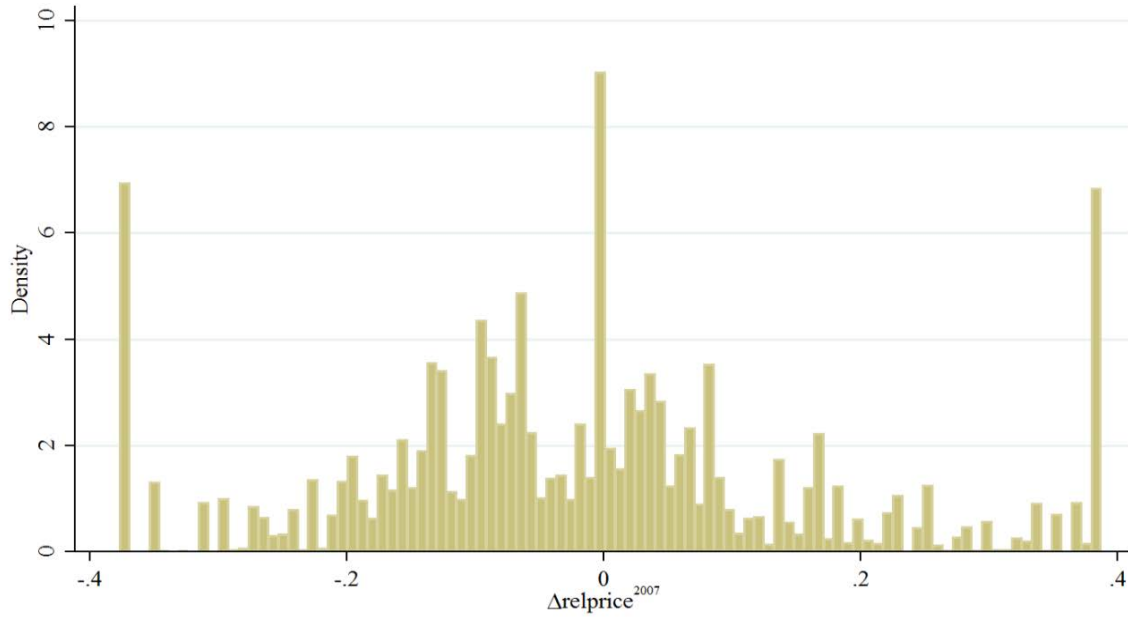
Clemens, Jeffrey, Joshua D. Gottlieb, and Tímea Laura Molnár. 2017. "Do health insurers innovate? Evidence from the anatomy of physician payments." *Journal of Health Economics* 55: 153-167.

Appendix 2, Table 1: Effect of physician $\Delta\text{relprice}^{2010}$ on probability of physician VI

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.460 <i>[0.0439]***</i>	0.0336 <i>[0.0150]**</i>	0.426 <i>[0.0462]***</i>
$\Delta\text{relprice}^{2007}$	-0.103 <i>[0.0163]***</i>	-0.00796 <i>[0.00557]</i>	-0.0952 <i>[0.0171]***</i>
R-sq	0.009	0.000	
N	16395	16527	

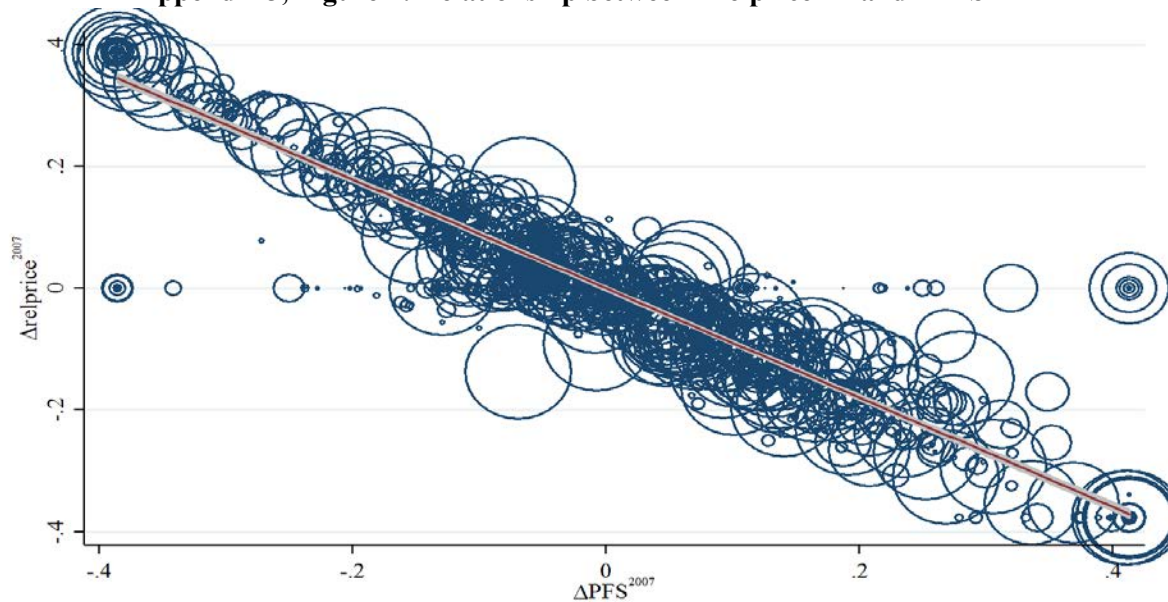
Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Standard errors are in *[]*. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

Appendix 3, Figure 1: Distribution of $\Delta\text{relprice}^{2007}$



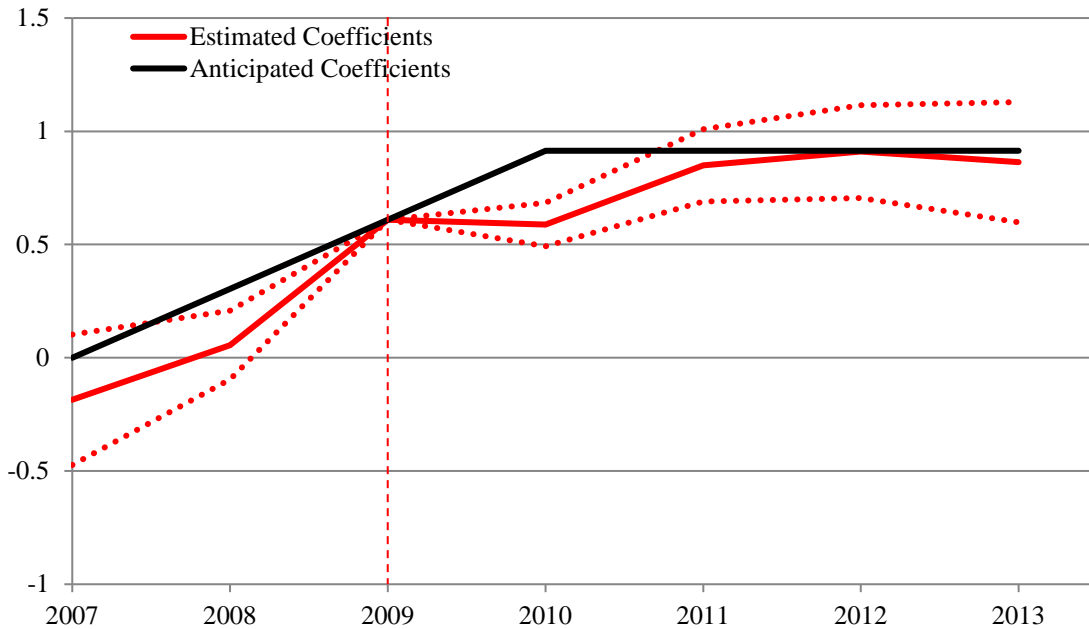
Notes: Unit of observation is the procedure, with procedures weighted by 2007 RVUs. Sampling restrictions are discussed in the text. Outliers are censored at the 5th and 95th percentile.

Appendix 3, Figure 2: Relationship between $\Delta\text{relprice}^{2007}$ and ΔPFS^{2007}



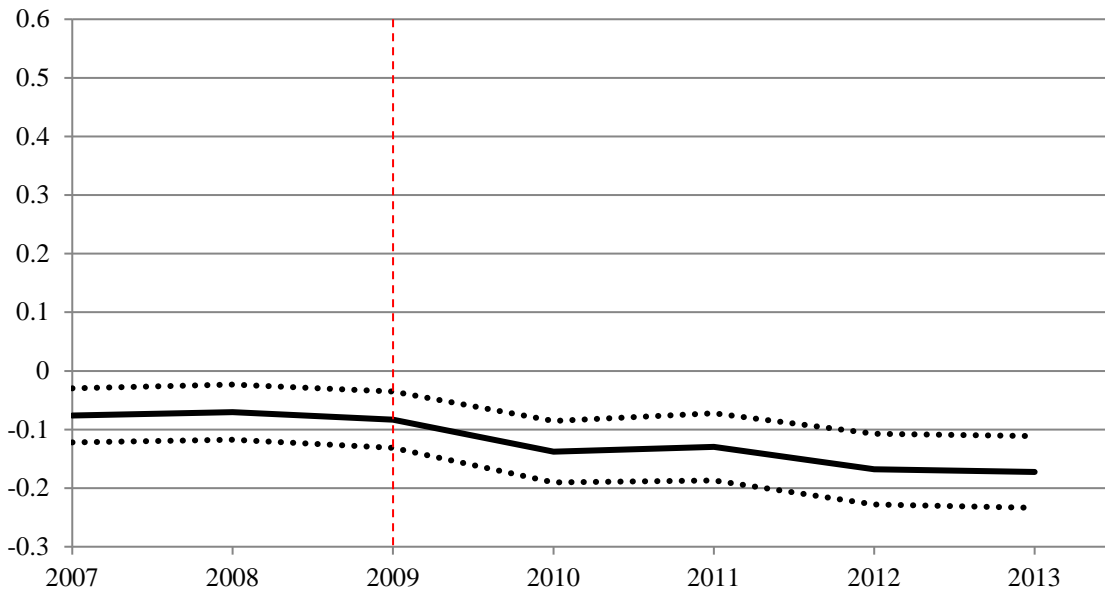
Notes: Unit of observation is the procedure, with procedures weighted by 2007 RVUs. Sampling restrictions are discussed in the text. Outliers are censored at the 5th and 95th percentile. Red line is OLS estimate of relationship and grey shaded area is 95 percent confidence interval.

Appendix 3, Figure 3: Time varying effect of procedure $\Delta\text{relprice}^{2007}$ on Medicare relprice



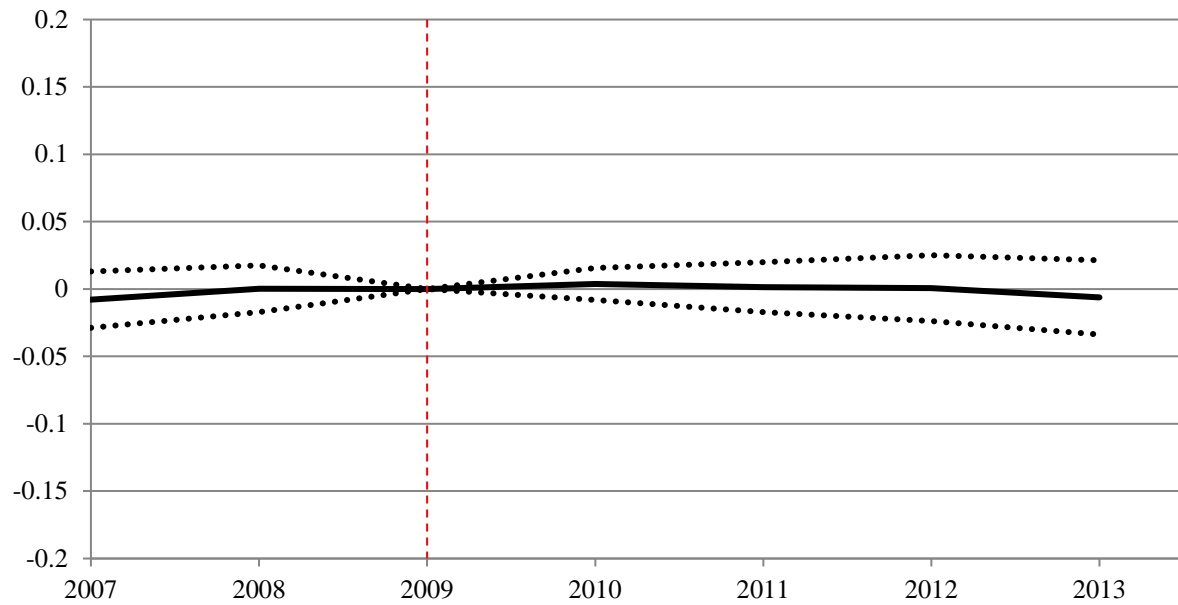
Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2010}$. Sampling restrictions are discussed in the text. Relprice, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 3, Figure 4: Time varying effect of $\Delta\text{relprice}^{2007}$ on physician VI



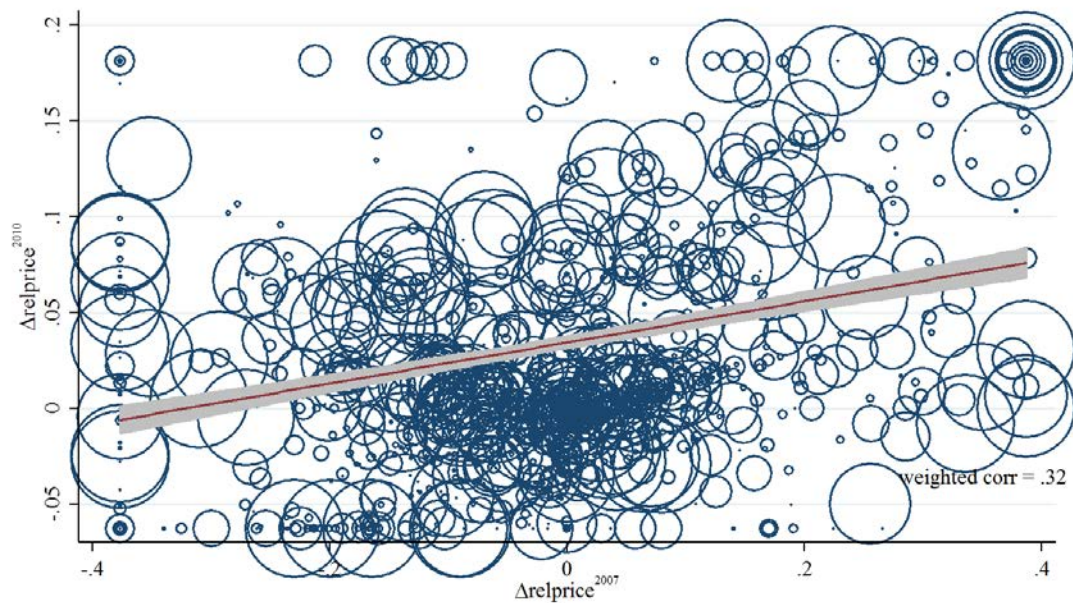
Notes: Unit of observation in regression is the physician-year. Unreported covariates include year fixed effects, and interactions between year and $\Delta\text{relprice}^{2010}$. Sample is restricted to physicians present in all years with in-sample claims in 2007. $\Delta\text{relprice}^{2007}$ and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by physician.

Appendix 3, Figure 5: Time varying effect of procedure $\Delta\text{relprice}^{2007}$ on procedure Medicare share facility



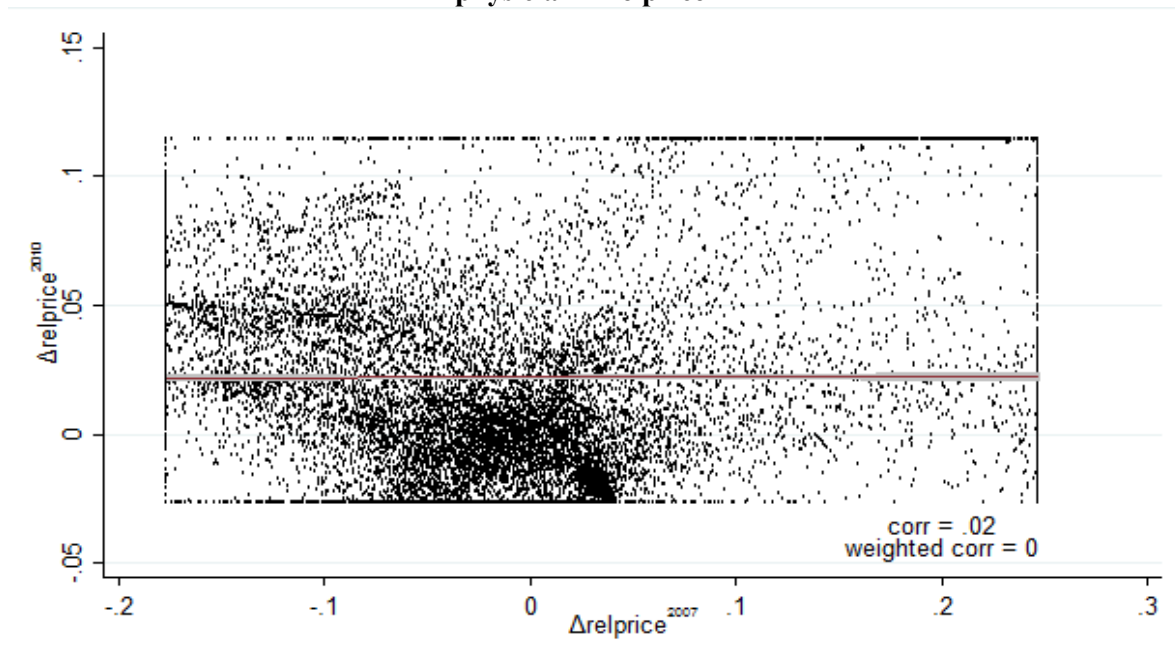
Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2010}$. Sampling restrictions are discussed in the text. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 3, Figure 6: Relationship between procedure $\Delta\text{relprice}^{2007}$ and procedure $\Delta\text{relprice}^{2010}$



Notes: Unit of observation is the procedure, with procedures weighted by 2007 RVUs. Sampling restrictions are discussed in the text. Outliers are censored at the 5th and 95th percentile. Red line is OLS estimate of relationship and grey shaded area is 95 percent confidence interval.

Appendix 3, Figure 7: Relationship between physician $\Delta\text{relprice}^{2007}$ and physician $\Delta\text{relprice}^{2010}$



Notes: Unit of observation is the physician. $\Delta\text{relprice}^{2007}$ and $\Delta\text{relprice}^{2010}$ are calculated for the main sample of procedures using the private claims data. Outliers are censored at the 5th and 95th percentile. Weighted correlation is based upon 2007 RVUs. Red line is OLS estimate of relationship and grey shaded area is 95 percent confidence interval.

Appendix 3, Figure 8: Time varying effect of physician $\Delta\text{relprice}^{2010}$ on physician VI (Robustness to excluding interactions between year and $\Delta\text{relprice}^{2007}$)



Notes: Unit of observation in regression is the physician-year. Unreported covariates include year fixed effects. Sample is restricted to physicians present in all years with in-sample claims in 2007. $\Delta\text{relprice}^{2010}$ is censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by physician.

**Appendix 3, Table 1: Effect of physician $\Delta\text{relprice}^{2010}$ on
probability of physician VI
(Robustness to not controlling for $\Delta\text{relprice}^{2007}$)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.456 <i>[0.0439]***</i>	0.0334 <i>[0.0150]**</i>	0.423 <i>[0.0463]***</i>
R-sq	0.007	0.000	
N	16395	16527	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ is censored at the 5th and 95th percentile. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 3, Table 2: Effect of physician $\Delta\text{relprice}^{2010}$ on
probability of physician VI
(Robustness to controlling for quintiles of $\Delta\text{relprice}^{2007}$)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.451 [0.0490]***	0.0221 [0.0168]	0.429 [0.0516]***
<i>Quintiles of $\Delta\text{relprice}^{2007}$</i>			
1	omitted	omitted	
2	0.00195 [0.00541]	-0.00343 [0.00185]*	0.00538 [0.00570]
3	-0.00728 [0.00540]	-0.00264 [0.00185]	-0.00464 [0.00569]
4	-0.0257 [0.00589]***	-0.00635 [0.00202]***	-0.0194 [0.00621]***
5	-0.0254 [0.00530]***	-0.00446 [0.00182]**	-0.0209 [0.00559]***
R-sq	0.009	0.001	
N	16395	16527	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ is censored at the 5th and 95th percentile. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 3, Table 3: Effect of physician $\Delta\text{relprice}^{2010}$ on
probability of physician VI
(Robustness to controlling for vintiles of $\Delta\text{relprice}^{2007}$)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.382 [0.0502]***	0.0146 [0.0172]	0.362 [0.0523]***
R-sq	0.017	0.003	
N	16395	16527	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ is censored at the 5th and 95th percentile. Unreported controls are vintiles of $\Delta\text{relprice}^{2007}$. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 3, Table 4: Effect of physician $\Delta\text{relprice}^{2010}$ on
probability of physician VI
(Robustness to allowing effect of $\Delta\text{relprice}^{2007}$ to vary across its quintiles)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.394 [0.0490]***	0.0107 [0.0168]	0.384 [0.0516]***
<i>$\Delta\text{relprice}^{2007}$ interacted with quintile bins</i>			
1	-0.199 [0.0383]***	-0.0469 [0.0131]***	-0.152 [0.0403]***
2	-0.358 [0.0881]***	-0.0285 [0.0302]	-0.329 [0.0929]***
3	-1.048 [0.298]***	-0.248 [0.102]**	-0.800 [0.314]**
4	-0.207 [0.181]	-0.00494 [0.0622]	-0.202 [0.191]
5	-0.00644 [0.0304]	0.0205 [0.0104]**	-0.0269 [0.0321]
R-sq	0.010	0.001	
N	16395	16527	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 3, Table 5: Effect of physician $\Delta\text{relprice}^{2010}$ on probability of physician VI
(Robustness to allowing effect of for $\Delta\text{relprice}^{2007}$ to vary across its vintiles)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.378 [0.0498]***	0.0129 [0.0171]	0.369 [0.0527]***
R-sq	0.017	0.003	
N	16395	16527	

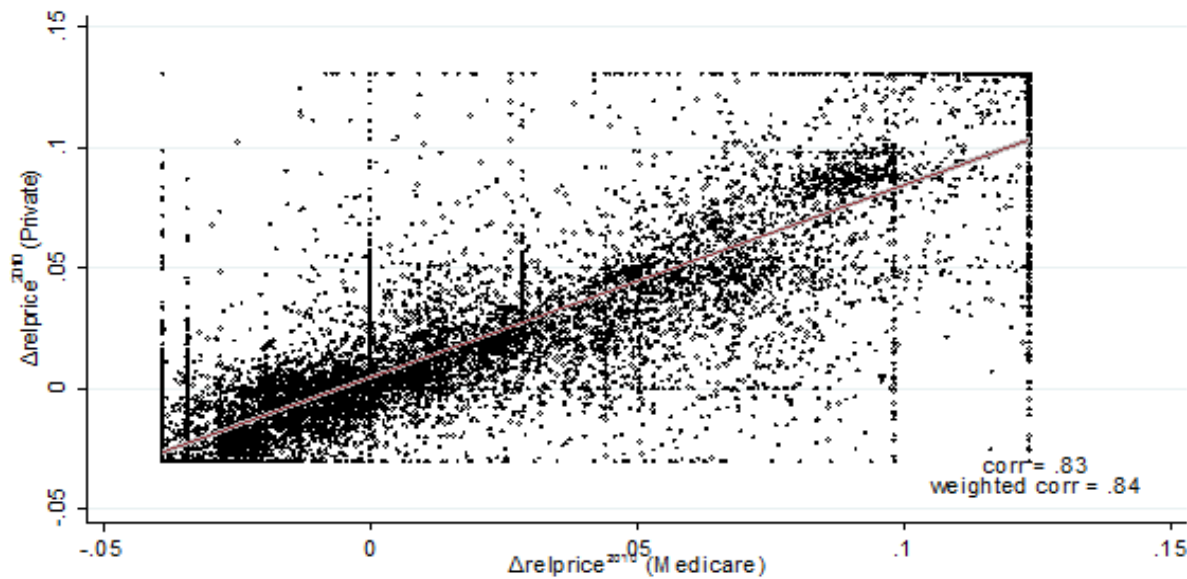
Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Unreported controls include interactions between $\Delta\text{relprice}^{2007}$ and 20 indicator variables for the vintiles of $\Delta\text{relprice}^{2007}$. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 3, Table 6: Effect of procedure $\Delta\text{relprice}^{2010}$ on procedure Medicare share facility
(Robustness to alternative controls for $\Delta\text{relprice}^{2007}$)**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\Delta\text{relprice}^{2010} * \text{PI}^{2010}$	0.0919 [0.0380]**	0.0931 [0.0359]***	0.0936 [0.0389]**	0.111 [0.0386]***	0.103 [0.0381]***	0.0987 [0.0409]**	0.104 [0.0385]***
R-sq	0.997	0.997	0.997	0.997	0.997	0.997	0.997
N	8610	8610	8610	8610	8610	8610	8610

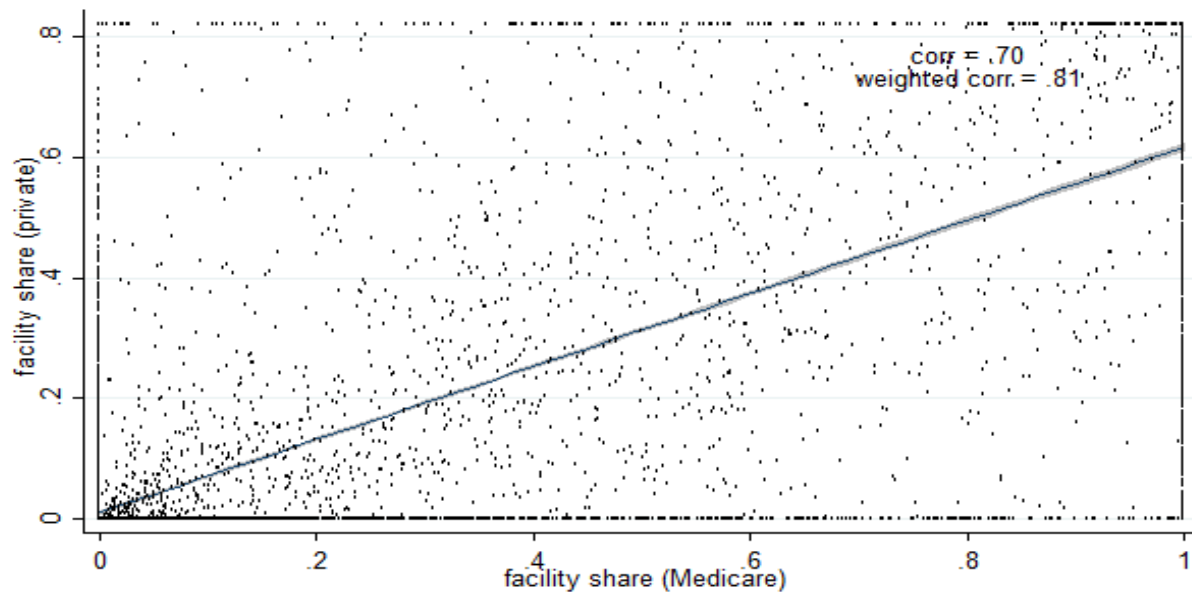
Notes: Unit of observation in regression is the procedure-year. Sampling restrictions are discussed in the text. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. PI^{2007} and PI^{2010} are the gradual phase-in functions described in the text. Unreported covariates include procedure fixed effects, year fixed effects, and controls for the 2007 price shock. Those controls are: (1) $\Delta\text{relprice}^{2007} * \text{PI}^{2007}$; (2) None; (3) $\Delta\text{relprice}^{2007}$ interacted with indicators for the year; (4) Quintiles of $\Delta\text{relprice}^{2007}$ interacted with indicators for the year; (5) Vintiles of $\Delta\text{relprice}^{2007}$ interacted with indicators for the year; (6) Quintiles of $\Delta\text{relprice}^{2007}$ interacted $\Delta\text{relprice}^{2007}$ and with indicators for the year; (7) Vintiles of $\Delta\text{relprice}^{2007}$ interacted $\Delta\text{relprice}^{2007}$ and with indicators for the year. Procedures are weighted by 2007 RVUs. Standard errors are in [] and are clustered by procedure. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

Appendix 4, Figure 1: Relationship between private physician $\Delta\text{relprice}^{2010}$ and Medicare physician $\Delta\text{relprice}^{2010}$



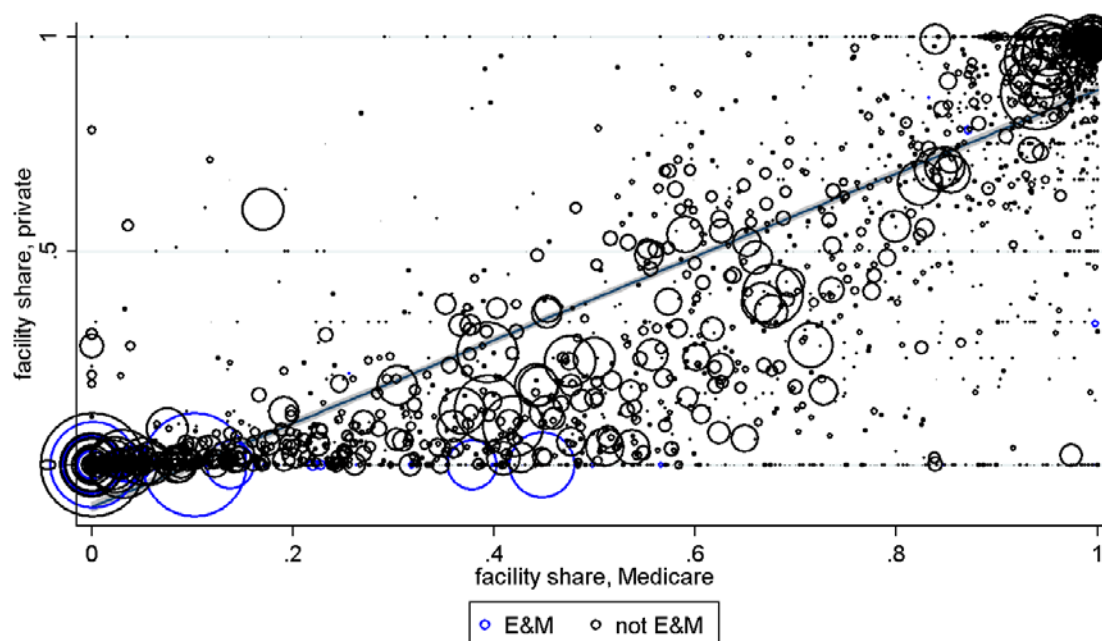
Notes: Sample is restricted to those physicians with in-sample procedures in both the private claims data for 2007 and the Medicare PUF for 2012. Weights are an average of Medicare and private RVUs, with private RVUs rescaled to have the same mean as Medicare RVUs. Red line is OLS estimate of relationship and grey shaded area is 95 percent confidence interval.

Appendix 4, Figure 2: Relationship between private physician facility share and Medicare physician facility share



Notes: Sample is restricted to those physicians present in both the private claims data and the Medicare PUF for 2012. Weights are an average of Medicare and private RVUs, with private RVUs rescaled to have the same mean as Medicare RVUs. Red line is OLS estimate of relationship and grey shaded area is 95 percent confidence interval.

Appendix 4, Figure 3: Relationship between private procedure facility share and Medicare procedure facility share



Notes: Sample is all major procedures, rather than just those major procedures that are in our final estimation sample. Facility shares are calculated based on 2007 data. Procedures are weighted by 2007 RVUs. The line and shading around it are the least squares relationship between the variables, along with the 95 percent confidence interval.

**Appendix 4, Table 1: Effect of physician $\Delta\text{relprice}^{2010}$ on
probability of physician VI
(Robustness to calculating $\Delta\text{relprice}$ with 2012 Medicare PUF)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.343 [0.0330]***	0.0488 [0.0150]***	0.294 [0.0361]***
$\Delta\text{relprice}^{2007}$	0.00132 [0.0128]	-0.0361 [0.00579]***	0.0374 [0.0140]***
R-sq	0.009	0.004	
N	11633	11739	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are calculated based on Medicare's 2012 Public Use File and are censored at the 5th and 95th percentile. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 4, Table 2: Effect of physician $\Delta\text{relprice}^{2010}$ on
probability of physician VI
(Including both Medicare and private $\Delta\text{relprice}^{2010}$)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
<i>$\Delta\text{relprice}$ calculated from private claims</i>			
$\Delta\text{relprice}^{2010}$	0.454 [0.0757]***	0.00909 [0.0308]	0.444 [0.0815]***
$\Delta\text{relprice}^{2007}$	-0.00836 [0.0213]	-0.00745 [0.00868]	-0.000902 [0.0230]
<i>$\Delta\text{relprice}$ calculated from Medicare claims</i>			
$\Delta\text{relprice}^{2010}$	-0.0527 [0.0629]	0.0209 [0.0256]	-0.0736 [0.0678]
$\Delta\text{relprice}^{2007}$	0.0124 [0.0191]	-0.0194 [0.00779]**	0.0318 [0.0206]
R-sq	0.011	0.002	
N	10843	10932	

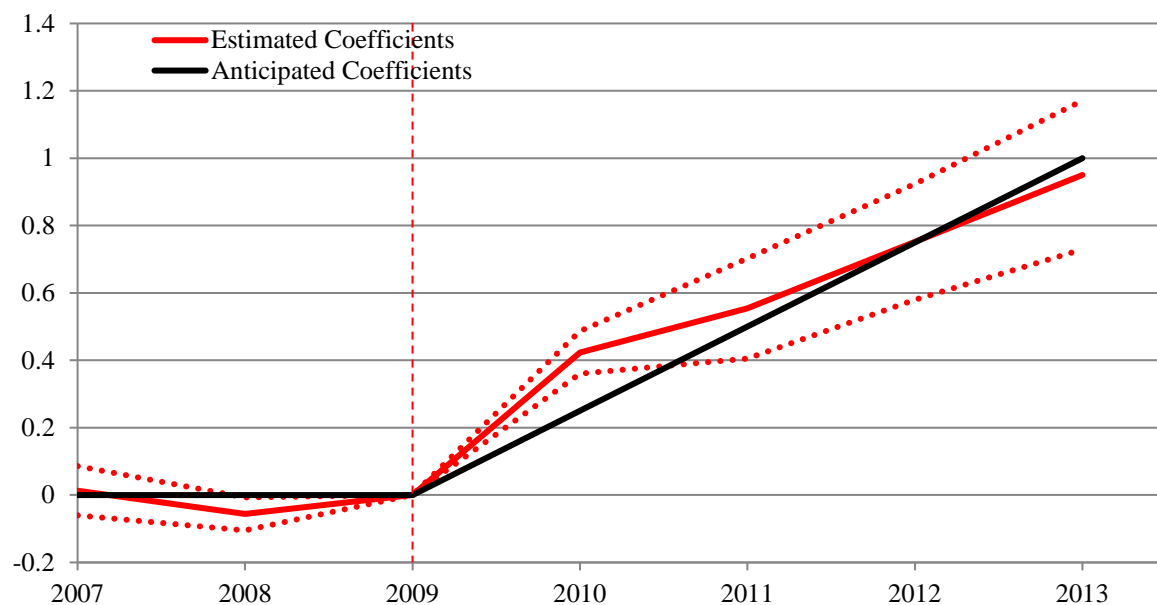
Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 4, Table 3: Effect of physician $\Delta\text{relprice}^{2010}$ on probability of physician VI
(Restricted to physicians without in-sample procedures for Medicare patients in 2012)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	
$\Delta\text{relprice}^{2010}$	0.183 <i>[0.0900]**</i>	0.0478 <i>[0.0317]</i>	0.136 <i>[0.0951]</i>
$\Delta\text{relprice}^{2007}$	-0.123 <i>[0.0335]***</i>	-0.00376 <i>[0.0118]</i>	-0.119 <i>[0.0354]***</i>
R-sq	0.003	0.000	
N	5552	5595	

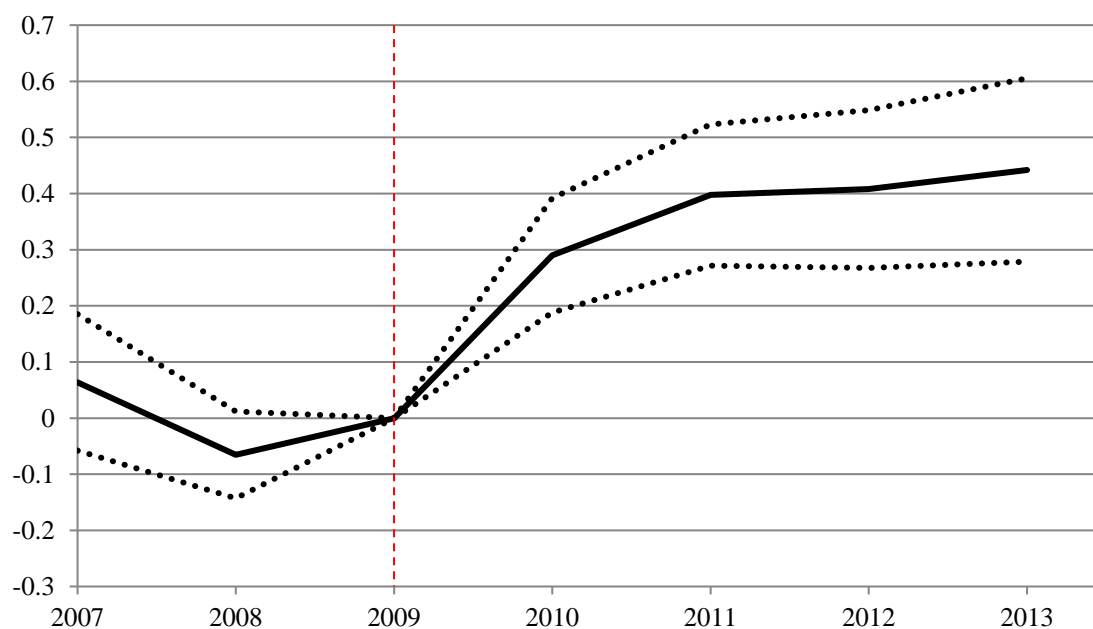
Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3, but also excludes any physicians for which we observe in-sample procedures for Medicare patients in 2012. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are calculated with the private claims data and are censored at the 5th and 95th percentile. Standard errors are in *[]*. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

Appendix 5, Figure 1: Time varying effect of procedure ΔPFS^{2010} on $\ln(\text{non-facility Medicare price})$



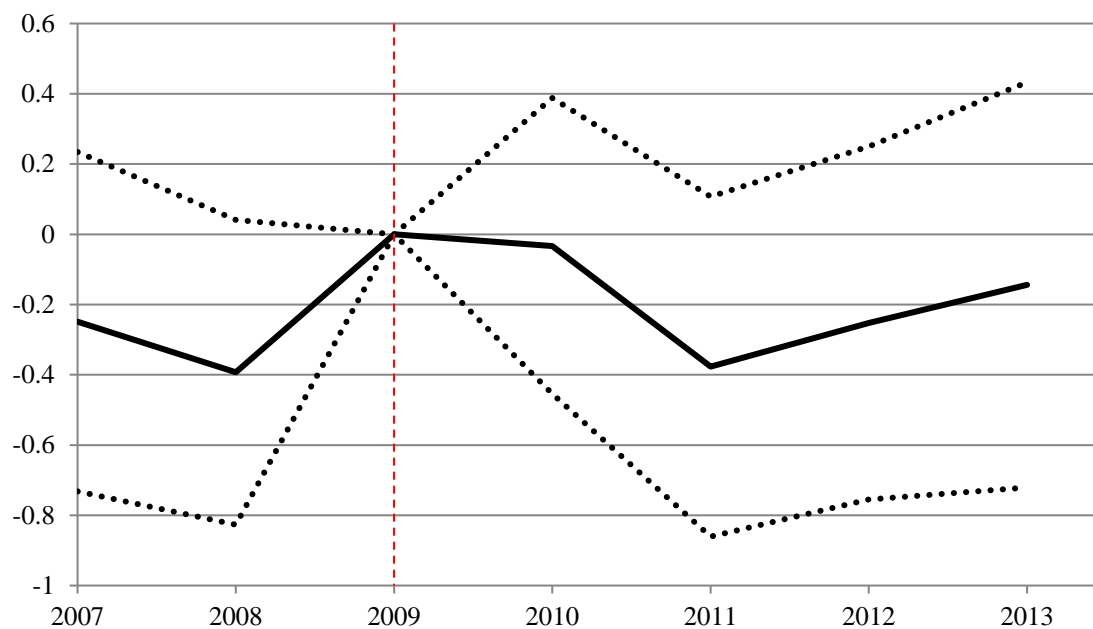
Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and ΔPFS^{2007} . Sampling restrictions are discussed in the text. Non-facility Medicare price, ΔPFS^{2007} , and ΔPFS^{2010} are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 5, Figure 2: Time varying effect of procedure ΔPFS^{2010} on $\ln(\text{non-facility private price})$



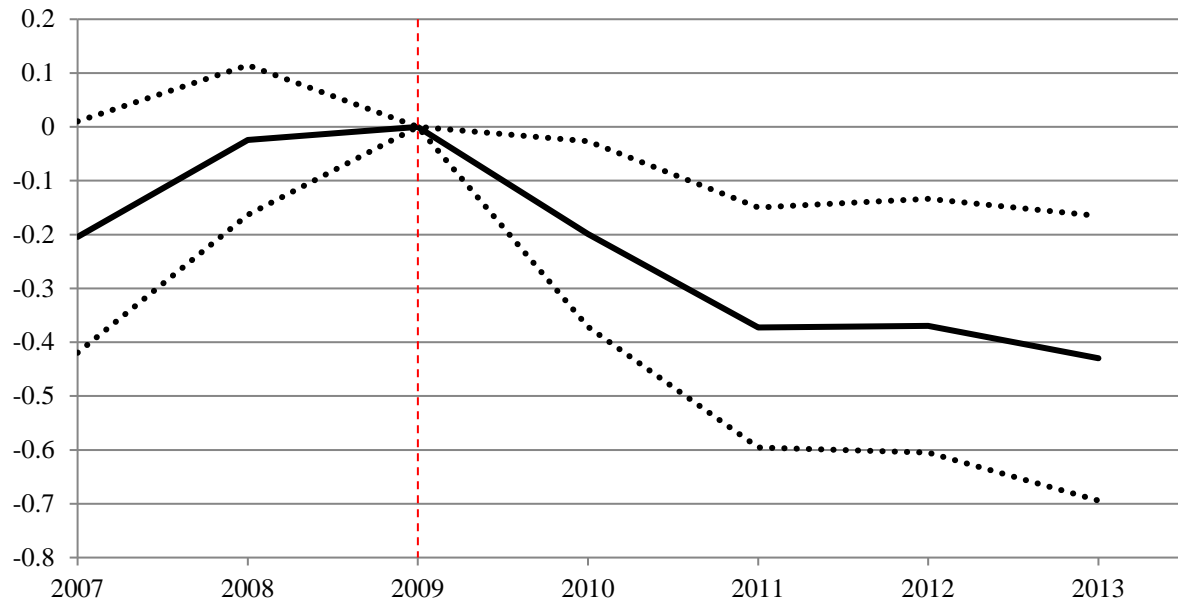
Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and ΔPFS^{2007} . Sampling restrictions are discussed in the text. Non-facility private price, ΔPFS^{2007} , and ΔPFS^{2010} are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 5, Figure 3: Time varying effect of procedure ΔPFS^{2010} on $\ln(\text{facility private prices})$



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and ΔPFS^{2007} . Sampling restrictions are discussed in the text. Facility private price, ΔPFS^{2007} , and ΔPFS^{2010} are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 5, Figure 4: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{non-facility private price})$



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Non-facility private price, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 5, Figure 5: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{facility private prices})$



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Facility private price, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 5, Table 1: Effect of procedure ΔPFS^{2010} on $\ln(\text{private non-facility prices})$
Prevalence of procedure in private data versus Medicare data

	Low	Medium	High
	(1)	(2)	(3)
$\Delta PFS^{2007} * PI^{2007}$	0.546 [0.0628]***	0.413 [0.0649]***	0.520 [0.0697]***
$\Delta PFS^{2010} * PI^{2010}$	0.345 [0.106]***	0.329 [0.125]***	0.470 [0.179]***
R-sq	0.998	0.998	0.999
N	1738	2246	2324

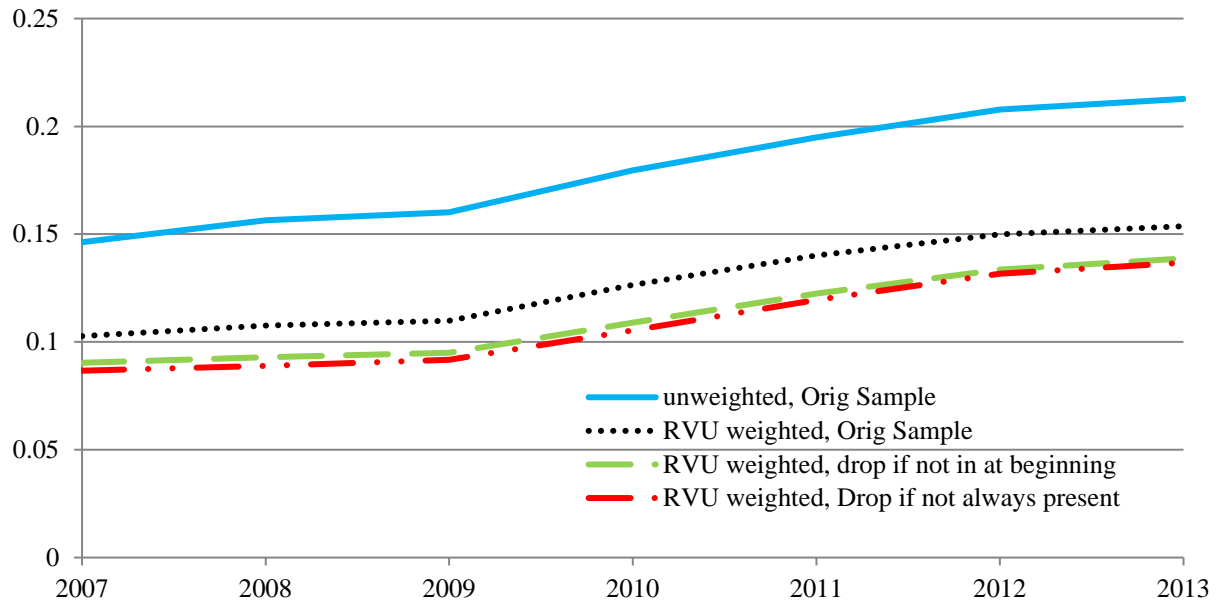
Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure and year fixed effects. Sampling restrictions are discussed in the text. Private non-facility prices, ΔPFS^{2007} and ΔPFS^{2010} are censored at the 5th and 95th percentile. PI^{2007} and PI^{2010} are the gradual phase-in functions described in the text. Procedures are weighted by 2007 RVUs. Standard errors are in [] and are clustered by procedure. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

Appendix 5, Table 2: Effect of procedure $\Delta\text{relprice}^{2010}$ on procedure Medicare relprice

	(1)	(2)	(3)
$\Delta\text{relprice}^{2007} * \text{PI}^{2007}$	1.348 [0.148]***		2.142 [0.514]***
$\Delta\text{relprice}^{2010} * \text{PI}^{2010}$	1.980 [0.381]***		-0.327 [0.656]
$\Delta\text{PFS}^{2007} * \text{PI}^{2007}$		-1.169 [0.147]***	0.733 [0.483]
$\Delta\text{PFS}^{2010} * \text{PI}^{2010}$		-1.659 [0.261]***	-1.799 [0.462]***
R-sq	0.974	0.974	0.975
N	8610	8610	8610

covariates include procedure and year fixed effects. Sampling restrictions are discussed in the text. Relprice , $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. PI^{2007} and PI^{2010} are the gradual phase-in functions described in the text. Procedures are weighted by 2007 RVUs. Standard errors are

Appendix 6, Figure 1: Effect of weighing and sampling restrictions on share of physicians VI

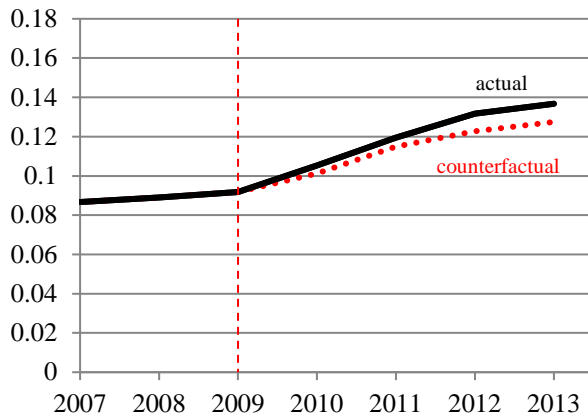


Notes: Unweighted gives equal weight to each physician. RVU weighted weights by 2007 RVUs. The line "RVU weighted, drop if not in at beginning" has eliminated a small number of physicians who disintegrated, as well as physicians who enter after 2007 or who have no outpatient reimbursement under PFS. The final line further eliminates any remaining physicians who are not present in each year in the data.

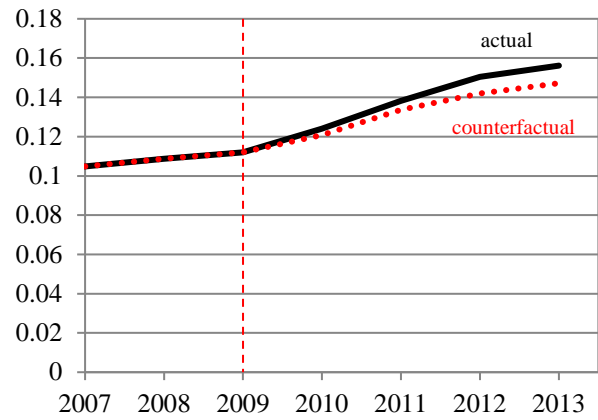
**Appendix 6, Figure 2: Actual physician VI versus counterfactual VI
in absence of 2010 price shock**

(Robustness to alternative weights and VI definitions)

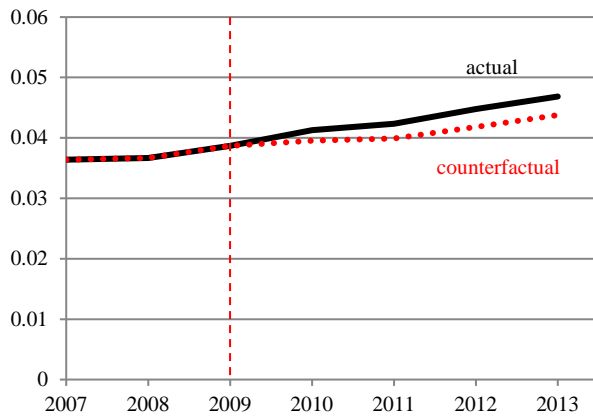
Panel A: RVU Weighted, VI from all sources



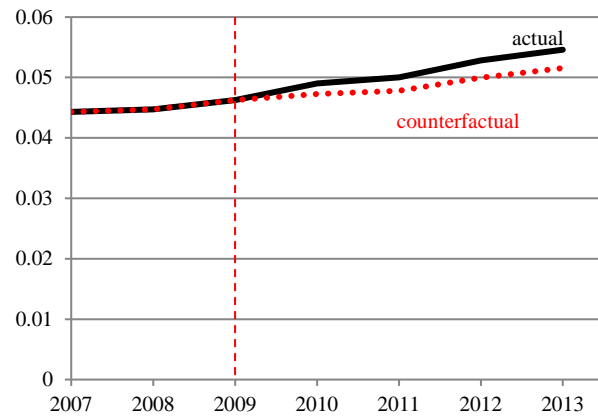
Panel B: Unweighted, VI from all sources



Panel C: RVU Weighted, VI from TINs

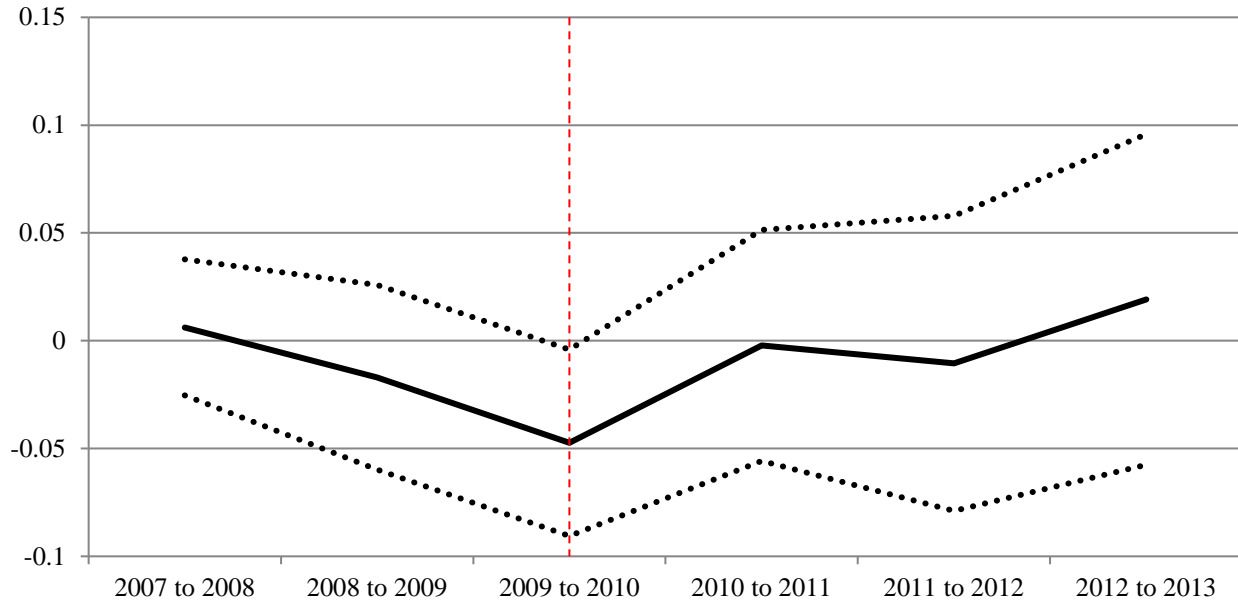


Panel D: Unweighted, VI from TINs



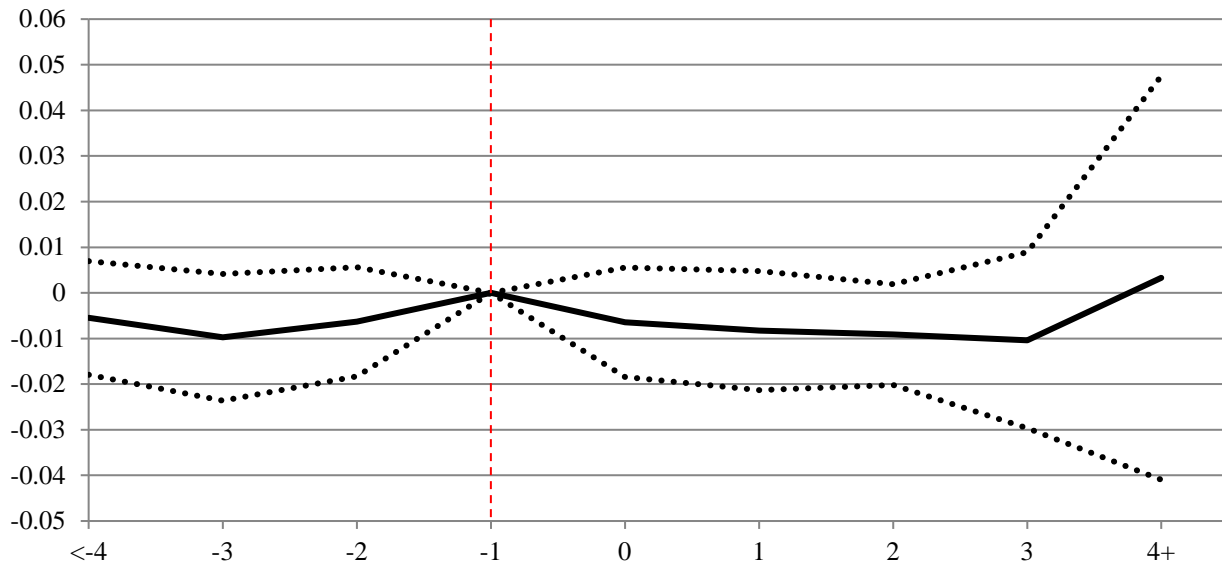
Notes: Panel A is identical to Figure 6. Panels B through D are produced identically, except that Panels B and D are unweighted. In Panels C and D, VI is measured based solely upon whether a physician's TIN is also used by a hospital in the raw claims data, without performing any aggregation of TINs that are part of the same organization.

Appendix 6, Figure 3: Time varying effect of physician $\Delta\text{relprice}^{2010}$ on physician exit



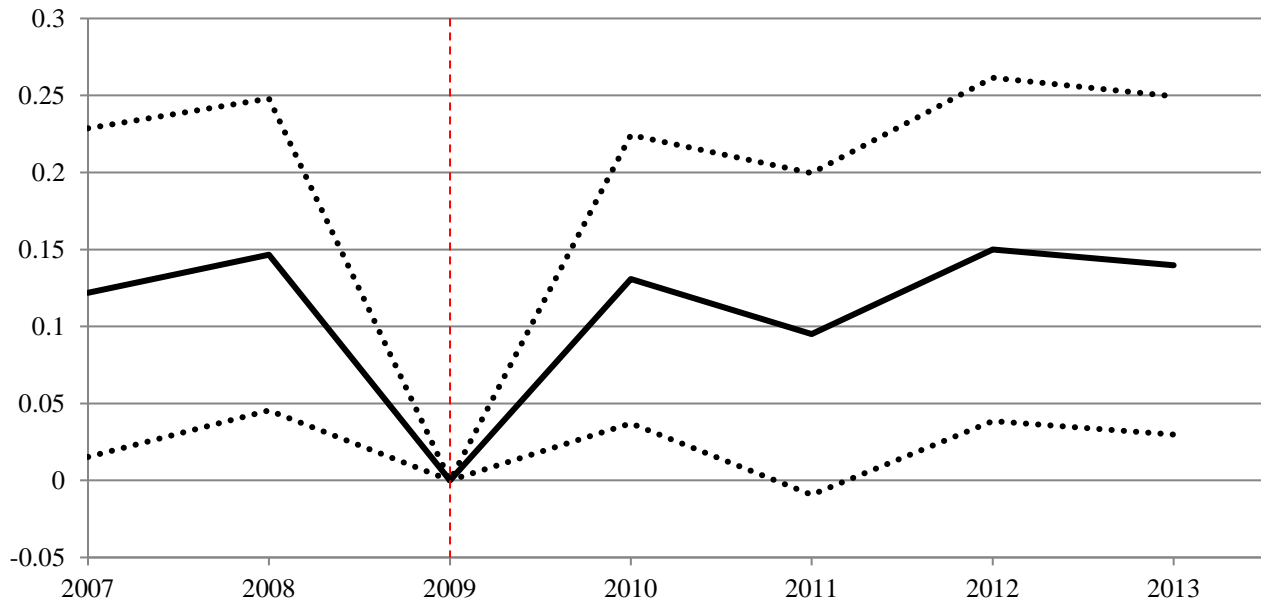
Notes: Unit of observation in regression is the physician-year. Dependent variable is probability that physician exits in time window. Unreported covariates include year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. The plotted independent variables are the effect of $\Delta\text{relprice}^{2010}$ on physician exit in each time window. Sample is restricted to physicians with in-sample claims in 2007. $\Delta\text{relprice}^{2007}$ and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval.

Appendix 6, Figure 4: Effect of physician VI on physician procedure mix



Notes: Unit of observation in regression is the physician-year. Dependent variable is the share of a physician's procedures that would be performed in a facility setting if the physician was as likely to perform the procedure in a facility setting as physicians in general. Unreported covariates include physician and year fixed effects. The plotted parameter estimates are the effect of lags and leads of the physician VI decision on physician procedure mix. For consistency, sampling restrictions are identical to Figure 5. Dependent variable is censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval, where standard errors are clustered so that all physicians in the same practice in all years are in the same cluster.

Appendix 6, Figure 5: Time varying effect of physician $\Delta\text{relprice}^{2010}$ on physician facility share



Notes: Unit of observation in regression is the physician-year. Unreported covariates include physician fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sample is restricted to physicians present in all years with in-sample claims in 2007. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by physician.

Appendix 6, Figure 6: Time varying effect of quintiles of physician $\Delta\text{relprice}^{2010}$ on physician VI



Notes: Unit of observation in regression is the physician-year. Unreported covariates include year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sample is restricted to physicians present in all years with in-sample claims in 2007. $\Delta\text{relprice}^{2007}$ is censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs. Confidence intervals are omitted.

**Appendix 6, Table 1: Effect of physician $\Delta\text{relprice}^{2010}$ on
physician probability of VI
(Robustness to aggregating physicians into pseudo-practices)**

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.565 [0.0643]***	0.0437 [0.0221]**	0.521 [0.0678]***
$\Delta\text{relprice}^{2007}$	-0.140 [0.0260]***	-0.00814 [0.00891]	-0.132 [0.0274]***
R-sq	0.012	0.001	
N	9403	9451	

Notes: Unit of observation in columns (1) and (2) is the physician pseudo-practice. Appendix text describes the method for physicians aggregating physicians into pseudo-practices. Sample in column (1) is restricted to the subset of pseudo-practices from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physician pseudo-practices are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Standard errors are in *[]*. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 6, Table 2: Effect of physician $\Delta\text{relprice}^{2010}$ on physician probability
of VI**

(Robustness to not weighing physicians)

	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.579 [0.0430]***	0.0607 [0.0176]***	0.518 [0.0463]***
$\Delta\text{relprice}^{2007}$	-0.104 [0.0162]***	-0.000778 [0.00663]	-0.104 [0.0174]***
R-sq	0.014	0.001	
N	16395	16527	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are not weighted. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Standard errors are in *[]*. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 6, Table 3: Effect of physician $\Delta\text{relprice}^{2010}$ on physician probability of VI
(Robustness to alternative procedure samples)**

Procedure Sample 1: Procedures MedPac deems appropriate for site neutral reimbursement			
	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.430 [0.0444]***	0.0150 [0.0147]	0.415 [0.0467]***
$\Delta\text{relprice}^{2007}$	-0.0433 [0.0139]***	-0.000699 [0.00460]	-0.0426 [0.0146]***
R-sq	0.007	0.000	
N	15319	15428	
Procedure Sample 2: Main sample			
	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.460 [0.0439]***	0.0336 [0.0150]**	0.426 [0.0462]***
$\Delta\text{relprice}^{2007}$	-0.103 [0.0163]***	-0.00796 [0.00557]	-0.0952 [0.0171]***
R-sq	0.009	0.000	
N	16395	16527	
Procedure Sample 3: All major and separately billable procedures			
	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}$	0.527 [0.0448]***	0.0446 [0.0155]***	0.483 [0.0473]***
$\Delta\text{relprice}^{2007}$	-0.0543 [0.0192]***	-0.00211 [0.00662]	-0.0522 [0.0202]***
R-sq	0.008	0.000	
N	17681	17838	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007

RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Standard errors are in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 6, Table 4: Effect of physician $\Delta\text{relprice}^{2010}$ on physician probability of VI
(Heterogeneity by share of physician spending from in-sample procedures)**

Panel A: Physician has above median share of private spending from in-sample procedures			
	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	
$\Delta\text{relprice}^{2010}$	0.298 [0.0459]***	0.0203 [0.0175]	0.278 [0.0490]***
$\Delta\text{relprice}^{2007}$	0.00587 [0.0177]	0.0000766 [0.00671]	0.00579 [0.0189]
R-sq	0.005	0.000	
N	8645	8698	
Panel B: Physician has below median share of private spending from in-sample procedures			
	2009 to 2013	2007 to 2009	Difference
	(1)	(2)	
$\Delta\text{relprice}^{2010}$	0.456 [0.0783]***	0.0351 [0.0254]	0.421 [0.0820]***
$\Delta\text{relprice}^{2007}$	-0.219 [0.0282]***	-0.0189 [0.00912]**	-0.200 [0.0295]***
R-sq	0.014	0.001	
N	7750	7829	

Notes: Unit of observation in columns (1) and (2) is the physician. Sample in column (2) is restricted to the same set of physicians present in main physician sample in Table 3. Sample in column (1) is restricted to the subset of physicians from column (2) who have not integrated by 2009. Column (3) gives the difference between columns (1) and (2). Physicians are weighted by 2007 RVUs. $\Delta\text{relprice}^{2010}$ and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Standard errors are in *[]*. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 6, Table 5: Effect of physician $\Delta\text{relprice}^{2010}$ on physician VI
(Robustness to estimation via a Cox proportional hazard model)**

	(1)	(2)
$\Delta\text{relprice}^{2010} * (\text{year}=2008)$	6.351 [2.39]**	
$\Delta\text{relprice}^{2010} * (\text{year}=2009)$	6.552 [2.11]**	
$\Delta\text{relprice}^{2010} * (\text{year}=2010)$	12.84 [8.20]***	
$\Delta\text{relprice}^{2010} * (\text{year}=2011)$	5.404 [3.70]***	
$\Delta\text{relprice}^{2010} * (\text{year}=2012)$	15.36 [10.41]***	
$\Delta\text{relprice}^{2010} * (\text{year}=2013)$	5.280 [2.24]**	
$\Delta\text{relprice}^{2010}$		6.436 [3.19]***
$\Delta\text{relprice}^{2010} * (\text{year} \geq 2010)$		3.801 [1.75]*
N	97141	97141

Notes: Unit of observation in regression is the physician-year. Unreported covariates are interactions between year and $\Delta\text{relprice}^{2007}$. Sampling is restricted to physicians present in all years with in-sample claims in 2007. $\Delta\text{relprice}^{2007}$ and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. T-statistics are given in []. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

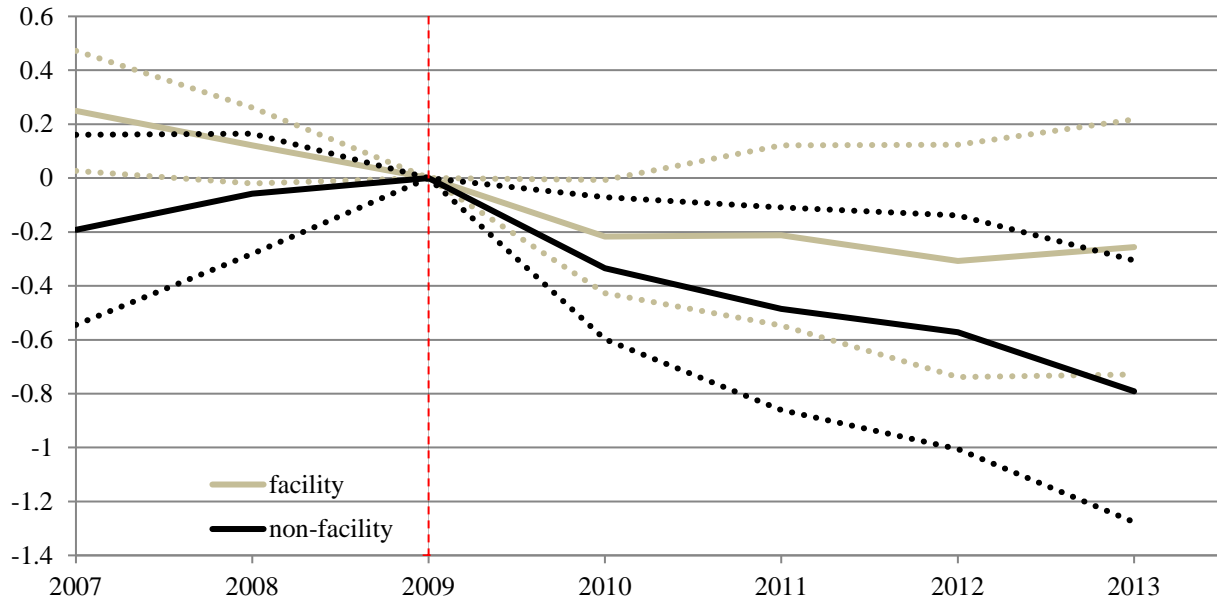
**Appendix 6, Table 6: Effect of physician $\Delta\text{relprice}^{2010}$ on
physician facility share**

	(1)	(2)	(3)
$\Delta\text{relprice}^{2010}*(\text{year}\geq 2010)$	0.0387 [0.0371]	-0.0469 [0.0571]	-0.0296 [0.0552]
<i>Time Fixed Effects</i>			
year	x		
year-specialty		x	
year-CBSA		x	
year-specialty-CBSA			x
R-sq	0.814	0.818	0.841
N	120258	120231	119079

Notes: Unit of observation in regression is the physician-year. Unreported covariates are physician fixed effects and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling is restricted to physicians present in all years with in-sample claims in 2007. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs. Standard errors are in [] and are clustered by physician.

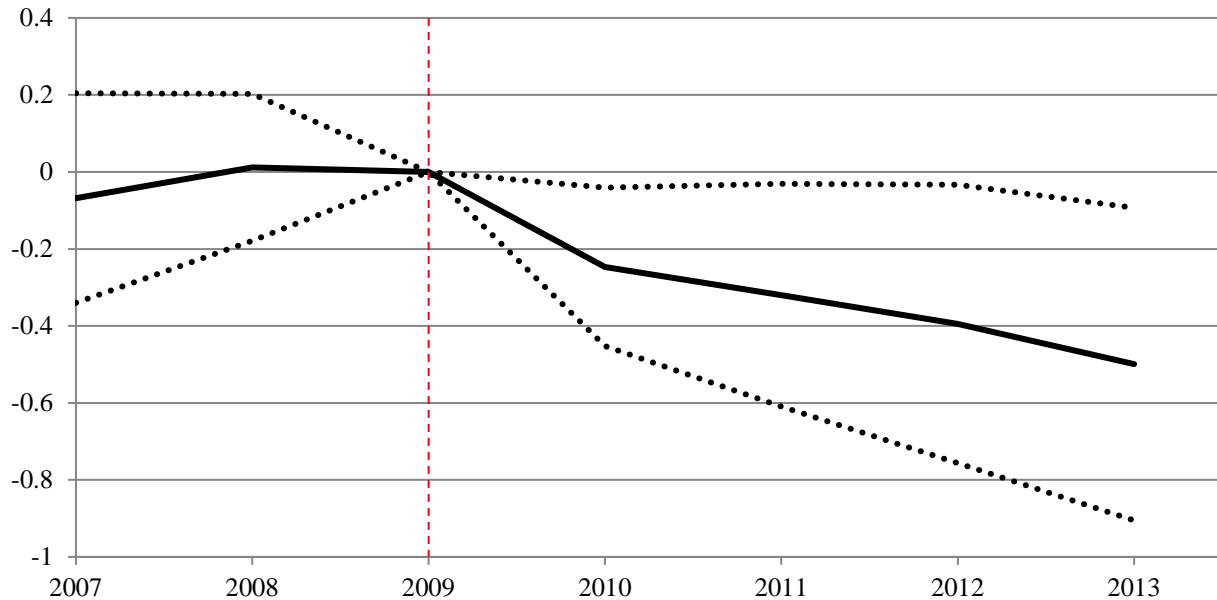
* P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

Appendix 7, Figure 1: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{Medicare facility quantity})$ and $\ln(\text{Medicare non-facility quantity})$



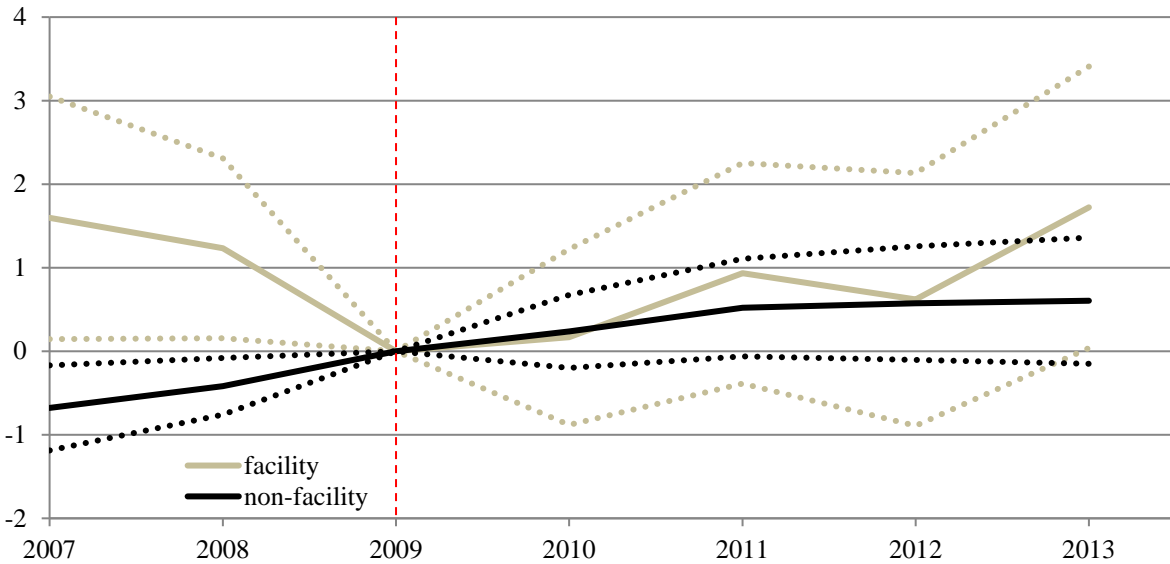
Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Quantities, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 7, Figure 2: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{Medicare quantity})$



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Quantities, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 7, Figure 3: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{private facility quantity})$ and $\ln(\text{private non-facility quantity})$



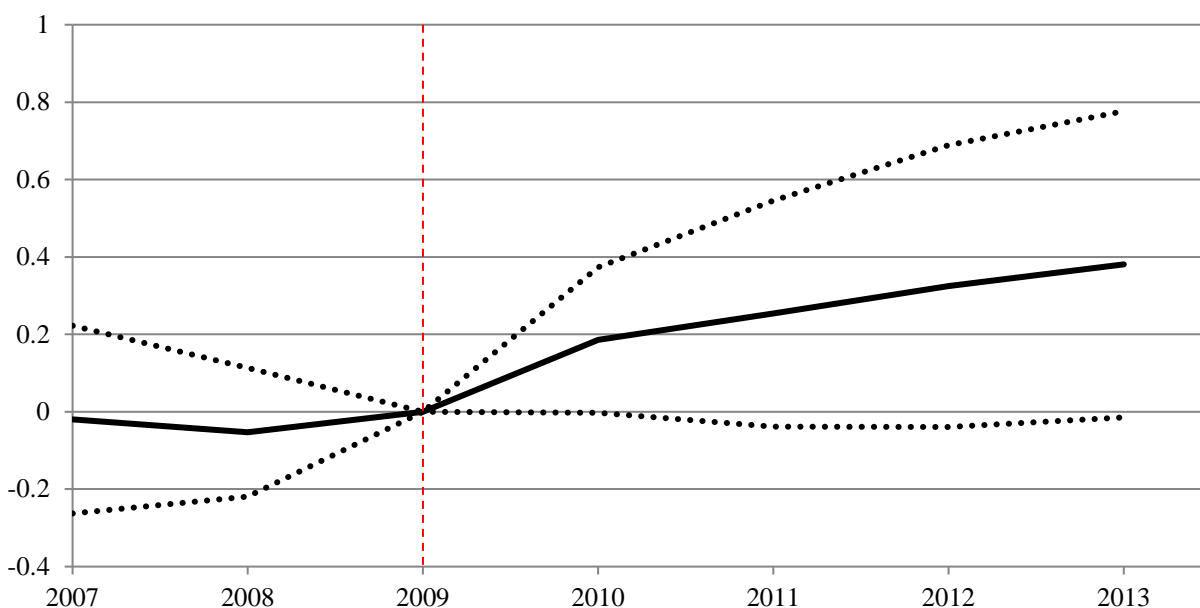
Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Quantities, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 7, Figure 4: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{private quantity})$



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Quantities, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 7, Figure 5: Time varying effect of 2010 procedure price shock on $\ln(\text{total quantity, Medicare})$



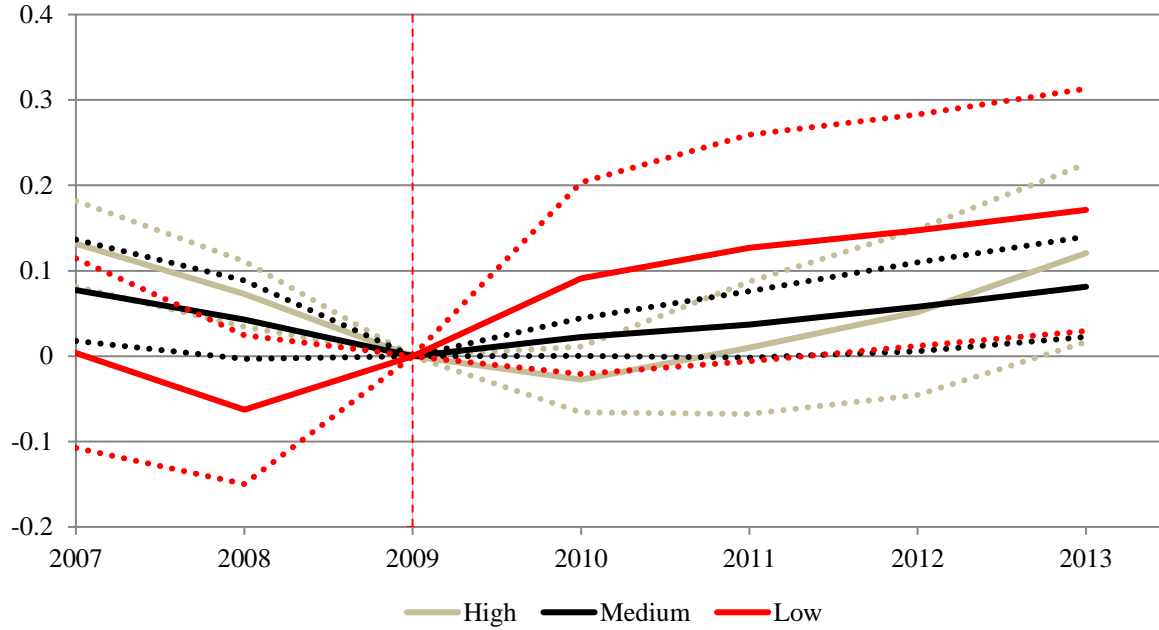
Notes: Unit of observation in regression is the procedure-year. Procedure price shocks are calculated as a weighted average of the facility and non-facility price shocks, based upon 2007 shares. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and the 2007 procedure level price change. Sampling restrictions are identical to other procedure level analyses. Total quantity, $\Delta \text{relprice}^{2007}$, and $\Delta \text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 7, Figure 6: Time varying effect of 2010 procedure price shock on $\ln(\text{total quantity, private})$



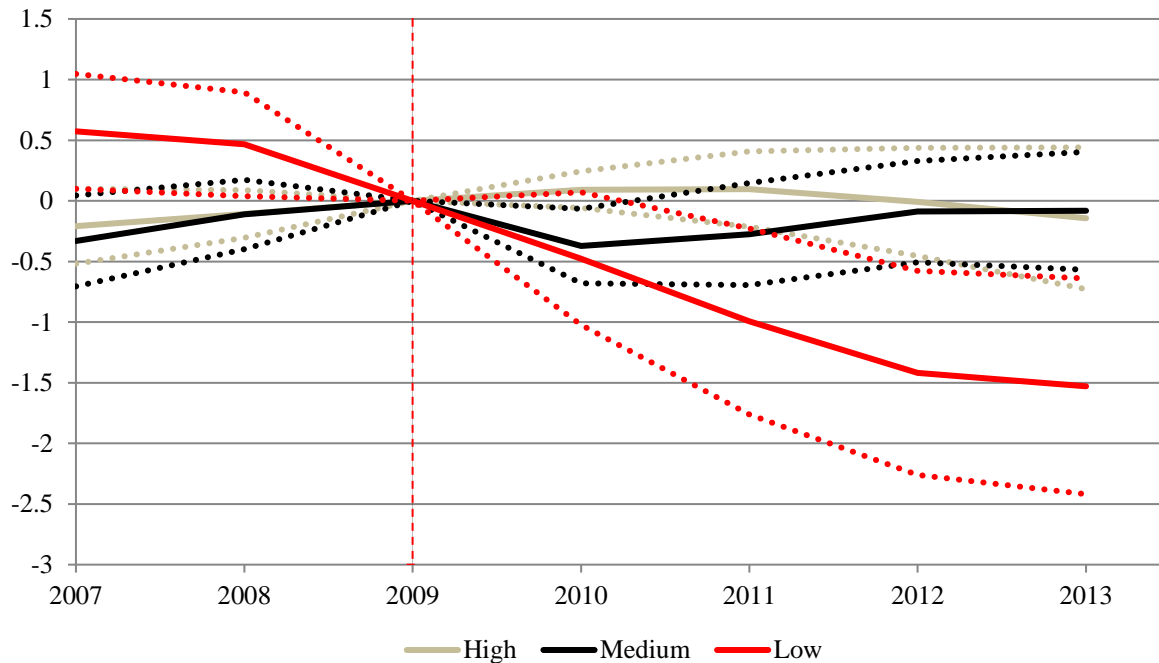
Notes: Unit of observation in regression is the procedure-year. Procedure price shocks are calculated as a weighted average of the facility and non-facility price shocks, based upon 2007 shares. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and the 2007 procedure level price change. Sampling restrictions are identical to other procedure level analyses. Total quantity, $\Delta \text{relprice}^{2007}$, and $\Delta \text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

**Appendix 7, Figure 7: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on Medicare procedure facility share
(Heterogeneity by substitutability within physician)**



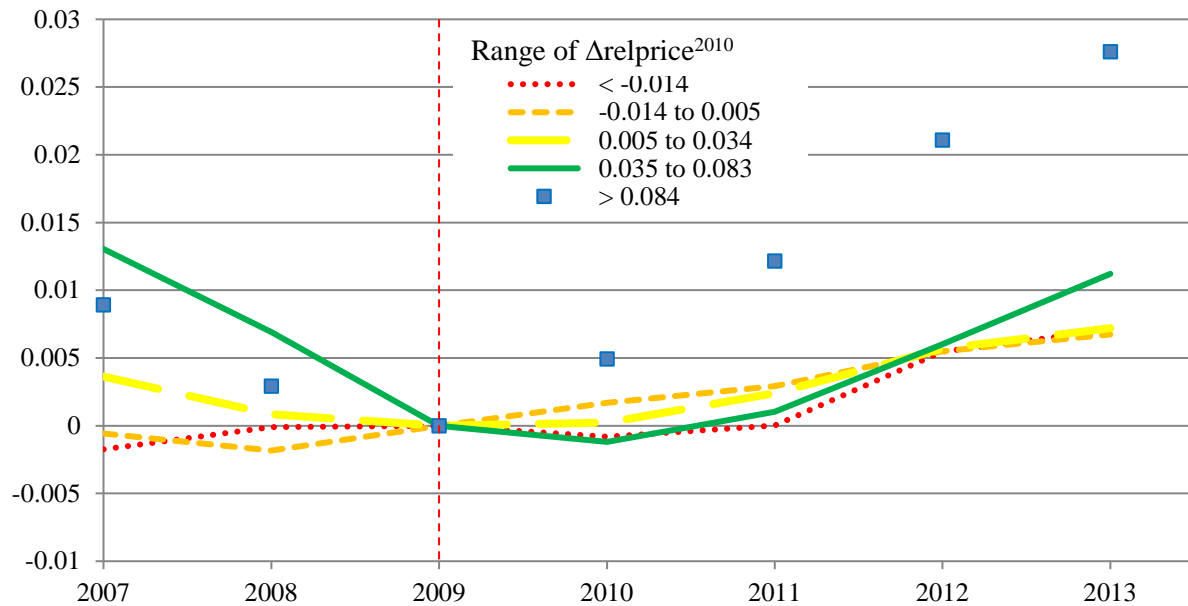
Notes: Unit of observation in regression is the procedure-year. Low substitutability procedures are the ones in categories with the highest HHIs, as reported in the text. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

**Appendix 7, Figure 8: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{Medicare procedure quantity})$
(Heterogeneity by substitutability within physician)**



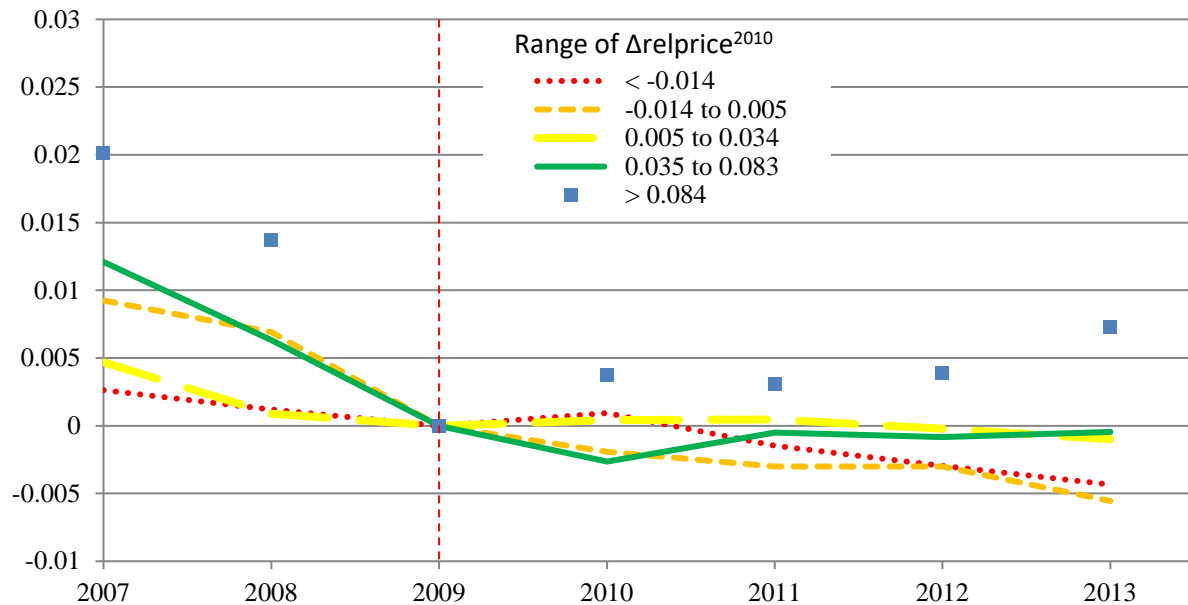
Notes: Unit of observation in regression is the procedure-year. Low substitutability procedures are the ones in categories with the highest HHIs, as reported in the text. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 7, Figure 9: Time varying effect of quintiles of procedure $\Delta\text{relprice}^{2010}$ on Medicare procedure facility share



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Facility share and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 7, Figure 10: Time varying effect of quintiles of procedure $\Delta\text{relprice}^{2010}$ on private procedure facility share



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Facility share and $\Delta\text{relprice}^{2007}$ are censored at the 5th and 95th percentile. Procedures are weighted by 2007 RVUs. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

**Appendix 7, Table 1: Effect of procedure $\Delta\text{relprice}^{2010}$ on Medicare procedure facility share
(Heterogeneity by substitutability within physician)**

	High	Medium	Low
	(1)	(2)	(3)
$\Delta\text{relprice}^{2007} * \text{PI}^{2007}$	-0.00823 [0.0312]	0.0344 [0.0326]	-0.0380 [0.0792]
$\Delta\text{relprice}^{2010} * \text{PI}^{2010}$	0.0292 [0.0651]	0.0231 [0.0355]	0.190 [0.0931]**
R-sq	0.997	0.996	0.991
N	3073	2723	2800

Notes: Unit of observation in regression is the procedure-year. Low substitutability procedures are the ones in categories with the highest HHIs, as reported in the text. Unreported covariates include procedure and year fixed effects. Sampling restrictions are discussed in the text. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. PI^{2007} and PI^{2010} are the gradual phase-in functions described in the text. Procedures are weighted by 2007 RVUs. Standard errors are in [] and are clustered by procedure. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

**Appendix 7, Table 2: Effect of procedure $\Delta\text{relprice}^{2010}$ on $\ln(\text{Medicare procedure quantity})$
(Heterogeneity by substitutability within physician)**

	High	Medium	Low
	(1)	(2)	(3)
$\Delta\text{relprice}^{2007} * \text{PI}^{2007}$	0.0578 [0.139]	-0.0358 [0.284]	0.144 [0.392]
$\Delta\text{relprice}^{2010} * \text{PI}^{2010}$	0.0196 [0.350]	-0.0424 [0.217]	-1.970 [0.511]***
R-sq	0.998	0.998	0.993
N	3073	2723	2800

Notes: Unit of observation in regression is the procedure-year. Low substitutability procedures are the ones in categories with the highest HHIs, as reported in the text. Unreported covariates include procedure and year fixed effects. Sampling restrictions are discussed in the text. Facility share, $\Delta\text{relprice}^{2007}$, and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. PI^{2007} and PI^{2010} are the gradual phase-in functions described in the text. Procedures are weighted by 2007 RVUs. Standard errors are in [] and are clustered by procedure. * P-value ≤ 0.10 ** P-value ≤ 0.05 *** P-value ≤ 0.001

Appendix 8, Figure 1: Excerpt From Federal Register with further details on practice expense calculations

TABLE 2—INDIRECT PE/HR AND INDIRECT PERCENTAGES
[Current and PPIS]

Specialty	Current indirect PE/HR	PPIS indirect PE/HR	Current indirect %	PPIS indirect %	Current crosswalk
All Physicians.	\$59.04	\$86.36	67	74	All Physicians.
Allergy and Immunology	153.29	162.68	62	67	
Anesthesiology	19.76	29.37	56	82	
Audiology	59.04	72.17	67	85	Internal Medicine.
Cardiology	131.02	88.04	56	65	
Cardiothoracic Surgery	61.75	67.83	68	83	
Chiropractor	49.60	65.33	69	86	Psychiatry.
Clinical Laboratory (Billing Independently) *	66.46	71.01	37	37	
Clinical Psychology	29.07	20.07	90	93	
Clinical Social Work	29.07	17.80	90	97	Psychiatry.
Colon & Rectal Surgery	53.93	90.85	77	80	
Dermatology	158.49	184.62	70	70	
Emergency Medicine	36.85	38.36	88	94	
Endocrinology	49.60	84.39	69	73	
Family Medicine	52.79	90.15	62	76	
Gastroenterology	101.30	96.78	70	75	
General Practice	52.79	78.59	62	69	
General Surgery	53.93	82.74	77	82	
Geriatrics	49.60	54.14	69	74	
Hand Surgery	98.56	148.78	72	77	
Independent Diagnostic Testing Facilities *	466.16	501.45	50	50	
Internal Medicine	49.60	84.03	69	76	
Interventional Pain Medicine	59.04	156.79	67	70	
Interventional Radiology	118.48	82.55	58	81	
Medical Oncology	141.84	129.94	59	56	
Nephrology	49.60	66.00	69	80	
Neurology	66.05	110.39	74	87	
Neurosurgery	89.64	115.76	86	87	
Nuclear Medicine	118.48	39.80	58	77	
Obstetrics/Gynecology	69.74	99.32	67	67	
Ophthalmology	103.28	170.08	65	70	All Physicians.
Optometry	59.04	88.02	67	77	
Oral Surgery (Dentist only)	96.01	173.19	71	65	

Federal Register/Vol. 74, No. 132/Monday, July 13, 2009/Proposed Rules

33531

TABLE 2—INDIRECT PE/HR AND INDIRECT PERCENTAGES—Continued
[Current and PPIS]

Specialty	Current indirect PE/HR	PPIS indirect PE/HR	Current indirect %	PPIS indirect %	Current crosswalk
Orthopaedic Surgery	98.56	131.40	72	81	
Osteopathic Manipulative Therapy	59.04	53.93	67	93	
Otolaryngology	96.01	141.53	71	75	
Pain Medicine	59.04	122.41	67	70	
Pathology	59.80	74.98	70	74	
Pediatrics	51.52	76.27	62	69	
Physical Medicine and Rehabilitation	84.92	110.13	71	84	
Physical Therapy	35.17	57.26	65	84	
Plastic Surgery	99.32	134.82	67	74	
Podiatry	59.04	74.76	67	82	All Physicians.
Psychiatry	29.07	30.09	90	94	
Pulmonary Disease	44.63	55.26	76	74	
Radiation Oncology (Hospital Based & Freestanding)	114.00	126.66	50	56	
Radiology	118.48	95.60	58	71	
Registered Dietitians	59.04	18.45	67	84	
Rheumatology	84.92	98.08	71	67	All Physicians.
Urology	119.57	97.02	69	73	
Vascular Surgery	60.10	83.98	63	73	

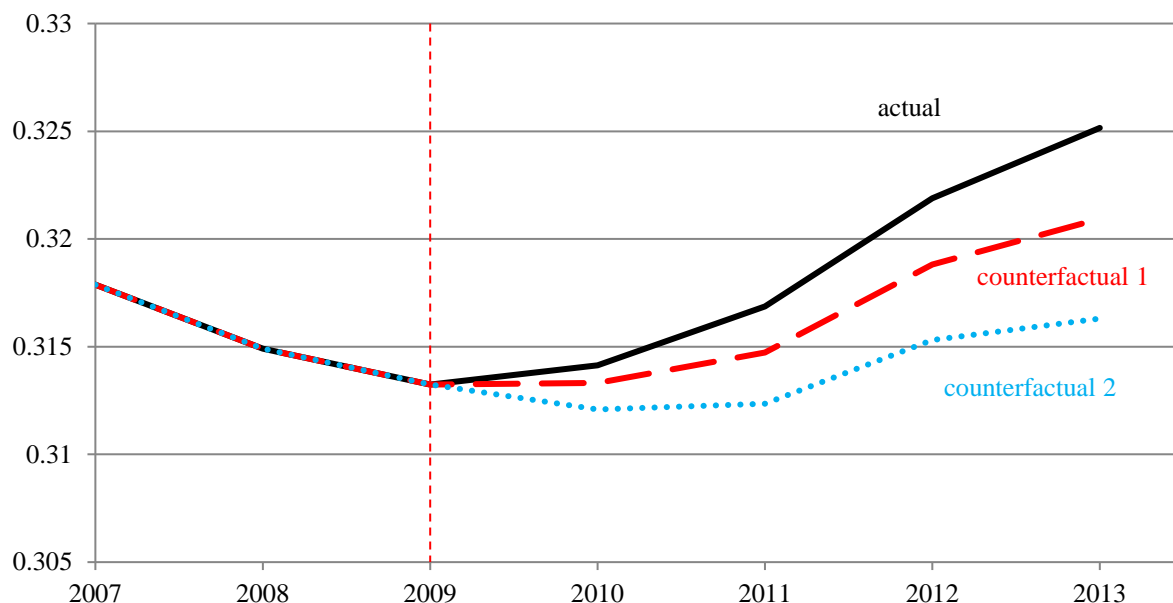
* Did not participate in PPIS. Data based on Supplemental Survey.

Appendix 8, Figure 2: Excerpt From Federal Register with further details on practice expense calculations

TABLE 1: Calculation of PE RVUs under Methodology for Selected Codes

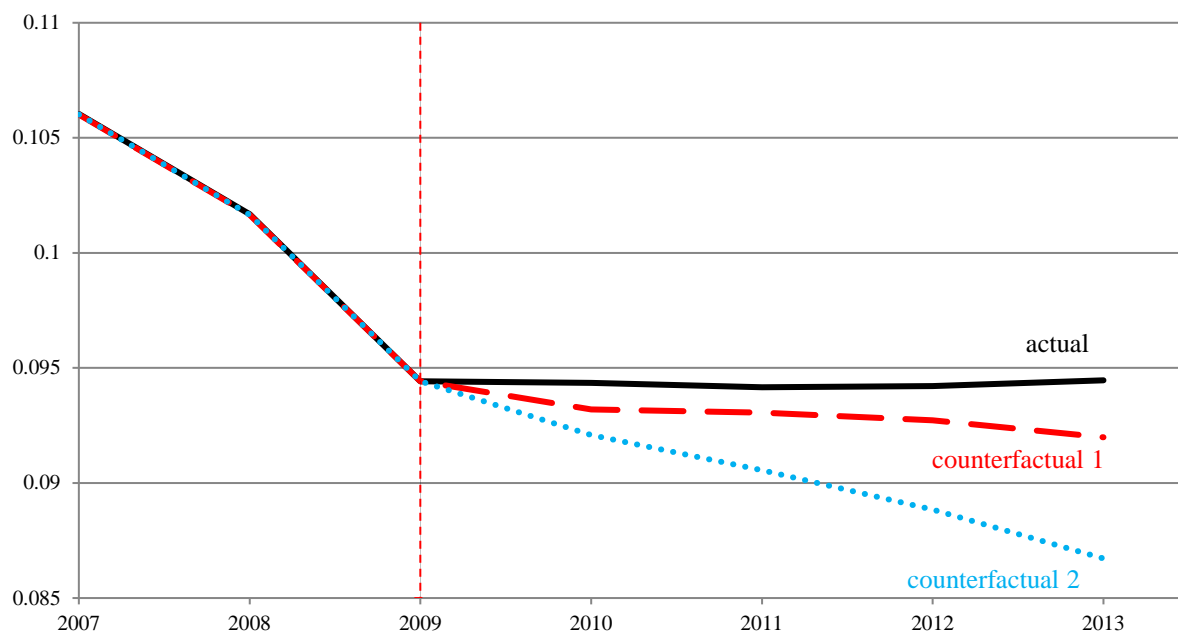
	Step	Source	Formula	99213 Office visit, not Nonfacility	33533 CABG, arterial, single Percut	71820 Chest x-ray Nonfacility	71820TC Chest x-ray Nonfacility	718206 Chest x-ray Nonfacility	93000 ECG, complete Nonfacility	93005 ECG, resting Nonfacility	93010 ECG, report Nonfacility
(1)	Lab cost (Lab)	AMA		\$13.32	\$7.52	\$5.74	\$5.74	\$—	\$6.12	\$6.12	\$—
(2)	Supply cost (Spp)	AMA		\$2.08	\$3.34	\$3.39	\$3.39	\$—	\$3.19	\$3.19	\$—
(3)	Equipment cost (Eqp)	AMA		\$0.19	\$0.65	\$3.17	\$3.17	\$—	\$0.12	\$0.12	\$—
(4)	Direct cost (Dir)			\$16.50	\$85.51	\$17.31	\$17.31	\$—	\$7.43	\$7.43	\$—
(5)	Direct adjustment (Dir Adj)	See footnote*	$-(1)+(2)+(3)$	0.508	0.508	0.508	0.508	0.508	0.508	0.508	0.508
(6)	Adjusted labor	—Lab*Dir Adj	$-(1)+(5)$	\$6.76	\$39.35	\$2.91	\$2.91	\$—	\$3.11	\$3.11	\$—
(7)	Adjusted supplies	—Spp*Dir Adj	$-(2)+(5)$	\$1.51	\$3.73	\$1.72	\$1.72	\$—	\$0.61	\$0.61	\$—
(8)	Adjusted equipment	—Eqp*Dir Adj	$-(3)+(5)$	\$0.10	\$0.33	\$4.15	\$4.15	\$—	\$0.06	\$0.06	\$—
(9)	Adjusted direct		$-(6)+(7)+(8)$	\$8.38	\$43.41	\$8.79	\$8.79	\$—	\$3.77	\$3.77	\$—
(10)	Conversion Factor (CF)	MF'S		36.0666	36.0666	36.0666	36.0666	36.0666	36.0666	36.0666	36.0666
(11)	Adj. labor cost converted	—(Lab*Dir Adj)*CF	$-(6)(10)$	0.19	1.09	0.08	0.08	0.08	0.09	0.09	0.09
(12)	Adj. supply cost converted	—(Spp*Dir Adj)*CF	$-(7)(10)$	0.04	0.10	0.05	0.05	0.05	0.02	0.02	0.02
(13)	Adj. equip cost converted	—(Eqp*Dir Adj)*CF	$-(8)(10)$	0.09	0.01	0.12	0.12	0.12	0.00	0.00	0.00
(14)	Adj. direct cost converted		$-(11)+(12)+(13)$	0.23	1.20	0.24	0.24	0.24	0.10	0.10	0.10
(15)	Wk RVU	MF'S		0.97	33.64	0.22	0.22	0.22	0.17	0.17	0.17
(16)	Dir pct			25.6%	18.0%	28.5%	28.5%	28.5%	28.8%	28.8%	28.8%
(17)	Ind. Alloc. Formula (1st part)	See Step 8		74.4%	82.0%	71.5%	71.5%	71.5%	71.2%	71.2%	71.2%
(18)	Ind. Alloc. (1st part) for Ind. Formula			$[(14)(16)/(17)]$	$[(14)(16)/(17)]$	$[(14)(16)/(17)]$	$[(14)(16)/(17)]$	$[(14)(16)/(17)]$	$[(14)(16)/(17)]$	$[(14)(16)/(17)]$	$[(14)(16)/(17)]$
(19)	Ind. Alloc. (2nd part) for Ind. Formula	See Step 8		0.68	5.48	0.61	0.61	0.26	0.26	0.26	0.26
(20)	Ind. Alloc. (2nd part)			$[(18)+(19)]$	$[(18)+(19)]$	$[(18)+(19)]$	$[(18)+(19)]$	$[(18)+(19)]$	$[(18)+(19)]$	$[(18)+(19)]$	$[(18)+(19)]$
(21)	Ind. Alloc. (2nd part) for Ind. Formula			0.97	31.64	0.39	0.39	0.22	0.11	0.11	0.11
(22)	Ind. Alloc. (2nd part) for Ind. Formula			1.65	39.12	0.94	0.94	0.22	0.51	0.37	0.17
(23)	Ind. Alloc. (2nd part) for Ind. Formula	See footnote**	$-(19)+(23)$	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367
(24)	Adjusted Indirect Allocation	—Ind Alloc. * Ind Adj		0.60	14.35	0.33	0.25	0.08	0.19	0.14	0.06
(25)	Ind. Alloc. (2nd part) for Ind. Formula	See Steps 12-16		1.094	0.901	0.846	0.846	0.846	0.929	0.929	0.929
(26)	Adjusted Indirect	—Adj. Ind Alloc * Ind Adj	$-(24)+(25)$	0.66	12.92	0.28	0.27	0.07	0.18	0.13	0.06
(27)	PE RVU	*Indin	$-(14)+(26)$	0.89	14.07	0.52	0.46	0.07	0.28	0.23	0.09

Appendix 8, Figure 3: Actual Medicare procedure facility share versus counterfactual facility share in absence of 2010 price shock



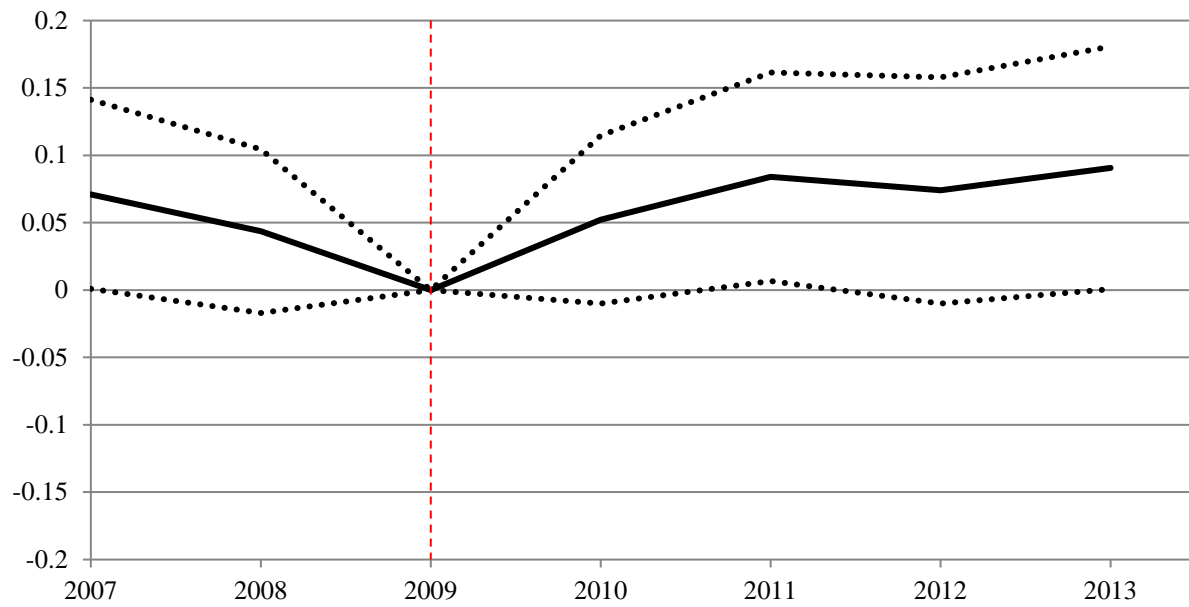
Notes: Counterfactual 1 is based upon the Medicare regression in Figure 7. Counterfactual 2 alters the regression in Figure 7 to include an interaction between linear time trend in $\Delta \text{relprice}^{2010}$ and excludes interaction between the year and $\Delta \text{relprice}^{2010}$ for the years 2007 and 2008. Both counterfactual codes the effect of $\Delta \text{relprice}^{2010}$ to be zero after 2009.

Appendix 8, Figure 4: Actual private procedure facility share versus counterfactual facility share in absence of 2010 price shock



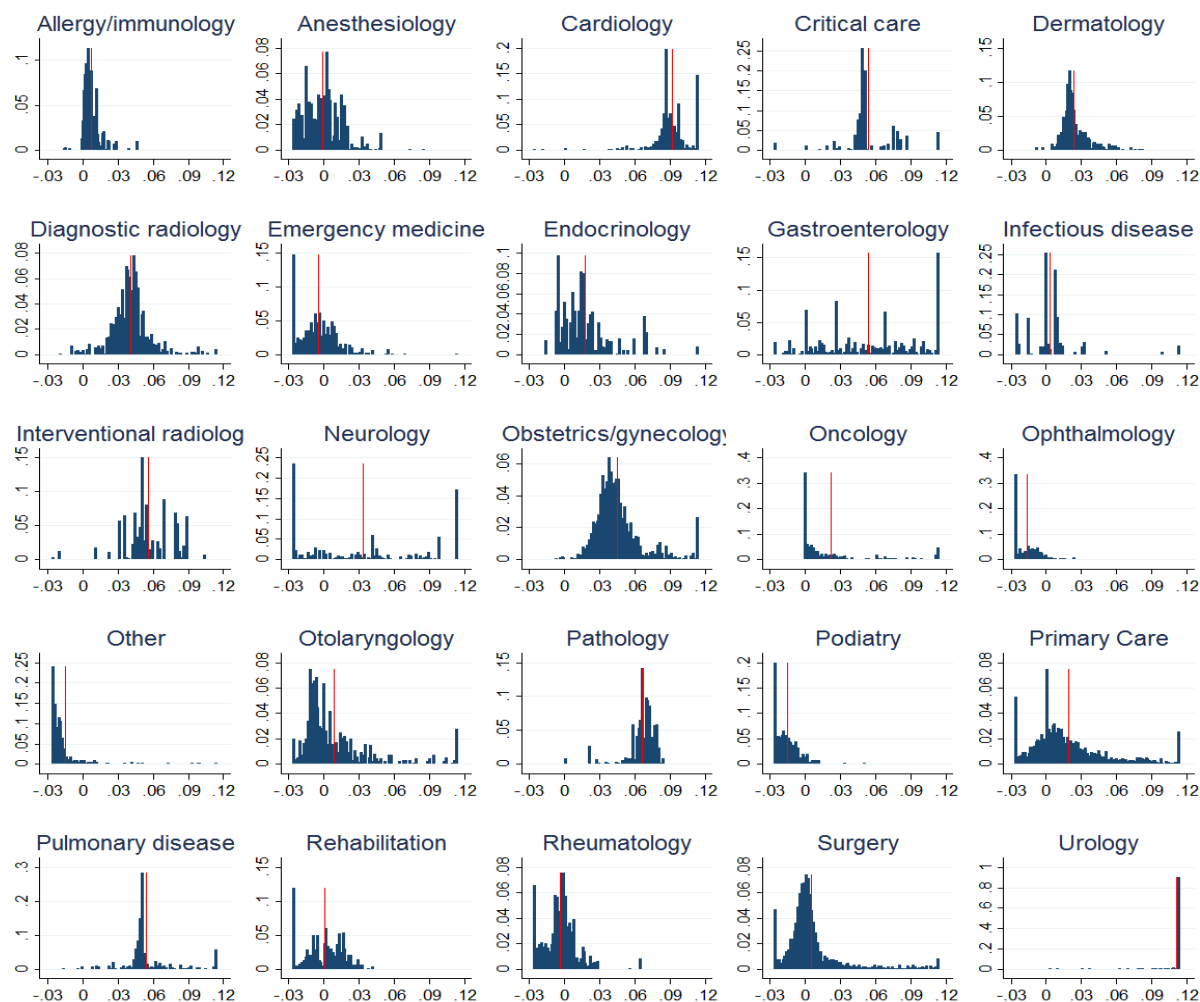
Notes: Counterfactual 1 is based upon the private regression in Figure 7. Counterfactual 2 alters the regression in Figure 7 to include an interaction between linear time trend in $\Delta \text{relprice}^{2010}$ and excludes interaction between the year and $\Delta \text{relprice}^{2010}$ for the years 2007 and 2008. Both counterfactual codes the effect of $\Delta \text{relprice}^{2010}$ to be zero after 2009.

Appendix 8, Figure 5: Time varying effect of procedure $\Delta\text{relprice}^{2010}$ on Medicare procedure facility share (unweighted)



Notes: Unit of observation in regression is the procedure-year. Unreported covariates include procedure fixed effects, year fixed effects, and interactions between year and $\Delta\text{relprice}^{2007}$. Sampling restrictions are discussed in the text. Facility share, $\Delta\text{relprice}^{2007}$ and $\Delta\text{relprice}^{2010}$ are censored at the 5th and 95th percentile. Procedures are unweighted. Dotted lines represent a 95 percent confidence interval based upon standard errors clustered by procedure.

Appendix 8, Figure 6: Distribution of $\Delta\text{relprice}^{2010}$ by specialty



Notes: Unit of observation is the physician. Height of the bars denotes the the share of each specialty's physicians in each bin of $\Delta\text{relprice}^{2010}$. Red line gives the average of $\Delta\text{relprice}^{2010}$ for each specialty. $\Delta\text{relprice}^{2010}$ is censored at the 5th and 95th percentile. Physicians are weighted by 2007 RVUs.