Online Appendix

Public Insurance Expansions and Labor Demand in Physician Practices

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Appendix A

We derive Equation (6) by using the product rule for two correlated variables to rewrite Equation (4) as:

$$E\left[U'(\pi)\times\left(\frac{\partial g}{\partial N}-r\right)\right]=0$$

$$EU'(\pi)\times E\left[\frac{\partial g}{\partial N}-r\right]+\text{cov}\left[U'(\pi),\frac{\partial g}{\partial N}\right]=0$$

$$E\left[\frac{\partial g}{\partial N}\right]=r-\frac{\text{cov}\left[U'(\pi),\frac{\partial g}{\partial N}\right]}{EU'(\pi)}$$

To sign Equation (6), we need to sign $\text{cov}\left[U'(\pi),\frac{\partial g}{\partial N}\right]$, which we can do by examining the

comparative static of each component of the covariace with respect to (p) (Holthausen 1976).

The first component is given by:

$$\frac{\partial U'(\pi)}{\partial p}=\frac{\partial \pi}{\partial p}\times U''(\pi)=\frac{\partial\left[pq(D^*,N)-wD^*-rN\right]}{\partial p}U''(\pi)$$

$$=\left[q+\left(p\frac{\partial q}{\partial D}-w\right)\frac{\partial D^*}{\partial p}+\left(p\frac{\partial q}{\partial N}-r\right)\frac{\partial N}{\partial p}\right]U''(\pi)$$

Assuming that physician and non-physician labor are normal goods, larger values of price will be

associated with greater need for both types of labor, so $\frac{\partial D^*}{\partial p}>0$ and $\frac{\partial N}{\partial p}>0$. For the firm to

viably operate, the value of the marginal product must be as high as the marginal cost of each of

the factors of input, so we assume $\left(p\dfrac{\partial q}{\partial D} - w \right) > 0$ and $\left(p\dfrac{\partial q}{\partial N} - r \right) > 0$. Thus, $\dfrac{\partial U'(\pi)}{\partial p}$ has the

same sign as $U''(\pi)$, which is positive when firms are risk loving (convex), negative when firms

are risk averse (concave), and zero when firms are risk neutral (linear).

The comparative static of the second random variable of the covariance is given by:

$\dfrac{\partial}{\partial p}\left(\dfrac{\partial g(N, p, w)}{\partial N} \right) = \dfrac{\partial^2 g}{\partial p \partial N}$. We can sign this by considering how the marginal revenue product

with respect to non-physician labor is affected by price changes. In the short-run, non-physician

labor labor is held constant, so if prices are higher than expected, firms will have underinvested

in non-physician labor. In the long-run, assuming non-physician labor is a normal good, non-

physician labor will adjust and increase. These observations imply that $\dfrac{\partial g}{\partial N}$ is smaller than it

would be if non-physician labor could adjust, so $\dfrac{\partial^2 g}{\partial p \partial N} < 0$.

Together, the two components imply that $\mathrm{cov}\left[U'(\pi), \dfrac{\partial g}{\partial N} \right]$ is negative when firms are

risk-loving, zero when firms are risk neutral, and positive when firms are risk averse. Since

$EU'(\pi) > 0$, risk-loving firms will have $E\left[\dfrac{\partial g}{\partial N} \right] > r$, risk-neutral firms will have $E\left[\dfrac{\partial g}{\partial N} \right] = r$,

and risk-averse firms will have $E\left[\dfrac{\partial g}{\partial N} \right] < r$.

Appendix B

Appendix Table B1: Testing for Differential Pre-Trends in Our DD Setup

	Number of Physicians	Pr(Employ NP)	Pr(Employ PA)
	(1)	(2)	(3)
Expanded x Year	0.00040	-0.01019	-0.00015
	(0.0027)	(0.0012)	(0.0005)
Practice FE	Yes	Yes	Yes
Unique Practices	129,514	129,514	129,514
Observations (N)	647,750	647,750	647,750

Notes: *** P value at 0.01 ** P value at 0.05 * P value at 0.10, standard errors clustered at the state level. Data is restricted to the 2009-2013 period. We additionally include an indicator for the state expanding Mediciad in 2014, a linear year time trend, and practice fixed effects.

Appendix Table B2: Diff-in-Diff Estimation for Medicaid Expansion Effect on the Probability of Increasing the Number of Providers from Prior Year

	Pr(Increase Physician Number)	Pr(Increase NP Number)	Pr(Increase PA Number)
	(1)	(2)	(3)
DD Estimate	-0.001	-0.011**	-0.003
	(0.003)	(0.005)	(0.004)
Practice FE	Yes	Yes	Yes
Unique Practices	129,514	16,197	12,937
Observations (N)	906.598	113,379	90,559

Notes: *** P value at 0.01 ** P value at 0.05 * P value at 0.10, standard errors clustered at the state level. Columns 2 and 3 restrict to practices with at least one of the relevant providers on staff during the 2009-2012 period.

Appendix Table B3: Triple Differences Estimation for Heterogeneity in the Medicaid Expansion Effects on the Likelihood of Employing NPs and PAs

Source of Heterogeneity	Pr(Employ NP)				Pr(Employ PA)			
	Full NP SOP State	High MMC Penetration	Independent Practice	Large Expansion Eligible Population	Full NP SOP State	High MMC Penetration	Independent Practice	Large Expansion Eligible Population
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
DDD Estimate	-0.003	-0.008	0.001	-0.002	-0.004	0.001	0.004	-0.002
	(0.012)	(0.009)	(0.005)	(0.004)	(0.009)	(0.004)	(0.004)	(0.003)
Practice FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Unique Practices	129,514	129,514	129,514	129,514	129,514	129,514	129,514	129,514
Observations (N)	1,036,112	1,036,112	1,036,112	1,036,112	1,036,112	1,036,112	1,036,112	1,036,112

Notes: Full NP SOP states are those that grant full practice authority to NPs as of 2013 (binary variable). The Medicaid Managed Care (MMC) indicator variable is equal to one for practices within counties that are in the top tercile for MMC penetration as of 2013. The independent practice indicator variable is equal to one for practices that are not horizontally or vertically integrated with other practices, in terms of ownership structure, as of 2013. "Large Expansional Eligible Population" is defined as being located in a county above the median in terms of share of population age 19-64 under 138% of the federal poverty line (FPL) in 2013—data derived from SAHIE (Census) publicly available information.

*** P value at 0.01 ** P value at 0.05 * P value at 0.10, standard errors clustered at the state level

Appendix Table B4: Triple Differences Estimation for Heterogeneity Based on 2013 Share of Age 19-64 138-400% FPL Population Uninsured

	Number of Physicians	Pr(Employ NP)	Pr(Employ PA)
	(1)	(2)	(3)
Post **x** Above Median Uninsured HIX Eligible	0.069	-0.011**	0.0003
	(0.057)	(0.005)	(0.005)
Poxt **x** Above Median Uninsured HIX Eligible **x** Expansion State	-0.090	-0.006	-0.002
	(0.059)	(0.008)	(0.00)
Practice FE	Yes	Yes	Yes
Unique Practices	129,514	129,514	129,514
Observations (N)	1,036,112	1,036,112	1,036,112

Notes: *** P value at 0.01 ** P value at 0.05 * P value at 0.10, standard errors clustered at the state level. Post is equal to one for years 2014-2016. The indicator variable for Above Median Uninsured HIX Eligible is equal to one for all counties in the top half of the national distribution for the share of 19-64 year olds in the 138-400% FPL range that were uninsured in 2013 (immediately prior to the 2014 debut of the heavily regulated and federally subsidized individual market).

Appendix Table B5: Difference-in-Difference Estimates for 2013 to 2014 Medicaid Payment on Staffing in Physician Practices, By Practice Specialty

| Fee Bump Extension	Number of Physicians	Pr(Employ NP)	Pr(Employ PA)
	(1)	(2)	(3)
	A. Primary Care		
Change in Fees* Post	0.00026**	-0.00023**	5.19e-6
	(0.00012)	(0.00080)	(0.00005)
Unique Practices	16,560	16,560	16,560
Observations (N)	99,360	99,360	99,360
	B. Medical Subspecialties		
Change in Fees* Post	5.30e-6	-0.00011	-0.0001
	(0.0060)	(0.000067)	(0.00006)
Unique Practices	13,166	13,166	13,166
Observations (N)	78,996	78,996	78,996
	C. Surgical Specialties		
Change in Fees* Post	-7.22e-6	-0.000060	0.00010***
	(0.00028)	(0.000058)	(0.000031)
Unique Practices	12,509	12,509	12,509
Observations (N)	75,054	75,054	75,054
	D. Multispecialty		
Change in Fees* Post	-0.0016	0.000073	-0.00035***
	(0.0018)	(0.00012)	(0.00011)
Unique Practices	5,830	5,830	5,830
Observations (N)	34,980	34,980	34,980

Notes: *** P value at 0.01 ** P value at 0.05 * P value at 0.10, standard errors clustered at the state level. Data sample is non-expansion states from 2009 to 2014, and we show estimates for Equation 8 (see Section IV.D). Post is equal to one for years 2013-2014. "Change in fees" are the percent change in Medicaid payment rates between 2012 to 2013.

Appendix Table B6: Difference-in-Difference Estimates Comparing Hiring Patterns in States That Extended the Medicaid Fee Bump in 2015 and 2016 to Those That Did Not

|	Number of Physicians (1)	Pr(Employ NP) (2)	Pr(Employ PA) (3)
	A. Primary Care		
1(Extend) * 1(Post)	0.0099	0.016	-0.0064
	(0.021)	(0.011)	(0.0072)
Unique Practices	17,483	17,483	17,483
Observations (N)	139,864	139,864	139,864
	B. Medical Subspecialties		
1(Extend) * 1(Post)	0.023	0.0095	-0.016
	(0.047)	(0.013)	(0.011)
Unique Practices	13,900	13,900	13,900
Observations (N)	111,200	111,200	111,200
	C. Surgical Specialties		
1(Extend) * 1(Post)	-0.014	0.0028	0.0056
	(0.046)	(0.0053)	(0.0067)
Unique Practices	13,252	13,252	13,252
Observations (N)	106,016	106,016	106,016
	D. Multispecialty		
1(Extend) * 1(Post)	0.049	-0.017	-0.0046
	(0.016)	(0.013)	(0.016)
Unique Practices	6,163	6,163	6,163
Observations (N)	49,304	49,304	49,304

Notes: *** P value at 0.01 ** P value at 0.05 * P value at 0.10, standard errors clustered at the state level. Data sample is non-expansion states from 2009 to 2016, and we show estimates of Equation 9 (see Section IV.D). Post is equal to one for years 2015-2016. "1(Extend)" is an indicator equal to one if the state extended the Medicaid-to-Medicare fee parity for primary care services in 2015 and 2016.

**Appendix Figure B1: Average Percent of Change in Commercial Insurance and Medicaid Enrollment**
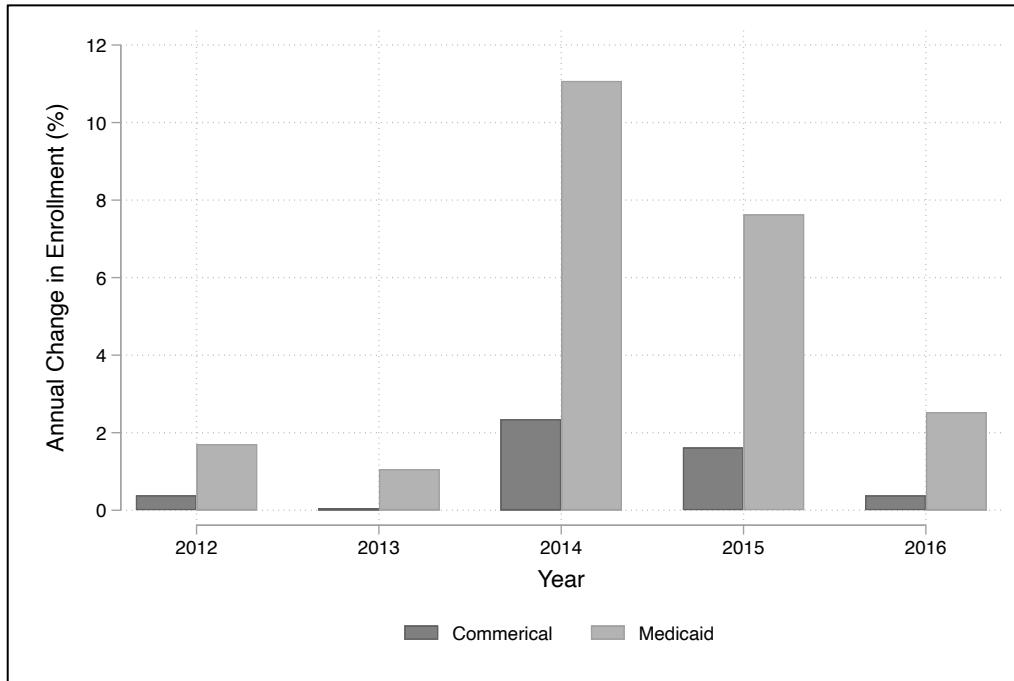
Notes: Data are from the Kaiser Family Foundation. For each state that expanded Mediciad in 2014, we calculate the annual pecent change in the number of people insured with commercial versus Medicaid insurance.

Appendix Figure B2: Impact of the 2013-2014 Medicaid Fee Bump on Physician Practice Staffing
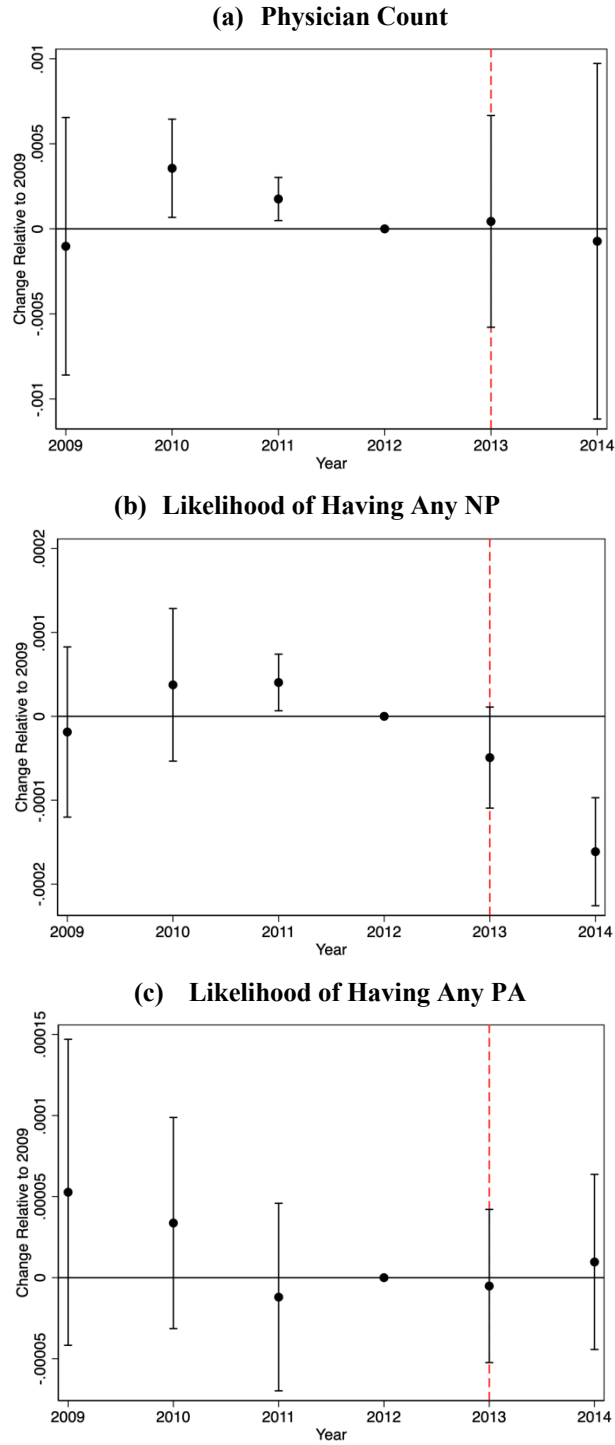
(a) Physician Count

(b) Likelihood of Having Any NP

(c) Likelihood of Having Any PA

Notes: Point estimates and 95% confidence intervals. These figures depict the event-study version of the DD estaimtes of Table 5, Panel A. The dashed red line demarcates the year when the fee bump went into effect.

Appendix Figure B3: Change in Physician Hiring Patterns in States Extending the Medicaid Fee Bump in 2015 and 2016 Relative to States That Did Not Extend
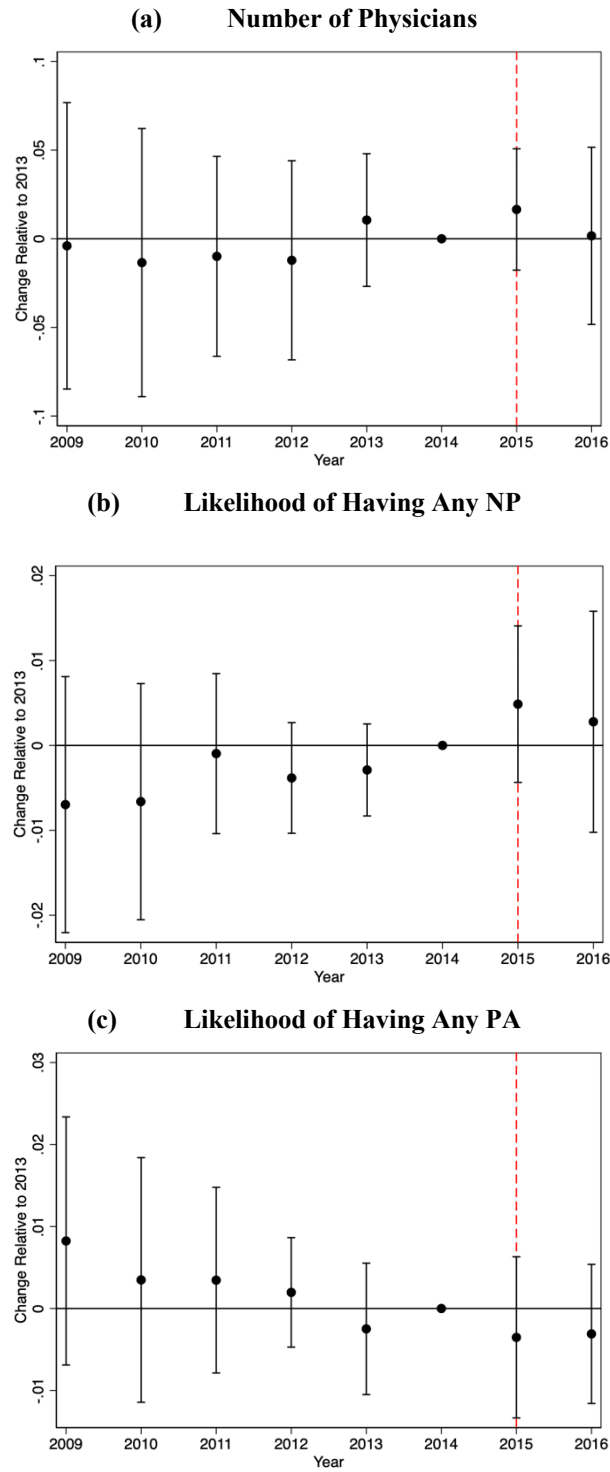
(a) Number of Physicians

(b) Likelihood of Having Any NP

(c) Likelihood of Having Any PA

Notes: Point estimates and 95% confidence intervals. These figures depict the event-study version of the DD estaimtes of Table 5, Panel B. The dashed red line depicts the year the fee bump was removed.