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Appendices to 'Beyond Physicians: The Effect of Licensing and Liability Laws on the Supply of Nurse Practitioners and Physician Assistants'

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APPENDICES

To Accompany

Beyond Physicians: The Effect of Licensing and Liability Laws on the Supply of Nurse Practitioners and Physician Assistants

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Appendix A: Additional Figures and Tables

Figure A1: Placebo distributions from Column (1) of Table 2

Panel A: (NP Independence)
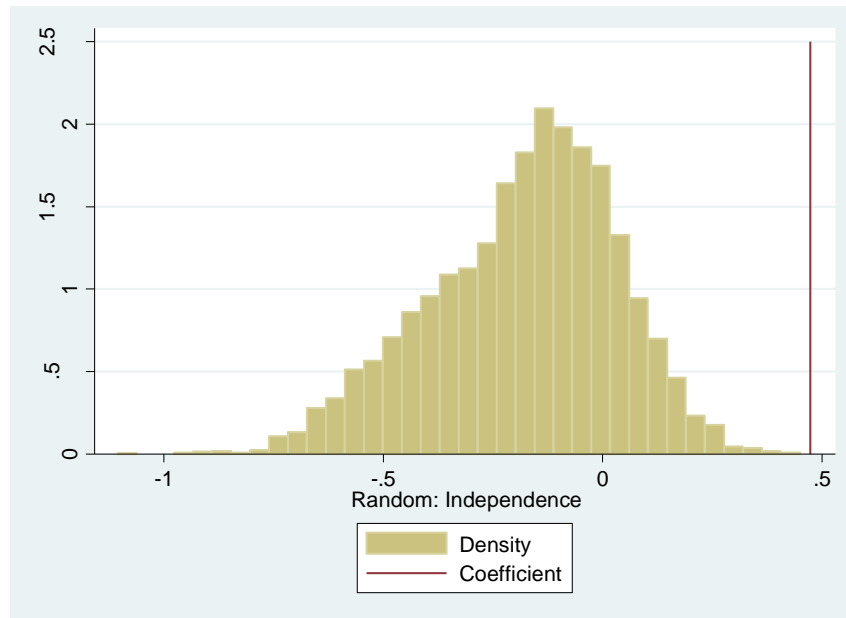
Panel B: (NP Independence)xlog(MDs office)
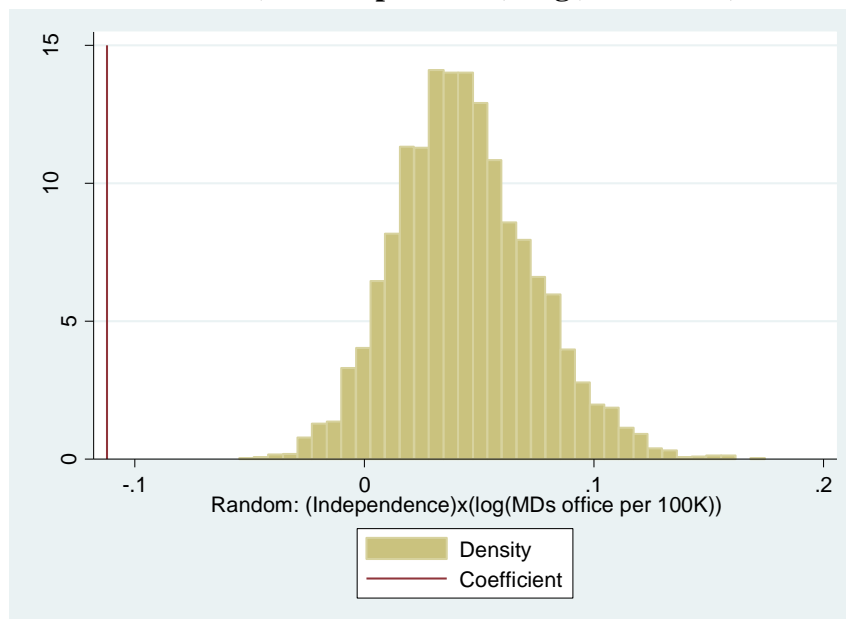
Panel C: (NP Independence)xlog(MDs hospital)
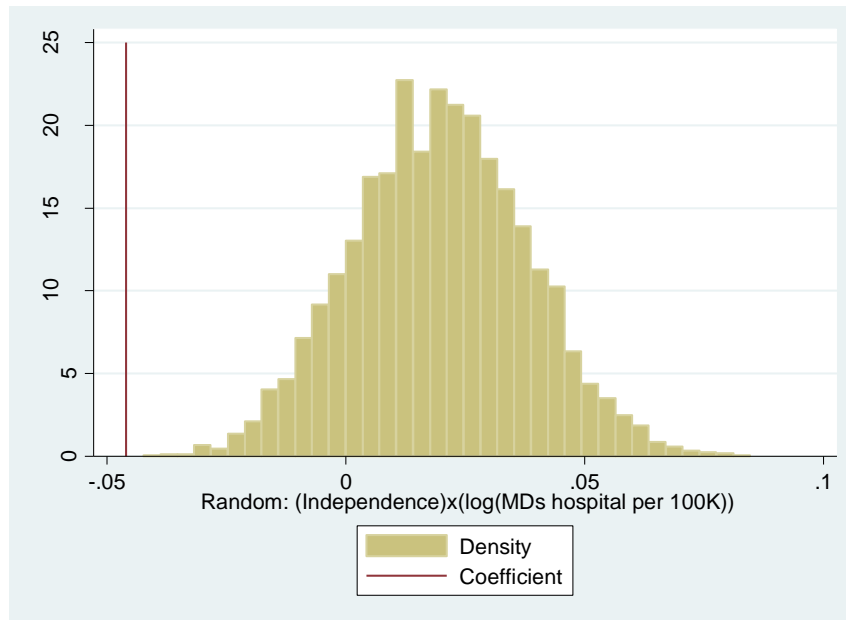
Notes: Each panel reports the histogram of the estimated coefficients for the placebo law or interaction of the placebo law with a physician supply variable (which is not a placebo) based on the specification reported in column (1) of Table 2. In all panels, a vertical line indicates where the actual estimated coefficient (not based on placebo laws) falls relative to the distribution of placebo coefficients.

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Table A1: Supervision Laws: 1998–2015

Panel A: Physician Supervision Laws for Nurse Practitioners

Always Independence	Always Prescription Supervision	Always Complete Supervision
AK, DC, IA, ME, MT, NH, NM, OR, UT, WY	AR, MI, IN, NJ, OK, WV	AL, CA, DE, FL, GA, IL, KS, LA, MS, MO, NE, NV, NY, NC, OH, PA, SC, SD, TN, VA, WI,
Change from Complete to Prescription Supervision	**Change from Complete Supervision to Independence**	**Change from Prescription Supervision to Independence**
KY (2001), MA (2012), MD (2011) TX (2002)*	CT (2014), ID (2005), MN (2015), VT (2011),	AZ (2000), CO (2010), HI (2010), MD (2012), ND (2011), RI (2014), WA (2001)

Panel B: Physician Supervision Laws for Physician Assistants

Always Remote Practice	Always Quasi-Remote Practice	Always Onsite Supervision
AK, CA, HI, KS, KY, LA, ME, MD, MA, MI, MN, MT, NE, NH, NY, NC, TN, VT, VA, WI, WY	AL, AZ, IA, NJ, OK, WA	AR, FL, GA, IL, IN, MS, OH, PA, SC, WV
Change from Onsite to Quasi-remote	**Change from Onsite to Remote**	**Change from Quasi-remote to Remote**
MO (2010), OR (2002), TX (2003)	CO (2006), DE (2014), DC (2008), ID (1999), RI (2002), UT (2002),	CT (2008), NV (1999), NM (2006), ND (2003), OR (2010), SD (2008), TX (2014)

Note: All reported years reflect the first year a state is coded as having the new law. If a state enacted a law in the second half of a given calendar year, it is not coded as having that new law in place until the following calendar year. To be classified as having a given law, both a state's statutes and its regulations must be consistent with that classification.
*Texas amended its law to move from prescription supervision to complete supervision in 2002.

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Table A2: Prescription Authority Laws: 1998–2015

Panel A: Nurse Practitioner Prescription Authority

Always Full Prescription Authority	Always Restricted Prescription Authority
AK, AZ, CO, DE, DC, IN, IA, ME, MD, MA, MN, MT, NH, NM, NY, ND, RI, VT	AL, AR, FL, GA, KY, MO, NC, OH, OK, PA, SC, TX, WV, WI
Change from Restricted to Full Prescription Authority	
CA (2005), CT (2000), HI (2006), ID (1999), IL (2013), KS (2002), LA (2006), MI (2000), MS (2003), NE (2007), NV (2003), NJ (2005), OR (2001), SD (2007), TN (2000), UT (2000), VA (2007), WA (2009), WY (2002)	

Panel B: Physician Assistant Prescription Authority

Always Full Prescription Authority	Always Restricted Prescription Authority
CO, DE, MA, MN, MT, NV, NH, NM, UT, VT, WA,	AL, AR, FL, GA, HI, IL, IN, KY, LA, MO, NJ, NY, OH, OK, PA, SC, TX, WV,
Change from Restricted to Full Prescription Authority	
AK (2002), AZ (2012), CA (2008), CT (2001), DC (2008), HI (2015), ID (2002), IA (2009), KS (2002), LA (2015), ME (2006), MD (2000), MI (2012), MS (2006), NE (2006), NY (2015), NC (2000), ND (2010), OR (2006), RI (2000), SD (2008), TN (2002), VA (2008), WI (2000), WY (2003)	

Note: All reported years reflect the first year a state is coded as having the new law. If a state enacted a law in the second half of a given calendar year, it is not coded as having that new law in place until the following calendar year. To be classified as having a given law, both a state's statutes and its regulations must be consistent with that classification.

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Table A3: Regression Results for Nurse Practitioner Laws—Naïve Specifications

	(1) log(NPs)	(2) log(NPs)	(3) log(NPs)	(4) log(NPs)	(5) log(NPs)	(6) log(NPs)	(7) log(NPs)	(8) log(NPs)	(9) log(NPs)	(10) log(NPs)	(11) log(NPs)
NP Independence	-0.051		-0.061	-0.048	-0.052		-0.052		-0.061	-0.026	-0.031
	(0.075)		(0.075)	(0.062)	(0.063)		(0.074)		(0.073)	(0.063)	(0.064)
RX supervision				0.010	0.023					0.068	0.080
				(0.060)	(0.057)					(0.080)	(0.085)
NP Cont Subst		-0.084	-0.087		-0.089			-0.077	-0.081		-0.086
		(0.131)	(0.131)		(0.131)			(0.125)	(0.124)		(0.125)
Nonecon cap						0.112	0.112	0.107	0.107	0.129	0.126
						(0.088)	(0.088)	(0.089)	(0.089)	(0.092)	(0.094)
log(MDs office)	0.123***	0.122***	0.122***	0.123***	0.122***	0.123***	0.123***	0.122***	0.122***	0.123***	0.122***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
log(MDs hospital)	0.098***	0.098***	0.098***	0.098***	0.098***	0.098***	0.098***	0.098***	0.098***	0.098***	0.098***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)
Observations	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909
R-squared	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.326	0.326	0.325	0.326

Notes: The dependent variable in all specifications is the natural logarithm of the number of NPs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing NPs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A4: Regression Results for Physician Assistant Laws—Naïve Specifications

	(1) log(PAs)	(2) log(PAs)	(3) log(PAs)	(4) log(PAs)	(5) log(PAs)	(6) log(PAs)	(7) log(PAs)	(8) log(PAs)	(9) log(PAs)	(10) log(PAs)	(11) log(PAs)
Remote Practice	-0.029 (0.029)		-0.029 (0.029)	-0.040 (0.047)	-0.039 (0.047)		-0.028 (0.027)		-0.028 (0.027)	-0.033 (0.037)	-0.033 (0.038)
Restricted Practice				-0.019 (0.039)	-0.018 (0.038)					-0.008 (0.033)	-0.009 (0.033)
PA Cont Subst		0.006 (0.033)	0.006 (0.032)		0.004 (0.032)			-0.000 (0.031)	-0.001 (0.031)		-0.002 (0.031)
Nonecon cap						-0.075** (0.034)	-0.075** (0.033)	-0.075** (0.034)	-0.075** (0.032)	-0.074** (0.031)	-0.074** (0.031)
log(MDs office)	0.054* (0.027)	0.054** (0.027)	0.054** (0.027)	0.054** (0.027)	0.054** (0.027)	0.054* (0.027)	0.054* (0.027)	0.054* (0.027)	0.054* (0.027)	0.054* (0.027)	0.054* (0.027)
log(MDs hospital)	0.085*** (0.013)	0.085*** (0.013)	0.085*** (0.013)	0.085*** (0.013)	0.085*** (0.013)	0.084*** (0.013)	0.084*** (0.013)	0.084*** (0.013)	0.084*** (0.013)	0.084*** (0.013)	0.084*** (0.013)
Observations	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950
R-squared	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380

Notes: The dependent variable in all specifications is the natural logarithm of the number of PAs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A5: Regression Results for the Effect of Physician Assistant Laws on the Supply of Physician Assistants with a General Remote Practice Category

	(1) log(PAs)	(2) log(PAs)	(3) log(PAs)	(4) log(PAs)
General Remote Practice	0.393**	0.367**	0.272	0.254
	(0.169)	(0.163)	(0.211)	(0.196)
PA Cont Subst		0.093		0.065
		(0.186)		(0.145)
Noneconomic damages cap			0.418**	0.416**
			(0.163)	(0.159)
(General Remote)xlog(MDs office)	-0.106***	-0.101**	-0.073	-0.071
	(0.038)	(0.040)	(0.050)	(0.048)
(General Remote)xlog(MDs hospital)	-0.010	-0.003	-0.014	-0.007
	(0.024)	(0.031)	(0.022)	(0.028)
(PA Cont Subst)xlog(MDs office)		-0.015		-0.009
		(0.047)		(0.038)
(PA Cont Subst)xlog(MDs hospital)		-0.020		-0.020
		(0.030)		(0.028)
(Nonecon cap)xlog(MDs office)			-0.108***	-0.108***
			(0.037)	(0.037)
(Nonecon cap)xlog(MDs hospital)			-0.057**	-0.056**
			(0.024)	(0.024)
log(MDs office)	0.138***	0.142***	0.172***	0.175***
	(0.035)	(0.041)	(0.040)	(0.044)
log(MDs hospital)	0.089***	0.094***	0.110***	0.115***
	(0.018)	(0.018)	(0.020)	(0.022)
Observations	19,950	19,950	19,950	19,950
R-squared	0.384	0.384	0.392	0.393

Notes: The dependent variable in all specifications is the natural logarithm of the number of PAs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A6: Regression Results for the Effect of Nurse Practitioner Laws on Provider Shortages With Noneconomic Damages Caps

	(1) I(HPSA)	(2) I(HPSA)	(3) I(HPSA)	(4) I(HPSA)	(5) I(HPSA)	(6) I(HPSA)
NP Independence		-0.110***		-0.076*	-0.094**	-0.064
		(0.036)		(0.040)	(0.035)	(0.043)
RX supervision					0.068	0.061
					(0.097)	(0.089)
NP Cont Subst			-0.099**	-0.077*		-0.071*
			(0.038)	(0.044)		(0.042)
Nonecon cap	-0.095**	-0.081**	-0.097**	-0.087**	-0.078**	-0.083**
	(0.043)	(0.039)	(0.036)	(0.037)	(0.037)	(0.033)
(Independence)x log(MDs office)		0.023***		0.014	0.021**	0.013
		(0.008)		(0.009)	(0.009)	(0.010)
(Independence)x log(MDs hospital)		0.004		0.002	-0.000	0.000
		(0.010)		(0.013)	(0.011)	(0.013)
(RX Supervision)x log(MDs office)					-0.011	-0.008
					(0.020)	(0.019)
(RX Supervision)x log(MDs hospital)					-0.017*	-0.018*
					(0.010)	(0.010)
(NP Cont Subst)x log(MDs office)			0.021**	0.016		0.015
			(0.010)	(0.012)		(0.011)
(NP Cont Subst)x log(MDs hospital)			0.002	0.001		-0.003
			(0.010)	(0.013)		(0.013)
(Nonecon cap)x log(MDs office)	0.018	0.015	0.019*	0.017*	0.015	0.016*
	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)
(Nonecon cap)x log(MDs hospital)	0.006	0.005	0.006	0.006	0.004	0.004
	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.009)
log(MDs office)	-0.039***	-0.042***	-0.052***	-0.051***	-0.041***	-0.049***
	(0.008)	(0.008)	(0.012)	(0.012)	(0.007)	(0.010)
log(MDs hospital)	-0.003	-0.004	-0.004	-0.004	0.001	0.002
	(0.009)	(0.009)	(0.010)	(0.010)	(0.011)	(0.012)
Observations	18,819	18,819	18,819	18,819	18,819	18,819

| R-squared | 0.186 | 0.188 | 0.188 | 0.188 | 0.188 | 0.189 |

Notes: The dependent variable in all specifications is an indicator for whether any part of a county was designated as a primary care HPSA. All physician supply variables are measured in the number of physicians per 100,000 county residents. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A7: Regression Results for the Effect of Physician Assistant Laws on Provider Shortages With Noneconomic Damages Caps

	(1) I(HPSA)	(2) I(HPSA)	(3) I(HPSA)	(4) I(HPSA)	(5) I(HPSA)	(6) I(HPSA)
Remote Practice		-0.027		0.025	-0.033	0.013
		(0.033)		(0.048)	(0.044)	(0.056)
Quasi-remote					-0.009	-0.022
					(0.049)	(0.046)
PA Cont Subst			-0.060	-0.079		-0.081
			(0.045)	(0.059)		(0.058)
Nonecon cap	-0.095**	-0.098**	-0.099**	-0.102**	-0.104**	-0.106***
	(0.043)	(0.044)	(0.038)	(0.039)	(0.042)	(0.038)
(Remote Practice)x log(MDs office)		-0.001		-0.016	-0.006	-0.019
		(0.010)		(0.012)	(0.012)	(0.014)
(Remote Practice)x log(MDs hospital)		0.021**		0.024**	0.031***	0.033***
		(0.010)		(0.011)	(0.010)	(0.012)
(Quasi-remote)x log(MDs office)					-0.010	-0.005
					(0.016)	(0.014)
(Quasi-remote)x log(MDs hospital)					0.021*	0.021*
					(0.011)	(0.010)
(PA Cont Subst)x log(MDs office)			0.015	0.025*		0.025*
			(0.011)	(0.013)		(0.013)
(PA Cont Subst)x log(MDs hospital)			0.011	-0.002		-0.001
			(0.010)	(0.011)		(0.010)
(Nonecon cap)x log(MDs office)	0.018	0.018	0.019*	0.020*	0.019*	0.020**
	(0.011)	(0.011)	(0.010)	(0.010)	(0.011)	(0.010)
(Nonecon cap)x log(MDs hospital)	0.006	0.006	0.006	0.006	0.005	0.004
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
log(MDs office)	-0.039***	-0.038***	-0.048***	-0.045***	-0.033***	-0.042***
	(0.008)	(0.009)	(0.012)	(0.011)	(0.009)	(0.011)
log(MDs hospital)	-0.003	-0.015*	-0.010	-0.015**	-0.024***	-0.024***
	(0.009)	(0.008)	(0.006)	(0.007)	(0.008)	(0.007)
Observations	18,819	18,819	18,819	18,819	18,819	18,819

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R-squared	0.186	0.187	0.188	0.189	0.188	0.189

Notes: The dependent variable in all specifications is an indicator for whether any part of a county was designated as a primary care HPSA. All physician supply variables are measured in the number of physicians per 100,000 county residents. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A8: Regression Results for the Effect of Nurse Practitioner Laws on the Supply of Nurse Practitioners with Two-Way Clustered Standard Errors

	(1) log(NPs)	(2) log(NPs)	(3) log(NPs)	(4) log(NPs)	(5) log(NPs)	(6) log(NPs)	(7) log(NPs)	(8) log(NPs)	(9) log(NPs)	(10) log(NPs)	(11) log(NPs)
NP Independence	0.474***		0.358**	0.511***	0.395**		0.414***		0.282*	0.490***	0.352**
	(0.172)		(0.170)	(0.167)	(0.168)		(0.160)		(0.151)	(0.149)	(0.149)
RX supervision				0.156	0.197					0.294*	0.342**
				(0.166)	(0.159)					(0.157)	(0.142)
NP Cont Subst		0.256	0.093		0.108			0.262	0.125		0.146
		(0.180)	(0.162)		(0.161)			(0.161)	(0.149)		(0.147)
Noneconomic cap						0.457***	0.399***	0.448***	0.407***	0.446***	0.463***
						(0.128)	(0.113)	(0.111)	(0.107)	(0.113)	(0.111)
(Independence)x log(MDs office)	-0.112***		-0.089***	-0.119***	-0.095***		-0.100***		-0.074**	-0.109***	-0.081***
	(0.033)		(0.032)	(0.034)	(0.034)		(0.029)		(0.029)	(0.029)	(0.030)
(Independence)x log(MDs hospital)	-0.046***		-0.038**	-0.046**	-0.039**		-0.043**		-0.033*	-0.043**	-0.034*
	(0.016)		(0.018)	(0.018)	(0.019)		(0.017)		(0.018)	(0.018)	(0.018)
(RX Supervision)x log(MDs office)				-0.035	-0.040					-0.050	-0.058*
				(0.040)	(0.038)					(0.036)	(0.031)
(RX Supervision)x log(MDs hospital)				0.004	-0.002					0.003	-0.004
				(0.014)	(0.015)					(0.014)	(0.015)
(NP Cont Subst) xlog(MDs office)		-0.075**	-0.039		-0.043			-0.074**	-0.044		-0.050
		(0.036)	(0.034)		(0.035)			(0.031)	(0.031)		(0.031)
(NP Cont Subst)x log(MDs hospital)		-0.027	-0.014		-0.015			-0.029	-0.017		-0.020
		(0.018)	(0.019)		(0.019)			(0.018)	(0.019)		(0.019)
(Nonecon cap)x log(MDs office)						-0.084***	-0.071***	-0.083***	-0.074***	-0.077***	-0.080***

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
						(0.030)	(0.026)	(0.028)	(0.027)	(0.026)	(0.026)
(Nonecon cap)x log(MDs hospital)						-0.014	-0.010	-0.016	-0.012	-0.010	-0.013
						(0.018)	(0.018)	(0.017)	(0.017)	(0.018)	(0.018)
log(MDs office)	0.148***	0.163***	0.164***	0.155***	0.174***	0.166***	0.182***	0.205***	0.201***	0.195***	0.218***
	(0.024)	(0.034)	(0.034)	(0.023)	(0.033)	(0.027)	(0.027)	(0.041)	(0.039)	(0.024)	(0.035)
log(MDs hospital)	0.105***	0.111***	0.111***	0.105***	0.112***	0.100***	0.106***	0.115***	0.113***	0.106***	0.116***
	(0.011)	(0.015)	(0.015)	(0.013)	(0.018)	(0.011)	(0.011)	(0.016)	(0.016)	(0.014)	(0.020)
Observations	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909
R-squared	0.332	0.330	0.334	0.333	0.334	0.330	0.336	0.335	0.338	0.337	0.339

Notes: The dependent variable in all specifications is the natural logarithm of the number of NPs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing NPs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state and year are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A9: Regression Results for the Effect of Physician Assistant Laws on the Supply of Physician Assistants with Two-Way Clustered Standard Errors

	(1) log(PAs)	(2) log(PAs)	(3) log(PAs)	(4) log(PAs)	(5) log(PAs)	(6) log(PAs)	(7) log(PAs)	(8) log(PAs)	(9) log(PAs)	(10) log(PAs)	(11) log(PAs)
Remote Practice	0.154		0.088	0.374*	0.301		0.085		0.035	0.250	0.194
	(0.185)		(0.155)	(0.223)	(0.188)		(0.170)		(0.138)	(0.240)	(0.194)
Quasi-remote Practice				0.437**	0.452**					0.316	0.328
				(0.200)	(0.207)					(0.229)	(0.232)
PA Cont Subst		0.196	0.125		0.153			0.134	0.094		0.116
		(0.202)	(0.192)		(0.186)			(0.187)	(0.175)		(0.177)
Noneconomic cap						0.470***	0.456***	0.457***	0.453***	0.422***	0.417***
						(0.153)	(0.152)	(0.147)	(0.151)	(0.162)	(0.159)
(Remote Practice)x log(MDs office)	-0.039		-0.024	-0.100**	-0.083*		-0.020		-0.009	-0.067	-0.054
	(0.042)		(0.034)	(0.049)	(0.044)		(0.039)		(0.032)	(0.055)	(0.046)
(Remote Practice)x log(MDs hospital)	-0.027		-0.023	-0.017	-0.013		-0.032*		-0.029	-0.022	-0.019
	(0.022)		(0.024)	(0.022)	(0.029)		(0.019)		(0.021)	(0.019)	(0.025)
(Quasi-remote Practice)x log(MDs office)				-0.121**	-0.125**					-0.089	-0.092
				(0.051)	(0.052)					(0.057)	(0.058)
(Quasi-remote Practice)x log(MDs hospital)				0.009	0.008					0.010	0.009
				(0.031)	(0.031)					(0.029)	(0.029)
(PA Cont Subst)x log(MDs office)		-0.039	-0.026		-0.032			-0.025	-0.020		-0.025
		(0.050)	(0.048)		(0.045)			(0.045)	(0.043)		(0.042)
(PA Cont Subst)x log(MDs hospital)		-0.021	-0.011		-0.011			-0.022	-0.008		-0.009
		(0.024)	(0.026)		(0.026)			(0.023)	(0.025)		(0.025)

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(Nonecon cap)x log(MDs office)						-0.122***	-0.119***	-0.119***	-0.118***	-0.110***	-0.109***
						(0.037)	(0.038)	(0.037)	(0.038)	(0.039)	(0.039)
(Nonecon cap)x log(MDs hospital)						-0.055**	-0.055**	-0.055**	-0.055**	-0.055***	-0.055***
						(0.023)	(0.022)	(0.022)	(0.022)	(0.021)	(0.021)
log(MDs office)	0.077*	0.076	0.082*	0.137***	0.146***	0.122***	0.132***	0.134**	0.135***	0.172***	0.178***
	(0.041)	(0.047)	(0.049)	(0.046)	(0.055)	(0.036)	(0.044)	(0.052)	(0.051)	(0.055)	(0.064)
log(MDs hospital)	0.099***	0.095***	0.103***	0.089***	0.093***	0.101***	0.119***	0.112***	0.121***	0.110***	0.113***
	(0.018)	(0.019)	(0.021)	(0.017)	(0.018)	(0.013)	(0.019)	(0.021)	(0.022)	(0.019)	(0.021)
Observations	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950
R-squared	0.381	0.381	0.382	0.384	0.384	0.390	0.391	0.391	0.391	0.393	0.393

Notes: The dependent variable in all specifications is the natural logarithm of the number of PAs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state and year are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A10: Regression Results for the Effect of Nurse Practitioner Laws on the Supply of Nurse Practitioners with State-Specific Linear Time Trends

	(1) log(NPs)	(2) log(NPs)	(3) log(NPs)	(4) log(NPs)	(5) log(NPs)	(6) log(NPs)	(7) log(NPs)	(8) log(NPs)	(9) log(NPs)	(10) log(NPs)	(11) log(NPs)
NP Independence	0.562*** (0.152)		0.458*** (0.164)	0.591*** (0.169)	0.488*** (0.179)		0.499*** (0.141)		0.376** (0.151)	0.539*** (0.152)	0.411** (0.163)
RX supervision				0.128 (0.172)	0.171 (0.166)					0.197 (0.168)	0.253 (0.162)
NP Cont Subst		0.129 (0.187)	-0.039 (0.190)		-0.025 (0.193)			0.127 (0.164)	-0.012 (0.167)		0.012 (0.167)
Noneconomic cap						0.336* (0.175)	0.280* (0.165)	0.337** (0.156)	0.296* (0.158)	0.306* (0.167)	0.333** (0.159)
(Independence)x log(MDs office)	-0.116*** (0.036)		-0.095** (0.038)	-0.121*** (0.039)	-0.099** (0.040)		-0.103*** (0.033)		-0.079** (0.034)	-0.111*** (0.034)	-0.084** (0.036)
(Independence)x log(MDs hospital)	-0.040** (0.018)		-0.030 (0.021)	-0.041** (0.019)	-0.032 (0.021)		-0.038** (0.018)		-0.025 (0.021)	-0.039* (0.019)	-0.026 (0.021)
(RX Supervision)x log(MDs office)				-0.026 (0.039)	-0.031 (0.039)					-0.044 (0.037)	-0.051 (0.036)
(RX Supervision)x log(MDs hospital)				-0.003 (0.018)	-0.009 (0.018)					0.000 (0.018)	-0.008 (0.019)
(NP Cont Subst) xlog(MDs office)		-0.074* (0.039)	-0.036 (0.039)		-0.039 (0.040)			-0.073** (0.032)	-0.041 (0.033)		-0.046 (0.033)
(NP Cont Subst)x log(MDs hospital)		-0.027 (0.018)	-0.017 (0.020)		-0.020 (0.020)			-0.029 (0.018)	-0.021 (0.019)		-0.024 (0.019)
(Nonecon cap)x log(MDs office)						-0.092***	-0.079***	-0.091***	-0.081***	-0.083***	-0.087***

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
						(0.030)	(0.028)	(0.026)	(0.027)	(0.029)	(0.028)
(Nonecon cap)x log(MDs hospital)						-0.007	-0.003	-0.010	-0.006	-0.003	-0.007
						(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.019)
log(MDs office)	0.149***	0.162***	0.163***	0.153***	0.170***	0.169***	0.186***	0.208***	0.204***	0.197***	0.218***
	(0.023)	(0.033)	(0.033)	(0.025)	(0.035)	(0.022)	(0.021)	(0.031)	(0.031)	(0.022)	(0.031)
log(MDs hospital)	0.106***	0.113***	0.113***	0.107***	0.117***	0.099***	0.104***	0.114***	0.113***	0.104***	0.117***
	(0.010)	(0.014)	(0.014)	(0.013)	(0.017)	(0.012)	(0.012)	(0.016)	(0.016)	(0.015)	(0.019)
Observations	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909
R-squared	0.359	0.357	0.361	0.360	0.361	0.357	0.363	0.362	0.365	0.363	0.366

Notes: The dependent variable in all specifications is the natural logarithm of the number of NPs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing NPs are excluded. All specifications include state and year fixed effects as well as state-specific linear time trends. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A11: Regression Results for the Effect of Physician Assistant Laws on the Supply of Physician Assistants with State-Specific Linear Time Trends

	(1) log(PAs)	(2) log(PAs)	(3) log(PAs)	(4) log(PAs)	(5) log(PAs)	(6) log(PAs)	(7) log(PAs)	(8) log(PAs)	(9) log(PAs)	(10) log(PAs)	(11) log(PAs)
Remote Practice	0.217		0.149	0.483**	0.405**		0.159		0.104	0.358	0.297
	(0.188)		(0.172)	(0.185)	(0.190)		(0.171)		(0.152)	(0.223)	(0.206)
Quasi-remote Practice				0.504***	0.515***					0.368*	0.378*
				(0.171)	(0.172)					(0.213)	(0.211)
PA Cont Subst		0.218	0.138		0.168			0.153	0.106		0.130
		(0.223)	(0.217)		(0.193)			(0.181)	(0.156)		(0.146)
Noneconomic cap						0.561***	0.561***	0.549***	0.556***	0.520***	0.513***
						(0.144)	(0.153)	(0.143)	(0.151)	(0.162)	(0.158)
(Remote Practice)x log(MDs office)	-0.043		-0.027	-0.107**	-0.089*		-0.024		-0.011	-0.074	-0.060
	(0.046)		(0.041)	(0.043)	(0.045)		(0.044)		(0.038)	(0.054)	(0.051)
(Remote Practice)x log(MDs hospital)	-0.028		-0.023	-0.014	-0.009		-0.031		-0.028	-0.017	-0.014
	(0.025)		(0.027)	(0.026)	(0.033)		(0.021)		(0.024)	(0.022)	(0.029)
(Quasi-remote Practice)x log(MDs office)				-0.127***	-0.131***					-0.095*	-0.098*
				(0.044)	(0.044)					(0.053)	(0.052)
(Quasi-remote Practice)x log(MDs hospital)				0.017	0.016					0.019	0.018
				(0.033)	(0.034)					(0.032)	(0.032)
(PA Cont Subst)x log(MDs office)		-0.043	-0.028		-0.035			-0.029	-0.023		-0.028
		(0.053)	(0.052)		(0.047)			(0.044)	(0.039)		(0.037)
(PA Cont Subst)x log(MDs hospital)		-0.022	-0.012		-0.013			-0.022	-0.008		-0.009
		(0.027)	(0.029)		(0.029)			(0.025)	(0.028)		(0.028)

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(Nonecon cap)x log(MDs office)						-0.128***	-0.124***	-0.124***	-0.123***	-0.114***	-0.113***
						(0.032)	(0.035)	(0.034)	(0.035)	(0.037)	(0.037)
(Nonecon cap)x log(MDs hospital)						-0.055**	-0.055**	-0.055**	-0.055**	-0.057**	-0.056**
						(0.025)	(0.024)	(0.025)	(0.024)	(0.023)	(0.023)
log(MDs office)	0.078*	0.077	0.084*	0.142***	0.151***	0.124***	0.136***	0.138***	0.140***	0.179***	0.187***
	(0.042)	(0.048)	(0.050)	(0.035)	(0.041)	(0.027)	(0.036)	(0.038)	(0.040)	(0.041)	(0.045)
log(MDs hospital)	0.100***	0.096***	0.103***	0.085***	0.089***	0.101***	0.118***	0.112***	0.121***	0.106***	0.108***
	(0.018)	(0.018)	(0.019)	(0.017)	(0.017)	(0.013)	(0.019)	(0.019)	(0.021)	(0.019)	(0.020)
Observations	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950
R-squared	0.385	0.385	0.386	0.388	0.388	0.394	0.395	0.395	0.396	0.397	0.397

Notes: The dependent variable in all specifications is the natural logarithm of the number of PAs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing PAs are excluded. All specifications include state and year fixed effects as well as state-specific linear time trends. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A12: Regression Results for the Effect of Nurse Practitioner Laws on the Supply of Nurse Practitioners for Post 2009

	(1) log(NPs)	(2) log(NPs)	(3) log(NPs)	(4) log(NPs)	(5) log(NPs)
NP Independence	0.628***		0.496***	0.623***	0.499***
	(0.144)		(0.169)	(0.167)	(0.182)
RX supervision				-0.020	0.032
				(0.193)	(0.211)
NP Cont Subst		0.429**	0.250		0.254
		(0.163)	(0.174)		(0.181)
(Independence)xlog(MDs office)	-0.124***		-0.097**	-0.123***	-0.097**
	(0.035)		(0.039)	(0.039)	(0.040)
(Independence)xlog(MDs hospital)	-0.052***		-0.042*	-0.052**	-0.042*
	(0.019)		(0.023)	(0.021)	(0.023)
(RX Supervision)xlog(MDs office)				0.004	-0.006
				(0.042)	(0.050)
(RX Supervision)xlog(MDs hospital)				0.000	-0.006
				(0.020)	(0.022)
(NP Cont Subst)xlog(MDs office)		-0.089**	-0.049		-0.049
		(0.041)	(0.044)		(0.046)
(NP Cont Subst)xlog(MDs hospital)		-0.032	-0.018		-0.020
		(0.020)	(0.022)		(0.023)
log(MDs office)	0.163***	0.184***	0.184***	0.162***	0.186***
	(0.022)	(0.034)	(0.034)	(0.026)	(0.040)
log(MDs hospital)	0.111***	0.118***	0.118***	0.111***	0.120***
	(0.011)	(0.015)	(0.015)	(0.013)	(0.019)
Observations	17,276	17,276	17,276	17,276	17,276
R-squared	0.300	0.296	0.301	0.300	0.301

Notes: The dependent variable in all specifications is the natural logarithm of the number of NPs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing NPs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A13: Regression Results for the Effect of Physician Assistant Laws on the Supply of Physician Assistants for Post 2009

	(1) log(PAs)	(2) log(PAs)	(3) log(PAs)	(4) log(PAs)	(5) log(PAs)
Remote Practice	0.276		0.126	0.670***	0.502**
	(0.214)		(0.169)	(0.200)	(0.234)
Quasi-remote Practice				0.726***	0.750***
				(0.233)	(0.237)
PA Cont Subst		0.447	0.355		0.416
		(0.307)	(0.318)		(0.260)
(Remote Practice)xlog(MDs office)	-0.066		-0.028	-0.160***	-0.120*
	(0.052)		(0.043)	(0.049)	(0.063)
(Remote Practice)xlog(MDs hospital)	-0.034		-0.026	-0.015	-0.006
	(0.029)		(0.032)	(0.032)	(0.046)
(Quasi-remote)xlog(MDs office)				-0.176***	-0.189***
				(0.063)	(0.062)
(Quasi-remote)xlog(MDs hospital)				0.019	0.017
				(0.042)	(0.044)
(PA Cont Subst)xlog(MDs office)		-0.083	-0.066		-0.079
		(0.078)	(0.083)		(0.071)
(PA Cont Subst)xlog(MDs hospital)		-0.033	-0.021		-0.023
		(0.035)	(0.039)		(0.039)
log(MDs office)	0.110**	0.121	0.128*	0.203***	0.232***
	(0.050)	(0.075)	(0.072)	(0.039)	(0.042)
log(MDs hospital)	0.114***	0.113***	0.121***	0.095***	0.103***
	(0.023)	(0.028)	(0.029)	(0.024)	(0.025)
Observations	15,009	15,009	15,009	15,009	15,009
R-squared	0.376	0.377	0.378	0.380	0.383

Notes: The dependent variable in all specifications is the natural logarithm of the number of PAs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A14: Nurse Practitioner Event Study Results

	(1) log(NPs)		(2) log(NPs)
NP Independence Lead 3	-0.184*	NP Independence Lag 1	0.673***
	(0.098)		(0.163)
(Indep)xlog(MDs office) lead 3	0.047*	(Indep)xlog(MDs office) lag 1	-0.178***
	(0.026)		(0.041)
(Indep)xlog(MDs hospital) lead 3	0.000	(Indep)xlog(MDs hospital) lag 1	-0.002
	(0.038)		(0.032)
NP Independence Lead 2	-0.361***	NP Independence Lag 2	0.680***
	(0.118)		(0.174)
(Indep)xlog(MDs office) lead 2	0.105***	(Indep)xlog(MDs office) lag 2	-0.160***
	(0.026)		(0.036)
(Indep)xlog(MDs hospital) lead 2	-0.050*	(Indep)xlog(MDs hospital) lag 2	-0.046
	(0.028)		(0.032)
NP Independence Lead 1	0.340	NP Independence Lag 3	0.486
	(0.289)		(0.305)
(Indep)xlog(MDs office) lead 1	-0.088	(Indep)xlog(MDs office) lag 3	-0.128*
	(0.067)		(0.068)
(Indep)xlog(MDs hospital) lead 1	0.017	(Indep)xlog(MDs hospital) lag 3	-0.033
	(0.033)		(0.039)
NP Independence Actual	0.609***	NP Independence 4 Plus	0.382**
	(0.178)		(0.150)
(Indep)xlog(MDs office) actual	-0.133***	(Indep)xlog(MDs office) 4 Plus	-0.117***
	(0.049)		(0.036)
(Indep)xlog(MDs hospital) actual	-0.021	(Indep)xlog(MDs hospital) 4 Plus	-0.062*
	(0.019)		(0.032)

Notes: The dependent variable in all specifications is the natural logarithm of the number of NPs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing NPs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. The coefficients for the natural logarithm of office-based and hospital-based physicians are 0.144 and 0.102, respectively, and both are significant at the 1% level. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A15: Physician Assistant Event Study Results

	(1) log(PAs)		(2) log(PAs)
Remote Lead 3	0.304*	Remote Lag 1	0.001
	(0.160)		(0.195)
(Remote)xlog(MDs office) lead 3	-0.114***	(Remote)xlog(MDs office) lag 1	-0.005
	(0.038)		(0.060)
(Remote)xlog(MDs hospital) lead 3	0.013	(Remote)xlog(MDs hospital) lag 1	0.008
	(0.039)		(0.059)
Remote Lead 2	0.166	Remote Lag 2	0.193
	(0.187)		(0.281)
(Remote)xlog(MDs office) lead 2	-0.073	(Remote)xlog(MDs office) lag 2	-0.044
	(0.063)		(0.076)
(Remote)xlog(MDs hospital) lead 2	0.016	(Remote)xlog(MDs hospital) lag 2	0.006
	(0.059)		(0.066)
Remote Lead 1	0.135	Remote Lag 3	-0.022
	(0.195)		(0.280)
(Remote)xlog(MDs office) lead 1	-0.064	(Remote)xlog(MDs office) lag 3	0.013
	(0.059)		(0.078)
(Remote)xlog(MDs hospital) lead 1	-0.030	(Remote)xlog(MDs hospital) lag 3	0.000
	(0.043)		(0.070)
Remote Actual	0.240	Remote 4 Plus	-0.273
	(0.240)		(0.279)
(Remote)xlog(MDs office) actual	-0.074	(Remote)xlog(MDs office) 4 Plus	0.058
	(0.064)		(0.079)
(Remote)xlog(MDs hospital) actual	-0.056	(Remote)xlog(MDs hospital) 4 Plus	0.035
	(0.063)		(0.066)

Notes: The dependent variable in all specifications is the natural logarithm of the number of PAs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. The coefficients for the natural logarithm of office-based and hospital-based physicians are 0.057 and 0.090, respectively, and the former is significant at the 1% level. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A16: Identified Sets for Nurse Practitioner Results

Panel A: Licensing Laws Only

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
NP Independence	0.474	0.607			0.358	0.463	0.511	0.573	0.395	0.429
RX supervision							0.156	-0.039	0.197	0.001
NP Cont Subst			0.256	0.410	0.093	0.242			0.108	0.267
(Independence)xlog(MDs office)	-0.112	-0.118			-0.089	-0.088	-0.119	-0.122	-0.095	-0.092
(Independence)xlog(MDs hospital)	-0.046	-0.062			-0.038	-0.050	-0.046	-0.062	-0.039	-0.051
(RX Supervision)xlog(MDs office)							-0.035	-0.020	-0.040	-0.029
(RX Supervision)xlog(MDs hospital)							0.004	-0.006	-0.002	-0.011
(NP Cont Subst)xlog(MDs office)			-0.075	-0.088	-0.039	-0.053			-0.043	-0.056
(NP Cont Subst)xlog(MDs hospital)			-0.027	-0.037	-0.014	-0.018			-0.015	-0.021

Panel B: Licensing and Liability Laws

	(6a)	(6b)	(7a)	(7b)	(8a)	(8b)	(9a)	(9b)	(10a)	(10b)	(11a)	(11b)
NP Independence			0.414	0.542			0.282	0.384	0.490	0.555	0.352	0.390
RX supervision									0.294	0.117	0.342	0.167
NP Cont Subst					0.262	0.409	0.125	0.268			0.146	0.296
Noneconomic damages cap	0.457	0.531	0.399	0.466	0.448	0.524	0.407	0.481	0.446	0.472	0.463	0.494
(Independence)xlog(MDs office)			-0.100	-0.106			-0.074	-0.073	-0.109	-0.113	-0.081	-0.078
(Independence)xlog(MDs hospital)			-0.043	-0.059			-0.033	-0.046	-0.043	-0.060	-0.034	-0.047
(RX Supervision)xlog(MDs office)									-0.050	-0.039	-0.058	-0.050
(RX Supervision)xlog(MDs hospital)									0.003	-0.004	-0.004	-0.010
(NP Cont Subst)xlog(MDs office)					-0.074	-0.086	-0.044	-0.057			-0.050	-0.062
(NP Cont Subst)xlog(MDs hospital)					-0.029	-0.037	-0.017	-0.021			-0.020	-0.024
(Nonecon cap)xlog(MDs office)	-0.084	-0.096	-0.071	-0.082	-0.083	-0.094	-0.074	-0.084	-0.077	-0.085	-0.080	-0.090
(Nonecon cap)xlog(MDs hospital)	-0.014	0.002	-0.010	0.005	-0.016	-0.001	-0.012	0.002	-0.010	0.005	-0.013	0.001

Notes: Each numbered set of columns corresponds to the same number column in Table 2. Within each set of columns, the "a" portion reports the estimated coefficient as reported in Table 2, and the "b" portion reports the treatment effect derived from the analysis developed by Oster (2016). Together, the estimated

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coefficient and Oster's (2016) treatment effect represent an identified set, consistent with Tamer (2010) and Manksi (2003). In general, if an identified set excludes zero, that is evidence of causality (Oster 2016).

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Table A17: Identified Sets for Physician Assistant Results

Panel A: Licensing Laws Only

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)	(5a)	(5b)
Remote Practice	0.154	0.228			0.088	0.138	0.374	0.398	0.301	0.310
Quasi-remote Practice							0.437	0.334	0.452	0.361
PA Cont Subst			0.196	0.275	0.125	0.191			0.153	0.213
(Remote Practice)xlog(MDs office)	-0.039	-0.054			-0.024	-0.030	-0.100	-0.110	-0.083	-0.085
(Remote Practice)xlog(MDs hospital)	-0.027	-0.015			-0.023	-0.019	-0.017	0.006	-0.013	0.002
(Quasi-remote Practice)xlog(MDs office)							-0.121	-0.110	-0.125	-0.115
(Quasi-remote Practice)xlog(MDs hospital)							0.009	0.033	0.008	0.032
(PA Cont Subst)xlog(MDs office)			-0.039	-0.059	-0.026	-0.042			-0.032	-0.047
(PA Cont Subst)xlog(MDs hospital)			-0.021	-0.005	-0.011	0.003			-0.011	0.002

Panel B: Licensing and Liability Laws

	(6a)	(6b)	(7a)	(7b)	(8a)	(8b)	(9a)	(9b)	(10a)	(10b)	(11a)	(11b)
Remote Practice			0.085	0.150			0.035	0.078	0.250	0.269	0.194	0.200
Quasi-remote Practice									0.316	0.227	0.328	0.249
PA Cont Subst					0.134	0.206	0.094	0.155			0.116	0.171
Noneconomic damages cap	0.470	0.493	0.456	0.472	0.457	0.480	0.453	0.472	0.422	0.452	0.417	0.449
(Remote Practice)xlog(MDs office)			-0.020	-0.033			-0.009	-0.014	-0.067	-0.076	-0.054	-0.056
(Remote Practice)xlog(MDs hospital)			-0.032	-0.021			-0.029	-0.023	-0.022	-0.002	-0.019	-0.004
(Quasi-remote Practice)xlog(MDs office)									-0.089	-0.080	-0.092	-0.084
(Quasi-remote Practice)xlog(MDs hospital)									0.010	0.030	0.009	0.029
(PA Cont Subst)xlog(MDs office)					-0.025	-0.041	-0.020	-0.033			-0.025	-0.038
(PA Cont Subst)xlog(MDs hospital)					-0.022	-0.009	-0.008	0.002			-0.009	0.001
(Nonecon cap)xlog(MDs office)	-0.122	-0.124	-0.119	-0.118	-0.119	-0.119	-0.118	-0.117	-0.110	-0.111	-0.109	-0.110
(Nonecon cap)xlog(MDs hospital)	-0.055	-0.048	-0.055	-0.049	-0.055	-0.049	-0.055	-0.049	-0.055	-0.050	-0.055	-0.051

Notes: Each numbered set of columns corresponds to the same number column in Table 3. Within each set of columns, the "a" portion reports the estimated coefficient as reported in Table 3, and the "b" portion reports the treatment effect derived from the analysis developed by Oster (2016). Together, the estimated

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coefficient and Oster's (2016) treatment effect represent an identified set, consistent with Tamer (2010) and Manksi (2003). In general, if an identified set excludes zero, that is evidence of causality (Oster 2016).

Table A18: Nurse Practitioner Border County Regression Results

	(1) log(NPs)	(2) log(NPs)	(3) log(NPs)	(4) log(NPs)	(5) log(NPs)	(6) log(NPs)	(7) log(NPs)	(8) log(NPs)	(9) log(NPs)	(10) log(NPs)	(11) log(NPs)
NP Independence	-0.124** (0.055)		-0.119** (0.056)	-0.135** (0.055)	-0.127** (0.057)		-0.134** (0.056)		-0.137** (0.056)	-0.142** (0.056)	-0.133** (0.058)
RX supervision				0.039 (0.057)	0.030 (0.055)					0.048 (0.059)	0.038 (0.058)
NP Cont Subst		-0.060 (0.054)	-0.028 (0.056)		-0.049 (0.057)						-0.066 (0.057)
Noneconomic cap						-0.019 (0.047)	-0.031 (0.046)	-0.027 (0.047)	-0.036 (0.046)	-0.040 (0.047)	-0.044 (0.046)
(Independence)x log(MDs office)	0.012** (0.005)		0.014*** (0.005)	0.012** (0.005)	0.014*** (0.005)		0.012*** (0.005)		0.015*** (0.005)	0.012** (0.005)	0.014*** (0.005)
(Independence)x log(MDs hospital)	-0.013*** (0.004)		-0.015*** (0.005)	-0.012*** (0.004)	-0.015*** (0.005)		-0.013*** (0.004)		-0.016*** (0.005)	-0.013*** (0.004)	-0.016*** (0.005)
(RX Supervision)x log(MDs office)				-0.008* (0.005)	-0.010* (0.005)					-0.009* (0.005)	-0.010* (0.005)
(RX Supervision)x log(MDs hospital)				0.006 (0.005)	0.008 (0.005)					0.006 (0.005)	0.008 (0.005)
(NP Cont Subst) xlog(MDs office)		0.002 (0.004)	-0.003 (0.004)		-0.003 (0.004)			-0.001 (0.003)	-0.005 (0.003)		-0.002 (0.004)
(NP Cont Subst)x log(MDs hospital)		-0.001 (0.003)	0.004 (0.004)		0.005 (0.004)			-0.001 (0.003)	0.004 (0.004)		0.005 (0.004)
(Nonecon cap)x log(MDs office)						-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)	-0.005 (0.004)
(Nonecon cap)x log(MDs hospital)						0.007*	0.008**	0.007*	0.008**	0.008**	0.009**

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						(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
log(MDs office)	-0.009*	-0.007	-0.008	-0.007	-0.006	-0.003	-0.006	-0.002	-0.004	-0.005	-0.005
	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
log(MDs hospital)	-0.002	-0.004	-0.003	-0.003	-0.006*	-0.008***	-0.005**	-0.007**	-0.007**	-0.007**	-0.009**
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
Observations	7,173	7,173	7,173	7,173	7,173	7,173	7,173	7,173	7,173	7,173	7,173
R-squared	0.268	0.266	0.268	0.268	0.269	0.266	0.269	0.266	0.269	0.269	0.270

Notes: The dependent variable in all specifications is the natural logarithm of the number of NPs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing NPs are excluded. All specifications include state and year fixed effects. Unlike other reported results, the legal variables in this table represent the laws of the state that a given county borders (not the laws of the state in which a county is located). For counties that border multiple states, the legal variables are population weighted averages of the relevant laws in all counties that both border a given county and are located within a different state. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A19: Physician Assistant Border County Regression Results

	(1) log(PAs)	(2) log(PAs)	(3) log(PAs)	(4) log(PAs)	(5) log(PAs)	(6) log(PAs)	(7) log(PAs)	(8) log(PAs)	(9) log(PAs)	(10) log(PAs)	(11) log(PAs)
Remote Practice	-0.046 (0.049)		0.042 (0.057)	0.019 (0.049)	0.106* (0.056)		-0.092* (0.050)		-0.093* (0.050)	-0.008 (0.050)	0.079 (0.056)
Quasi-remote Practice				0.337*** (0.055)	0.348*** (0.055)					0.312*** (0.057)	0.320*** (0.057)
PA Cont Subst		-0.183*** (0.050)	-0.195*** (0.060)		-0.203*** (0.060)						-0.211*** (0.059)
Noneconomic cap						0.131** (0.052)	0.138** (0.055)	0.121** (0.053)	0.139** (0.055)	0.112** (0.057)	0.121** (0.057)
(Remote Practice)x log(MDs office)	0.006 (0.004)		0.003 (0.005)	0.006 (0.004)	0.003 (0.005)		0.010** (0.004)		0.012*** (0.005)	0.009** (0.004)	0.006 (0.005)
(Remote Practice)x log(MDs hospital)	-0.010*** (0.003)		-0.013*** (0.004)	-0.010*** (0.004)	-0.013*** (0.004)		-0.011*** (0.003)		-0.015*** (0.004)	-0.012*** (0.004)	-0.014*** (0.004)
(Quasi-remote Practice)x log(MDs office)				-0.017*** (0.005)	-0.018*** (0.005)					-0.014*** (0.005)	-0.015*** (0.005)
(Quasi-remote Practice)x log(MDs hospital)				0.004 (0.004)	0.004 (0.004)					0.003 (0.004)	0.003 (0.005)
(PA Cont Subst)x log(MDs office)		0.009** (0.004)	0.006 (0.005)		0.007 (0.005)			-0.002 (0.003)	-0.005 (0.003)		0.008 (0.005)
(PA Cont Subst)x log(MDs hospital)		-0.001 (0.003)	0.006 (0.004)		0.006 (0.004)			-0.001 (0.003)	0.007* (0.004)		0.006 (0.004)
(Nonecon cap)x log(MDs office)						-0.012*** (0.004)	-0.014*** (0.004)	-0.012*** (0.004)	-0.014*** (0.004)	-0.012*** (0.004)	-0.012*** (0.004)

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(Nonecon cap)x log(MDs hospital)						0.007**	0.008***	0.007**	0.008***	0.008***	0.008***
						(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
log(MDs office)	-0.017***	-0.018***	-0.019***	-0.012***	-0.015***	-0.005	-0.010**	-0.004	-0.009*	-0.008	-0.010**
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
log(MDs hospital)	0.000	-0.004*	-0.001	0.000	-0.001	-0.008***	-0.003	-0.008***	-0.004	-0.002	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Observations	8,997	8,997	8,997	8,997	8,997	8,997	8,997	8,997	8,997	8,997	8,997
R-squared	0.382	0.381	0.383	0.385	0.386	0.381	0.383	0.381	0.383	0.386	0.387

Notes: The dependent variable in all specifications is the natural logarithm of the number of PAs per 100,000 county residents. Similarly, all physician supply variables are measured in the number of physicians per 100,000 county residents. Counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Unlike other reported results, the legal variables in this table represent the laws of the state that a given county borders (not the laws of the state in which a county is located). For counties that border multiple states, the legal variables are population weighted averages of the relevant laws in all counties that both border a given county and are located within a different state. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A20: Regression Results for the Effect of Nurse Practitioner Laws on the Supply of Office-Based Physicians

	(1) log(MDs office)	(2) log(MDs office)	(3) log(MDs office)	(4) log(MDs office)	(5) log(MDs office)	(6) log(MDs office)	(7) log(MDs office)	(8) log(MDs office)	(9) log(MDs office)	(10) log(MDs office)	(11) log(MDs office)
NP Independence	-0.056		-0.062	-0.048	-0.051		-0.055		-0.062	-0.055	-0.058
	(0.093)		(0.092)	(0.085)	(0.084)		(0.092)		(0.092)	(0.085)	(0.083)
RX supervision				0.021	0.030					0.002	0.010
				(0.059)	(0.058)					(0.072)	(0.071)
NP Cont Subst		-0.054	-0.058		-0.060			-0.057	-0.061		-0.061
		(0.038)	(0.038)		(0.039)			(0.039)	(0.039)		(0.040)
Noneconomic cap						-0.042	-0.041	-0.046	-0.045	-0.041	-0.043
						(0.037)	(0.037)	(0.036)	(0.035)	(0.043)	(0.043)
Observations	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909
R-squared	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099

Notes: The dependent variable in all specifications is the natural logarithm of the number of office-based physicians per 100,000 county residents. For consistency with earlier models, counties with no practicing NPs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A21: Regression Results for the Effect of Nurse Practitioner Laws on the Supply of Hospital-Based Physicians

	(1) log(MDs hospital)	(2) log(MDs hospital)	(3) log(MDs hospital)	(4) log(MDs hospital)	(5) log(MDs hospital)	(6) log(MDs hospital)	(7) log(MDs hospital)	(8) log(MDs hospital)	(9) log(MDs hospital)	(10) log(MDs hospital)	(11) log(MDs hospital)
NP Independence	0.026 (0.100)		0.023 (0.100)	0.076 (0.071)	0.075 (0.070)		0.026 (0.100)		0.023 (0.100)	0.076 (0.071)	0.075 (0.070)
RX supervision				0.135 (0.091)	0.143 (0.093)					0.135 (0.091)	0.143 (0.093)
NP Cont Subst		-0.022 (0.047)	-0.021 (0.046)		-0.035 (0.049)			-0.022 (0.047)	-0.021 (0.046)		-0.035 (0.049)
Noneconomic cap						-0.091 (0.079)	-0.092 (0.078)	-0.087 (0.080)	-0.088 (0.079)	-0.044 (0.093)	-0.035 (0.095)
Observations	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909	19,909
R-squared	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164

Notes: The dependent variable in all specifications is the natural logarithm of the number of hospital-based physicians per 100,000 county residents. For consistency with earlier models, counties with no practicing NPs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

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Table A22: Regression Results for the Effect of Physician Assistant Laws on the Supply of Office-Based Physicians

	(1) log(MDs office)	(2) log(MDs office)	(3) log(MDs office)	(4) log(MDs office)	(5) log(MDs office)	(6) log(MDs office)	(7) log(MDs office)	(8) log(MDs office)	(9) log(MDs office)	(10) log(MDs office)	(11) log(MDs office)
Remote Practice	-0.003		-0.003	0.024	0.024		-0.009		-0.009	0.019	0.019
	(0.017)		(0.017)	(0.028)	(0.028)		(0.020)		(0.020)	(0.026)	(0.026)
Quasi-remote				0.038	0.038					0.041	0.041
				(0.026)	(0.026)					(0.026)	(0.026)
PA Cont Subst		-0.004	-0.004		-0.003			-0.004	-0.004		-0.004
		(0.019)	(0.019)		(0.019)			(0.019)	(0.019)		(0.019)
Noneconomic cap						-0.042	-0.046	-0.042	-0.046	-0.050	-0.050
						(0.029)	(0.033)	(0.029)	(0.033)	(0.034)	(0.034)
Observations	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950
R-squared	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179	0.179

Notes: The dependent variable in all specifications is the natural logarithm of the number of office-based physicians per 100,000 county residents. For consistency with earlier models, counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table A23: Regression Results for the Effect of Physician Assistant Laws on the Supply of Hospital-Based Physicians

	(1) log(MDs hospital)	(2) log(MDs hospital)	(3) log(MDs hospital)	(4) log(MDs hospital)	(5) log(MDs hospital)	(6) log(MDs hospital)	(7) log(MDs hospital)	(8) log(MDs hospital)	(9) log(MDs hospital)	(10) log(MDs hospital)	(11) log(MDs hospital)
Remote Practice	0.055		0.055	0.054	0.053		0.048		0.048	0.046	0.046
	(0.035)		(0.035)	(0.037)	(0.037)		(0.035)		(0.036)	(0.036)	(0.036)
Quasi-remote				-0.002	-0.002					-0.002	-0.002
				(0.030)	(0.030)					(0.029)	(0.029)
PA Cont Subst		0.014	0.013		0.013			0.014	0.013		0.013
		(0.026)	(0.027)		(0.027)			(0.027)	(0.027)		(0.027)
Noneconomic cap						-0.059	-0.051	-0.059	-0.051	-0.051	-0.051
						(0.036)	(0.035)	(0.036)	(0.036)	(0.035)	(0.036)
Observations	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950	19,950
R-squared	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129	0.129

Notes: The dependent variable in all specifications is the natural logarithm of the number of hospital-based physicians per 100,000 county residents. For consistency with earlier models, counties with no practicing PAs are excluded. All specifications include state and year fixed effects. Additional covariates include population density, the natural logarithm of median household income, the percentage of the population identifying as black or African-American, the percentage of the population identifying as Hispanic, and the percentage of the population eligible for Medicare. Standard errors clustered by state are reported in parentheses. *** significant at 1% level; ** significant at 5% level; * significant at 10% level.

Appendix B: HPSA Regulations

CRITERIA FOR DESIGNATION OF AREAS HAVING SHORTAGES OF PRIMARY
MEDICAL CARE PROFESSIONAL(S)

Part I—Geographic Areas

A. Criteria

A geographic area will be designated as having a shortage of primary medical care manpower if the following three criteria are met:

1. The area is a rational area for the delivery of primary medical care services.

2. One of the following conditions prevails within the area:

(a) The area has population to full-time-equivalent primary care physician ratio of at least 3,500:1.

(b) The area has a population to full-time-equivalent primary care physician ratio of less than 3,500:1 but greater than 3,000:1 and has usually high needs for primary care services or insufficient capacity of existing primary care providers.

3. Primary medical care manpower in contiguous areas are overutilized, excessively distant, or inaccessible to the population of the area under consideration.

B. Methodology.

In determining whether an area meets the criteria established by paragraph A of this part, the following methodology will be used:

1. Rational Areas for the Delivery of Primary Medical Care Services.

(a) The following areas will be considered rational areas for the delivery of primary medical care services:

(i) A county, or a group of contiguous counties whose population centers are within 30 minutes travel time of each other.

(ii) A portion of a county, or an area made up of portions of more than one county, whose population, because of topography, market or transportation patterns, distinctive population characteristics or other factors, has limited access to contiguous area resources, as measured generally by a travel time greater than 30 minutes to such resources.

(iii) Established neighborhoods and communities within metropolitan areas which display a strong self-identity (as indicated by a homogeneous socioeconomic or demographic structure and/or a tradition of interaction or interdependency), have limited interaction with contiguous areas, and which, in general, have a minimum population of 20,000.

(b) The following distances will be used as guidelines in determining distances corresponding to 30 minutes travel time:

(i) Under normal conditions with primary roads available: 20 miles.

(ii) In mountainous terrain or in areas with only secondary roads available: 15 miles.

(iii) In flat terrain or in areas connected by interstate highways: 25 miles.

Within inner portions of metropolitan areas, information on the public transportation system will be used to determine the distance corresponding to 30 minutes travel time.

2. Population Count.

The population count used will be the total permanent resident civilian population of the area, excluding inmates of institutions, with the following adjustments, where appropriate:

(a) Adjustments to the population for the differing health service requirements of various age-sex population groups will be computed using the table below of visit rates for 12 age-sex population cohorts. The total expected visit rate will first be obtained by multiplying each of the 12 visit rates in the table by the size of the area population within that particular age-sex cohort and adding the resultant 12 visit figures together. This total expected visit rate will then

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be divided by the U.S. average per capita visit rate of 5.1, to obtain the adjusted population for the area.

Sex	Age groups					
	Under 5	5-14	15-24	25-44	45-64	65 and over
Male	7.3	3.6	3.3	3.6	4.7	6.4
Female	6.4	3.2	5.5	6.4	6.5	6.8

(b) The effect of transient populations on the need of an area for primary care professional(s) will be taken into account as follows:

(i) Seasonal residents, i.e., those who maintain a residence in the area but inhabit it for only 2 to 8 months per year, may be included but must be weighted in proportion to the fraction of the year they are present in the area.

(ii) Other tourists (non-resident) may be included in an area's population but only with a weight of 0.25, using the following formula: Effective tourist contribution to population=0.25x(fraction of year tourists are present in area)x(average daily number of tourists during portion of year that tourists are present).

(iii) Migratory workers and their families may be included in an area's population, using the following formula: Effective migrant contribution to population=(fraction of year migrants are present in area)x(average daily number of migrants during portion of year that migrants are present).

3. Counting of Primary Care Practitioners.

(a) All non-Federal doctors of medicine (M.D.) and doctors of osteopathy (D.O.) providing direct patient care who practice principally in one of the four primary care specialties—general or family practice, general internal medicine, pediatrics, and obstetrics and gynecology—will be counted. Those physicians engaged solely in administration, research, and teaching will be excluded. Adjustments for the following factors will be made in computing the number of full-time-equivalent (FTE) primary care physicians:

(i) Interns and residents will be counted as 0.1 full-time equivalent (FTE) physicians.

(ii) Graduates of foreign medical schools who are not citizens or lawful permanent residents of the United States will be excluded from physician counts.

(iii) Those graduates of foreign medical schools who are citizens or lawful permanent residents of the United States, but do not have unrestricted licenses to practice medicine, will be counted as 0.5 FTE physicians.

(b) Practitioners who are semi-retired, who operate a reduced practice due to infirmity or other limiting conditions, or who provide patient care services to the residents of the area only on a part-time basis will be discounted through the use of full-time equivalency figures. A 40–hour work week will be used as the standard for determining full-time equivalents in these cases. For practitioners working less than a 40–hour week, every four (4) hours (or ½ day) spent providing patient care, in either ambulatory or inpatient settings, will be counted as 0.1 FTE (with numbers obtained for FTE's rounded to the nearest 0.1 FTE), and each physician providing patient care 40 or more hours a week will be counted as 1.0 FTE physician. (For cases where data are available only for the number of hours providing patient care in office settings, equivalencies will be provided in guidelines.)

(c) In some cases, physicians located within an area may not be accessible to the population of the area under consideration. Allowances for physicians with restricted practices can be made, on a case-by-case basis. However, where only a portion of the population of the area cannot access existing primary care resources in the area, a population group designation may be more appropriate (see part II of this appendix).

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(d) Hospital staff physicians involved exclusively in inpatient care will be excluded. The number of full-time equivalent physicians practicing in organized outpatient departments and primary care clinics will be included, but those in emergency rooms will be excluded.

(e) Physicians who are suspended under provisions of the Medicare–Medicaid Anti–Fraud and Abuse Act for a period of eighteen months or more will be excluded.

4. Determination of Unusually High Needs for Primary Medical Care Services.

An area will be considered as having unusually high needs for primary health care services if at least one of the following criteria is met:

(a) The area has more than 100 births per year per 1,000 women aged 15–44.

(b) The area has more than 20 infant deaths per 1,000 live births.

(c) More than 20% of the population (or of all households) have incomes below the poverty level.

5. Determination of Insufficient Capacity of Existing Primary Care Providers.

An area's existing primary care providers will be considered to have insufficient capacity if at least two of the following criteria are met:

(a) More than 8,000 office or outpatient visits per year per FTE primary care physician serving the area.

(b) Unusually long waits for appointments for routine medical services (i.e., more than 7 days for established patients and 14 days for new patients).

(c) Excessive average waiting time at primary care providers (longer than one hour where patients have appointments or two hours where patients are treated on a first-come, first-served basis).

(d) Evidence of excessive use of emergency room facilities for routine primary care.

(e) A substantial proportion ($2/3$ or more) of the area's physicians do not accept new patients.

(f) Abnormally low utilization of health services, as indicated by an average of 2.0 or less office visits per year on the part of the area's population.

6. Contiguous Area Considerations.

Primary care professional(s) in areas contiguous to an area being considered for designation will be considered excessively distant, overutilized or inaccessible to the population of the area under consideration if one of the following conditions prevails in each contiguous area:

(a) Primary care professional(s) in the contiguous area are more than 30 minutes travel time from the population center(s) of the area being considered for designation (measured in accordance with paragraph B.1(b) of this part).

(b) The contiguous area population-to-full-time-equivalent primary care physician ratio is in excess of 2000:1, indicating that practitioners in the contiguous area cannot be expected to help alleviate the shortage situation in the area being considered for designation.

(c) Primary care professional(s) in the contiguous area are inaccessible to the population of the area under consideration because of specified access barriers, such as:

(i) Significant differences between the demographic (or socio-economic) characteristics of the area under consideration and those of the contiguous area, indicating that the population of the area under consideration may be effectively isolated from nearby resources. This isolation could be indicated, for example, by an unusually high proportion of non-English-speaking persons.

(ii) A lack of economic access to contiguous area resources, as indicated particularly where a very high proportion of the population of the area under consideration is poor (i.e., where more than 20 percent of the population or the households have incomes below the poverty level), and Medicaid-covered or public primary care services are not available in the contiguous area.

C. Determination of Degree of Shortage.

Designated areas will be assigned to degree-of-shortage groups, based on the ratio (R) of population to number of full-time equivalent primary care physicians and the presence or absence of unusually high needs for primary health care services, according to the following table:

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	High needs not indicated	**High needs indicated**
Group 1	No physicians	No physicians; or R≥5,000
Group 2	R≥5,000	5,000>R≥4,000
Group 3	5,000>R≥4,000	4,000>R≥3,500
Group 4	4,000>R≥3,500	3,500>R≥3,000

D. Determination of size of primary care physician shortage. Size of Shortage (in number of FTE primary care physicians needed) will be computed using the following formulas:

(1) For areas without unusually high need or insufficient capacity:

Primary care physician shortage=area population/3,500−number of FTE primary care physicians

(2) For areas with unusually high need or insufficient capacity:

Primary care physician shortage=area population/3,000−number of FTE primary care physicians

Part II—Population Groups

A. Criteria.

1. In general, specific population groups within particular geographic areas will be designated as having a shortage of primary medical care professional(s) if the following three criteria are met:

(a) The area in which they reside is rational for the delivery of primary medical care services, as defined in paragraph B.1 of part I of this appendix.

(b) Access barriers prevent the population group from use of the area's primary medical care providers. Such barriers may be economic, linguistic, cultural, or architectural, or could involve refusal of some providers to accept certain types of patients or to accept Medicaid reimbursement.

(c) The ratio of the number of persons in the population group to the number of primary care physicians practicing in the area and serving the population group is at least 3,000 : 1.

2. Indians and Alaska Natives will be considered for designation as having shortages of primary care professional(s) as follows:

(a) Groups of members of Indian tribes (as defined in section 4(d) of Pub.L. 94–437, the Indian Health Care Improvement Act of 1976) are automatically designated.

(b) Other groups of Indians or Alaska Natives (as defined in section 4(c) of Pub.L. 94–437) will be designated if the general criteria in paragraph A are met.

B. Determination of Degree of Shortage.

Each designated population group will be assigned to a degree-of-shortage group, based on the ratio (R) of the group's population to the number of primary care physicians serving it, as follows:

Group 1—No physicians or R>5,000.

Group 2—5,000>R≥4,000.

Group 3—4,000>R≥3,500.

Group 4—3,500>R≥3,000.

Population groups which have received "automatic" designation will be assigned to degree-of-shortage group 4 if no information on the ratio of the number of persons in the group to the number of FTE primary care physicians serving them is provided.

C. Determination of size of primary care physician shortage. Size of shortage (in number of primary care physicians needed) will be computed as follows:

Primary care physician shortage=number of persons in population group/3,000−number of FTE primary care physicians

A. Federal and State Correctional Institutions.

    1. Criteria.

Medium to maximum security Federal and State correctional institutions and youth detention facilities will be designated as having a shortage of primary medical care professional(s) if both the following criteria are met:

    (a) The institution has at least 250 inmates.

    (b) The ratio of the number of internees per year to the number of FTE primary care physicians serving the institution is at least 1,000:1.

    Here the number of internees is defined as follows:

        (i) If the number of new inmates per year and the average length-of-stay are not specified, or if the information provided does not indicate that intake medical examinations are routinely performed upon entry, then—Number of internees=average number of inmates.

        (ii) If the average length-of-stay is specified as one year or more, and intake medical examinations are routinely performed upon entry, then—Number of internees=average number of inmates+(0.3)xnumber of new inmates per year.

        (iii) If the average length-of-stay is specified as less than one year, and intake medical examinations are routinely performed upon entry, then—Number of internees=average number of inmates+(0.2)x(1+ALOS/2)xnumber of new inmates per year where ALOS=average length-of-stay (in fraction of year). (The number of FTE primary care physicians is computed as in part I, section B, paragraph 3 above.)

    2. Determination of Degree of Shortage.

Designated correctional institutions will be assigned to degree-of-shortage groups based on the number of inmates and/or the ratio (R) of internees to primary care physicians, as follows:

Group 1—Institutions with 500 or more inmates and no physicians.

Group 2—Other institutions with no physicians and institutions with R greater than (or equal to) 2,000:1.

Group 3—Institutions with R greater than (or equal to) 1,000:1 but less than 2,000:1.

B. Public or Non–Profit Medical Facilities.

    1. Criteria.

Public or non-profit private medical facilities will be designated as having a shortage of primary medical care professional(s) if:

    (a) the facility is providing primary medical care services to an area or population group designated as having a primary care professional(s) shortage; and

    (b) the facility has insufficient capacity to meet the primary care needs of that area or population group.

    2. Methodology

In determining whether public or nonprofit private medical facilities meet the criteria established by paragraph B.1 of this Part, the following methodology will be used:

    (a) Provision of Services to a Designated Area or Population Group.

    A facility will be considered to be providing services to a designated area or population group if either:

        (i) A majority of the facility's primary care services are being provided to residents of designated primary care professional(s) shortage areas or to population groups designated as having a shortage of primary care professional(s); or

        (ii) The population within a designated primary care shortage area or population group has reasonable access to primary care services provided at the facility. Reasonable access will be assumed if the area within which the population resides lies within 30 minutes travel time of the facility and non-physical barriers (relating to demographic and socioeconomic characteristics of the population) do not prevent the population from receiving care at the facility.

Migrant health centers (as defined in section 319(a)(1) of the Act) which are located in areas with designated migrant population groups and Indian Health Service facilities are assumed to be meeting this requirement.

(b) Insufficient capacity to meet primary care needs.

A facility will be considered to have insufficient capacity to meet the primary care needs of the area or population it serves if at least two of the following conditions exist at the facility:

(i) There are more than 8,000 outpatient visits per year per FTE primary care physician on the staff of the facility. (Here the number of FTE primary care physicians is computed as in Part I, Section B, paragraph 3 above.)

(ii) There is excessive usage of emergency room facilities for routine primary care.

(iii) Waiting time for appointments is more than 7 days for established patients or more than 14 days for new patients, for routine health services.

(iv) Waiting time at the facility is longer than 1 hour where patients have appointments or 2 hours where patients are treated on a first-come, first-served basis.

3. Determination of Degree of Shortage.

Each designated medical facility will be assigned to the same degree-of-shortage group as the designated area or population group which it serves.