Does Scope of Practice Affect Mobility of Nurse Practitioners Serving Medicare Beneficiaries?

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Abstract

The shortage of Nurse Practitioners (NPs) in the United States has widespread effects on the access, quality, and cost of care for an aging population across both metro and rural areas. Some states and policymakers try to combat these challenges by expanding the NPs' scope of practice or autonomy to order testing, prescribe medications, and to diagnose, initiate, and manage patient treatments. We aim to estimate the impact of expanded NP scope of practice on the mobility decisions of NPs serving Medicare beneficiaries. Since these expansions are state level, it is crucial to know if the legal differences in the job roles of NPs affect where they decide to both live and practice. We identify the location decision of individual NPs between 2014 to 2017 by using their National Provider Identifier (NPI) from the Part D Prescriber Public Use File (PUF) data. Then, we examine if there was an increased movement of NPs from restrictive practice to full practice states. We find that NPs practicing in restrictive practice states are both 0.46 percent more likely to move and 5.33 percent less likely to move to other restrictive states. Our estimates display NP's preference for practicing in states with a full scope of practice autonomy that allows them to perform independently to the extent of their education and training.

Keywords: XXX, XXX, XXX
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1 Introduction

The shortage of Nurse Practitioners (NPs) in the United States has widespread effects on the access, quality, and cost of care for an aging population across both metro and rural areas. NPs are on the front-line of this ever-increasing shortage of primary care. Therefore, some states have expanded the scope of practice for nurse practitioners. In these states, nurses can exercise the full extent of their training and education in various roles of primary care, such as ordering testing, prescribing medication, and diagnosing, initiating, and maintaining patient treatment. However, little is known about if these scope of practice policy changes are incentivizing NPs to relocate to areas in which they have the full range of practice autonomy.

We estimate the impact of expanded NP scope of practice on the mobility decisions of NPs who are serving Medicare beneficiaries enrolled in the Part D prescription drug program. These expansions are at the state-level regulation. Therefore it is crucial to know if the legal differences in the job roles of nurse practitioners affect where they decide to both live and practice. We identify the location decision of individual NPs between 2014 to 2017 by using their National Provider Identifier (NPI) from the Part D Prescriber Public Use File (PUF) data. Then, we examine if there is an increased movement of NPs from restrictive practice to full practice states to elicit direction and magnitude of mobility decisions.

Using a regression framework, we first determine if NPs from states with the restricted or full scope of practice are more likely to move out of state. We find that NPs that work in the restrictive scope of practice states is 0.46 percent more likely to relocate than nurses working in states with full job autonomy. Though this initial movement decision is insightful, we are interested in not only which subgroup is more likely to move, but where nurses are moving. This is an essential distinction for policymakers because it will determine if these policy differences are driving the location decision of NPs during a period of increasing primary care shortages. Using our regression framework, we find that NPs are 5.33 percent less likely to relocate to states that maintain restrictive rules regarding NP scope of practice.

These estimations provide crucial insight for both researchers and policymakers regarding how the ability to operate independently affects the mobility decision of nurses. Broadening the scope of practice and allowing NPs to act independently and without complicated contracts with primary care physicians can attract NPs. Therefore, if a state wants to attract more NPs

to offset primary care shortages, expanding the scope of practice can be a viable policy option.

Section 2 contains a review of the relevant literature. Section 3 describes the data sources, methodology, and research framework. Section 4 outlines the results. Section 5 discusses policy implications and concludes.

2 Literature

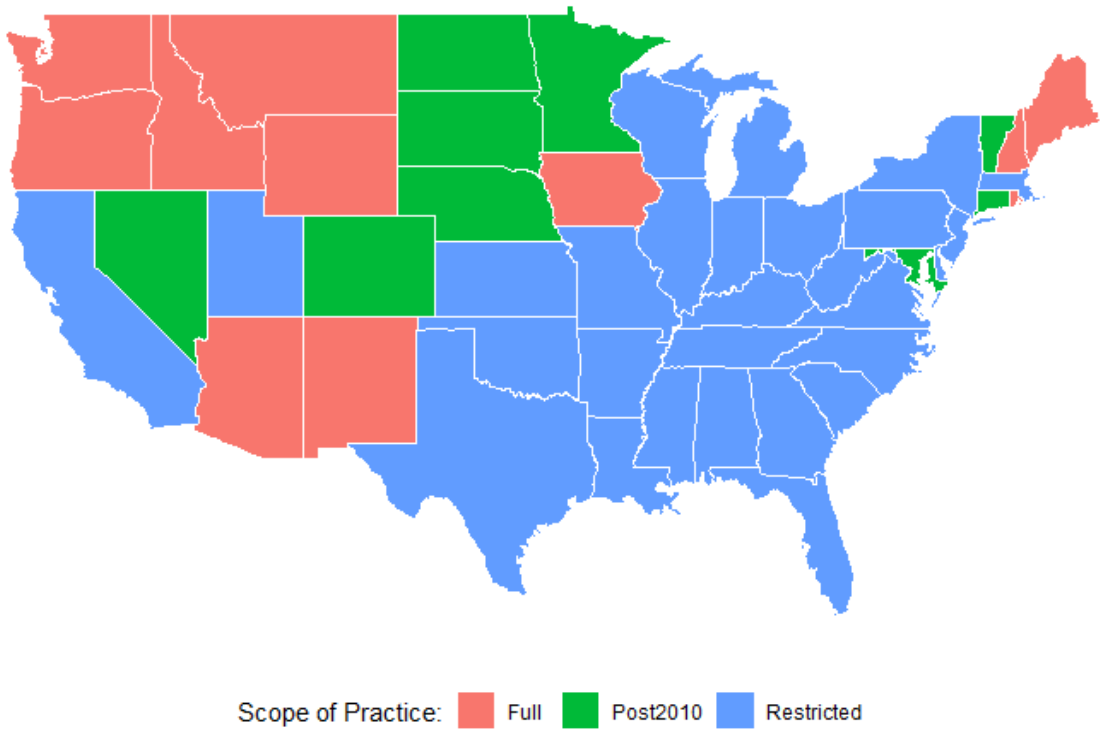
Pigou (1938) and Stigler (1971) have laid the contradicting[1] theoretical groundwork on the domain of causes and consequence of regulation. Pigou (1938) defines regulations as a positive policy tool that can address market failures, monopoly powers, and externalities, along with other goals of the benevolent policymakers to prompt socially superior outcomes. Stigler (1971), however, contradicts Pigou by defining regulation as the outcome that serves the special-interests and rent-seeking behavior of industry leaders, often at the expense of competing groups such as workers, entrants, and other industries. Hence, the regulations subdue the competitors and raise the profits for industry incumbents, which creates higher market power and profit. These outcomes of regulations are socially inefficient.

The Association of Medical Colleges has consistently reported that the demand for physician care is outpacing medical school enrollments, and they expect the projected shortage of physicians to reach 100,000 by 2030 (AMC, 2020). With the increased demand for primary care and labor supply shortages, more NPs are acting as primary caregivers, particularly in states with full practicing authority. This full practice authority represents being able to work in accordance with one's level of education, training, and licensure Kandrack et al. (2019). Figure 1 depicts the states with the full or restrictive scope of practice. Table 1 contains definitions of restricted, reduced, and full scope of practice for NPs, these definitions have been designated by the American Association of Nurse Practitioners (Klein, 2005). In states with a full practice, NPs are allowed to order testing, prescribe medication and controlled substances, and initiate and managed diagnosis and treatment of patients. Restricted or reduced practice states instill barriers that restrict the scope of services NPs may provide, which can lead to many additional problems for the medical market such as difficulty scheduling appointments, longer

[1] Hall and Shakya (2019) try to reconcile these two contradicting theories and validate an inverted U-shaped relation of regulations to industry growth. In contrast, Scarcioffolo et al. (2020) exhibit some regulations can be expressive without the significant effects in the industry.

waiting periods for routine visits, higher healthcare costs, and higher administrative costs for some physician practices (Fairman et al., 2011; Pittman and Williams, 2012; Traczynski and Udalova, 2018).

Figure 1: Scope of Practice for Nurse Practitioner



Notes: Post2010 represents the state that became a full scope of practice after 2010. These states are Colorado (2010), Hawaii (2010), North Dakota (2011), Vermont (2011), Nevada (2013), Connecticut (2014), Minnesota (2014), Nebraska (2015), Maryland (2015), and South Dakota (2018). Enclosed in the parentheses shows the corresponding year when the state became full scope of practice.

Table 1: Scope of Practice Regime Definitions

Restricted Practice	Reduced Practice	Full Practice
There are state laws regarding the practice and licensure of NPs that require supervision, delegation, of team management by another health provider in order to engage in at least one element of NP practice	There are state laws regarding the practice and licensure of NPs that require collaboration or written practice agreements with another health provider in order to engage in at least one element of NP practice	State laws regarding the practice and licensure of NPs allow all NPs to order testing, prescribe medications, prescribe controlled substances, and initiate and manage diagnosis and treatment of patients

NPs are considered advanced practice clinicians, meaning that much like physician assistants and advanced practice registered nurses, they have post-graduate medical training, with either a Masters of Science in Nursing or Doctor of Nursing Practice degree, but do not attend a

medical school or go through the same residency process as physicians. Both physicians and NPs can choose specializations in medicine, and while most physicians elect to specialize in lucrative fields such as pediatrics, cardiology, obstetrics, etc. over 80 percent of NPs choose to focus on general practice medicine for the primary care setting (AANP). The Office of Technology Assessment of the U.S. Congress first began assessing the quality of NP care in 1986 and found "NPs performed as well as physicians with respect to patient outcomes, proper diagnoses, management of 'indicator' medical conditions, frequency of patient hospitalization, and patient satisfaction" (U.S. Congress, Office of Technology Assessment, 1986).

The American Medical Association is strongly against expanding the NP scope of practice, citing concerns for patient safety for NPs operating without physician oversight (Iglehart, 2013). In fact, increased political spending by physician interest groups raises the probability that a state will maintain the restrictive scope of practice regulations on NPs (McMichael, 2017). Various medical studies have found, however, that NPs provide a level of care that is similar in quality to physicians (Laurant et al., 2005; Lenz et al., 2004; Mundinger et al., 2000; Swan et al., 2015). Hughes et al. (2015) uses Medicare patient data to compare the performance of NPs and physician assistants to critically analyze the hypothesis that NPs are sufficient for simple general care but unprepared for more complicated medical needs. They found that NPs provided similar care to physicians in all but the rarest cases. NPs ordered more imaging than physicians for rare diagnoses, while physicians order more additional imaging for routine ailments such as sinusitis.

Stronger regulations of nurse practitioners are associated with higher prices for general medical visits for children, yet there was no difference in infant mortality of malpractice, which is thought to be measures of health care quality (Kleiner, 2016). NP scope of practice expansions may also serve as a cost-saving measure, as states with a higher ratio of primary care to patients experience lower Medicare and Medicaid expenditures (Starfield et al., 2005; Timmons, 2017). With recent labor market shortages, the number of registered nurses who obtain graduate degrees and nurse practitioner licenses has swelled, and in the early 1990s, they were granted the ability to even bill Medicare at 85 percent of physician fees (Balanced Budget Act of 1997, 1997; Spratley et al, 2002). Areas with the least access to primary care, such as rural or impoverished counties, are better able to maintain the wage rate of NPs relative to physicians,

meaning that the increased scope of practice allowing NPs to act independently provides crucial sources of primary care access to underserved areas and has been shown to reduce obesity and diabetes (Gaglioti et al., 2016; Grumbach et al., 2003; Lenz et al., 2004; Martin, 2000; Perry, 2009; Stange, 2014).

Policy discussions regarding the scope of practice expansions are prevalent through many facets of the medical field beyond NPs, including dental hygienists, midwives, and physician assistants. Using dental records of Air Force personnel overtime, Kleiner and Kurdle (2000) found that stricter scope of practice regulations for dental hygienists rose the price of dental services and the income of dentists, but did not lead to improved oral health. Lanfelier et al. (2016) later did find increased dental health for areas with the less restrictive scope of practice, as these areas had increased dental care utilization and lower probability of teeth removal for decay or disease. This leads to the argument that the scope of practice restrictions are preventing dental hygienists from performing at the level of their education and training, which is penalizing access to oral healthcare for many underrepresented populations (Manski et al., 2015). Similar studies in midwifery found that states with the full scope of practice for certified midwives saw improvements in infant birthweight (Markowitz et al., 2017).

3 Data and Methods

3.1 Data

In our analysis, we track the state-level mobility of the nurse practitioners from 2013 to 2017 using National Provider Identifier (NPI) from the Part D Prescriber Public Use File (PUF). Our analysis only includes the subset of nurse practitioners who serve beneficiaries enrolled in the Medicare Part D prescription drug program (i.e., approximately two-thirds of all Medicare beneficiaries).

First, we merge the data of NPs from 2013 and 2014 to keep the data of NPs in 2013 whose data is available in 2014. Some NPs from 2013 could change their specialty, and we drop these cases. For each NP, we compare their state of practice to create a new indicator variable of mobility, and we will refer to this new indicator as Move_{it+1}. If the state of practice is the same, then we infer that the NP remained in the same state for the years 2013 and 2014. If the state of practice is different in 2014 from 2013, we infer that the NP moved to a different

state. Second, we utilize Table (1), which provides detail of the scope of practice for each state to identify if a state has either the restricted or full scope of practice for NPs. Restricted scope of practice in our assessment includes states that are identified as either restricted or reduced practice as defined within our table definitions. We use Regime_{it}, and Regime_{it+1} for the scope of practice regime for each year and succeeding year. Third, we repeat this step, for the pair of the years 2014-2015, 2015-2016, and 2016-2017, to develop a panel data.

3.2 Model

We consider NPs in two time periods t and $t+1$. At time period t, an NP, indexed as i, can be in the state that allows restrictive scope of practice or state that allows full scope of practice. We define this as Regime_{it} and can be expressed as:

$$\text{Regime}_{it} = \begin{cases} 1 \text{ Restrictive or reduced scope of practice state at time } t, \\ 0 \text{ Full scope of practice state at time } t. \end{cases}$$

Each NP can decide to move to a different state in next time period $t+1$ or remain in the same state, given as Move_{it+1}:

$$\text{Move}_{it+1} = \begin{cases} 1 \text{ if individual } i \text{ moved to different state at time } t+1, \\ 0 \text{ if individual } i \text{ remained in same state at time } t+1. \end{cases}$$

In time period $t+1$, and NP can be in the same state or a different state while the regime of scope of practice can remain same as previous period or can be changed. Let's express state's regime of scope of practice as Regime_{it+1}:

$$\text{Regime}_{it+1} = \begin{cases} 1 \text{ Restrictive or reduced scope of practice state at time } t+1, \\ 0 \text{ Full scope of practice state at time } t+1. \end{cases}$$

We assume that Regime_{it} can predict Move_{it+1}, and Move_{it+1} can predict Regime_{it+1} as:

$$\text{Regime}_{it} \longrightarrow \text{Move}_{it+1} \longrightarrow \text{Regime}_{it+1}$$

3.3 Effect of Scope of practice Regime on the Mobility of Nurse Practitioners

We are interested in quantifying if there exists an effect of the scope of practice regime on the mobility of NPs. If the occupational licensing restrict the scope of practice of NPs, then these NPs are more likely to move to a different state. Therefore, we would expect the following quantity to be a positive number suggesting, NPs in the restricted scope of practice states are more likely to move to different states than NPs from states that allow the full scope of practice.

$$E\left[\text{Move}_{it+1} = 1 \,|\text{Regime}_{it} = 1\right] - E\left[\text{Move}_{it+1} = 1 \,|\text{Regime}_{it} = 0\right] \tag{1}$$

The quantity in equation (1) can be estimated using the regression below.

$$\text{Move}_{it+1} = \alpha_i + \beta_i \text{Regime}_{it} + \gamma_i + \varsigma_t + \varepsilon_{it} \tag{2}$$

where, β_i estimates the quantity in equation (1), γ_i and ζ_t are additive individual state and year fixed effects respectively to account for the unobserved heterogeneity associated with state and year. The estimates are robust-to heteroskedasticity.

3.4 Where do Nurse Practitioners Move?

The equation (2) allows us to estimate the effect of scope of practice regime on the Mobility of NPs. However, more interesting aspect to study would be to answer where do NPs move? Do they move to state that allows full scope of practice or not? To answer, this we can estimate the following quantity:

$$E\left[\text{Regime}_{it+1} = 1 \,|\text{Move}_{it} = 1\right] - E\left[\text{Regime}_{it+1} = 1 \,|\text{Move}_{it} = 0\right] \tag{3}$$

The quantity in equation (3) can be estimated using the regression below.

$$\text{Regime}_{it+1} = \alpha_i + \beta_i \text{Move}_{it} + \gamma_i + \varsigma_t + \varepsilon_{it} \tag{4}$$

where, β_i estimates the quantity in equation (1), γ_i and ζ_t are additive individual state and year fixed effects respectively to account for the unobserved heterogeneity associated with state and year. The estimates are robust-to heteroskedasticity.

4 Results

We begin our analysis with the time-series overview of NPs in Table (2). The column (1) provides total NPs for each year, and column (2) provides the numbers of NPs that we could match in the following year. For example, let's examine the year 2014. In 2014, there were 109,105 NPs, and 90,406 NPs were matched in this year from 2013, or we could not match 109,145-904,406=18,739 NPs. There can be several reasons; NPs simply stopped practicing, retired, deaths, or change their specialty from 2013 to 2014. Also, there may be new NPs entered in the market in 2014.

Table 2: Summaries of Medicare Beneficiaries Serving Nurse Practitioners Mobility

Year (1)	Total NPs (2)	Matched NPs (3)	Restricted (4)	Move (5)	F$\rightarrow F$ (6)	F$\rightarrow R$ (7)	R$\rightarrow F$ (8)	R$\rightarrow R$ (9)
2013	97,693	-	-	-	-	-	-	-
2014	109,105	90,406	76,572	1,518	130	154	318	916
2015	122,793	101,145	82,092	1,647	183	232	365	867
2016	137,777	113,999	90,265	1,538	179	233	326	800
2017	153,922	128,145	101,949	1,833	218	285	392	938

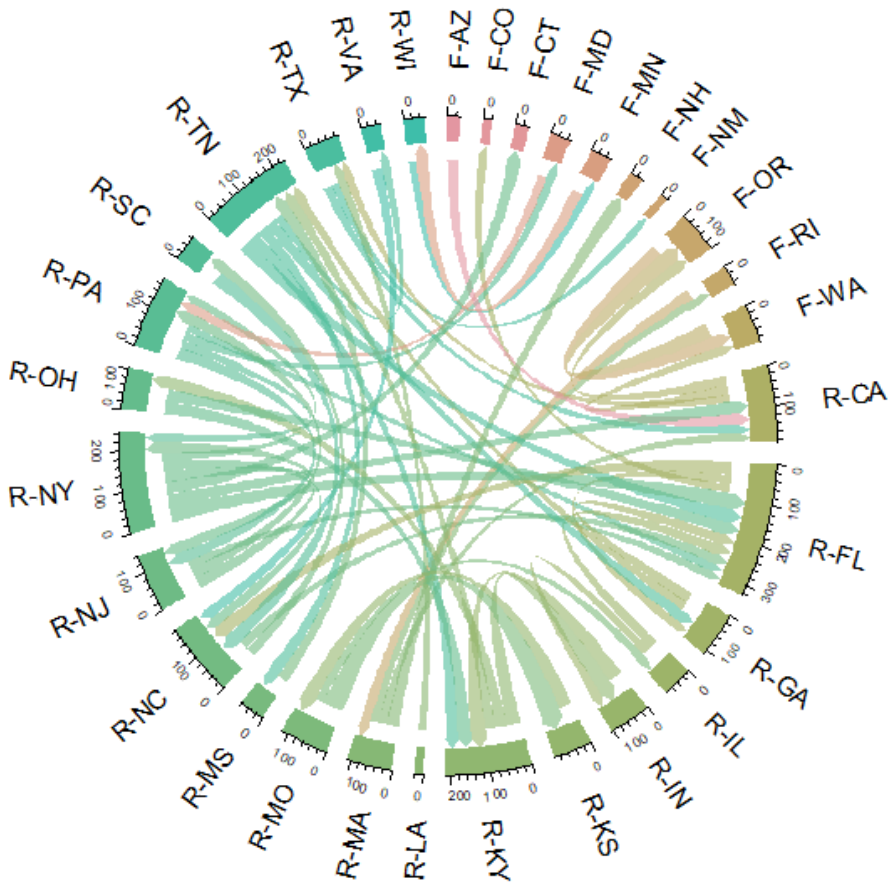
Notes: In column (6) to (9), "F" represent the states that allow the full scope of practice, and "R" represent states with the restrictive scope of practice.

Table (2), column (3) shows the numbers of matched nurses in the restrictive scope of practice states. Column (4) represents the numbers of match NPs who moved from the previous year. For example, Out of 90,406 matched nurses, 76,572 were in restrictive scope of practice states in 2014, and 1518 NPs moved to different states from 2013 to 2014. The columns (6) to (9) shows the details of NPs mobility. For example, in column (6), out of 1518 NPs, 130 NPs move from full sop states to other full sop states. Column (7) shows 154 NPs were in full sop states in 2013 and moved to restrictive sop states in 2014. Column (8) shows 318 NPs in restrictive sop states in 2013 move to full sop states in 2014. Finally, column (9) shows 916 NPs in restrictive sop states in 2013 move to other restrictive sop states in 2014.

Figure 2 compliments Table (2) by depicting a graphical representation of aggregated interstate movement of NPs from 2013-2017. In this chord-diagram, the full scope of practice states are prefixed by "F-" and restricted scope of practice states are prefixed by "R-" on the two-letter abbreviation of state names.

For example, R-FL represents the state of Florida. The prefix "R-" represents Florida has

Figure 2: Mobility of NPs, State-level, (2013-2017)



Notes: "F-" represent states that allow the full scope of practice, and "R-" represent the states with the restrictive scope of practice. If less than 30 NPs move, we suppress those records for the purpose of graphical illustration.

the restricted scope of practice regime for NPs. If we closely examine, there are two types of arrows, arrows heads that touch the chord-label represents inflow and arrows that branch out outflow. When we look at the state of Florida, we see many nurses move into Florida, but few leave. If we look at the state of New York, "R-NY", which also has the restricted scope of practice, we see more NPs move-out that come into New York. Furthermore, we would also see that there are many interstate movements of NPs within the restricted scope of practice states; however, there is less outflow of NPs from the full scope of practice states.

4.1 Impacts of scope of practice regime on NP's Mobility

Table (3), columns (1)-(5) provides five different regression specifications of NPs decision to move during the next period based on the scope of practice regime that the NP belongs to during

their current period. The regression output in column (5) exhibits the results of the equation (2). The estimates in column (1) is a simple regression. Column (2) is a simple regression with heteroskedasticity robust standard errors. Column (3) extends by including year fixed effects. All these estimates are negative, suggesting NPs who practice in restrictive states are less likely to move, compared to NPs who practice in states with the full scope of practice. However, this doesn't account for inherent state-level differences. When we include state fixed effects in column(4) and both state and year fixed effects (5), the sign flips to suggests that NPs who practice in restrictive states are more likely to move, compared to NPs who practice in the state with the full scope of practice.

Table 3: Effect of scope of practice regime on the Mobility of Nurse Practitioners, (2013-2017)

	Mobility of Nurse Practitioners, Move_{it+1}				
	(1)	(2)	(3)	(4)	(5)
Regime_{it}	-0.0055***	-0.0055***	-0.0056***	0.0067***	0.0046**
	(0.0005)	(0.0005)	(0.0005)	(0.0020)	(0.0021)
Constant	0.0195***	0.0195***			
	(0.0004)	(0.0005)			
R^2	0.0003	0.0003	0.0005	0.0016	0.0017
Adj-R^2	0.0003	0.0003	0.0004	0.0015	0.0016
$F-$stat	134.7***	110.4888	117.4888	11.40***	5.028**
	(1; 433693)	(1; 433693)	(1; 433690)	(1; 433643)	(1; 433640)
HC2		✓	✓	✓	✓
Year FE			✓		✓
State FE				✓	✓

Notes: The 1%, 5% and 10% level of significance are given as ***, **, and * respectively. $\text{Regime}_{it} = 1$ represents states that allow NPs for restrictive scope of practice at time period t, $\text{Move}_{it+1} = 1$ indicate NPs decision to move to different state in time period $t + 1$. HC2 represents Heteroskedasticity consistent standard errors. Number of observation is 433,695.

4.2 Where do NPs move?

Next, we show the estimates of if these NPs who move are likely to move to states that allow the full scope of practice or not. Table (4) follows the same structure as Table (3). The estimates in column (1) to (3) show NPs are about 11.8% less likely to move to states that allow the restrictive scope of practice. The estimates of column (4) and (5) suggest that NPs are about 5.33% less likely to move to states that allow the restrictive scope of practice.

Table 4: Choice of Scope of practice by Nurse Practitioners, (2013-2017)

	Choice of Scope of practice by Nurse Practitioners, Regime_{it+1}				
	(1)	(2)	(3)	(4)	(5)
Move_{it}	-0.1179***	-0.1179***	-0.118***	-0.0527	-0.0533***
	(0.005)	(0.006)	(0.006)	(0.0073)	(0.0073)
	0.7950***	0.7950***			
	(0.0006)	(0.0006)			
R^2	0.0013	0.0013	0.002	0.939	0.939
Adj-R^2	0.0013	0.0013	0.002	0.939	0.939
$F-$stat	546.5***	411***	413.4***	52.56***	53.38***
	(1; 433693)	(1; 433693)	(1; 433690)	(1; 433643)	(1; 433640)
HC2		(Y)	(Y)	(Y)	(Y)
Year FE			(Y)		(Y)
State FE				(Y)	(Y)

Notes: The 1%, 5% and 10% level of significance are given as ***, **, and * respectively. $\text{Regime}_{it+1} = 1$ represents states that allow NPs for restrictive scope of practice at time period t, $\text{Move}_{it+1} = 1$ indicate NPs decision to move to different state in time period $t + 1$. HC2 represents Heteroskedasticity consistent standard errors. Number of observation is 433,695.

5 Conclusion

In this study, we analyze how a state's NP scope of practice regime influences NP moving and location decisions. Although there has been a significant body of research on the effects of the scope of practice on quality and wages, to our knowledge, no studies have focused on the intrastate movement of NPs in response to differences in their legal ability to work independently. Our regression framework, coupled with Medicare Part D prescription drug program information on NPs serving Medicare beneficiaries, allows us to track and analyze individual NPs between 2013 and 2017.

We find that NPs in states with the restrictive scope of practice laws that require NPs to work in complicated relationships with physicians were 0.46 percent more likely to move in a given time period. Not only were NPs residing in restrictive practice sates more likely to move, but they were also 5.33 percent less likely to relocate to similarly restrictive states and instead display a preference for moving to states with the full scope of practice autonomy.

The US is facing a drastic shortage of primary care physicians that are only projected to be exacerbated over the next decade as physicians are more likely to pursue more lucrative specializations. To address the lack in primary care, some states have granted NPs full scope

of practice autonomy, which allows them to work independently and to the extent of their education and training. Our study finds that states who have these increased scopes of practice are more enticing to NPs from restrictive states, as NPs from restrictive states are more likely to both move and, more specifically, to move to a state which grants them a wider array of job functions.

Much of the current literature has found that NPs provide similar levels of primary care across various metrics in all but the rarest of cases. States faced with the labor supply shortage of primary care physicians who have not adopted full scope of practice autonomy for NPs would benefit from changing their policies by both having a qualified set of NPs in their own state now able to work to the full extent of their ability and also by reducing out of state movement of their NPs as well as potentially attracting NPs from other restrictive states. This is crucial for impoverished and rural areas that may not be able to sustain the wages of primary care physicians in each municipality.

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