The Effect of Nurse Practitioner Scope of Practice on Health Care Utilization and Health: Evidence from Law Changes and Patient Moves

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Abstract

About half of US states require nurse practitioners (NPs) to have a contractual relationship with a physician in order to provide health care. Whether such constraints on NP scope of practice benefit patients has been unclear. We use Medicare and commercial insurance claims data along with law changes and patient moves to estimate the effect of expanding NP scope of practice on the quantity, quality, and price of health care. We find no evidence patients are harmed and some evidence of health benefits for Medicare beneficiaries, with no effect on access to outpatient care or long-term effect on office visit prices.

Keywords: Nurse practitioners, Scope-of-practice laws, utilization, health outcomes, occupational licensing
JEL Codes: I11, I18, J44

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1 Introduction

Professional licensing and quality-centric regulation generally balance a distinct trade-off. Because quality may be hard for consumers to discern, licensing could guarantee a baseline level of quality. Alternatively, licensing regimes create a barrier to entry, and may restrict access to services and competition among service providers. As a second-best result, the optimal policy balances the former against the latter.

The main policy lever for medical professional licensing in the US is the delineation of the scope of practice (SOP) legally available to medical professionals with different levels of training. Recent policy advocacy has focused on expanding the scope of practice available to non-physician health care providers, like nurse practitioners (NPs). As of January 2018, NPs could practice fully independently, i.e., without state-mandated physician supervision or a contractual relationship with a physician in just under half of the states in the US (Pearson, 2004-18). Expanding NP scope of practice to allow for full independence will relax a constraint that limits the circumstances under which NPs can treat patients. Relaxing this constraint may allow firms to use a closer to optimal mix of labor to provide health care, potentially lowering the cost of care, increasing the quantity of health care supplied, allowing provision of care in more accessible locations, and increasing the quality of care provided (Adams & Markowitz, 2018; Gilman & Koslov, 2014; Xue & Intrator, 2016). Opponents of expanded scope of practice, like the American Medical Association, argue that without state mandated collaboration between NPs and physicians, quality of care will decline, and patients will be harmed (Iglehart, 2013).[1]

We measure the consequences of recent reforms to medical licensing in the United States that increased NPs scope of practice using up to 17 years of Medicare administrative data and 9 years of commercial health insurance claims. Together these data allow us to accurately measure health care utilization, health care prices, and, most importantly, health for patient populations that comprise a large portion of health care spending. These outcomes allow us to measure whether expanded

[1]See also, Maria Castellucci, December 14, 2017, "Advanced practitioners oppose AMA effort to limit their practice authority" *Modern Healthcare* and AMA policy "Independent Practice of Medicine by Advanced Practice Registered Nurses" H-35.988, last modified in 2018.

scope of practice in fact harms patients' health as its opponents suggest, whether it leads to a sufficient increase productivity or competition to lower prices, and to test for underlying mechanisms.

We estimate the effect of expanding NP scope of practice to allow for full independence using both state law changes in a difference-in-differences framework, and a patient mover design that exploits patient moves between states with different scope of practice laws conditional on the effect of moving between states with the same scope of practice laws. The difference-in-differences strategy estimates a policy relevant parameter, i.e., what happens to people in states that expand NP scope of practice. The mover analysis complements the difference-in-differences model by allowing us to check if the results of a quite different estimation strategy show qualitatively similar effects of scope of practice expansion on patient health. The mover approach is particularly useful in this setting because it may take some time for health care providers to re-organize in response to the relaxed scope of practice constraint. For example, recent works suggests that effects on NP self-employment and hours worked do not appear until about 12 years after the law change (Markowitz & Adams, 2020).[2] So if there are any negative effects of scope of practice changes, it may take years to be able to detect them. However, even if it takes the supply side some time to adjust, Finkelstein *et al.* (2016) find that demand for health care services adjust quickly when patients move; so the mover analysis reflects outcomes in the new, broader scope of practice equilibrium.

We find that expansions of NP scope of practice that allow nurse practitioners to provide care independently have not harmed patient safety, contrary to the concerns of organizations like the American Medical Association. In particular, we find no evidence that law changes that expanded NP scope of practice increased inpatient admissions, ER visits, readmissions, deaths, or measures of disease progression for diabetes and hypertension, which all would be consistent with worse patient health. In fact, inpatient admissions and inpatient spending in the over-65 population actually fall significantly a few years after NP scope of practice is expanded, which is consistent with improved health. These null effects are not due to a lack of power and allow us to reject small to

[2]This paper is based on 5 waves of a survey that occurs about every four years so the effects 12 years out are based on relatively few state law changes and the coefficients for each lag of the law changes are imprecisely estimate, so we interpret their results as suggestive of the timing.

moderate increases in inpatient care and ER visits. We find evidence of short-term reductions in average office visit prices following the law changes, but no persistent effect, which is inconsistent with increased competition from NPs or lower costs of production driving down prices. However, we do find suggestive evidence that allowing NPs full independence caused a decrease in opioid use.

A plausible mechanism for these limited health improvements is an increase in the supply of outpatient care or access to care by NPs, which should result in more outpatient visits or prescriptions. However, we find the law changes did little increase the number of office-based visits, number of filled prescriptions, and prescription spending. Because health outcomes linked to diabetes and hypertension are not affected by NP scope of practice, we do not think the mechanism for diminished inpatient hospitalization is improved care for these chronic conditions. Finally, because the event study design for inpatient stays indicates that the effect is not temporary, we do not think that the effect on inpatient stays can be attributable to temporary disruptions to the structure of health care organizations.[3]

NPs are an important source of care in rural areas (Graves *et al.*, 2016), and expanding their scope of practice could help provide primary care to the 80 million Americans who live in health care provider shortage areas (Health Resources & Services Administration, 2020). This is particularly important because the lack of access to primary care has grown over time (Health Resources & Services Administration, 2013, 2019). Other research, such as McMichael *et al.* (2019), has linked NP regulation to excess use of emergency rooms to access care. We check if the evidence of limited effects on access to care holds in places where we hypothesize expanded scope of practice may be more important, such as rural areas, primary care physician shortage areas, and counties where NPs are a large share of providers. We find outpatient care does not increase significantly in those areas relative to areas where we expect the effect to be smaller, but we do see relatively larger declines in inpatient utilization in some of these areas.

Estimates for moves from states with narrow scope of practice to states with full independence

[3]See Ritter *et al.* (2020) for a discussion of contracting and organizational burdens for NP providers.

also allow us to to reject moderate increases in inpatient admissions, ER visits, and readmissions, which also indicates expanding NP scope of practice does not harm patients. Although, we can only reject fairly large increases in mortality. This design does show evidence of effects on visits by the type of provider (NP vs. PCP), which is consistent with the law changes affecting practice patterns or patient utilization of providers in the longer term.

The results for the mover and difference-in-differences estimation strategies are consistent for many outcomes. For example, the magnitude of the effect of moving from states with restricted practice to states with full independence on inpatient care and ER visits is very similar to the point estimates in the difference-in-differences design. As would be expected, the effect of moves to states that expanded scope of practice the earliest on inpatient care are larger than the long term effects in the difference-in-differences analysis. The results of the two designs differ for some outcomes like office visits by type of provider. It is plausible the effects the mover design picks up for office visits are driven by supply side adjustments that take some time to occur. That said, there are a number of reasons the results of the mover and difference-in-differences designs could differ to some degree. These two empirical approaches require different assumptions, the set of states identifying the key parameters in the mover analysis is much broader than the set that change their laws during the sample period, states differ in how tightly their SOP laws constrain practice which is a potential source of heterogeneity in treatment effects across states, and movers be could differentially affected by scope of practice expansions than non-movers.

The lack of evidence of harm to patients from expanding NP scope of practice laws across both identification strategies paired with some limited evidence of health benefits suggests states do not need to limit NPs' scope of practice in order to protect patients. The fact that a population that is as medically complex as Medicare beneficiaries is not harmed by expanded scope of practice suggests younger, less medically complex populations will also not be injured. That said, by and large the two identification strategies produce null effects for most outcomes. This suggests some limits on how tightly scope of practice law constraints bind firms.

The licensing of medical professionals, and state regulation of occupations generally, has long

been a subject of interest to economists. Recent studies have exploited state law changes using difference-in-differences designs to assess the consequences of scope of practice reform (Alexander & Schnell, 2019; Hamilton III, 2017; Kleiner *et al.*, 2016; McMichael, 2018; Stange, 2014; Timmons, 2017; Traczynski & Udalova, 2018). That work found mixed effects of expanding NP scope of practice on health care use (Hamilton III, 2017; Timmons, 2017; Traczynski & Udalova, 2018), lower prices for well-child visits (Kleiner *et al.*, 2016), reduced use of opioids (Hamilton III, 2017; McMichael, 2018), increased prescribing of psychiatric drugs in under-served areas (Alexander & Schnell, 2019), and some evidence of health benefits in the form of reduced suicide rates and better self-reported mental health in underserved areas (Alexander & Schnell, 2019) and reduced ER visits for ambulatory sensitive conditions (Traczynski & Udalova, 2018). There is evidence that expanding NP scope of practice has additional benefits including reduced administrative burdens (Traczynski & Udalova, 2018) and lower cost episodes of care involving retail clinics (Spetz *et al.*, 2013).

This subject generally, and comparisons between care provided by NPs and MDs in particular, has also been studied extensively by health services and medical researchers. For example, in Kinnersley *et al.* (2000), patients in the United Kingdom were randomly assigned to either a nurse practitioners or general practitioners, and the authors' found that along many dimensions, such as patient satisfaction and incidence of referrals and prescriptions, the care was similar; among others, such as duration of the visit and the health information conveyed to the patient, nurse practitioners provided more care. Recently, Neprash *et al.* (2020b) documented some cross-sectional differences between urban and rural NPs, and Neprash *et al.* (2020a) found that NPs and general practice physicians provide similar kinds of care in the main. For systematic reviews of the literature from the health services or medical researcher perspective see Horrocks *et al.* (2002); Xue *et al.* (2016).

The most closely related prior work in the economic literature to ours is Hamilton III (2017); Traczynski & Udalova (2018); Stange (2014) who use difference-in-differences designs and state law changes to study the effect of increases in NP scope of practice that allow NPs to practice fully independently (Traczynski & Udalova, 2018) or prescribe controlled substances (Hamilton III,

2017; Stange, 2014) on health care utilization (Hamilton III, 2017; Traczynski & Udalova, 2018; Stange, 2014), prices (Kleiner *et al.*, 2016; Stange, 2014), and health (Hamilton III, 2017; Traczynski & Udalova, 2018) largely using the Medical Expenditure Panel Survey.[4]

Our paper makes makes a number of contributions relative to this prior work. We use two large administrative claims data sets rather than survey data, which plausibly provides more accurate measures of the outcomes of interest and increases the statistical power to detect effects.[5] Most importantly, the data give us the ability to measure whether full independence increases mortality rates, reduces the effectiveness of care for chronic conditions, and results in increased inpatient care and ER visits. The large size of the data is key for being able to rule out meaningful declines in health after NP scope of practice increases. The Medicare sample is also valuable because Medicare beneficiaries are quite medically complex and thus a population where harm from lower quality care would be more likely to be detectable. We are also able to measure effects on a much wider range of prices than in past work and show increased scope of practice does not decrease spending via price decreases. Finally, the administrative data allow us to implement the mover identification strategy, which allows us to show that expanded scope of practice does not harm patients even after the supply side has had a significant amount of time to adjust to the loosened restrictions. This is particularly important in this context, because if NP practice patterns do not change quickly, it make take some years to detect any health effects of expanded scope of practice.

The trade-offs in licensing for medical professionals are symptomatic of the arguments made for a broader range of professions. The growth in professional licensing across industries and

[4]Traczynski & Udalova (2018) focus on law changes that allow NPs to practice independently, while Hamilton III (2017); Stange (2014) focus on law changes that allow NPs to prescribe controlled substances, although Hamilton III (2017) also studies law changes that allow NPs to both practice independently and prescribe controlled substances for opioid outcomes. Stange (2014) also studies the effect of increasing the supply of NPs and PAs interacted with a time-invariant measure of SOP.

[5]We note prior work has used aggregate administrative data in a difference-in-differences framework including Timmons (2017) who used state-level Medicaid data. Alexander & Schnell (2019) have administrative data on suicides and prescription drugs, but their work is distinct from ours in their focus on mental health. Kleiner *et al.* (2016) have administrative price data, but focus on a fairly narrow set of prices, i.e., the price of a well-child visit. We are aware of a conference presentation by Ulrike Muench and Christopher Whaley in 2018 titled "The Effects of Nurse Scope of Practice Laws on Healthcare Spending, Prices, and Access" that uses Health Care Cost Institute commercial claims data to study the effect of NP SOP laws on health care utilization and prices, but we are unaware of a publicly posted version of this paper.

occupations has been documented in White House Report (2015); Kleiner & Krueger (2013). The literature on health care provider scope of practice includes other professions (e.g., midwifery) and other types of outcomes, such as the relative income of the different professions, among other the labor market consequences of occupational licensing (DePasquale & Stange, 2016; Anderson *et al.*, 2016; Markowitz *et al.*, 2017; Perry, 2009; Kleiner & Krueger, 2013).

Our paper is tied to a broader literature on the determinants of provider ability or style and its effects patient outcomes (Agha *et al.*, 2018; Molitor, 2016; Currie *et al.*, 2016; Currie & MacLeod, 2017; Tu, 2017). Our analysis using the mover identification strategy is related to a larger literature in health economics that exploits patient or provider moves to estimate plausibly causal effects on a variety of outcomes (Agha *et al.*, 2018; Finkelstein *et al.*, 2016; Hull, 2018; Molitor, 2016; Tu, 2017).

2 Background

As of January 2018, NP scope of practice laws allowed experienced NPs to practice independently of physicians in just under half of US states. The details of the scope of practice laws in the remaining states vary, but they generally prevent NPs from practicing or prescribing without some sort of physician supervision or without a collaborative practice agreement with a physician (Pearson, 2004-18). These rules place nontrivial restrictions on NPs, even in states where the extent of supervision required is quite limited, because they require NPs to find, and in some cases pay, physicians to sign a practice agreement (Gilman & Koslov, 2014). In states where the requirements are more onerous (e.g., require physicians to review NPs' charts), they can further restrict the supply of NPs and cause physicians to spend time on administrative tasks they might otherwise spend providing patient care (Gilman & Koslov, 2014; Traczynski & Udalova, 2018).

Scope of practice restrictions effectively place a constraint on health care providers that limits the circumstances under which they can treat patients.[6] Additionally, complying with these laws

[6]See Markowitz *et al.* (2017); Adams & Markowitz (2018) for a discussion of mechanisms that this section draws on, as well as Gilman & Koslov (2014); Traczynski & Udalova (2018).

imposes direct costs and burdens like obtaining a collaborative practice agreement or mandated chart view. Allowing for full independence relaxes this constraint and removes these administrative costs and burdens. If the constraint does not bind and the direct costs of the regulation are low, then we should not expect to see an effect on patient health or other patient outcomes. For example, we would expect a null effect of expanding NP scope of practice on patient outcomes if, absent the scope of practice restrictions, NPs would choose to have contractual relationships with physicians and if the administrative burdens associated with the laws are limited. However, if the constraint binds or costs of complying with the restrictions are substantial, expanding scope of practice could matter for patient health and other patient outcomes. Then, relaxing the constraint would lower the cost of providing health care by allowing firms to choose closer to the optimal mix of health care providers and supervision of NPs, rather having it prescribed by law. It will also remove costs associated with complying with the law. The lower cost of providing health care will affect the optimal quantity and quality of health care supplied, plausibly, but not necessarily, shifting out the supply of outpatient health care and increasing the optimal quality of care. Relaxing the scope of practice constraint might not only change how health care is provided in existing locations, but also make it easier for NPs to practice places where their presence would increase access to care like new retail clinics or in rural areas. The AMA's concern is essentially that once the constraint is relaxed, quality of care will fall. This is possible if the scope of practice laws push quality above the optimum absent the constraint. In this framework, relaxing scope of practice laws could have no effect on patient outcomes, could increase or decrease the quantity of outpatient care, or could increase or decrease quality of care.

An important policy question then is whether expanding NP scope of practice harms patient health. It could lead to worse health if the restrictions ensure some level of health care quality or benefit patients if relaxing the constraint reduces the cost of providing care, increases the optimal quality of care or causes the supply of outpatient health care to shift out. Prior work using survey measures from the Medical Expenditure Panel Survey (MEPS) found that granting NPs controlled substances prescriptive authority and full independence led to health benefits measured using self-

reported health, ER visits, and hospitalizations (Hamilton III, 2017; Traczynski & Udalova, 2018). There is also evidence that NP prescriptive authority resulted in improved self-reported health and reduced suicides in medically undeserved areas (Alexander & Schnell, 2019). We expand on the prior work by estimating the effect of full independence on similar proxies for health, but using two large administrative claims data sets rather than survey data, and by using direct measures of health including all-cause mortality and hypertension and diabetes disease progression. We find that across this broad set of health measures, expanded NP scope of practice does not lead to worse health outcomes and there is some evidence of health benefits that is consistent with the existing literature. The mover analysis contributes to the literature because it may take some time for NP practice patterns to respond to expanded scope of practice so the effects in the short and long-term could could differ. Our null effects on health measures for people who move to states with broader scope of practice many years after their expansion suggests that in the longer-term patients are also not harmed.

The most immediate mechanism for expanded NP scope of practice to affect health outcomes would be to increase the supply of outpatient care. We are able to measure this potential effect using specific office visit and annual checkup codes to capture the kinds of care that NPs could easily supply. Further, we might expect these effects to be larger in areas where physicians are less available, such as rural and medically underserved areas. Prior work found that expanding NP scope of practice leads to increases in self-reported measures of annual check-ups in both urban and rural areas (Traczynski & Udalova, 2018), while other work found decreases in a broader set of office visits in the MEPS (Hamilton III, 2017), and increases in psychiatric drug prescriptions concentrated in underserved areas (Alexander & Schnell, 2019). Our claims-based measures of office visits and prescriptions find small effects that are not statistically significant with similar effects in underserved areas. Relaxing a supply-side constraint by expanding NP scope of practice could also lower the price of office visits. Kleiner *et al.* (2016) finds lower prices of well-child visits and Stange (2014) find largely null effects on aggregate prices in the MEPS. We find that expanded NP scope of practice laws does not affect the price of a wide array of other, similar

services, with no evidence of changes in the intensity or complexity of billed services.

Quality of care could increase if relaxing the scope of practice constraint lowers costs or fall if these laws impose a higher than equilibrium level of quality. This effect is hard to measure directly, but there are indications of increased quality in the form of reduced opioid prescriptions in the MEPS (Hamilton III, 2017) and a near universal pharmacy database (McMichael, 2018). Consistent with this work we find that expanding NP scope of practice diminishes billed narcotic prescriptions with limited effects on other prescriptions. Some have hypothesized expanded scope of practice could lower quality in the form of over-testing. We can capture ancillary spending on labs, tests, and imaging, and we find that spending on these services does not increase. We also find no evidence of deterioration in the management of chronic conditions including diabetes and hypertension.

3 Data

3.1 Scope of Practice Laws

We adopt the existing practice of translating legislation governing providers' scope practice into several dichotomous outcomes. We are aided in this exercise by the existing literature (Traczynski & Udalova, 2018; Hamilton III, 2017; Kleiner *et al.*, 2016; Kuo *et al.*, 2013; McMichael, 2017), trade publications that track changes in NP scope of practice (Pearson, 2004-18), various news articles, and the laws themselves. These sources provide us with dichotomous characterizations of nurse practitioner and physician assistant scope of practice regulations along a number of dimensions. We characterize the NP regulations as whether the NP has independent prescription authority, the ability to practice independently, or both independent prescription and practice authority ("fully independent"). We refer to states that do not have full independence as having "restricted practice." We follow Traczynski & Udalova (2018) in focusing our analysis on the transition from less than full independence to full independence because those transitions remove the requirement that NPs have a contractual relationship with a physician. NPs are plausibly substitutes for physi-

cians assistants (PAs) who also provide health care in primary care settings. We characterize the PA scope laws by the extent to which they are allowed to practice remotely from their supervising physician and use the PA scope of practice laws as controls (McMichael, 2017).

We use law changes that happened between 2001 and 2013.[7] In particular we use transitions to full independence that occurred in 2001 (Washington), 2004 (Idaho), 2010 (Colorado, Hawaii, & Maryland), 2011 (North Dakota & Vermont), and 2013 (Nevada & Rhode Island). In some of these states NPs already had independent practice authority and obtained full independence by receiving independent prescriptive authority. In other states NPs obtained both simultaneously. These states provide the variation in scope of practice laws that identifies our difference-in-differences model.

The movers model is identified off of moves between states with different scope of practice laws. During the sample period there is substantial variation in these laws. For example, during the 2005-2012 period, when we have detailed Medicare claims data, NPs are fully independent in about 29% of state-years, and have less than full independence about 71% of state-years.

3.2 Claims Data

We seek to understand the consequences associated with scope of practice regulations by constructing utilization and spending measures from the medical claims of a 5% sample of fee-for-service (FFS) Medicare beneficiaries at the beneficiary-year level from 1999-2015; more detailed Medicare beneficiary claim level data from 2005-2012; and the Truven MarketScan employer-sponsored insurance (ESI) commercial claims data from 2007-2015 provided by © 2016 Truven Health Analytics Inc., an IBM Company. The MarketScan database is a convenience sample of claims from certain large privateemployers and managed care organizations.

Using the Medicare and MarketScan claims data to address our questions has both benefits and limitations. These data sets are complementary: they allow us to study both the elderly and the ESI population. A significant benefit of the data is that it is extensive. The samples cover over 2.5

[7] Our outcome variable data ends in 2015. We do not use law changes that happened after 2013 so we have a sufficient post-period to measure the effect of the law change, and law changes prior to 2001 so we have a pre-period.

million Medicare FFS beneficiaries per year and 40 million commercial patients per year. Both data sources allow us to follow beneficiaries over time. The Medicare data has some benefits over the MarketScan data in that beneficiaries typically only exit the data due to death or conversion into the Medicare Advantage program rather than though employment changes. As are result, we can reliably follow Medicare beneficiaries when they move between states and use those moves to estimate the effects of NP SOP laws. We cannot reliably track MarketScan patients after they move. The Medicare data also has sub-state-level geographic information about patients which allows us to study how effects of SOP laws vary with characteristics of a beneficaries' community. The limitations of the Medicare data are well-established. Because we only consider the traditional Medicare population, we not able to measure the consequences for beneficiaries on Medicare Advantage. This means we cannot estimate the effect of SOP regulations on prices in this sample because the prices for care provided under Medicare FFS are set by CMS. In contrast, the prices in the MarketScan data reflect the market-specific negotiations, and we are able to test if SOP regulations alter the balance of those negotiations.

Annual baseline eligibility files are our first source of Medicare data. These files report when the beneficiary was on Medicare FFS, as well as the reason for their eligibility. We focus on the old-age eligible; i.e., those sixty-five years old or older who are enrolled in Medicare FFS for an entire year. These files also provide a ZIP code and state of residence, which allows us to assign them to a SOP law. We use the beneficiary geography data to identify beneficiaries that move between states and beneficiaries that live in rural counties, primary care physician (PCP) shortage counties, and counties where the NPs as a share of PCPs plus NPs is high.[8]

We use similar files for the MarketScan specifications except we do not observe the zip code or county of residence. In the MarketScan sample we also restrict the analysis to individuals enrolled in insurance for an entire year. To limit the MarketScan data to a manageable size while keeping

[8]Rural counties are counties that were classified as rural in 2013, PCP shortage areas were defined as shortage areas in 2010, and NPs as a share of PCPs plus NPs in a county is also from 2010. Each of these variables was constructed using the 2015 Area Resource File. The Area Resource File takes the number of nurse practitioners from the CMS NPPES and the number of PCPs from the HRSA, so the share of NPs will not be affected by changes in the number of claims billed under NPs own NPIs.

individuals with relatively long panels, we drop individuals who are enrolled for less than three years in total and exclude patients in seven states that both do not change their SOP laws before, during, or after our sample period and that do not border states that change their laws during our sample period.[9]

Outcomes in the Medicare data come from a variety of sources. We have annual utilization and chronic condition summary files from 1999-2015. More finely detailed utilization measures, such as office visits by type of provider, were captured using claim-level data aggregated to the person-year level from 2005-2012. We also examine outcomes that measure the disease progression for individuals with two common ambulatory sensitive conditions, diabetes and hypertension. These measures were developed by Koch *et al.* (Forthcoming) for Medicare beneficiaries and use ICD-9 codes to identify symptomatic and asymptomatic diabetes progression, glaucoma (which is related to diabetes) for diabetics; and AMI, ischemic heart disease, and other acute cardiac conditions for hypertensives. These measures start with individuals with low-acuity diabetes or hypertension as indicated by the ICD-9 codes on their medical claims. Progression of these medical conditions are indicated by a second set of ICD-9 codes associated with more acute forms of these conditions, or associated clinical outcomes, such as AMI. We assume that once disease progression occurs, the patient remains in that state, and they are removed from the sample in all subsequent years.[10]

We take a similar approach to building the MarketScan data, for which we start with enrollment data and combine that data with inpatient and outpatient claims aggregated to the person-year level. In both data sets Evaluation and Management (E & M) visits and well visits are limited to visits

[9]Because this sample restriction is only applied to the MarketScan data, it does not affect the mover analysis. The seven states are NC, SC, GA, FL, KY, IN, and MI. Absent this restriction, these states would be in the control group. We excluded them purely to reduce the sample size and because we expected that states that bordered states that changed their laws would be better controls than more distant states. The analysis using Medicare data includes all states and generally shows no evidence of pre-trends, which suggests analyses with a broader set of states are unlikely to violate the assumptions of a difference-in-differences model.

[10]Consider the following example from Koch *et al.* (Forthcoming): "The codes explicitly identify conditions that are related to the progression of diabetes. For example, the description for 250.10-250.13 is not simply "ketoacidosis," but rather "diabetes with ketoacidosis." The description provides a relationship between the outcome and the underlying chronic condition. In addition, the existence of the code suggests that providers monitor this complication to assess the progression of diabetes." The full description of codes used to identify differing acuity of disease can be found there.

provided by PCPs, NPs, and PAs and are also measured by type of provider: MD, NP, and PA.[11] These are an important measure of the amount of care provided to beneficiaries along the extensive margin, since they are often the first service provided when a patient is seen. Also, when prices are set by the market, their prices are a key outcome of that market's negotiations, since they represent a large portion of PCP revenue.

The amount of care provided by NPs appears to be significantly under counted in the claims data. We believe this is because when an NP provides services under the supervision of a physician, the care can be billed to Medicare as if the physician provided the care. Further, Medicare pays NPs 85 percent of the physicians rate, which provides a strong financial incentive for supervised NPs to bill as physicians (DesRoches *et al.*, 2013). Survey evidence indicates that thirty-one percent of primary care NPs who work with primary care MDs bill their care to Medicare as NPs (Buerhaus *et al.*, 2015). Thus, our analyses of this data are subject to the caveat that they reflect care billed as, but not necessarily provided by, these distinct sets of providers.

We measured Medicare prescriptions using Part D and thus we are only able to observe Medicare prescriptions starting in 2006, when Medicare Part D began providing coverage for Medicare beneficiaries. For both Medicare and MarketScan, we analyze the prescription data by a drug's controlled substance schedule status, which is the national standard by which drugs are grouped by their accepted medical use and their ability to create dependence.

All logged outcomes except prices are computed as the natural log of the underlying data plus one to avoid dropping zeros. In processing the MarketScan data, after aggregating observations to the beneficiary-year level, we drop values that are likely to be errors such as negative expenditures and office visit prices under $10. We then winsorize all counts, expenditures, and prices at the 1st and 99th percentiles of the non-zero values to adjust for implausibly small, non-zero values and implausibly large values.

[11] We kept all claims for E&M visits (CPT 99201-99205 and 99211-99215) and well visits (CPT 993181-993185 and 99391-99396) associated with the following provider specialty codes PCPs (1, 8, 11, 38); NPs (50); clinical nurse specialists (89); and PAs (97). Clinical nurse specialists are a small fraction of claims.

4 Empirical Strategies

4.1 Difference-in-Differences

We first estimate the effect of NP SOP laws on patient outcomes using a difference-in-differences design. Let y_{it} be an outcome such as outpatient visits or inpatient admissions for person i in year t, and D_{st} be an indicator for whether NPs are fully independent in state s in year t. For some law changes both practice and prescriptive authority are expanded simultaneously while in others only prescriptive authority is expanded and NPs already have independent practice authority. Our estimates are identified off a combination of those two types of law changes. We control for beneficiary characteristics using beneficiary fixed effects, γ_i, and age fixed effects, α_{it}; state characteristics using state fixed effects, δ_s, and a vector of changes in PA scope of practice laws, ρ_{st}; and time trends using time fixed effects, τ_t.[12] An error term, ε_{it}, is assumed to be orthogonal to the regressors. In the Medicare data we also include an indicator for whether the beneficiary's county of residence is rural, r_c, but we cannot construct it in the MarketScan data because we lack county of residence information. We estimate equation 1.[13]

$$y_{it} = \beta D_{st} + \gamma_i + \alpha_{it} + \delta_s + \rho_{st} + \kappa r_c + \tau_t + \varepsilon_{it} \tag{1}$$

The parameter β is an estimate of the effect of allowing NPs full independence on our outcomes of interest. It is identified off of both law changes and people who move between states with different scope of practice laws. We use the full sample of beneficiaries in our main results, but show the results are robust to limiting the sample of beneficiaries to those who never move between states.

[12] We control for PA law changes because although there are no instances where the PA and NP scope of practice law change simultaneously, there is some correlation between expanding NP and PA scope of practice in the cross-section. In particular, there are 248 state-years in our sample period where NPs have independent practice and 619 state-years where they do not. Of those 248 state-years, there are 60 state-years where PA's scope of practice was expanded; while of the 619 state-years there were 58 state-years where PA scope of practice was expanded. As a result, absent controls, PA scope of practice expansions could affect both the mover estimates and the long-term effects in the difference-in-differences analysis.

[13] The regression models are estimated using the Stata command reghdfe described in Correia (2016).

A key assumption required to interpret β as a causal effect of law changes on the outcomes is that absent the law changes, the trends in the outcomes in the treated and control states would be the same. We look for evidence that this assumption is violated by regressing our outcomes of interest on leads and lags of changes in the state law variable, ΔD_{st}, using equation 2 where the first lead is normalized to zero. We estimate only one lag for outcomes using Medicare data when the sample ends in 2012 because of limited post-law-change years, $l = 1$, and four lags for the other Medicare outcomes and the MarketScan sample, $l = 4$. The leads and lags are constructed to only using within state-changes in SOP laws, so β_j is identified off of law changes alone, not law changes and movers.

$$y_{it} = \sum_{j=4}^{-l} \beta_j \Delta D_{s(t-j)} + \gamma_i + \alpha_{it} + \delta_s + \rho_{st} + \kappa r_c + \tau_t + \varepsilon_{it} \tag{2}$$

A pre-trend in the leads of ΔD_{st} would indicate that the common trend assumption is violated. We show that for most of our key outcomes, there is little evidence of such a trend. A possible source of bias the pre-trend analysis would miss is an event that exactly matches the timing of the law change and affects the outcomes of interest. Our fixed effects model controls for year fixed effects so it would have to be at the sub-national level.

4.2 Movers

4.2.1 Movers Model

We model the effect of NP scope of practice laws on health care consumption and health outcomes, y_{it}, as a function of person fixed effects, γ_i, state fixed effects, δ_s, local area characteristics like ruralness, r_c, year fixed effects, τ_t, and time varying person characteristics, x_{it}, which includes age fixed effects, α_{it}, and leads and lags of an indicator for any interstate move. The independent variables of interest are D^F_{ist}, which captures moves from states where NPs are not fully independent to states where they are fully independent, and D^R_{ist} which captures moves from states where NPs are fully independent to states where they are not fully independent. The variable D^F_{ist} is coded as

0 for individuals who live in a state with restricted scope of practice then 1 after they move to a state with full independence, while D^R_{ist} is coded as 0 for individuals who live in a state with full independence and then 1 after they move to a state with restricted practice. These variables are constructed so they only use variation in scope of practice from moves, and are based on the scope of practice laws in beneficiaries' origin and destination state when they move. However, we drop beneficiaries initially living in states with narrow SOP laws who move out of their home state after it expands its scope of practice.[14] We also limit the sample to people who move between states zero or one times. We only estimate this model for the Medicare data because we cannot reliably track people across moves in the MarketScan data. We estimate the model using equation 3.

$$y_{it} = \beta^F D^F_{ist} + \beta^R D^R_{ist} + \gamma_i + \delta_s + \rho_{it} + \kappa r_c + \tau_t + x_{it}\Psi + \varepsilon_{it} \tag{3}$$

The variable x_{it} controls both for the effect of increasing age on the outcomes, α_{it}, any changes in the outcomes that tend to occur around interstate moves, and for differences in the outcome between movers and non-movers because it includes leads and lags of an indicator for any interstate move.

Hull (2018) lays out the assumptions required for a mover design to identify a causal effect of treatment. In models with a single a binary treatment, e.g., if we assumed the effects of D^F_{ist} and D^R_{ist} were symmetric, these designs identify causal effects if there are no persistent effects on average of the last location on the outcome; and, if but-for the move, the trends in the outcome variable would be the same for movers between states with different scope of practice laws and movers between states with the same scope of practice laws. In this paper we do not impose symmetry so we must make additional assumptions Hull (2018). One option is to assume the treatment effect is not heterogeneous conditional on observables along with the no differential trends assumption. An alternative is to make a stronger "no persistence" assumption along with constant effects and conditional orthogonality. We focus on the former approach and look for evidence the common

[14]For example, someone living in Maryland in 2009, who moves out of the state in 2011, would be dropped from the movers analysis because Maryland expanded its scope of practice in 2010.

trends assumption is violated using models with leads and lags of our treatment variables. To do so, we estimate equation 4.

$$y_{it} = \sum_{j=4}^{-4} \beta_j^F \Delta D_{is(t-j)}^F \sum_{j=4}^{-4} \beta_j^R \Delta D_{is(t-j)}^R + \gamma_i + \delta_s + \rho_{it} + \kappa r_c + \tau_t + x_{it}\Psi + \varepsilon_{it} \quad (4)$$

A problem we face is that the exact timing of the moves is not observed and because of the structure of the Medicare data, the moves will necessarily be split between two calendar years. In our coding, moves occur during the $t = -1$ and $t = 0$ years. A pre-trend in the leads of the independent variable of interest would indicate that the common trend assumption is violated. However, because of the structure of the data, if the move immediately affects the outcome of interest, we would expect to see some change in the outcome between the -2 year and the -1 year. If there is even short delay in the effect, we would not expect to see it until year 0. Consequently, an effect in the -1 year is not necessarily evidence of a pre-trend. Although a change in the outcome between the -3 year and the -2 year is evidence of a pre-trend. We show that for moves to states with full independence for most of our outcomes, there is no clear evidence of pre-trends. A possible source of bias the pre-trend analysis would miss is an event that exactly matches the timing of the move and affects the outcomes of interest. Our controls for leads and lags of moves eliminate that concern as long as the shock is not specific to moves between states with different SOP laws.

4.2.2 Movers Identification

The individual fixed effects, γ_i, are identified by within person variation in the panel. The time fixed effects, τ_t, the age fixed effects, α_{it}, and the indicator for a rural county, κ, can all be identified using cross-sectional variation. The state fixed effects, δ_s, are separately identified from the individual fixed effects, γ_i, using cross-state moves as long as there are individual moves involving each state. The leads and lags of interstate moves in x_{it} are identified using movers between states with the same NP scope of practice laws. The parameters of interest β^R and β^F are identified off of moves between pairs of states with differing scope of practice laws. A move from a state

with broader to narrower scope of practice (or vice versa) of each type is sufficient to identify the parameters given there are moves that identify leads and lags of any interstate moves and the state fixed effects.

The key issue in interpreting the parameters is that Finkelstein *et al.* (2016) have shown that differences in health care utilization across local areas affects health care utilization even conditional on individual fixed effects. As a result, if on the state level, SOP laws and spending were correlated for reasons other than the passage of the law and δ_s does not adequately control for the level of the outcome in each state, the correlation between SOP laws and spending would bias our results. Fortunately, because δ_s is identified off of movers, differences in the fixed effect for movers and non-movers is not a problem. Since δ_s is identified from the changing health care utilization patterns of movers, it could be biased if there is some persistence or habit formation of past place on current consumption, but Finkelstein *et al.* (2016) suggests that is not likely the case. Thus, our movers estimates should account for the shifts in supply and demand due to this policy.

A related concern is if people move to states with narrow scope of practice laws they disproportionately choose places with low utilization relative to the rest of the state and when they move to states with broad SOP laws they choose places with high utilization relative to the rest of the state (or vice versa). Although, this is possible, we see no evidence of it.[15]

5 Cross-Sectional Comparisons

We start by reviewing some descriptive patterns of health care utilization by state policy. Table 1 reports the average spending, prescribing, and health outcomes for Medicare beneficiaries by the extent to which NPs are able to practice independently. The equivalent table for commercially-

[15]This assumption is not directly testable because one mechanism through which the NP SOP laws could affect outcomes is by differentially affecting access to care within a state. However, to see if there is any evidence of it, we computed risk adjusted average utilization levels by hospital referral region, then estimated equation 3 using these outcomes. We found no statistically significant effects of moving to states with a broader or narrower scope of practice laws on risk adjusted utilization levels, including admissions which for one treatment is significant at the 0.10 level (Online Appendix Table A.3). This suggests beneficiaries are not disproportionately choosing places with low (or high) utilization relative to the rest of the state when they move between states with different scope of practice laws.

insured beneficiaries in the MarketScan data is in Table 2. These conditional summary statistics provide the sample means for these outcomes, which will help guide interpretation of the results. Medicare beneficiaries in our sample have, on average, one half ER visit per year, have 3.5 evaluation and management visits (i.e., standard PCP visit) a year, and 17 prescribing events (filled prescriptions, including refills) per year. The annual mortality rate for Medicare beneficiaries is around five percent. These sample means are typically lower for the (younger) beneficiaries in the MarketScan sample. The one exception here is checkups (well-visits), which are common and frequent for young children.

These are also the static patterns that the fixed effects of the difference-in-differences research design will difference out. For example, inpatient spending is lower in states with full independence versus no independence. The same is true for imaging and testing spending. A direct, uncontrolled comparison between patients in any of the policy regime would be confounded by the geographic variation in medical spending and practice between states.

6 Main Results

6.1 Health

Opponents of expanding NP scope of practice argue that allowing NPs to practice without state-mandated supervision or collaboration with physicians is unsafe for patients (Iglehart, 2013), while proponents argue expanding NP scope of practice is unlikely to harm patients (Adams & Markowitz, 2018; Gilman & Koslov, 2014; Xue & Intrator, 2016). In Table 3 we test whether expanded NP scope of practice leads to worse health by estimating the effect of full independence on measures of intensive health care utilization that we expect to be correlated with health and a direct measure of health, death. The table summarizes the results of both the difference-in-differences (equation 1) and patient mover (equation 3) models, and the Medicare and commercial claims data sets.

We expect that if allowing full independence compromised patient safety, we would see signifi-

cant increases in inpatient admissions, inpatient spending, readmissions, ER visits, and deaths after states expanded NP scope of practice. In the Medicare difference-in-differences analysis reported in the top panel of Table 3, we see decreases in these outcomes that are sometimes marginally significant, although never statistically significant at the $p = 0.05$ level. The magnitudes of the point estimates are relatively large, e.g., the decrease in inpatient spending is about 8 percent. Results are similar for specifications that drop movers (Online Appendix Table A.1).

Figure 1 shows event study plots of the same outcomes. There is little evidence of trends that would bias the main difference-in-differences results. The figure shows that inpatient admissions, inpatient expenditures, and readmissions fall for several years after the law change and all three decreases are consistently statistically significant more than three years after the event. This is not true of ER visits and deaths, where we never see statistically significant decreases. If anything, the longer term statistically significant decreases in inpatient admissions, spending, and readmissions without a corresponding increase in deaths are consistent with expanded NP scope of practice causing improved health.

The second panel of Table 3 shows the effect of expanded NP scope of practice on commercial inpatient admissions, inpatient spending, and ER visits.[16] The point estimates are small in magnitude and never statistically significant. We find no statistically significant pre-trends or longer term effects in the post-period (Table 3 and Online Appendix Figure A.1).

The third panel of Table 3 shows the effect of moving to states with a broader or narrower scope of practice, estimated using equation 3, on the same set of outcomes as the Medicare difference-in-differences. For moves from states with restricted practice to states with full independence, the coefficients are negative for all outcomes with magnitudes that are very similar to the difference-in-differences results, with the exception of mortality which has a coefficient very close to zero. The only statistically significant result is the effect on admissions. However, the event study plot suggests the decrease in admissions happened in the two years prior to the move. Although, be-

[16]Unlike the Medicare data, the MarketScan data does not include a readmission variable so we do not report readmission results. We expect that death is not likely to be a useful health measure for this population in this data set so we also do not include it.

cause the mover event study coefficients tend to be estimated imprecisely and moves occur in both the -1 and 0 years, we interpret this apparent pre-trend with some caution. Regardless, there is no evidence that these outcomes increase post-move (see the left column of Online Appendix Figure A.2). There is also no evidence that effects for movers get larger over time after their moves, which suggests the null effects are not driven by disruptions in care. For moves from states with full independence to states with restricted practice, which is a policy change that is not observed for the difference-in-differences design, the effects are negative and statistically significant for each of the inpatient measures. Two of these outcomes show evidence of decreases prior to the move so we do not interpret them as causal (see the right column of Online Appendix Figure A.2).

The finding that health does not decline in the two difference-in-differences specifications reported in Table 3 is not simply due to a lack of power. For example, we can reject, at the 95 percent level, almost any positive increase in Medicare inpatient spending. We can can reject an increase in commercial inpatient spending of about 0.7 percent for a population that spends an average of $864 on inpatient care per year. These results suggest that expanding NP scope of practice does not harm either Medicare or commercial patients for several years after the event. The Medicare mover results from states with restricted practice to states with full independence have confidence intervals that allow us to reject small increases in inpatient spending and admissions, but only fairly large increases in mortality. The mover results suggest that even if the supply side has more time to adjust post-scope of practice expansion, there is still no evidence of harm to patient health.

Hamilton III (2017) estimates that allowing NP's to prescribe controlled substances reduces hospital admissions by a statistically insignificant 1.7 percent using the Medical Expenditures Panel Survey, which is between our findings of 7 percent decrease in the Medicare data and a 1 percent decrease in the commercial data. Our estimates for Medicare ER visits, a statistically insignificant decrease of 0.016 visits, is roughly in line with the estimates of Traczynski & Udalova (2018) using the MEPS data, -0.013 visits. Our estimates for commercial ER visits is a statistically insignificant increase of about 0.011 visits.

We expect that if expanded scope of practice is harmful to patients, we would see increased

disease progression of ambulatory sensitive conditions. We estimate these models using equations (1)-(4), but excluding beneficiaries from the sample a year after their disease progresses, which is analogous to a hazard model and follows the approach in Koch *et al.* (Forthcoming). Figure 2 shows event study plots of the effect of expanded scope of practice on disease progression for Medicare patients with diabetes. There are no significant pre-trends and no evidence of increased disease progression following scope of practice expansions. Figure 3 shows analogous plots for patients with hypertension. There is again no evidence of increased disease progression. Consistent with these findings, our difference-in-differences model finds null effects on all disease progression measures for diabetes and hypertension (Table 4). Mortality rates for patients with hypertension also fall, but like with overall mortality, this decrease happens in the year prior to the law change. Online Appendix Figures A.3-A.4 and Table 4 show the same set of results for movers. Consistent with the other results for this set of beneficiaries, there are generally no significant pre-trends and no significant effects on disease progression except for an increase in mortality for diabetes patients and hypertension patients when moving to states with narrower scope of practice.

Together these results suggest that at least for several years after the law change, it is unlikely that expanding NP scope of practice causes significant harm to patients. There is also some evidence of health benefits for Medicare patients in particular. The fact that there are benefits in this population is especially important because they are medically complex and thus a population that we might expect would be harmed a detectable amount by reductions in the quality of their care. Our estimates are consistent with the prior literature, which also finds little evidence of harm and some evidence of benefits from expanding NP scope of practice. These results suggest that relaxing the NP scope of practice constraint does not lower the optimal quality of care enough to harm patients' health.

6.2 Outpatient Care

A possible benefit of increasing NP scope of practice is that it will shift out the supply of outpatient care or lead to greater access to care, and thus increase utilization of outpatient care. Increased

outpatient care is also a plausible mechanism for the improvements in health detected for Medicare patients. We estimate the effect of expanding NP scope of practice on measures of outpatient care in Tables 5-7.

Table 5 summarizes the outpatient utilization results of both the difference-in-differences (equation 1) and patient mover (equation 3) models, and the Medicare and commercial claims data sets on measures of the quantity of outpatient care. The top two panels shows that expanding NP scope of practice does not increase the amount of outpatient care received by Medicare and commercial beneficiaries as measured by primary care Evaluation and Management visits, which we call "office visits"; well visits, which we call "checkups"; prescriptions and prescription spending.[17] Figure 4 shows event study plots of these outcomes using Medicare data and Online Appendix Figure A.5 shows the analogous results using commercial data. There is little evidence of trends that would bias the main difference-in-differences results and no evidence of an effect of the law changes on each outcome. These results suggest that the law changes do not increase access to care to an extent that the amount of outpatient care increases, and that the improvements in the health of Medicare patients are not driven by increased outpatient health care utilization.

The results for movers in the bottom panel of Table 5 show an increase in office visits when moving to states with narrower scope of practice and a decrease for moves to states with broader scope of practice, but the effect for moves to states with narrower scope of practice seems to be driven by a pre-trend (Online Appendix Figure A.6). There are no significant effects on checkups or prescriptions.

One concern with expanding scope of practice is that it could lead to over-testing because NPs have less training than physicians and may lean on testing to make diagnoses. Alternatively, increased testing could be beneficial if it is a result of increased access to needed care. The last two columns of Table 5 and the analogous event study plots in Figure 4 and Online Appendix Figures A.5 and A.6 show no clear evidence that increasing scope of practice leads to increased spending on imaging or testing. Although, imaging spending falls significantly for commercial patients, Online

[17] Results are similar for specifications that drop movers (Online Appendix Table A.2).

Appendix Figure A.5 suggests it is driven by a pre-trend. In addition, rather than increasing, log testing spending falls significantly for moves to states with full independence. There is no evidence of an increase in testing or imaging, which suggests that expanding NP scope of practice does not lead to over-testing.

Although we do not see effects on aggregate outpatient utilization, its possible there could be important compositional effects that are hidden by the aggregate results. We first look for evidence of substitution between different types of practitioners and then check if there are differential effects of expanded NP scope of practice on controlled substances prescriptions.

The data present inherent limitations in measuring substitution between different types of providers. Each claim lists the provider by the provider's National Provider Identifier (NPI). Per Medicare's billing rules, when an NP provides service under the supervision of a physician, the care can be billed as if the physician provided the care. Further, Medicare pays allied professionals eighty-five cents on the dollar for care reported (billed) as provided an allied professional, vis-a-vis that provided by (billed as) an physician. This provides a strong financial incentive for supervised allied professionals to bill as their supervising physician (DesRoches *et al.*, 2013). Thus, the effects we measure reflect the differences across care billed as, but not necessarily provided by, these two distinct sets of providers. This can be informative, insofar as it measures the sum of the increase in care provided by NPs and the amount of care provided by NPs newly practicing without physician supervision.

There is little evidence of substitution between different types of practitioners in either the Medicare or commercial difference-in-differences results (Online Appendix Tables A.4 and A.5). However, in the mover analysis we see significant reductions in visits billed to PCPs when moving to states with broader scope of practice and significant increases in visits billed to PCPs when moving to states with narrower scope of practice. As expected, we also see increases in visits billed to NPs following moves to states with full independence and decreases in visits to NPs following moves to states with restricted scope of practice, however neither is individually statistically significant (Table 6). This suggests that in the longer term, full independence affects how health care

provision is organized. However, as noted above, this analysis must be interpreted with some caution because NPs starting to bill independently rather than under a physician's NPI number could lead to an estimated increase in visits to NPs and decreases in visits to PCPs without NPs actually seeing additional patients.

Controlled substances are drugs whose consumption has the potential for abuse and dependence. The DEA regulates the prescribing of these drugs and classifies them into five schedules depending on the likelihood they will cause dependence and be abused. Only drugs in schedules II-V can be prescribed. We hypothesize that NPs may prescribe controlled substances differently than physicians because of their different experience and training, that expanding NP scope of practice could affect how they prescribe scheduled drugs, and that these potential differences could have meaningful effects on patient health.

Table 7 breaks down the effect on prescriptions by the schedule the drug belongs to which is a proxy for its potential for abuse using the difference-in-differences (equation 1) and patient mover (equation 3) models, and the Medicare and commercial claims data sets. The first column of the top panel shows the effect of expanded scope of practice on narcotic schedule II drugs prescribed to Medicare beneficiaries. The drugs include powerful opioids like Dilaudid, OxyContin, and fentanyl.[18] We see significant decreases in prescriptions of about 0.06 prescriptions per person, which is about a 10 percent decrease in narcotic schedule II prescriptions. This result implies that expanding NPs scope of practice substantially reduces prescriptions of the opioids most prone to abuse. There are also significant increases in non-narcotic schedule II drugs which are largely stimulants, but its effect is over an order of magnitude smaller than the effect on schedule II narcotic drugs. Event study plots support the finding that schedule II prescriptions fall, although part of the decrease happens in the year before the event (Figure 5). Decreased opioid prescriptions could contribute to reduced hospitalizations but is unlikely to fully explain the reduction because there are approximately 0.44 fewer inpatient admissions for each less opioid prescription and the causal effect of opioid prescriptions on future hospital admissions appears to be small (Barnett *et al.*,

[18] https://www.deadiversion.usdoj.gov/schedules/

2017).

There are no significant effects in the remaining categories including narcotic schedule III drugs that include opioids with less than 90 mg of codeine; non-narcotic schedule III drugs which includes drugs such as ketamine, anabolic steroids, testosterone; schedule IV drugs which includes some narcotic drugs like Darvocet as well as anti-anxiety drugs like Valium and sleep aids like Ambien; and schedule V drugs that may include small amounts of narcotics like some cough suppressants and antidiarrheal drugs.[19] Event study plots provide little evidence of effects in other categories (Figure 5). The mover analysis shows no significant effects on prescriptions of any of the categories of controlled substances except non-narcotic schedule II drugs where there are significant decreases for moves to state with full independence and significant increases for moves to states with restricted practice (Table 7 and Online Appendix Figure A.7). The effect of moving to states with a broader scope of practice on narcotic schedule II drugs is not significant, but the coefficient estimates are somewhat similar to the difference-in-differences model.

We have less detailed prescription data in the commercial sample because of how the drugs are coded. In particular, we cannot separate narcotic from non-narcotic drugs for both schedules II and III. We find no significant effects on schedule II, IV, or IV drugs (Table 7). There is a negative and statistically significant estimate for Schedule III prescriptions that include some opioids, but the event study plots from Schedule III prescriptions show evidence of a pre-trend so this result may not be causal (Online Appendix Figure A.8).

We find little evidence that expanding scope of practice increases outpatient healthcare utilization, but it may decrease opioid prescribing. Traczynski & Udalova (2018) found that increased NP scope of practice increased checkups while Hamilton III (2017) shows decreases in total office-based visits. The null effect on outpatient visits that we estimate using the difference-in-differences specification is precise and can reject effects of the magnitude of Hamilton III (2017).

Hamilton III (2017) finds a larger decreases in opioid prescriptions following increases in NP scope of practice that allow NPs to prescribe controlled substance than we do, while the McMichael

[19] See, https://www.dea.gov/drug-scheduling.

(2018) effects are smaller. The standard caveats apply—our estimates correspond to a later time period with later policy variation and the effect of these policies may have varied over time. Second, we focus on the Medicare FFS population, whereas Hamilton III (2017) uses the MEPS, which surveys the US civilian, non-institutionalized population. Finally, our results are difficult to compare to Hamilton III (2017), since we construct annual measures of health and utilization to map into the state-by-year nature of exposure to the policy change in the standard difference-in-differences research design. Hamilton III (2017) constructs biannual measures due to the instrument design of the MEPS.

6.3 Prices

A significant benefit of the MarketScan data is that it allows us to measure the effect of expanding NP scope of practice on prices for office visits. It is plausible that a broader scope of practice will lead to lower prices either through increased competition among primary care providers or lower costs of providing care, e.g., from increased use of independently practicing NPs, who tend to be paid less per visit, providing a larger share of services. To measure the effect of expanding NP scope of practice on prices, we compute average prices per visit across all office visit (evaluation and management) codes and for each office visit code.[20]

The log average price of office visits reflects the average price of the average visit. Because the provider has some ability to determine the visit duration and corresponding billing code, changes in NP prescription authority could both change the price per code, but also the distribution of the codes billed. That is to say, the average price could change for two reasons: conditional on the billing code, the price changes; or the average billing code changes. The estimates of equation (2) on the prices of evaluation and management codes can be found in Figure 6.

There is some evidence that expanding NP scope of practice reduces costs in the short-term, but

[20]Clemens & Gottlieb (2017) demonstrate a strong relationship between Medicare reimbursement for medical services and the corresponding prices paid by commercial payers. E.g., to minimize negotiating costs, a payer and a provider might agree to contract at a fifteen percent mark-up of Medicare rates. If Medicare pays $100 for a particular service at a particular year, then the commercial payer would pay $115. Because we are estimating within specific CPT service codes, we are tacitly measuring whether or not that mark-up above Medicare rates responds to NP regulation.

that effect does not persist. Figure 6 shows the average price per visit fall significantly in the year of the law change, but that effect does not persist and is no longer significant by the following year. The short-term price decrease appears to be drive by decreases in the price of 15 and 25 minute existing patient visits, which are the most frequently billed evaluation and management codes (15 or 25 minute visits for established patients; a 3 or 4 in the fifth digit, and a 1 in the fourth)

The long-term results in Table 8 estimated using equation (1) are consistent with the event study plots. The first column in the first row reports the average price paid for all evaluation and management visits. The difference-in-differences estimate is less than one-tenth of one percent. The balance of the first row reports the estimates for new patients, separately by visit intensity level. The second row reports the estimates for the established patient visits, also separately by intensity level. In no case do we see a statistically significant effect on price. The codes that do exhibit larger price changes with the law change (e.g., the new patient codes) are less frequently observed and have correspondingly noisier difference-in-differences estimates. The average price and the most frequently observed prices are relatively precisely estimated, with confidence intervals that typically reject effects of around 3 percent.

7 Heterogeneous effects

7.1 Populations where effects are more likely

Despite the fact that we found no effect on outpatient care in the sample as a whole, it is possible there are effects on outpatient care in places where nurse practitioners play a larger role in primary care and places where physicians are less available. In particular we check if there are differential effects of full independence in areas where NPs make up a larger share of providers, in rural areas, and in PCP shortage areas. We focus on the Medicare difference-in-differences analysis because we do not observe county or zipcode of residence in the MarketScan data. We also test whether the evidence of health effects we see in the Medicare difference-in-differences analysis are concentrated in places where we expect effects to be more likely, and find that in general they

are.

We might expect to see a greater response to law changes in areas where NPs are a larger share of primary care providers, in rural areas, and in PCP shortage areas. There is little evidence that there are larger increases in total visits or prescriptions for patients in rural areas or shortage areas than non-rural and non-shortage areas (Online Appendix Tables A.6-A.8). We actually see relative decreases in prescriptions in places where a large share of providers are NPs.[21] The reduced utilization of schedule II drugs seems to be driven by non-rural areas and places where a high share of providers are NPs (Online Appendix Tables A.6 and A.8). However, we see significantly larger reductions in imaging and testing spending in rural areas relative to non-rural areas and marginally significant decreases in shortage areas relative to non-shortage areas. Taken together these results suggest there are not differentially larger increases in access to care in places where we expect access to increase the most.

We also check if the effects on our proxies for health are higher in places where we expect NP independence to be more important (Online Appendix Tables A.9-A.11). We find that the reductions in utilization of multiple types of high intensity health care is significantly larger in PCP shortage areas (Online Appendix Table A.10). We also see the significant reductions in ER visits and mortality, but not other proxies for health, are driven by places with a high share of NPs (Online Appendix Table A.11).[22] These results are suggestive that the health effects are concentrated in places where we expect them to be larger, which is consistent with them being caused by full independence rather than something else, although they do not appear in all such places and they are not connected to increased use of outpatient care.

[21] We focus on areas where NPs make up a larger share of primary care providers by dividing the NP share into terciles and coding counties with the highest share of NPs as omitted category.

[22] Inpatient admissions and inpatient spending also decrease significantly in such places, but the estimates are fairly similar to places where the NP share is relatively low.

7.2 Reconciling the estimates for commercial and Medicare patients

We hypothesize that one reason why we may detect effects on our proxies for health for the Medicare patients but not the commercial patients is that the Medicare patients are closer to the margin of going to the hospital than the commercial patients. Medicare patients have about 3.9 times as many admissions per capita as commercial patients. Consequently, improvements in health that are measured with hospital admissions may be more likely to be detectable in Medicare than commercial patients.

We investigate this hypothesis by using the Medicare chronic conditions data to split the Medicare sample by their predicted health and then we check how the effect of the law change varies with prior patient health. We measure patient health using predictions of the probability the beneficiary will die in a particular year using lags of their chronic conditions. We then divide patients into terciles of their predicted probability of dying and ask if the effects are larger for patients with higher probabilities of dying.

Admissions and inpatient spending decline slightly for the healthiest two-thirds of Medicare patients, but the magnitude is much smaller than the pooled estimate and it is not close to being statistically significant. However, admissions and inpatient spending decline by over twice as much for the sickest third of patients, and the decrease relative to the healthiest third is statistically significant for admissions and marginally significant for log inpatient spending. However, the sickest Medicare patients also die at higher rates than the healthiest patients after the scope of practice expansion (Online Appendix Table A.12). The fact that the effects are larger for the sickest patients provides some evidence that the difference in the commercial and Medicare results is due to the relative health of those to populations.[23]

[23] We find no increase in visits or prescriptions for the patients with the highest probability of dying. There is an increase in visits, imaging, and testing for the middle tercile relative to the healthiest tercile. The reduction in schedule II prescriptions is entirely driven by the healthiest two-thirds of patients. There is no evidence of a reduction for the least healthy tercile of patients (Online Appendix Table A.13).

7.3 Short-term versus Long-term Effects

An advantage of the mover analyses is that there is substantial variation in how recently states gave nurse practitioners full independence. We check if there are heterogeneous effects by time since law changes, by splitting the sample of moves by moves involving the first 10 states to allow full independence and moves involving the second 10 states to allow full independence. The first 10 states all allowed full independence by 1998, which means all moves in the analysis data set involving the early law changes happen at least two years after the law change for this sample, and in most cases they will happen many years after.

We re-ran these models for our full set of Medicare mover outcomes including higher intensity health care, measures of disease progression, outpatient care and testing, and visits and prescriptions billed to NPs, PAs, and PCPs (Online Appendix Tables A.14-A.17). Broadly, we find that moves involving states that expanded NP SOP earlier point in the same direction as moves to states that expanded NP SOP later. In cases, where they do not, they are generally imprecisely estimated. The magnitudes for the moves to states with narrower scope of practice tend to be mixed, i.e., in some cases the effects for states that changed their laws early are larger than states that changed their laws later, but in other cases they are smaller. For the moves to states with broader scope of practice, there is more evidence of significant effects on patients that moved to states that expanded scope of practice early rather than recently. For example, we see significant reductions for all three measures of inpatient health care utilization (Online Appendix Table A.14). These estimates are also somewhat larger than the effects on inpatient care estimated using the difference-in-difference design (Table 3) including the significant estimates a few years after the law change (Figure 1). This provides limited evidence that longer term adjustments to the supply side affect patients, and suggests the two identification strategies are fairly consistent with respect to the effect of expanded scope of practice on inpatient care.

8 Conclusion

There is a basic trade-off associated with medical licensing, particularly when applied to nurses and physicians assistants: expanding scope of practice could benefit patients by increasing competition for primary care services and access to health care or harm patients by removing necessary supervision from providers with less training than physicians. Policy makers' choices in this area are important because expanding NP scope of practice has the potential to help the large and growing number of Americans living in health care provider shortage areas (Health Resources & Services Administration, 2013, 2019, 2020). We study these potential costs and benefits of the regulation of nurse practitioners using medical claims data on millions of patients. We use two distinct research designs that allow us to potentially distinguish temporary effects that occur in the short run from consequences that remain in the long term. The richness and variety of our data and estimation techniques allows us to scrutinize the findings of the existing literature, and fill in the gaps left by data limitations and limits on policy variation.

Using a difference-in-differences research design, we can reject that law changes cause small to moderate amounts of harm across many outcomes for several years following NP scope of practice expansions in the commercially insured and Medicare samples. We also find some evidence of benefits in that Medicare beneficiary inpatient admissions and spending fall significantly a few years after the event with no increase in mortality or progression of diabetes and hypertension. Our results suggest relaxing the constraint that limits how NPs can practice does not harm patients, and provide suggestive evidence that a broader scope of practice is beneficial. This finding is consistent with the broader literature (Alexander & Schnell, 2019; Hamilton III, 2017; Kleiner *et al.*, 2016; Markowitz *et al.*, 2017; Traczynski & Udalova, 2018), particularly with papers that have shown reductions in high intensity care like inpatient admissions or ER visits (Hamilton III, 2017; Traczynski & Udalova, 2018).

We have also shown the lack of harm is robust to studying direct measures of physical health, and that it extends to people who move to states that expanded scope of practice many years prior. The lack of harm for a medically complex population, Medicare beneficiaries, suggests that

healthier populations are also unlikely to be harmed by expanded NP scope of practice. Similar to the Alexander & Schnell (2019) study of the effect of expanded scope of practice on mental health, there is evidence that the health benefits we do find are greater in areas with limited access to care. We also showed that some of the other suggested harms, like over-testing, did not occur. We find some evidence of benefits from reduced opioid prescribing that is consistent with two others studies that use quite different data sets (Hamilton III, 2017; McMichael, 2018).

Not all possible benefits of broader scope of practice were realized. In particular, despite, e.g., Traczynski & Udalova (2018) finding of increased reported checkups, we did not find evidence of increased access to care with a broad set of measures of outpatient visits and prescriptions. This puts some limits on the benefits we can expect in terms of greater access to care from expanded scope of practice. Similarly, Kleiner *et al.* (2016) found price decreases for a narrow category of prices and Spetz *et al.* (2013) found evidence of lower costs per episode of care following visits to retail clinics, however, we do not find evidence of price decreases across many types of outpatient visits. This suggests that expanding NP scope of practice may not in general lead to lower prices for consumers. Our findings suggest there are benefits to patients of expanding NP scope of practice, but there are also limits on how tightly scope of practice constraints bind providers' actions today.

A limitation of this work is that the treatment effect of full independence may be heterogeneous and be different in states that still have not broadened scope of practice. For example, there are no states in the southeastern US that gave NPs full independence during our sample period and the treatment effect in these states could differ from the states in our sample.

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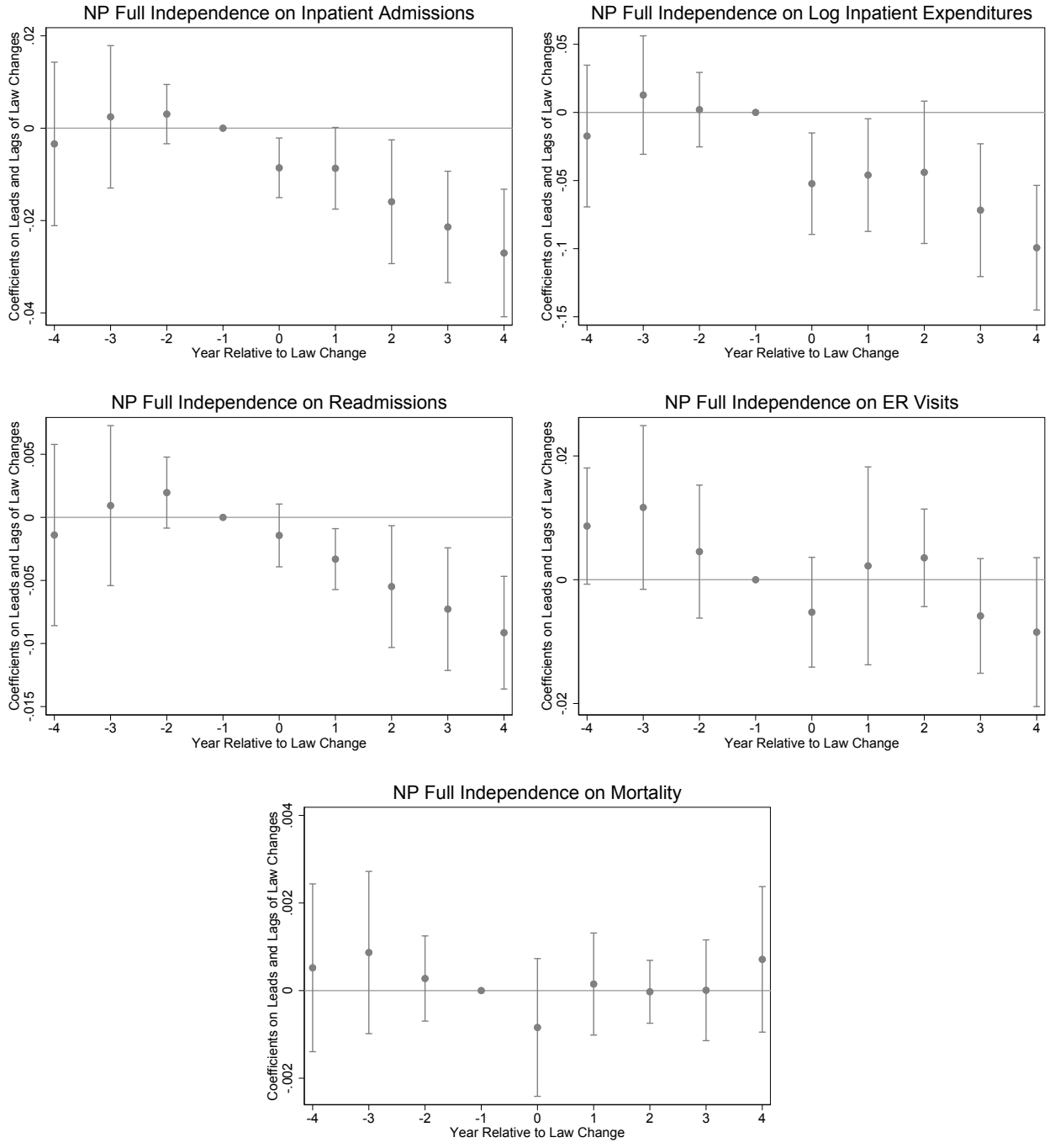
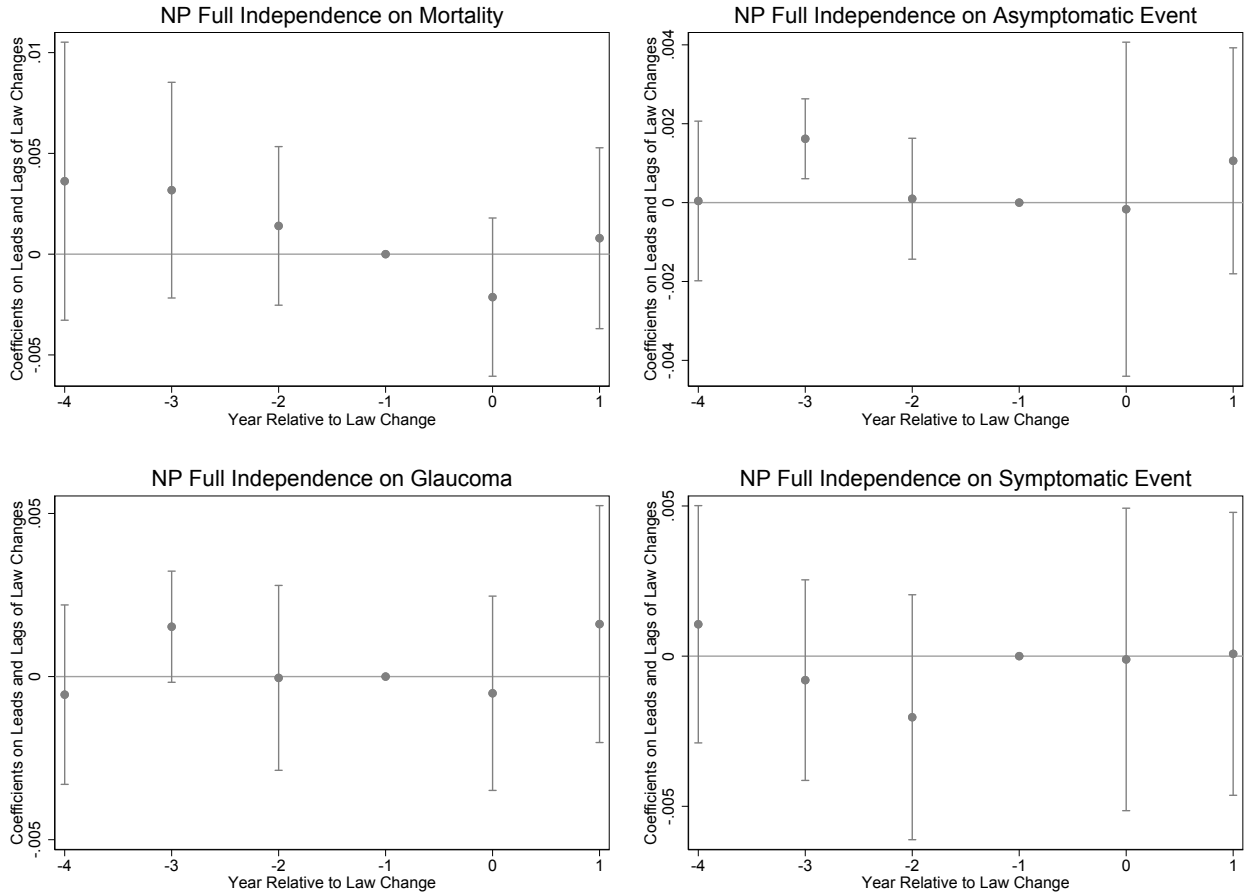
Figure 1: Effect of Expanding NP Scope of Practice on Proxies for Health for Medicare Beneficiaries



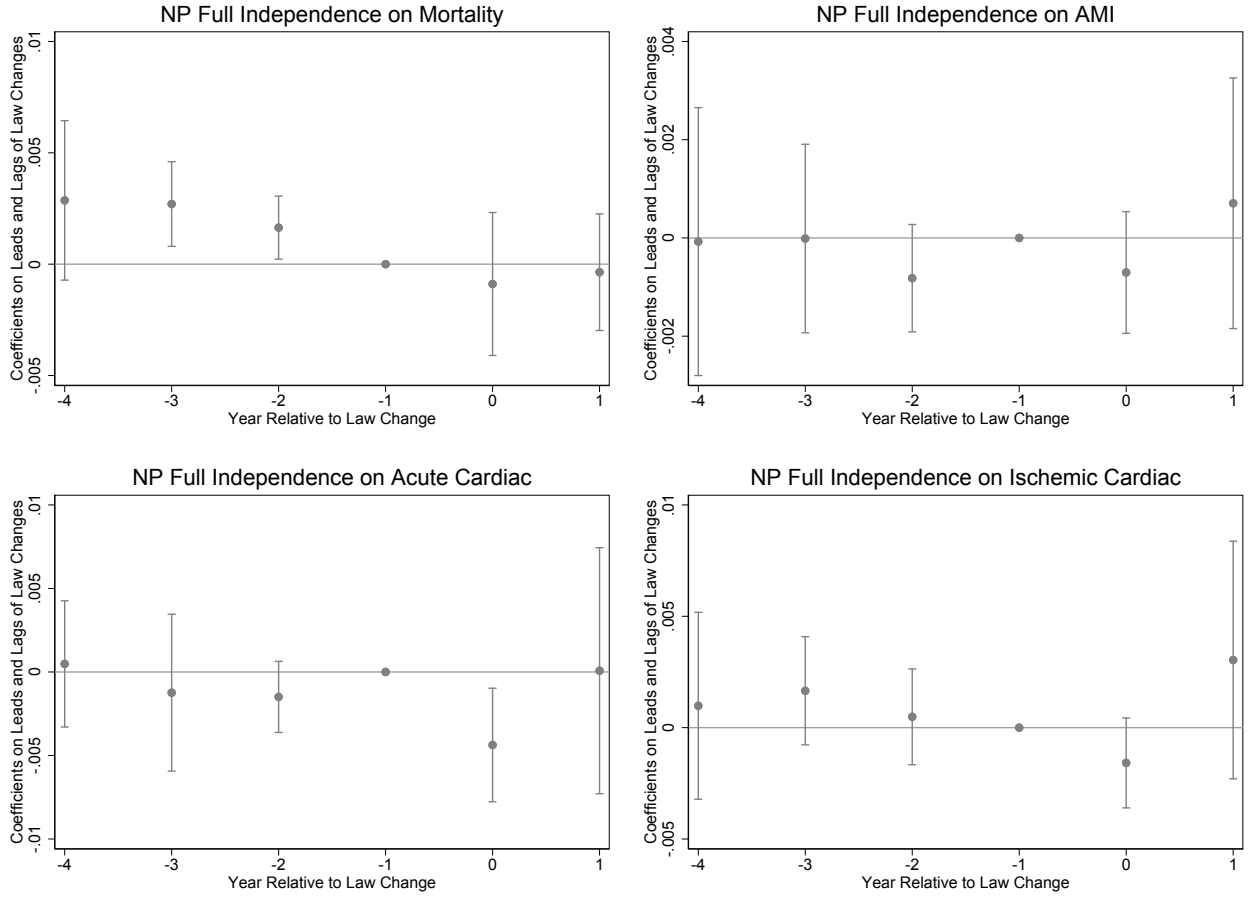
Notes: Data cover the 1999-2015 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Figure 2: Effect of Expanding NP Scope of Practice on Diabetes Complications for Medicare Beneficiaries with Diabetes



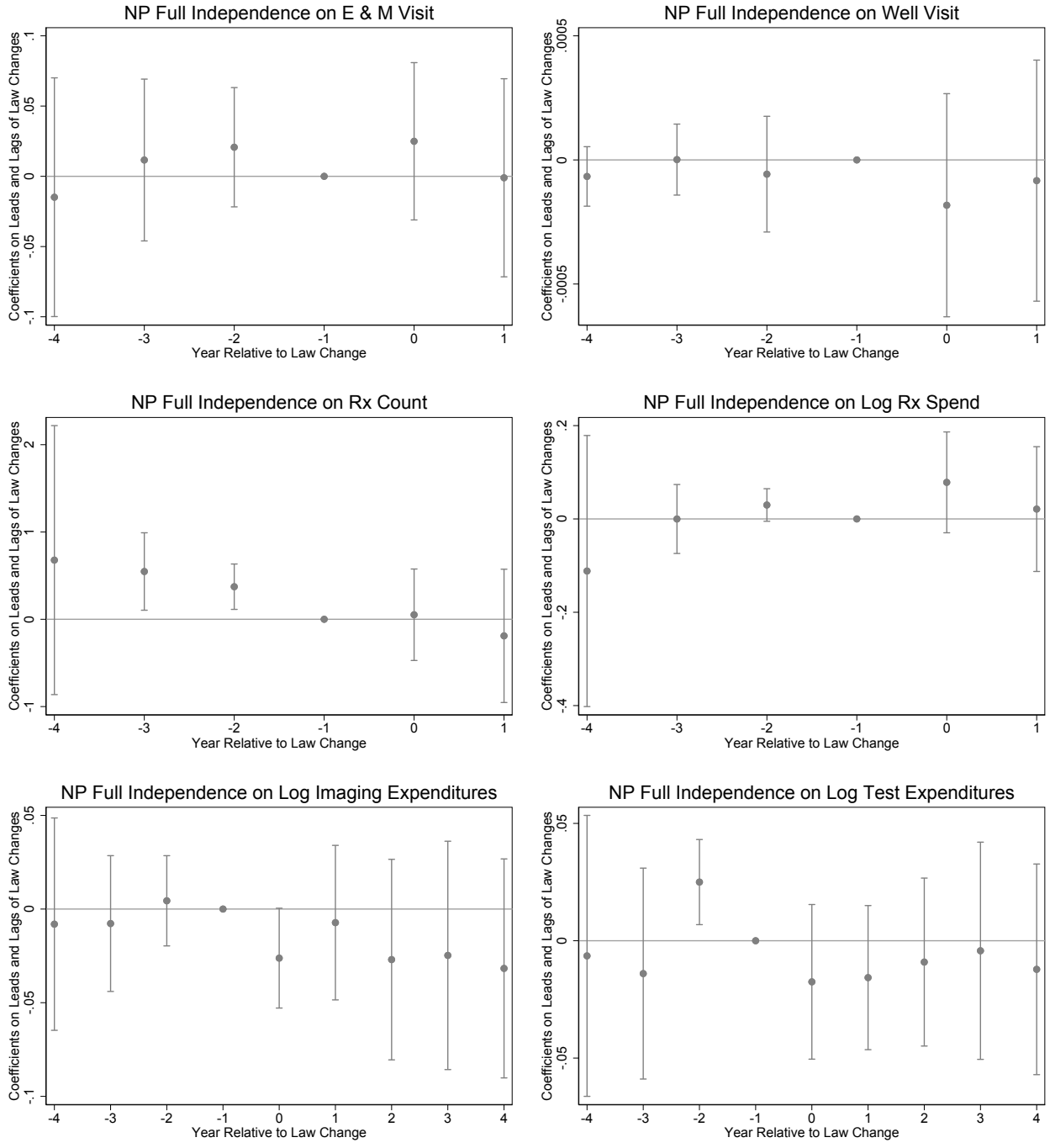
Notes: Data cover the 2005-2012 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Figure 3: Effect of Expanding NP Scope of Practice on Hypertension Complications for Medicare Beneficiaries with Hypertension



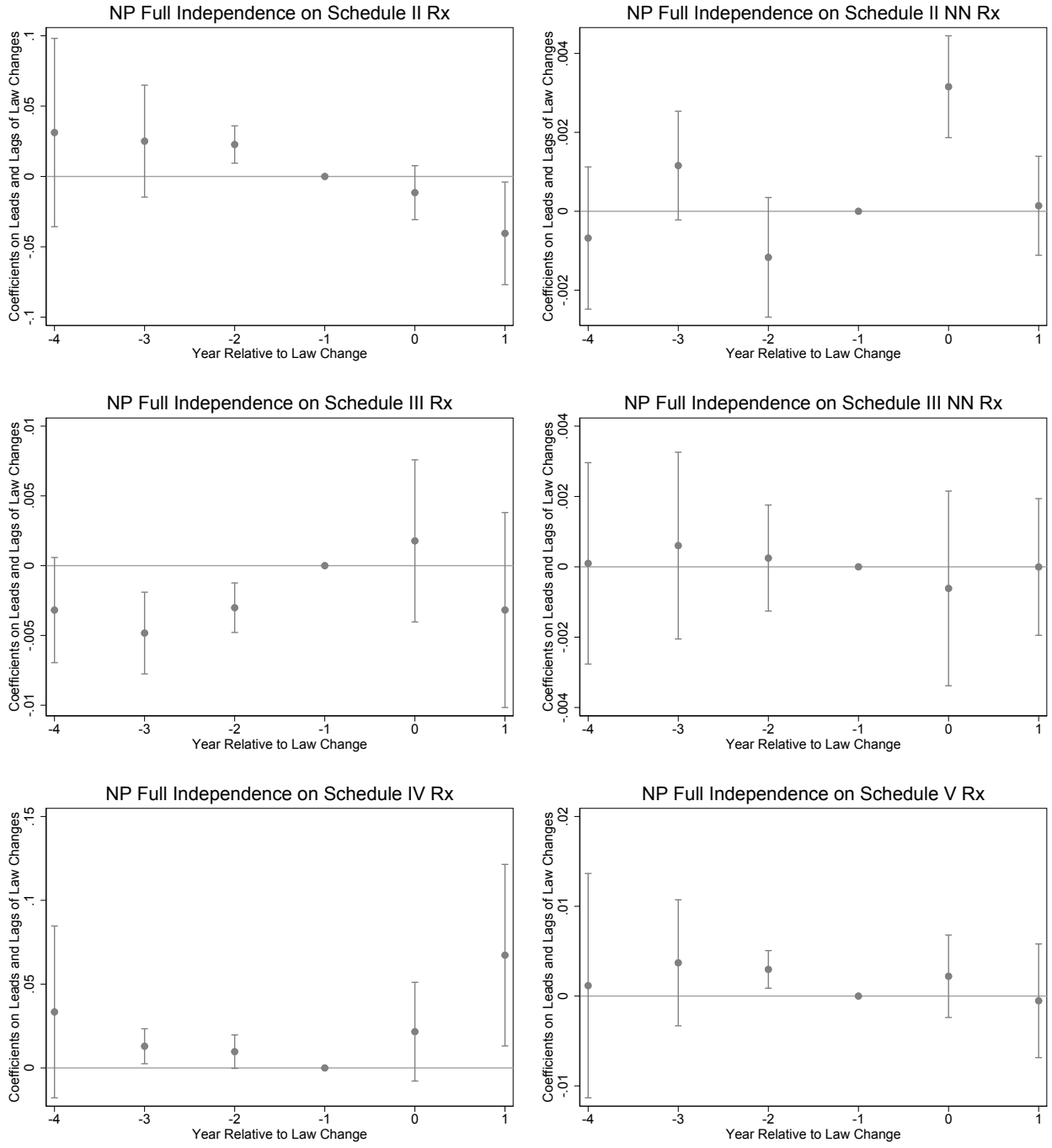
Notes: Data cover the 2005-2012 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Figure 4: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries



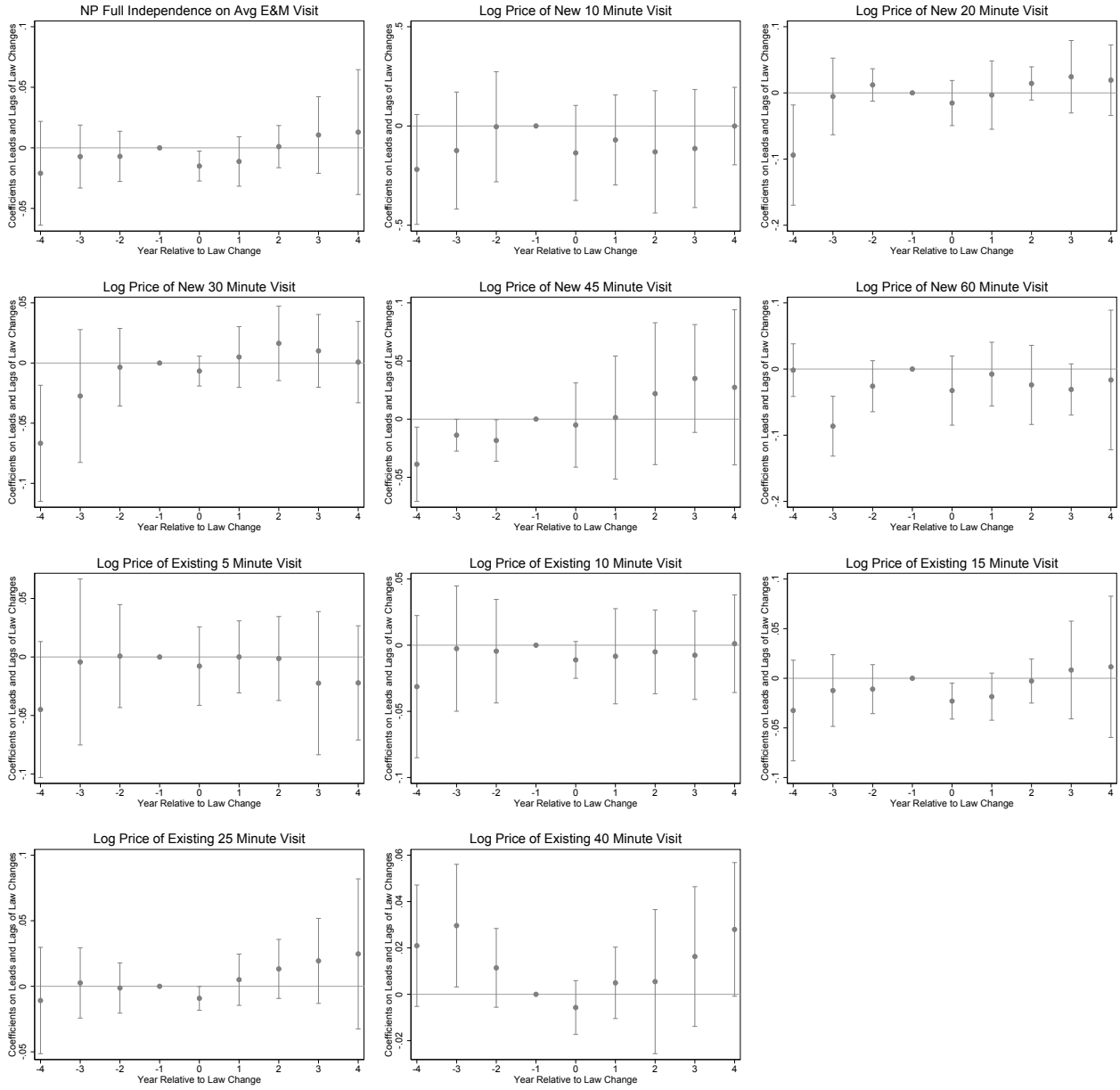
Notes: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Figure 5: Effect of Expanding NP Scope of Practice on Prescriptions for Medicare Beneficiaries



Notes: Data cover the 2006-2012 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Figure 6: Effect of Expanding NP Scope of Practice on Office Visit Prices of Commercially Insured Patients



Notes: Data cover the 2007-2015 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Table 1: State Summary Statistics for Medicare Beneficiaries

Average # Per Person	Fully Independent (1)	Not Independent (2)
Inpatient Admissions	0.285	0.354
Log Inpatient Spending	1.715	1.982
Readmissions	0.042	0.059
ER Visits	0.519	0.540
Office Visits (E & M Visits)	3.472	3.639
Checkups (Well Visits)	0.001	0.001
Log Physician Spending	4.924	5.130
Log Prescription Spending	3.186	3.365
Prescriptions	16.925	19.422
Schedule II Narcotic Prescriptions	0.632	0.579
Schedule II Non-narcotic Prescriptions	0.011	0.008
Schedule III Narcotic Prescriptions	0.040	0.044
Schedule III Non-narcotic Prescriptions	0.009	0.009
Schedule IV Prescriptions	0.340	0.468
Schedule V Prescriptions	0.043	0.058
Imaging Spending	3.465	3.751
Testing Spending	3.671	4.078
Log Total Spending	7.465	7.626
Deaths	0.051	0.055

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and admissions, readmissions, ER visits, deaths and all spending data except prescription spending which are available from 1999-2015. Each cell displays mean values per person per year of each variable in states with different NP scope of practice laws.

Table 2: State Summary Statistics for Commercially Insured Patients

Average # Per Person	Fully Independent (1)	Not Independent (2)
Inpatient Admissions	0.076	0.090
Inpatient Spending	839	864
ER Visits	0.193	0.221
Office Visits (E & M Visits)	1.639	1.643
Checkups (Well Visits)	0.300	0.259
Log Physician Spending	0.221	0.242
Log Inpatient Spending	0.333	0.361
Log Prescription Spending	3.161	3.181
Prescriptions	8.020	8.138
Unscheduled Prescriptions	6.852	7.023
Schedule II Prescriptions	0.368	0.273
Schedule III Prescriptions	0.255	0.268
Schedule IV Prescriptions	0.384	0.377
Schedule V Prescriptions	0.060	0.059
Imaging Spending	2.176	2.291
Testing Spending	2.750	2.923
Log Total Spending	5.904	5.897
Log Average Price	4.600	4.411

Note: Data cover the 2007-2015 period. Each cell displays mean values per person per year of each variable in states with different NP scope of practice laws.

Table 3: Effect of Expanding NP Scope of Practice on Higher Intensity Care and Health

Medicare Difference-in-Differences

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
Fully Independent	-0.026	-0.08	-0.0080	-0.0155	-0.0019
	(0.013)	(0.04)	(0.0055)	(0.0091)	(0.0010)
# Observations	24,586,939	24,586,939	24,586,939	24,586,939	24,586,939

Commercial Difference-in-Differences

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	ER Visits
Fully Independent	-0.001	-0.004	0.0114
	(0.004)	(0.005)	(0.0098)
# Observations	131,042,891	131,042,158	131,042,891

Medicare Movers

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
To Fully Independent	-0.023	-0.07	-0.0071	-0.0168	0.0009
	(0.011)	(0.05)	(0.0043)	(0.0179)	(0.0034)
To Restricted	-0.062	-0.24	-0.0152	-0.0326	-0.0058
	(0.012)	(0.05)	(0.0047)	(0.0206)	(0.0033)
# Observations	24,022,269	24,022,269	24,022,269	24,022,269	24,022,269

Note: Medicare data cover the 1999-2015 period and commercial data are from 2007-2015. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent rows are coefficients and standard errors (in parenthesis) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects. The Medicare DiD specification also includes county characteristics. The Medicare mover specification replaces the Fully Independent variable with separate indicator variables for moves from states with restricted NP SOP to fully independent states and moves from fully independent to states with restricted NP SOP. The mover specifications also includes indicators for leads and lags of interstate moves. Standard errors are clustered by state in the DiD regressions and using two-way clustering by state and beneficiary in the mover regressions.

Table 4: Effect of Expanding NP Scope of Practice on Complications from Chronic Conditions

Medicare Difference-in-Differences				
Diabetes Patient Complications				
Dependent Variable:	Mortality	Asymptomatic	Glacoma	Symptomatic
Fully Independent	-0.0036	0.0001	0.0006	-0.0012
	(0.0020)	(0.0017)	(0.0018)	(0.0038)
# Observations	3,913,145	3,712,655	3,692,323	3,367,291
Hypertension Patient Complications				
Dependent Variable:	Mortality	AMI	Acute Cardiac	Ischemic Heart
Fully Independent	-0.0029	-0.00003	-0.0037	-0.0016
	(0.0014)	(0.00120)	(0.0032)	(0.0022)
# Observations	9,323,444	8,968,582	7,598,019	8,127,242
Medicare Movers				
Diabetes Patient Complications				
Dependent Variable:	Mortality	Asymptomatic	Glacoma	Symptomatic
To Fully Independent	-0.0088	0.0037	-0.0052	0.0004
	(0.0088)	(0.0086)	(0.0059)	(0.0147)
To Restricted	0.0377	-0.0077	-0.0046	0.0219
	(0.0094)	(0.0094)	(0.0068)	(0.0162)
	3,812,868	3,619,309	3,599,040	3,283,543
Hypertension Patient Complications				
Dependent Variable:	Mortality	AMI	Acute Cardiac	Ischemic Heart
To Fully Independent	0.0042	-0.0019	-0.0193	-0.0055
	(0.0045)	(0.0061)	(0.0112)	(0.0114)
To Restricted	0.0128	-0.0041	0.0173	0.0010
	(0.0051)	(0.0069)	(0.0120)	(0.0126)
# Observations	9,081,063	8,738,361	7,409,640	7,922,780

Note: Medicare data cover the 2005-2012 period. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent rows are coefficients and standard errors (in parenthesis) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence, beneficiary age fixed effects, PA scope of practice indicators, county characteristics, beneficiary fixed effects, year fixed effects, and state fixed effects. The Medicare mover specification replaces the Fully Independent variable with separate indicator variables for moves from states with restricted NP SOP to fully independent states and moves from Fully Independent to states with restricted NP SOP. The mover specifications also includes indicators for leads and lags of interstate moves. Standard errors are clustered by state in the DiD regressions and using two-way clustering by state and Beneficiary in the mover regressions. Number of observations varies across the columns because estimation uses a hazard model-like approach where the patients is not included in the analysis in the years after they experience a given complication.

Table 5: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests

Medicare Difference-in-Differences

Dependent Variable:	Office Visits (Evaluation & Management)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
Fully Independent	0.016	-0.00024	-0.755	0.028	-0.044	-0.057
	(0.030)	(0.00019)	(0.466)	(0.078)	(0.048)	(0.037)
# Observations	11,268,572	11,268,572	9,740,318	9,740,318	24,586,939	24,586,939

Commercial Difference-in-Differences

Dependent Variable:	Office Visits (Evaluation & Management)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
Fully Independent	-0.0099	0.00088	-0.052	0.027	-0.060	-0.029
	(0.0473)	(0.01005)	(0.356)	(0.115)	(0.019)	(0.050)
# Observations	131,042,891	131,042,891	131,042,891	131,034,874	131,035,136	131,031,881

Medicare Movers

Dependent Variable:	Office Visits (Evaluation & Management)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
To Fully Independent	-0.308	-0.000123	-0.536	-0.061	-0.0362	-0.082
	(0.109)	(0.000869)	(0.975)	(0.093)	(0.0368)	(0.034)
To Restricted	0.410	-0.001227	-1.056	-0.051	-0.0379	0.020
	(0.127)	(0.001019)	(1.136)	(0.108)	(0.0381)	(0.048)
# Observations	10,983,383	10,983,383	9,493,538	9,493,538	24,022,269	24,022,269

Note: Medicare data cover the 1999-2015 period except the visits (2005-2012) and prescriptions (2006-2012). Commercial data are from 2007-2015. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent rows are coefficients and standard errors (in parenthesis) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects. The Medicare DiD specification also includes county characteristics. The Medicare mover specification replaces the Fully Independent variable with separate indicator variables for moves from states with restricted NP SOP to fully independent states and moves from fully independent to states with restricted NP SOP. The mover specifications also includes indicators for leads and lags of interstate moves. Standard errors are clustered by state in the DiD regressions and using two-way clustering by state and beneficiary in the mover regressions.

Table 6: Effect of Moving to State with Broader Scope of Practice on Outpatient Care for Medicare Beneficiaries by Provider Type

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions
NPs			
To Fully Independent	0.050	-0.00001	0.084
	(0.037)	(0.00006)	(0.198)
To Restricted	-0.044	-0.00052	0.063
	(0.039)	(0.00032)	(0.205)
# Observations	10,983,383	10,983,383	9,493,538
PAs			
To Fully Independent	-0.020	0.00063	-0.068
	(0.018)	(0.00065)	(0.153)
To Restricted	0.037	-0.00078	0.125
	(0.022)	(0.00072)	(0.170)
# Observations	10,983,383	10,983,383	9,493,538
PCPs			
To Independent	-0.338	-0.00074	-0.557
	(0.097)	(0.00074)	(1.070)
To Restricted	0.417	0.00008	-1.143
	(0.112)	(0.00081)	(1.195)
# Observations	10,983,383	10,983,383	9,493,538

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, two-way clustered by state and beneficiary) from regressions of the outcomes listed in each column for a sample of visits limited to the type of practitioner listed in each panel on an indicator for moves from states with restricted NP SOP to full independence moves from states with full independence to restricted SOP, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, state fixed effects, and indicators for leads and lags of interstate moves.

Table 7: Effect of Expanding NP Scope of Practice on Controlled Substances

Medicare Difference-in-Differences

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
Fully Independent	-0.0583	0.0015	0.0019	-0.0012	0.0372	-0.0018
	(0.0283)	(0.0005)	(0.0039)	(0.0015)	(0.0194)	(0.0022)
# Observations	9,740,318	9,740,318	9,740,318	9,740,318	9,740,318	9,740,318

Commercial Difference-in-Differences

Dependent Variable:	Not Scheduled	Schedule II	Schedule III	Schedule IV	Schedule V
Fully Independent	-0.1026	0.0150	-0.0223	0.0139	-0.0011
	(0.3153)	(0.0161)	(0.0068)	(0.0215)	(0.0033)
# Observations	131,042,891	131,042,891	131,042,891	131,042,891	131,042,891

Medicare Movers

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
To Fully Independent	-0.0420	-0.0109	-0.0068	-0.0085	-0.0099	-0.0142
	(0.0739)	(0.0050)	(0.0138)	(0.0069)	(0.0616)	(0.0214)
To Restricted	0.0381	0.0220	0.0220	0.0113	0.0066	-0.0104
	(0.0836)	(0.0063)	(0.0151)	(0.0086)	(0.0750)	(0.0220)
# Observations	9,493,538	9,493,538	9,493,538	9,493,538	9,493,538	9,493,538

Note: Medicare data cover the 2006-2012 period and commercial data are from 2007-2015. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent rows are coefficients and standard errors (in parenthesis) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects. The Medicare DiD specification also includes county characteristics. The Medicare mover specification replaces the Fully Independent variable with separate indicator variables for moves from states with restricted NP SOP to fully independent states and moves from fully independent to states with restricted NP SOP. The mover specifications also includes indicators for leads and lags of interstate moves. Standard errors are clustered by state in the DiD regressions and using two-way clustering by state and beneficiary in the mover regressions.

Table 8: Effect of Expanding NP Scope of Practice on Office Visit Prices for Commercially Insured Patients

Dependent Variable:	Log Avg. Price	Log Price of New Outpatient E&M Office Visit				
	E&M Office Visit	10 Minutes	20 Minutes	30 Minutes	45 Minutes	60 Minutes
Fully Independent	-0.0003	-0.103	0.002	0.030	0.032	0.001
	(0.0134)	(0.063)	(0.022)	(0.027)	(0.028)	(0.020)
R^2	0.71	0.80	0.72	0.68	0.75	0.75
# States	44	44	44	44	44	44
# Observations	71,690,930	14,549	637,474	2,355,500	729,623	98,319

Dependent Variable:	Log Price of Existing Outpatient E&M Office Visit				
	5 Minutes	10 Minutes	15 Minutes	25 Minutes	40 Minutes
Fully Independent	-0.002	-0.001	0.001	0.010	-0.003
	(0.012)	(0.014)	(0.015)	(0.013)	(0.015)
R^2	0.92	0.84	0.81	0.85	0.87
# States	44	44	44	44	44
# Observations	920,573	4,417,664	50,875,451	27,290,641	2,125,106

Note: Data cover the 2007-2015 period. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent rows are coefficients and standard errors (in parenthesis, clustered by state) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Online Appendix

A Data Appendix

A.1 Scope of Practice Laws

There are a number of cases cases where our sources disagree on the timing of the expansion of NP practice authority and NP prescriptive authority. However, the difference in timing is typically only a year or two, and there is often some ambiguity that implies both codings could be reasonable depending on the interpretation of independent practice and prescriptive authority.[24] We attempt to determine which coding is correct, and if there is any remaining uncertainty choose the earliest year the law change was recorded as occurring.

A.2 Claims data

Evaluation and management visits (CPT codes 99201-5 and 99211-5) are the most frequently billed codes in Medicare and reflect the charges for providers' time and effort in figuring out how to treat the patient. The fifth digit of the code reflects the resource intensity of the service, typically characterized by the duration of the visit. The fourth digit reflects whether or not the patient is new to the provider or practice.

The controlled substance status is included in the MarketScan data. We add it to the Medicare data by merging it with supplemented the FDA's National Drug File, which characterizes each drug (a National Drug Code) by its strength, class, generic status and controlled substance schedule status, among other things. There appear to be inconsistencies in the National Drug Codes in the MarketScan data, so we cannot merge it with the FDA's National Drug File.

[24] See, Traczynski & Udalova (2018); Hamilton III (2017); Kleiner *et al.* (2016); Kuo *et al.* (2013); McMichael (2017); Tu (2017).

B Appendix Figures

Online Appendix Figures A.1-A.2 show event study representations of the difference-in-differences analysis for commercial patients and the mover analysis for Medicare patients high intensity health care and mortality for Medicare patients.

Online Appendix Figures A.3-A.4 show event study representations of the difference-in-differences analysis for disease progression of Medicare patients.

Online Appendix Figures A.5-A.6 show event study representations of the difference-in-differences analysis for commercial patients and the mover analysis for Medicare patients for the outpatient care outcomes.

Online Appendix Figures A.7-A.8 show event study representations of the difference-in-differences analysis for commercial patients and the mover analysis for Medicare patients for the prescriptions of scheduled drugs outcomes.

C Appendix Tables

Online Appendix Tables A.1-A.2 show the main difference-in-differences results identified using only law changes, i.e., excluding interstate movers.

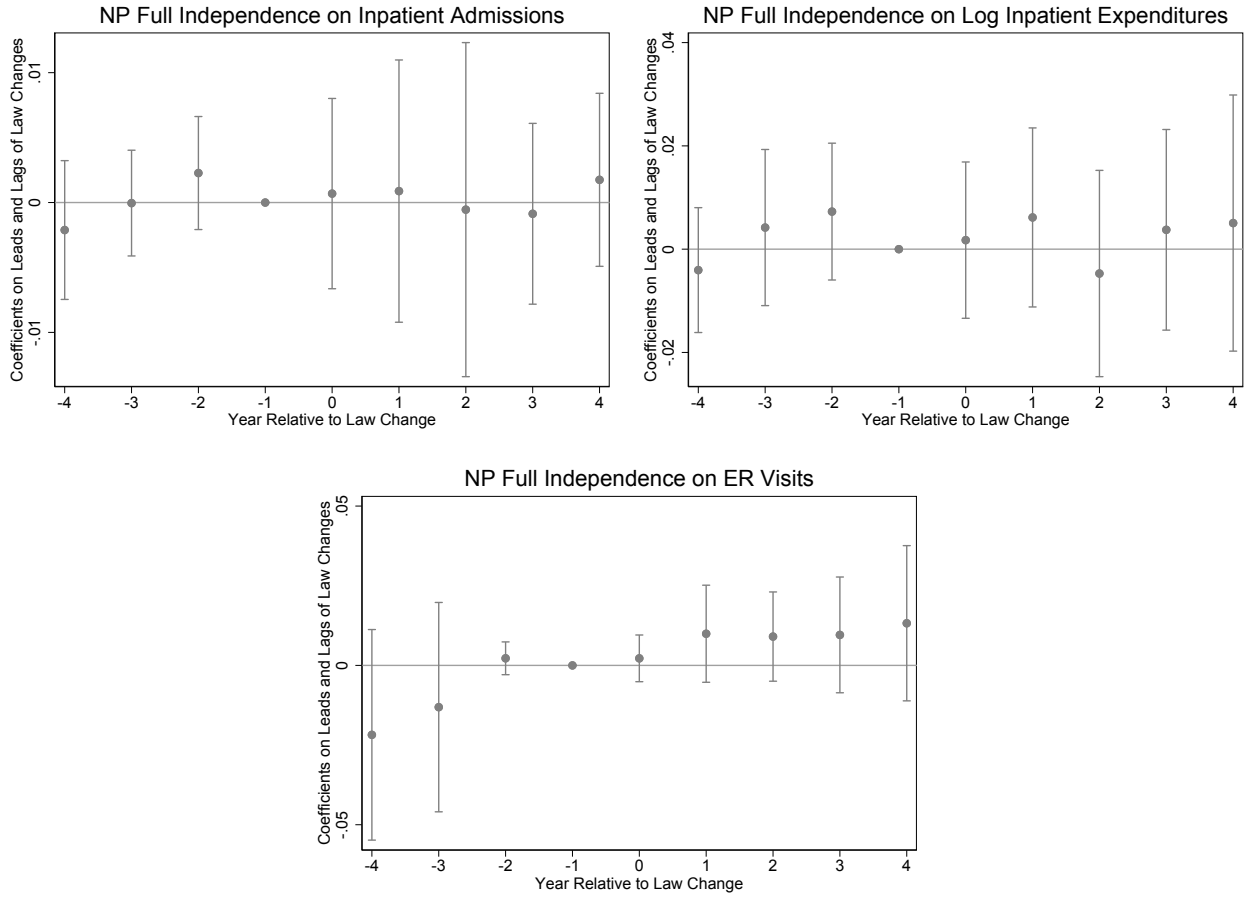
Online Appendix Table A.3 shows the mover model estimated with outcomes that are measures of the average risk adjusted health care utilization in each HRR.

Online Appendix Tables A.4-A.5 shows the effect of expanding SOP on visits and prescriptions billed by NPs, PCPs, and PAs.

Online Appendix Tables A.6-A.13 show the main difference-in-differences results interacted with rural status, physician shortage areas, the NP share of providers, and beneficiary health.

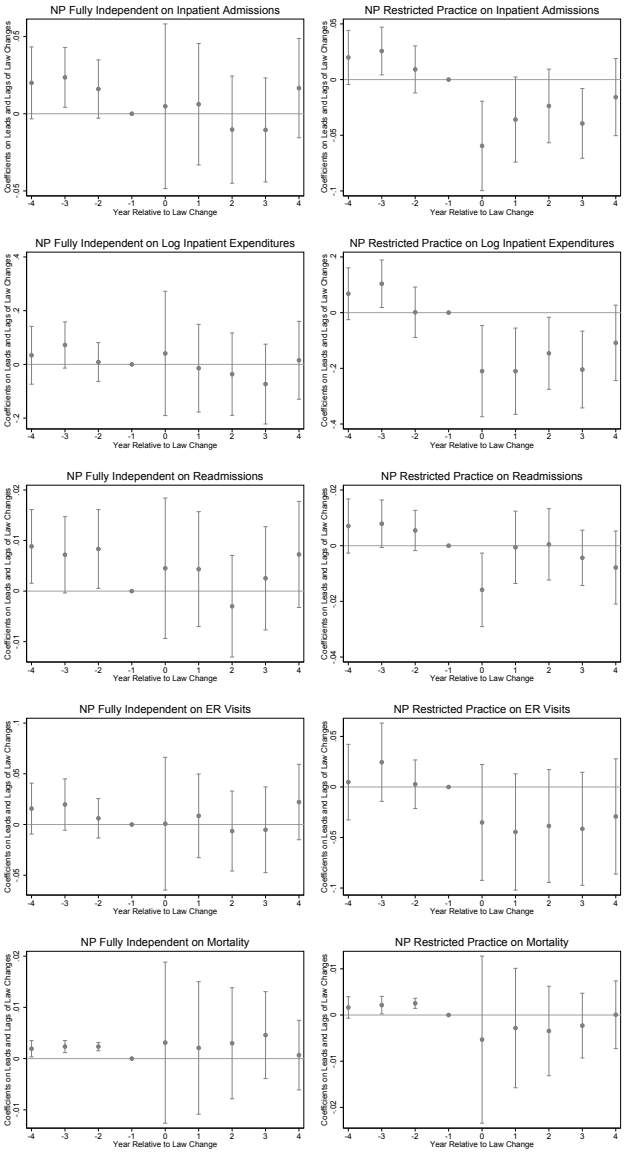
Online Appendix Tables A.14-A.17 show the mover results allowing for differential effects of moving to states with recent versus more remote scope of practice expansions.

Figure A.1: Effect of Expanding NP Scope of Practice on Proxies for Health for Commercially Insured Patients



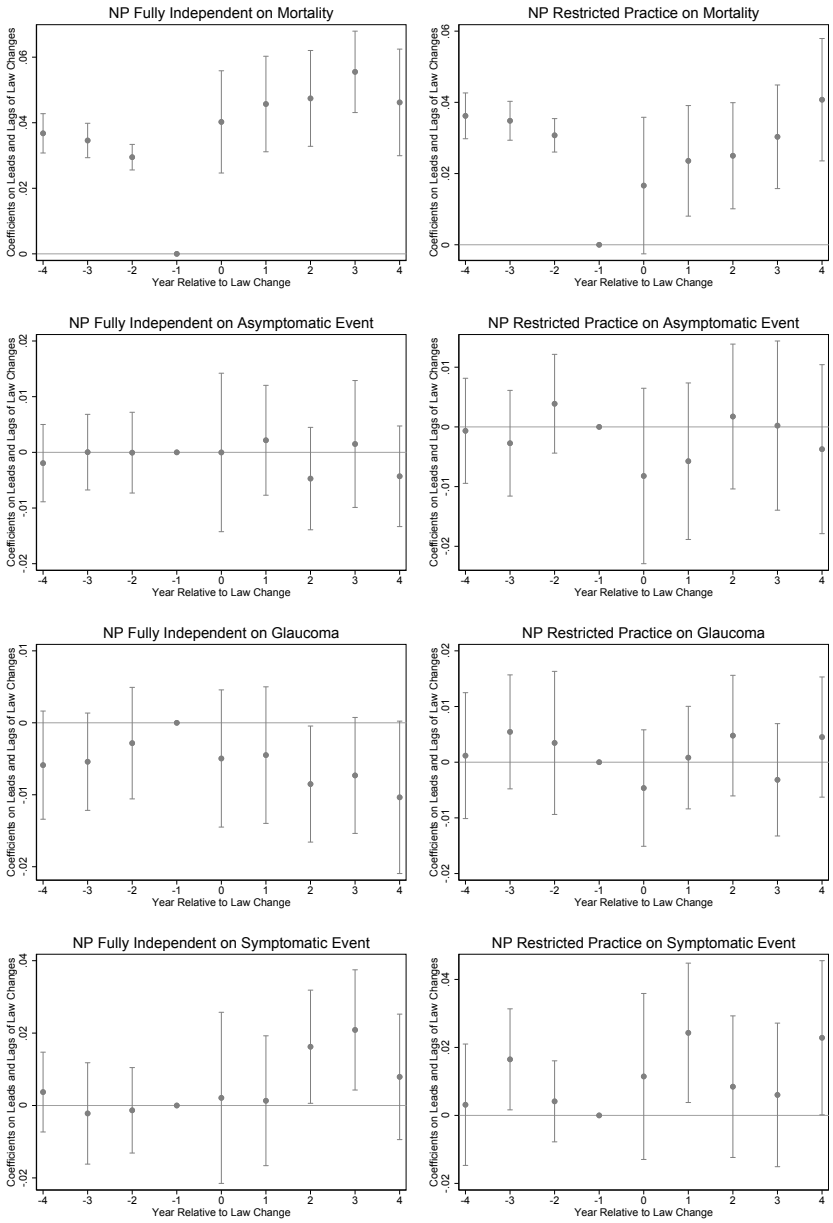
Notes: Data cover the 2007-2015 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Figure A.2: Effect of Moving to a State with Broader or Narrower NP Scope of Practice on Proxies for Health for Medicare Beneficiaries



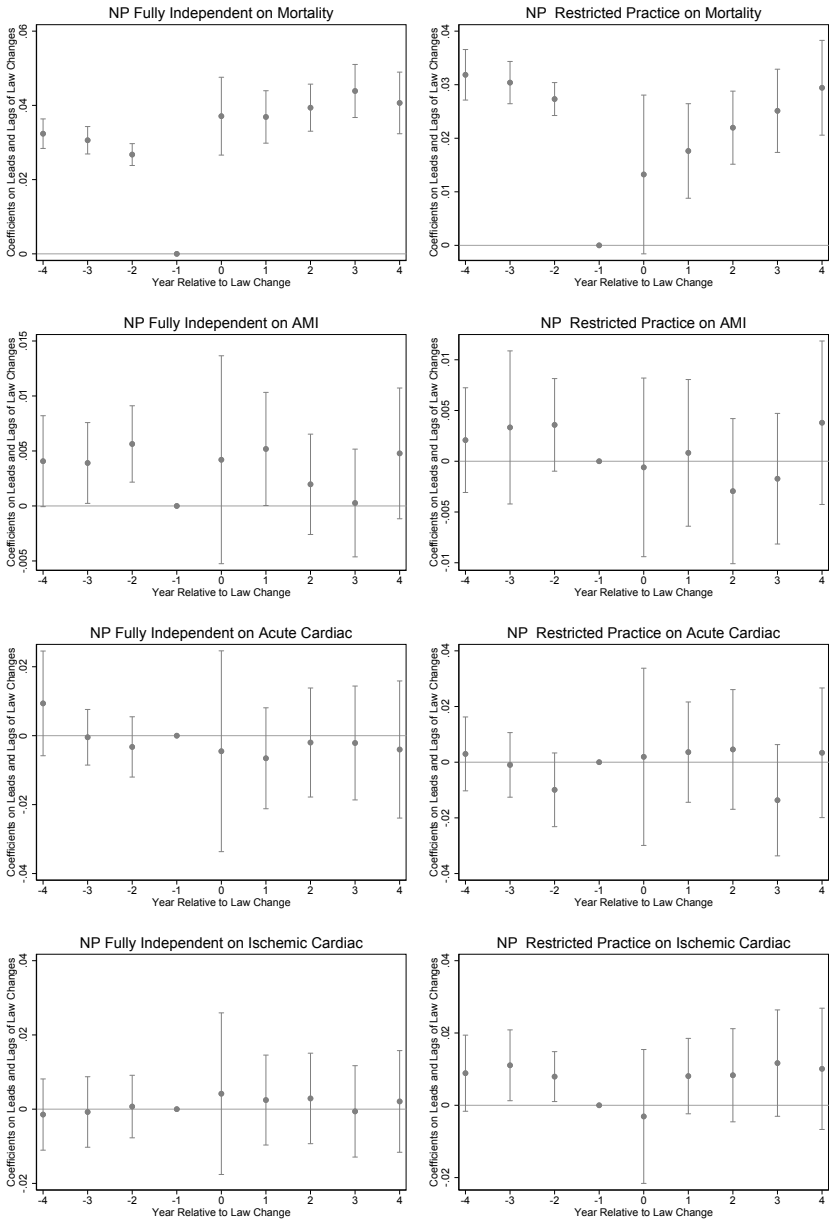
Data cover the 1999-2015 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of indicators for moves to independent or restricted scope of practice laws states with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the laws; beneficiary, age, state, and year fixed effects; leads and lags for of an indicator for an interstate move; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are two-way clustered by state and beneficiary.

Figure A.3: Effect of Moving to a State with Broader or Narrower NP Scope of Practice on Diabetes Complications for Medicare Beneficiaries with Diabetes



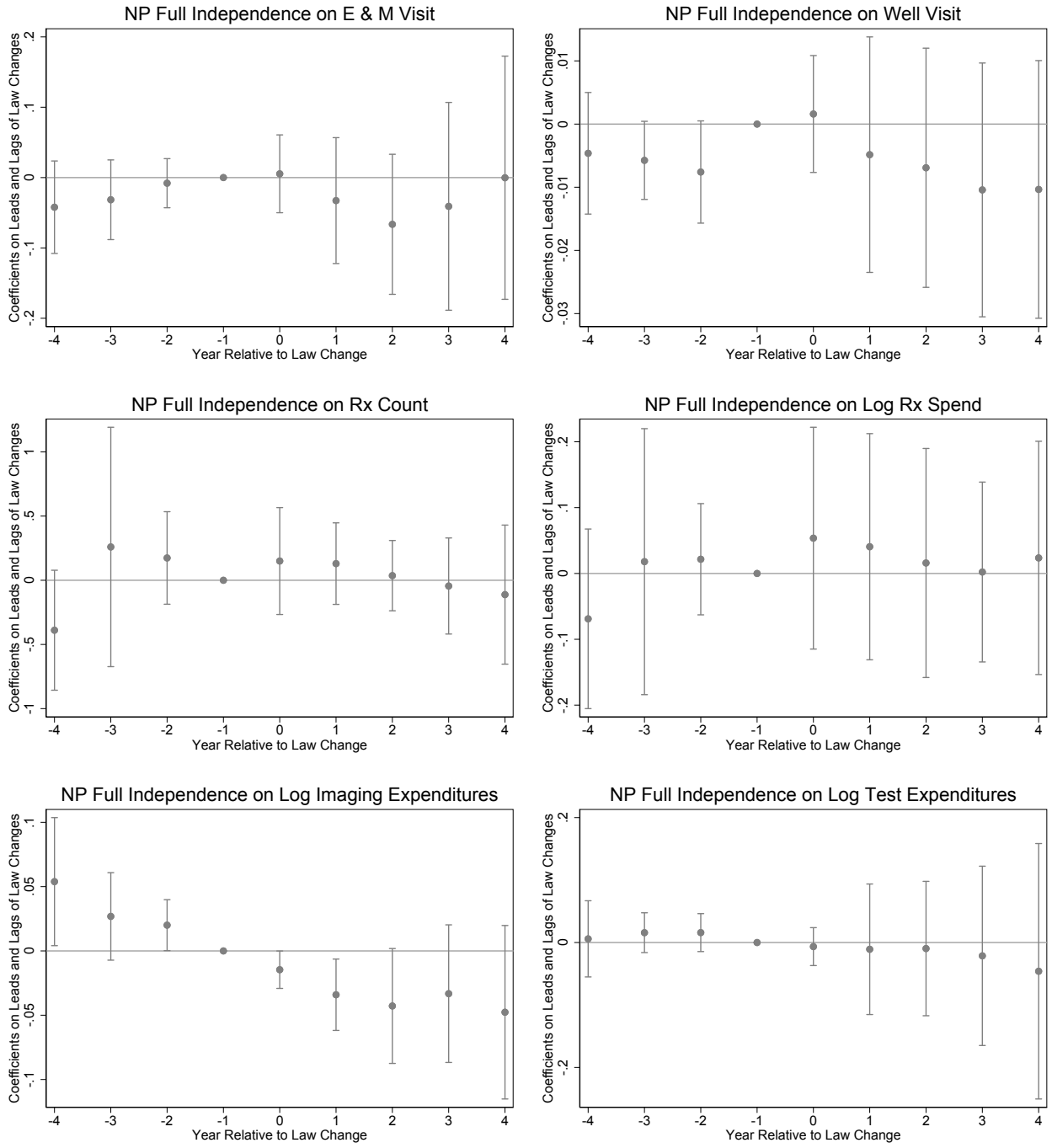
Data cover the 2005-2012 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of indicators for moves to independent or restricted scope of practice laws states with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the laws; beneficiary, age, state, and year fixed effects; leads and lags for of an indicator for an interstate move; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are two-way clustered by state and beneficiary.

Figure A.4: Effect of Moving to a State with Broader or Narrower NP Scope of Practice on Hypertension Complications for Medicare Beneficiaries with Hypertension



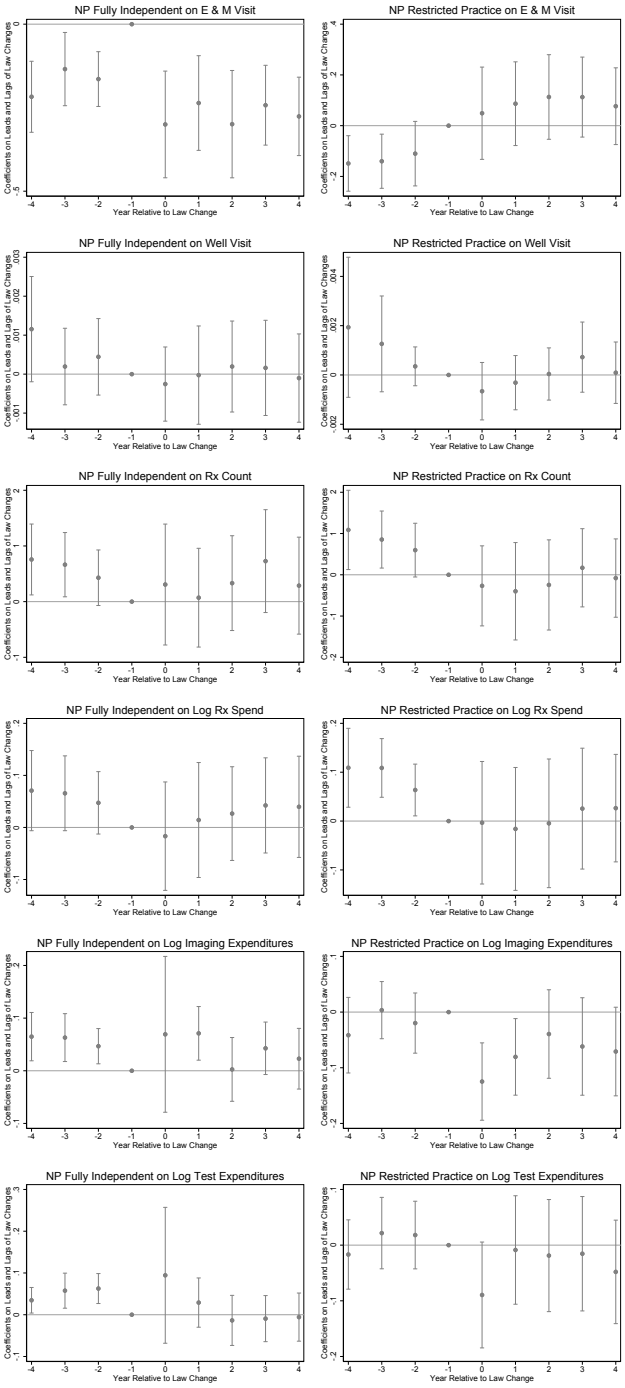
Data cover the 2005-2012 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of indicators for moves to independent or restricted scope of practice laws states with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the laws; beneficiary, age, state, and year fixed effects; leads and lags for of an indicator for an interstate move; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are two-way clustered by state and beneficiary.

Figure A.5: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests for Commercially Insured Patients



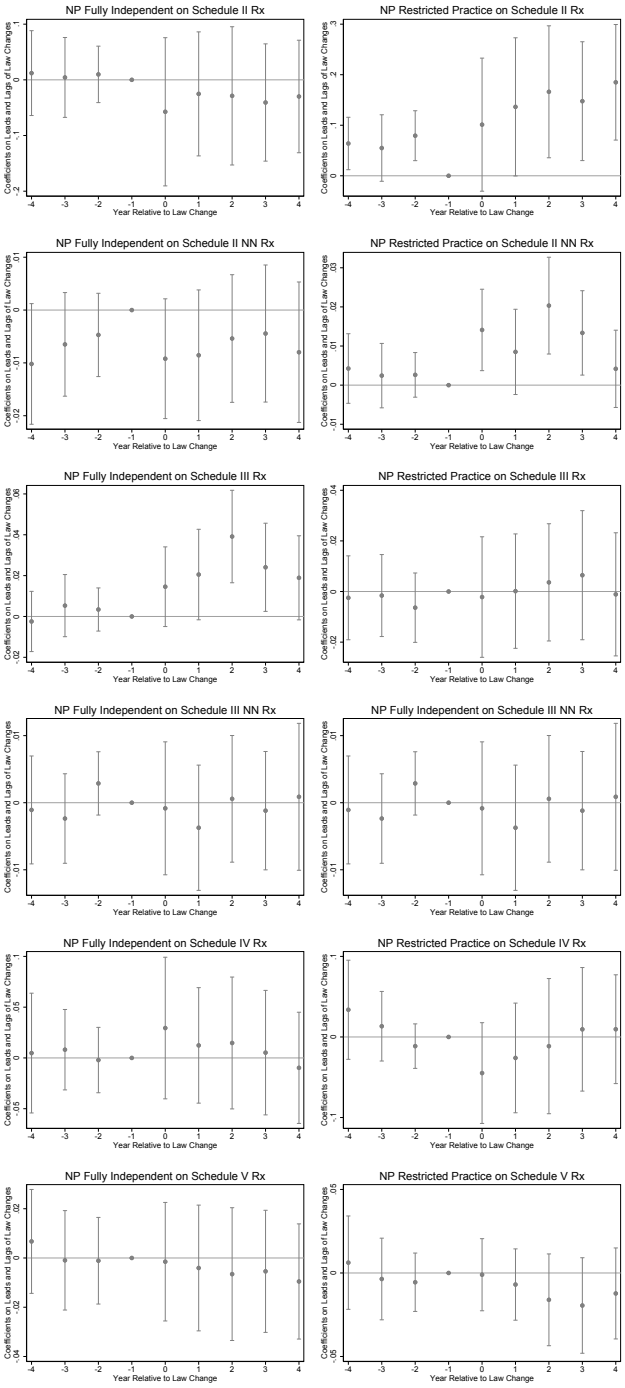
Notes: Data cover the 2007-2015 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Figure A.6: Effect of Moving to a State with Broader or Narrower NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries



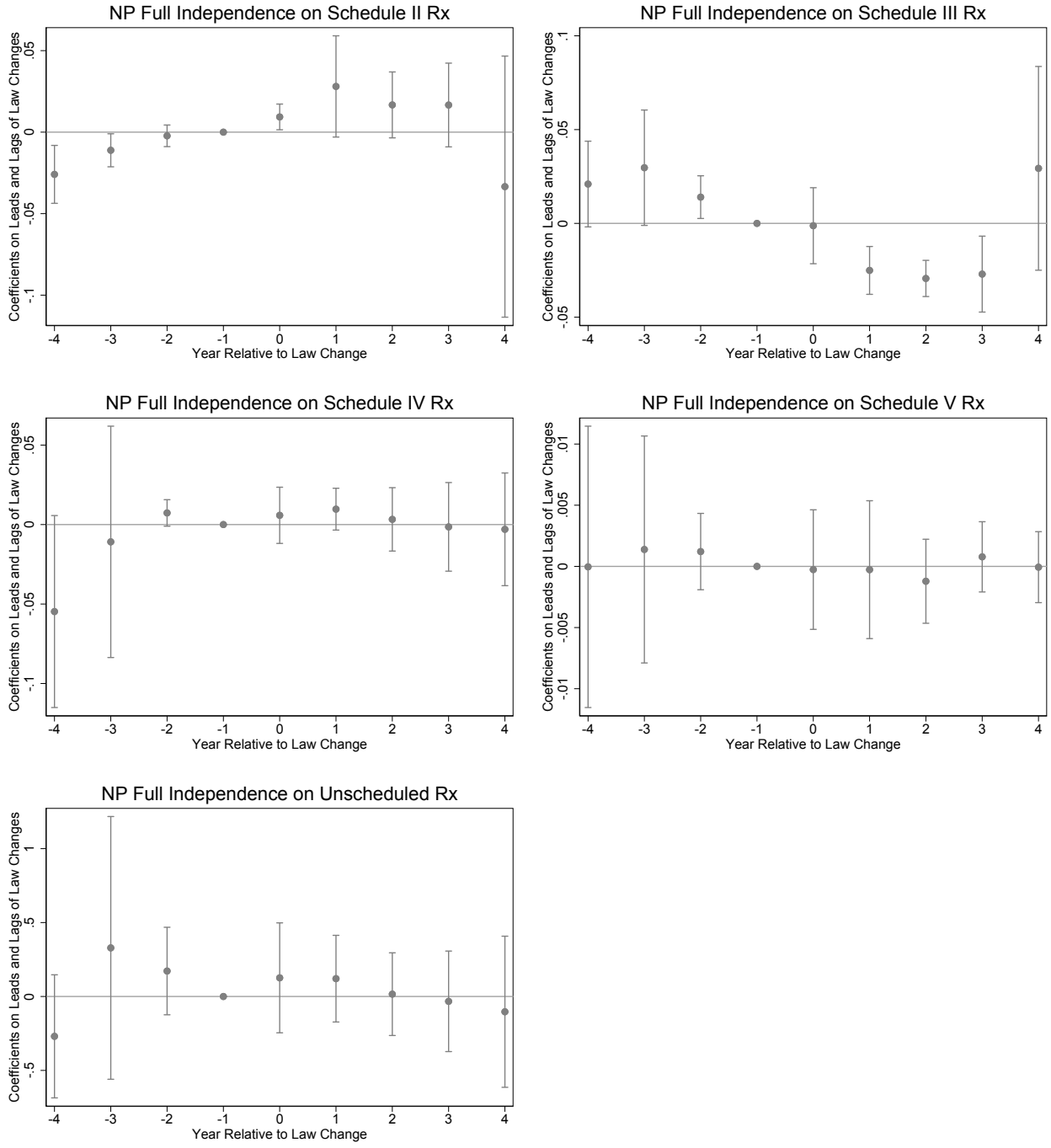
Notes: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of indicators for moves to independent or restricted scope of practice laws states with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the laws; beneficiary, age, state, and year fixed effects; leads and lags for of an indicator for an interstate move; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are two-way clustered by state and beneficiary.

Figure A.7: Effect of Moving to a State with Broader or Narrower NP Scope of Practice on Prescriptions for Medicare Beneficiaries



Notes: Data cover the 2006-2012 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of indicators for moves to independent or restricted scope of practice laws states with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the laws; beneficiary, age, state, and year fixed effects; leads and lags for of an indicator for an interstate move; an indicator for rural counties; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are two-way clustered by state and beneficiary.

Figure A.8: Effect of Expanding NP Scope of Practice on Prescriptions for Commercially Insured Patients



Notes: Data cover the 2007-2015 period. The unit of analysis is the beneficiary-year. Plots are of coefficients on leads and lags of the change in scope of practice laws with the one-year lead normalized to zero. The figures plot estimates from regressions of the level of the outcome variable on leads and lags of the law changes; beneficiary, age, state, and year fixed effects; and controls for PA scope of practice law changes. Error bars show the 95-percent confidence interval. Standard errors are clustered by state.

Table A.1: Effect of Expanding NP Scope of Practice on Higher Intensity Care and Health for Medicare Beneficiaries - Excluding Interstate Movers

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
Fully Independent	-0.025	-0.08	-0.0078	-0.0139	-0.0021
	(0.014)	(0.05)	(0.0061)	(0.0098)	(0.0010)
R^2	0.35	0.30	0.26	0.40	0.59
# States	51	51	51	51	51
# Observations	22,215,495	22,215,495	22,215,495	22,215,495	22,215,495

Note: Data cover the 1999-2015 period. The unit of observation is beneficiary-year. The sample excludes interstate movers. Numbers reported in the Fully Independent row are coefficients and standard errors (in parenthesis, clustered by state) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.2: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries - Excluding Interstate Movers

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
Fully Independent	0.014	-0.00028	-0.764	0.039	-0.040	-0.055
	(0.029)	(0.00022)	(0.463)	(0.083)	(0.051)	(0.039)
R^2	0.62	0.19	0.84	0.88	0.44	0.55
# States	51	51	51	51	51	51
# Observations	10,120,074	10,120,074	8,752,139	8,752,139	22,215,495	22,215,495

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
Fully Independent	-0.0604	0.0014	0.0017	-0.0014	0.0373	-0.0018
	(0.0295)	(0.0007)	(0.0044)	(0.0013)	(0.0198)	(0.0026)
R^2	0.71	0.67	0.64	0.55	0.66	0.61
# States	51	51	51	51	51	51
# Observations	8,752,139	8,752,139	8,752,139	8,752,139	8,752,139	8,752,139

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of observation is beneficiary-year. The sample excludes interstate movers. Numbers reported in the Fully Independent rows are coefficients and standard errors (in parenthesis, clustered by state) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, and state fixed effects.

Table A.3: Moving Between States with Different NP Scope of Practice and Average Local Health Care Utilization for Medicare Beneficiaries

Dependent Variable:	Constant HRR-Level			
	Total Spending	Inpatient Spending	Admissions	ERvisits
To Fully Independent	26.990	12.36	0.0013	0.0001
	(27.742)	(10.37)	(0.0006)	(0.0007)
To Restricted Practice	15.541	18.01	-0.0002	-0.0005
	(33.092)	(13.84)	(0.0009)	(0.0010)
R^2	0.98	0.98	0.98	0.98
# States	51	51	51	51
# Observations	23,999,384	23,999,384	23,999,384	23,999,384

Note: Data cover the 1999-2015 period. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent and Restricted Practice rows are coefficients and standard errors (in parenthesis, two-way clustered by state and beneficiary) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence an indicator for states not allowing full independence, indicators for leads and lags of interstate moves, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.4: Effect of Expanding NP Scope of Practice on Outpatient Care by Provider Type for Medicare Beneficiaries

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions
NPs	-0.0079	-0.000019	0.0024
	(0.0181)	(0.000016)	(0.1155)
# Observations	11,268,572	11,268,572	9,740,318
PAs	-0.0007	-0.000004	-0.0368
	(0.0144)	(0.000014)	(0.0511)
# Observations	11,268,572	11,268,572	9,740,318
PCPs	0.0241	-0.000221	-0.7205
	(0.0364)	(0.000188)	(0.4360)
# Observations	11,268,572	11,268,572	9,740,318

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012. The unit of observation is beneficiary-year. Numbers reported rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable from regressions of the level of each of the dependent variables for visits to/prescriptions by the provider listed in the row on an indicator for states allowing NPs full independence, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.5: Effect of Expanding NP Scope of Practice on Outpatient Care by Provider Type for Commercially Insured Patients

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)
NPs	0.0031	0.0016
	(0.0095)	(0.0015)
# Observations	131,042,891	131,042,891
PAs	0.0165	0.0005
	(0.0107)	(0.0004)
# Observations	131,042,891	131,042,891
PCPs	-0.0300	-0.0012
	(0.0467)	(0.0103)
# Observations	131,042,891	131,042,891

Note: Data cover the 2007-2015 period. The unit of observation is beneficiary-year. Numbers reported rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable from regressions of the level of each of the dependent variables for visits to/prescriptions by the provider listed in the row on an indicator for states allowing NPs full independence, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.6: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries - Rural Areas

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
Fully Independent	0.027	-0.00032	-0.750	0.045	-0.024	-0.041
	(0.025)	(0.00023)	(0.473)	(0.078)	(0.041)	(0.029)
Fully Independent×	-0.067	0.00044	-0.029	-0.099	-0.120	-0.098
Rural	(0.074)	(0.00026)	(0.503)	(0.052)	(0.040)	(0.045)
Rural	-0.068	-0.00019	-1.067	-0.014	-0.095	-0.191
	(0.039)	(0.00013)	(0.226)	(0.019)	(0.014)	(0.021)
R^2	0.62	0.19	0.83	0.88	0.44	0.54
# States	51	51	51	51	51	51
# Observations	11,268,572	11,268,572	9,740,318	9,740,318	24,586,939	24,586,939

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
Fully Independent	-0.0707	0.0011	0.0021	-0.0013	0.0427	-0.0034
	(0.0209)	(0.0004)	(0.0039)	(0.0014)	(0.0183)	(0.0022)
Fully Independent×	0.0738	0.0027	-0.0012	0.0009	-0.0326	0.0091
Rural	(0.0420)	(0.0014)	(0.0037)	(0.0013)	(0.0135)	(0.0038)
Rural	-0.0710	-0.0013	-0.0003	0.0034	-0.0051	-0.0022
	(0.0185)	(0.0013)	(0.0023)	(0.0010)	(0.0109)	(0.0041)
R^2	0.71	0.67	0.63	0.55	0.66	0.60
# States	51	51	51	51	51	51
# Observations	9,740,318	9,740,318	9,740,318	9,740,318	9,740,318	9,740,318

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Prescribe Independently variable fully interacted with an indicator for rural counties from regressions of the level of each of the dependent variables on an indicator for states allowing NPs to prescribe independently fully interacted with an indicator for a rural county, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.7: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries - PCP Shortage Areas

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
Fully Independent	0.029	-0.00021	-0.557	0.061	-0.027	-0.032
	(0.031)	(0.00022)	(0.596)	(0.104)	(0.045)	(0.033)
Fully Independent×	-0.030	-0.00008	-0.444	-0.074	-0.037	-0.052
PCP Shortage Area	(0.050)	(0.00018)	(0.396)	(0.092)	(0.019)	(0.028)
PCP Shortage Area	-0.038	0.00006	0.153	0.001	0.002	0.010
	(0.018)	(0.00008)	(0.126)	(0.015)	(0.006)	(0.010)
R^2	0.62	0.19	0.83	0.88	0.44	0.54
# States	51	51	51	51	51	51
# Observations	11,268,572	11,268,572	9,740,318	9,740,318	24,586,939	24,586,939

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
Fully Independent	-0.0551	0.0018	0.0036	0.0000	0.0508	-0.0009
	(0.0287)	(0.0006)	(0.0043)	(0.0014)	(0.0221)	(0.0023)
Fully Independent×	-0.0070	-0.0006	-0.0039	-0.0026	-0.0305	-0.0021
PCP Shortage Area	(0.0175)	(0.0016)	(0.0023)	(0.0015)	(0.0118)	(0.0023)
PCP Shortage Area	0.0079	0.0018	0.0020	-0.0007	0.0077	0.0018
	(0.0112)	(0.0013)	(0.0022)	(0.0012)	(0.0074)	(0.0035)
R^2	0.71	0.67	0.63	0.55	0.66	0.60
# States	51	51	51	51	51	51
# Observations	9,740,318	9,740,318	9,740,318	9,740,318	9,740,318	9,740,318

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable fully interacted with an indicator for counties that are PCP shortage areas from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence fully interacted with an indicator for PCP shortage counties, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.8: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries - By NP Share

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
Fully Independent	-0.004	-0.00047	-1.155	-0.003	-0.036	-0.036
	(0.041)	(0.00027)	(0.420)	(0.089)	(0.044)	(0.045)
Fully Independent×	0.028	0.00039	0.508	0.047	-0.017	-0.044
Middle Tercile	(0.030)	(0.00017)	(0.479)	(0.109)	(0.013)	(0.032)
Fully Independent×	0.030	0.00027	0.890	0.057	0.003	0.012
Bottom Tercile	(0.086)	(0.00036)	(0.821)	(0.152)	(0.027)	(0.044)
Middle Tercile	-0.024	-0.00018	-0.062	-0.018	-0.009	-0.024
	(0.020)	(0.00009)	(0.150)	(0.014)	(0.012)	(0.016)
Top Tercile	-0.025	-0.00026	-0.431	-0.041	-0.027	-0.055
	(0.027)	(0.00015)	(0.197)	(0.025)	(0.015)	(0.019)
R^2	0.62	0.19	0.83	0.88	0.44	0.54
# States	51	51	51	51	51	51
# Observations	11,254,582	11,254,582	9,728,314	9,728,314	24,555,757	24,555,757

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
Fully Independent	-0.101	0.00120	0.0014	0.0003	0.0196	-0.0080
	(0.030)	(0.00098)	(0.0027)	(0.0018)	(0.0089)	(0.0022)
Fully Independent×	0.072	0.00095	0.0013	-0.0020	0.0259	0.0090
Middle Tercile	(0.030)	(0.00149)	(0.0040)	(0.0016)	(0.0172)	(0.0022)
Fully Independent×	0.054	-0.00027	-0.0001	-0.0032	0.0318	0.0117
Bottom Tercile	(0.023)	(0.00171)	(0.0051)	(0.0015)	(0.0343)	(0.0037)
Middle Tercile	-0.016	0.00010	-0.0039	-0.0005	0.0046	-0.0073
	(0.012)	(0.00146)	(0.0024)	(0.0012)	(0.0073)	(0.0035)
Bottom Tercile	-0.000	-0.00001	-0.0043	-0.0011	-0.0182	-0.0021
	(0.014)	(0.00231)	(0.0027)	(0.0012)	(0.0107)	(0.0049)
R^2	0.71	0.67	0.63	0.55	0.66	0.60
# States	51	51	51	51	51	51
# Observations	9,728,314	9,728,314	9,728,314	9,728,314	9,728,314	9,728,314

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable fully interacted with indicators for terciles of the NP share of PCPs from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence fully interacted with indicators for terciles of the NP share of PCPs, beneficiary age fixed effects, PA scope of practice indicators, county characteristics, beneficiary fixed effects, year fixed effects, and state fixed effects. Lower terciles are associated with a lower share of NPs.

Table A.9: Effect of Expanding NP Scope of Practice on Higher Intensity Care and Health for Medicare Beneficiaries - Rural Areas

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
Fully Independent	-0.025	-0.08	-0.0079	-0.0162	-0.0018
	(0.013)	(0.04)	(0.0055)	(0.0089)	(0.0012)
Fully Independent×	-0.004	-0.01	-0.0006	0.0042	-0.0005
Rural	(0.007)	(0.03)	(0.0021)	(0.0127)	(0.0012)
Rural	-0.010	-0.05	-0.0023	-0.0006	-0.0046
	(0.003)	(0.01)	(0.0011)	(0.0050)	(0.0008)
R^2	0.35	0.29	0.26	0.39	0.59
# States	51	51	51	51	51
# Observations	24,586,939	24,586,939	24,586,939	24,586,939	24,586,939

Note: Data cover the 1999-2015 period. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable fully interacted with an indicator for rural counties from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence fully interacted with an indicator for a rural county, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.10: Effect of Expanding NP Scope of Practice on Higher Intensity Care and Health for Medicare Beneficiaries - PCP Shortage Areas

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
Fully Independent	-0.017	-0.05	-0.0052	-0.0116	-0.0013
	(0.013)	(0.04)	(0.0058)	(0.0101)	(0.0011)
Fully Independent×	-0.018	-0.05	-0.0061	-0.0084	-0.0012
PCP Shortage Area	(0.007)	(0.02)	(0.0027)	(0.0085)	(0.0006)
PCP Shortage Area	0.003	0.00	0.0015	0.0062	0.0000
	(0.002)	(0.01)	(0.0007)	(0.0028)	(0.0004)
R^2	0.35	0.29	0.26	0.39	0.59
# States	51	51	51	51	51
# Observations	24,586,939	24,586,939	24,586,939	24,586,939	24,586,939

Note: Data cover the 1999-2015 period. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable fully interacted with an indicator for counties that are PCP shortage areas from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence fully interacted with an indicator for a PCP shortage counties, beneficiary age fixed effects, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.11: Effect of Expanding NP Scope of Practice on Higher Intensity Care and Health for Medicare Beneficiaries - By NP Share

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
Fully Independent	-0.026	-0.085	-0.0078	-0.0265	-0.0040
	(0.011)	(0.038)	(0.0040)	(0.0119)	(0.0016)
Fully Independent×	0.001	0.009	-0.0010	0.0151	0.0032
Middle Tercile	(0.008)	(0.024)	(0.0034)	(0.0123)	(0.0013)
Fully Independent×	0.003	0.000	0.0018	0.0215	0.0027
Bottom Tercile	(0.011)	(0.036)	(0.0057)	(0.0176)	(0.0013)
Middle Tercile	-0.005	-0.019	-0.0012	-0.0010	-0.0010
	(0.004)	(0.013)	(0.0013)	(0.0039)	(0.0006)
Top Tercile	-0.007	-0.031	-0.0012	-0.0085	-0.0016
	(0.004)	(0.016)	(0.0015)	(0.0061)	(0.0008)
	0.35	0.29	0.26	0.39	0.59
# States	51	51	51	51	51
# Observations	24,555,757	24,555,757	24,555,757	24,555,757	24,555,757

Note: Data cover the 1999-2015 period. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable fully interacted with indicators for terciles of the NP share of PCPs from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence fully interacted with indicators for terciles of of the the NP share of PCPs plus NPs, beneficiary age fixed effects, PA scope of practice indicators, county characteristics, beneficiary fixed effects, year fixed effects, and state fixed effects. Lower terciles are associated with a lower share of NPs.

Table A.12: Effect of Expanding NP Scope of Practice on Higher Intensity Care and Health for Medicare Beneficiaries - By Patient Health

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
Fully Independent	-0.012	-0.035	-0.0030	-0.0210	-0.0065
	(0.011)	(0.040)	(0.0042)	(0.0110)	(0.0017)
Fully Independent×	0.000	0.002	0.0001	0.0083	0.0028
Middle Tercile	(0.002)	(0.010)	(0.0007)	(0.0036)	(0.0006)
Fully Independent×	-0.030	-0.101	-0.0109	0.0053	0.0103
Bottom Tercile	(0.014)	(0.052)	(0.0048)	(0.0188)	(0.0026)
Middle Tercile	0.001	-0.041	0.0021	0.0263	0.0014
	(0.001)	(0.004)	(0.0003)	(0.0019)	(0.0003)
Bottom Tercile	0.033	-0.028	0.0138	0.1172	0.0272
	(0.002)	(0.010)	(0.0008)	(0.0041)	(0.0008)
	0.35	0.30	0.26	0.40	0.60
# States	51	51	51	51	51
# Observations	21,261,218	21,261,218	21,261,218	21,261,218	21,261,218

Note: Data cover the 1999-2015 period. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Indepdendent variable fully interacted with indicators for terciles of beneficiary health from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence fully interacted with indicators for terciles of beneficiary health, beneficiary age fixed effects, PA scope of practice indicators, county characteristics, beneficiary fixed effects, year fixed effects, and state fixed effects. Lower terciles are associated with worse health.

Table A.13: Effect of Expanding NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries - By Patient Health

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
Fully Independent	-0.004	-0.00027	-0.755	0.022	-0.013	-0.016
	(0.035)	(0.00017)	(0.459)	(0.075)	(0.044)	(0.036)
Fully Independent×	0.029	0.00009	0.040	0.007	0.026	0.039
Middle Tercile	(0.014)	(0.00012)	(0.136)	(0.012)	(0.009)	(0.007)
Fully Independent×	0.033	0.00001	0.066	0.004	-0.092	-0.099
Bottom Tercile	(0.073)	(0.00012)	(0.595)	(0.033)	(0.020)	(0.027)
Middle Tercile	-0.043	0.00012	0.298	-0.029	-0.093	-0.126
	(0.007)	(0.00003)	(0.049)	(0.005)	(0.004)	(0.005)
Bottom Tercile	-0.164	0.00014	3.397	0.170	-0.084	-0.049
	(0.017)	(0.00004)	(0.197)	(0.010)	(0.005)	(0.008)
R^2	0.62	0.19	0.83	0.88	0.44	0.55
# States	51	51	51	51	51	51
# Observations	10,396,507	10,396,507	8,963,964	8,963,964	21,261,218	21,261,218

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
Fully Independent	-0.083	0.00163	0.0039	-0.0016	0.0371	0.0004
	(0.029)	(0.00061)	(0.0040)	(0.0017)	(0.0168)	(0.0025)
Fully Independent×	0.009	0.00039	-0.0004	0.0009	-0.0004	-0.0033
Middle Tercile	(0.007)	(0.00042)	(0.0018)	(0.0004)	(0.0040)	(0.0017)
Fully Independent×	0.067	0.00096	-0.0060	0.0002	0.0040	-0.0037
Bottom Tercile	(0.032)	(0.00142)	(0.0025)	(0.0009)	(0.0110)	(0.0031)
Middle Tercile	0.012	0.00041	0.0002	0.0000	0.0058	0.0027
	(0.003)	(0.00020)	(0.0004)	(0.0002)	(0.0018)	(0.0007)
Bottom Tercile	0.109	0.00259	0.0017	0.0012	0.0389	0.0117
	(0.009)	(0.00048)	(0.0008)	(0.0003)	(0.0042)	(0.0013)
R^2	0.70	0.66	0.64	0.55	0.66	0.60
# States	51	51	51	51	51	51
# Observations	8,963,964	8,963,964	8,963,964	8,963,964	8,963,964	8,963,964

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, clustered by state) on the Fully Independent variable fully interacted with indicators for terciles of beneficiary health from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence fully interacted with indicators for terciles of beneficiary health, beneficiary age fixed effects, PA scope of practice indicators, county characteristics, beneficiary fixed effects, year fixed effects, and state fixed effects. Lower terciles are associated with worse health.

Table A.14: Effect of Moving Between States with Different NP Scope of Practice on Higher Intensity Care and Health for Medicare Beneficiaries by Recency of Law Change

Dependent Variable:	Inpatient Admissions	Log Inpatient Spending	Readmissions	ER Visits	Mortality
To Fully Independent					
Early Law Change	-0.047	-0.16	-0.0155	-0.0392	-0.0002
	(0.017)	(0.07)	(0.0061)	(0.0255)	(0.0036)
Recent Law Change	-0.014	-0.03	-0.0035	-0.0070	0.0010
	(0.010)	(0.05)	(0.0046)	(0.0174)	(0.0035)
To Restricted Practice					
Early Law Change	-0.040	-0.15	-0.0077	-0.0126	-0.0043
	(0.015)	(0.07)	(0.0056)	(0.0243)	(0.0027)
Recent Law Change	-0.074	-0.28	-0.0172	-0.0384	-0.0081
	(0.021)	(0.08)	(0.0075)	(0.0308)	(0.0063)
R^2	0.35	0.29	0.26	0.39	0.59
# States	51	51	51	51	51
# Observations	24,022,269	24,022,269	24,022,269	24,022,269	24,022,269

Note: Data cover the 1999-2015 period. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent and Restricted Practice rows are coefficients and standard errors (in parenthesis, two-way clustered by state and beneficiary) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence or an indicator for states not allowing full independence for moves involving states that either allowed full independence prior to 1998 (Early Law Change) or did not (Recent Law Change), indicators for leads and lags of interstate moves, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.15: Effect of Expanding NP Scope of Practice on Complications from Chronic Conditions by Recency of Law Change

Medicare Movers				
Diabetes Patient Complications				
Dependent Variable:	Mortality	Asymptomatic	Glacoma	Symptomatic
To Fully Independent				
Early Law Change	0.0018	-0.0001	-0.0154	-0.0019
	(0.0098)	(0.0092)	(0.0083)	(0.0167)
Recent Law Change	-0.0139	0.0067	-0.0002	0.0020
	(0.0098)	(0.0099)	(0.0057)	(0.0160)
To Restricted Practice				
Early Law Change	0.0320	-0.0086	0.0011	0.0222
	(0.0106)	(0.0090)	(0.0085)	(0.0175)
Recent Law Change	0.0202	0.0139	0.0099	0.0302
	(0.0129)	(0.0126)	(0.0095)	(0.0213)
R^2	0.591	0.314	0.322	0.343
# States	51	51	51	51
# Observations	3,812,868	3,619,309	3,599,040	3,283,543

Hypertension Patient Complications				
Dependent Variable:	Mortality	AMI	Acute Cardiac	Ischemic Heart
To Fully Independent				
Early Law Change	0.0060	0.0022	-0.0285	-0.0071
	(0.0062)	(0.0059)	(0.0143)	(0.0109)
Recent Law Change	0.0030	-0.0036	-0.0145	-0.0047
	(0.0050)	(0.0064)	(0.0132)	(0.0124)
To Restricted Practice				
Early Law Change	0.0123	-0.0073	0.0240	0.0021
	(0.0062)	(0.0065)	(0.0131)	(0.0121)
Recent Law Change	0.0075	-0.0054	0.0227	0.0023
	(0.0079)	(0.0083)	(0.0195)	(0.0158)
R^2	0.585	0.293	0.331	0.332
# States	51	51	51	51
# Observations	9,081,063	8,738,361	7,409,640	7,922,780

Note: Medicare data cover the 2005-2012 period. The unit of observation is beneficiary-year. Numbers reported in the Fully Independent rows are coefficients and standard errors (in parenthesis, two-way clustered by state and beneficiary) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence or an indicator for states not allowing full independence for moves involving states that either allowed full independence prior to 1998 (Early Law Change) or did not (Recent Law Change), indicators for leads and lags of interstate moves, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects. Number of observations varies across the columns because estimation uses a hazard model-like approach where the patients is not included in the analysis in the years after they experience a given complication.

Table A.16: Effect of Moving Between States with Different NP Scope of Practice on Outpatient Care and Tests for Medicare Beneficiaries By Recency of Law Change

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions	Log Rx Spending	Log Imaging Spending	Log Testing Spending
To Fully Independent						
Early Law Change	-0.241	0.00152	-0.323	-0.012	-0.111	-0.126
	(0.159)	(0.00127)	(1.128)	(0.126)	(0.056)	(0.049)
Recent Law Change	-0.332	-0.00102	-0.731	-0.091	0.006	-0.054
	(0.105)	(0.00088)	(1.038)	(0.092)	(0.036)	(0.038)
To Restricted Practice						
Early Law Change	0.339	-0.00233	-0.994	-0.068	0.018	0.050
	(0.147)	(0.00130)	(1.214)	(0.126)	(0.038)	(0.049)
Recent Law Change	0.490	-0.00258	-2.322	-0.178	-0.009	0.052
	(0.182)	(0.00153)	(1.009)	(0.119)	(0.058)	(0.060)
R^2	0.62	0.19	0.83	0.88	0.44	0.55
# States	51	51	51	51	51	51
# Observations	10,983,383	10,983,383	9,493,538	9,493,538	24,022,269	24,022,269

Dependent Variable:	Schedule II Narcotics	Schedule II Non-narcotics	Schedule III Narcotics	Schedule III Non-narcotics	Schedule IV	Schedule V
To Fully Independent						
Early Law Change	-0.0025	-0.0065	-0.0334	-0.0076	-0.0290	-0.0471
	(0.0974)	(0.0063)	(0.0182)	(0.0113)	(0.0851)	(0.0258)
Recent Law Change	-0.0531	-0.0130	0.0034	-0.0090	-0.0023	-0.0029
	(0.0817)	(0.0057)	(0.0144)	(0.0062)	(0.0591)	(0.0226)
To Restricted Practice						
Early Law Change	-0.0010	0.0195	0.0429	0.0110	0.0211	0.0182
	(0.0929)	(0.0067)	(0.0171)	(0.0114)	(0.0935)	(0.0265)
Recent Law Change	0.0669	0.0160	0.0304	0.0090	0.0158	-0.0139
	(0.1290)	(0.0071)	(0.0171)	(0.0102)	(0.0790)	(0.0241)
R^2	0.71	0.67	0.63	0.55	0.66	0.60
# States	51	51	51	51	51	51
# Observations	9,493,538	9,493,538	9,493,538	9,493,538	9,493,538	9,493,538

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012 and imaging and testing which is from 1999-2015. The unit of observation is beneficiary-year. The sample excludes interstate movers. Numbers reported in the Fully Independent and Restricted Practice rows are coefficients and standard errors (in parenthesis, two-way clustered by state and beneficiary) from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence or an indicator for states not allowing full independence for moves involving states that either allowed full independence prior to 1998 (Early Law Change) or did not (Recent Law Change), indicators for leads and lags of interstate moves, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.

Table A.17: Effect of Moving to State with Broader Scope of Practice on Outpatient Care for Medicare Beneficiaries by Provider Type and Recency of Law Change

Dependent Variable:	Office Visits (E&M Visits)	Checkups (Well Visits)	Prescriptions
NPs: To Fully Independent			
Early Law Change	0.073	-0.00000	0.327
	(0.040)	(0.00025)	(0.223)
Recent Law Change	0.040	-0.00004	-0.007
	(0.040)	(0.00011)	(0.204)
To Restricted Practice			
Early Law Change	-0.066	-0.00049	-0.131
	(0.041)	(0.00021)	(0.210)
Recent Law Change	-0.029	-0.00074	0.002
	(0.045)	(0.00059)	(0.228)
# Observations	10,983,383	10,983,383	9,493,538
PAs: To Fully Independent			
Early Law Change	-0.079	0.00091	-0.076
	(0.024)	(0.00090)	(0.244)
Recent Law Change	0.013	0.00049	-0.057
	(0.019)	(0.00052)	(0.139)
To Restricted Practice			
Early Law Change	0.074	-0.00100	0.115
	(0.022)	(0.00091)	(0.216)
Recent Law Change	0.097	-0.00086	0.208
	(0.030)	(0.00085)	(0.224)
# Observations	10,983,383	10,983,383	9,493,538
PCPs: To Fully Independent			
Early Law Change	-0.235	0.00061	-0.605
	(0.144)	(0.00111)	(1.185)
Recent Law Change	-0.385	-0.00147	-0.654
	(0.092)	(0.00082)	(1.116)
To Restricted Practice			
Early Law Change	0.331	-0.00085	-0.870
	(0.132)	(0.00110)	(1.258)
Recent Law Change	0.421	-0.00097	-2.346
	(0.168)	(0.00124)	(1.088)
# Observations	10,983,383	10,983,383	9,493,538

Note: Data cover the 2005-2012 period except for the prescription data which is from 2006-2012. The unit of observation is beneficiary-year. Numbers reported in the rows are coefficients and standard errors (in parenthesis, two-way clustered by state and beneficiary) on indicators for NP scope of practice within a state for visits limited to the type of practitioner listed in each panel of the table from regressions of the level of each of the dependent variables on an indicator for states allowing NPs full independence or an indicator for states not allowing full independence for moves involving states that either allowed full independence prior to 1998 (Early Law Change) or did not (Recent Law Change), indicators for leads and lags of interstate moves, beneficiary age fixed effects, county characteristics, PA scope of practice indicators, beneficiary fixed effects, year fixed effects, and state fixed effects.