Access to Care and Physician-Practice Growth after the Interstate Medical Licensure Compact

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Abstract:

Because US physicians' licenses do not transfer between states, their labor mobility is limited, as is patients' access to care. The Interstate Medical Licensure Compact (IMLC) reduces this barrier in participating states. We estimate whether the IMLC expanded physician labor mobility by measuring the number of physician-practice locations and the number of states in which physicians practice using a staggered difference-in-differences model and data from the Centers for Medicare and Medicaid Services. We find a 3% increase in out-of-state practices for physicians whose primary state participates in the IMLC. Further, the IMLC increased the number of states in which physicians practiced, with more growth in participating states even after accounting for other policy reforms. [4]

Keywords: health economics, occupational licensing, labor mobility

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Growing health care–professional shortages are one of the most urgent issues in the US health care system, as shortages in rural areas and among disadvantaged communities reduce access to care, including preventive care and diagnostic services (Fathi et al. 2017; Scheffler 2019; Henning-Smith 2021). Shortages in health care markets have many causes, including state occupational-licensing laws restricting entry into the labor market. State-specific physician licensing laws reduce the supply of health care providers moving between states, as board-licensed health practitioners must be separately licensed in each state to practice (Johnson and Kleiner 2020; Plemmons 2022). The US Health Resources and Services Administration estimates that there are over 7,000 primary care Health Professional Shortage Areas and a shortage of about 15,000 primary care practitioners in family medicine, pediatrics, and internal medicine.[5] These shortages directly reduce patient access to care, especially as the mix of available physicians changes. For example, patients who must drive hours to see a doctor may decide not to see a doctor at all. Reducing interstate mobility barriers for providers can address these types of shortages and increase patient access to care by reducing licensing costs for providers moving between states or expanding their practice. In this study, we examine the effect of the Interstate Medical Licensure Compact (IMLC), which reduces interstate licensing barriers for physicians, on physician-practice growth and labor mobility.

[5] HRSA Health Workforce. "What is shortage designation?" US Health Resources & Services Administration. December 2020. Accessed December 12, 2022. *https://bhw.hrsa.gov/workforce-shortage-areas/shortage-designation*. This definition does not include nurse practitioners or physician assistants in the count of primary care providers.

Compared to other types of occupational licensing, state-specific physician licensing has similar effects on labor supply (Timmons and Norris 2022), wages (Kleiner et al. 2016), and costs (Anderson et al. 2020; Dillender et al. 2022), with few measurable benefits to public health and safety (Timmons and Mills 2018; Xia 2021). State-specific physician licensing also decreases patient access to care in underserved areas, further increasing health care–provider shortages after the COVID-19 pandemic (Nguyen et al. 2022). State-level physician licensing also limits patients' use of telehealth across state lines, as the pool of doctors is restricted to the providers serving within the state in which they are licensed, if telehealth is permitted at all. Meanwhile, patients generally cannot access health care in a different state because of state-specific health insurance restrictions. State licensure compacts, such as the IMLC, that recognize health professionals' existing licenses facilitate workforce mobility, including mobility to rural and underserved areas with few primary care physicians (Chaudhry et al. 2015; Adashi et al. 2021).

The IMLC was launched in September 2014 to facilitate physician licensing recognition between participating states and to support telehealth (Kleiner 2015; Silva 2015). The first states joined the IMLC in 2015, and the compact became operational in 2017, with 18 states having completed implementation as of this writing. Participation is voluntary and passed at the state level. Under the IMLC, physicians can transfer their license between participating states, be licensed in multiple states, and provide telehealth across state lines (IMLC 2023a). The IMLC therefore decreases the marginal cost of obtaining additional state-specific licenses for physicians. As most physicians meet the licensure criteria for the compact (IMLC 2023b), the IMLC has the potential to expand the pool of physicians serving rural and

underserved areas (Kleiner 2015; Silva 2015) instead of transferring existing resources from one state to another. Under the IMLC, providers could move to their highest-valued setting or increase total available care, which would increase benefits on the extensive margin. The compact can also positively interact with other policy reforms expanding access to care and health care–provider mobility, including the expansion of telehealth, expanded scope of practice, and state-level physician loan-forgiveness programs. However, the effects of these compacts on physician-practice growth and labor mobility have not yet been empirically tested to assess the rates of growth and the underlying mechanisms of that growth.

We use Physician Compare National Downloadable Files data on physicians and practice locations from the Centers for Medicare and Medicaid Services to measure the effect of the IMLC on physician labor mobility using the number of physician-practice locations and the number of states in which physicians practice between 2014 and 2020. As states joined the IMLC in different years, we use the staggered difference-in-differences methodology (Callaway and Sant'Anna 2021) to estimate the effects of the IMLC on our outcomes of interest. Our results indicate that following the adoption of the IMLC, there was about a 3% increase in the number of new out-of-state physician practices, with most of the growth concentrated in IMLC states. We also find that the IMLC increased the number of states in which physicians had practice locations, and states participating in the IMLC saw nearly double the practice growth of nonparticipating states. We further conduct robustness tests on physician-practice-location choice on state borders and in rural and urban areas. Finally, we account for the role of state telehealth payment-parity reforms, scope-of-practice reforms for nurse practitioners, and state physician loan-forgiveness programs that could affect

the marginal cost of labor for physicians opening new practices and with whom physicians could compete.

The paper proceeds as follows: Section 2 reviews the literature on health care access and remedies and provides background on the IMLC; Section 3 presents our data and empirical methods; Section 4 presents the primary empirical results; Section 5 provides tests for the robustness of the results; Section 6 discusses the results; and Section 7 concludes.

I. Background and Literature Review

State-specific occupational licensing requires licensed physicians to recomplete licensing requirements, such as training, exams, and fees, before they can practice in a new state. This reduces patients' access to care by restricting the mobility of physicians to rural and underserved areas, such as Health Professional Shortage Areas. Although high licensing barriers increase wages (Koumenta et al. 2022) and health care–provider income (Kleiner 2014), they do so without measurably increasing service quality (Timmons and Mills 2018; Kleiner and Kudrle 2000; Adams III et al. 2003) and while raising health care costs (Dillender et al. 2022). Licensing requirements also rise in response to increases in the labor supply, rather than negative shocks to public health and safety (Pagliero 2013). High barriers also impede the immigration of skilled physicians (Peterson et al. 2014), impede interstate health care teams (Timmons and Norris 2022), and reduce labor mobility (Johnson and Kleiner 2020; Shakya and Plemmons 2020; Plemmons 2022). Conversely, reducing occupational-licensing barriers increases wages for nurse practitioners and lowers service prices for consumers (Kleiner et al. 2016). Onerous or inflexible state licensing thus restricts labor market entry for health care professionals, exacerbating the provider shortages that reduce access to care. State-specific

licensing requirements also impede public access to care by limiting the number of health care providers in an area (Kleiner 2006; Scheffler 2019). Access to care is an ongoing challenge in rural areas (Henning-Smith 2021), in areas with critical access hospitals (Khaliq et al. 2015), in designated Health Professional Shortage Areas (AAPA Research 2022), and during natural disasters (Li et al. 2022). Rural areas face shortages of health professionals for important care in primary, specialty, dental, mental, and behavioral health, among other fields (Fathi et al. 2017). Long-term shortages of health care professionals are also forecast to increase through 2033, with a projected shortage of 54,000 to 139,000 providers (Dall et al. 2018). Provider shortages further worsened during the COVID-19 pandemic, exacerbating an already-difficult physician-patient matching problem (HHS 2022; Nguyen et al. 2022). Interstate licensing barriers may therefore disrupt timely care and create a discontinuity of care across state borders (Scheffler 2019). Conversely, access to care improved when states reduced barriers to care during the pandemic (Nguyen et al. 2023), and net migration increases to states that recognize out-of-state licenses (Deyo and Plemmons 2022). The IMLC has also increased access to care, as 30% of physicians taking advantage of the IMLC provide care in rural and other underserved areas (IMLC 2023a).

In recent years, states have joined licensing compacts such as the IMLC to reduce barriers to entry for already-licensed providers from other states. Such compacts are voluntary, passed at the state level, and recognize providers' existing state license in another state as long as their license is in good standing without requiring them to pay additional fees, recertify their educational credentials, or undergo a formal application process that may take months to complete. State licensure compacts can expand access to care

by allowing providers to work in multiple states, avoid costly duplicative verification of licensing requirements across states (Wakefield 2010), and ensure efficient use of scarce resources by state licensing boards (Mullangi et al. 2010). Other state medical compacts include the Advanced Practice Registered Nurse Compact, the Emergency Medical Services Compact, the Nurse Licensure Compact (NLC) for registered nurses and licensed practical/vocational nurses (HRSA 2022; NCSBN 2023), and the Psychology Interjurisdictional Compact (PSYPACT). Compact agreements fit into two models: mutual recognition and expedited licensure transfer. Under mutual recognition, member states permit providers from other states with valid licenses to practice in the compact states. Under expedited licensure transfer, member states prioritize the review and approval of licensure applications of providers from other states with valid licenses (CSG 2019). There is little research to date on the labor market effects of compacts except for the NLC, which increases the quality of follow-up care, increases patients' access to resources across compact states, and increases nurse labor mobility (Poe 2008; Shakya, Ghosh, and Norris 2022). The IMLC and NLC are similar in that both permit health care providers to practice in a state with an out-of-state license and both assist the providers in obtaining a new license in a compact-participating state (Litchfield 2010; DePasquale and Stange 2016; Kappel 2018). However, the IMLC uses the expedited-licensure-transfer model and permits physicians to move their license to another participating compact state, open a practice in another participating state without giving up their existing state license, and provide telehealth. In contrast, the NLC follows the mutual-recognition model and does not support interstate mobility or telehealth. As physicians face more expected benefits with the IMLC model, we expect to find larger effects on physician-practice growth

and labor mobility compared with the effects of the NLC. These benefits could arise from lower interstate barriers and greater flexibility in a physician's licensing status.

The Interstate Medical Licensure Compact Commission oversees the IMLC, coordinates compact activities, and processes applications. The first IMLC states joined in 2015, while the first states to become active participants did so in 2017 (IMLC 2023b). There is a delay between states' joining the IMLC and becoming active participants, as the states work with the Federal Bureau of Investigation to run criminal background checks. Once a state has completed the background-check process, it can actively participate in the IMLC, issue licenses for providers to practice in their state, and provide support for physicians in their state who are applying for licensure in another IMLC-participating state. As of August 2023, the IMLC included 39 states, the District of Columbia, and the territory of Guam, while 5 more states have joined but have not yet completed implementation. In order to participate once their state has joined the IMLC, applying physicians must hold either an MD or be a doctor of osteopathy (DO), and they must hold a valid license in their state of primary licensure (SPL). There are four qualifying options for physicians selecting their SPL: the state is where the physician lives; the state is where at least 25% of the physician's practice occurs (Chaudhry et al. 2015); the state is where the physician's employer is located; or the physician uses the state in filing their federal income taxes.[6] The IMLC estimates that 80% of US physicians meet the criteria for licensure under the IMLC (IMLC 2023b). Physicians can have their license transferred from one IMLC-participating state to another, hold a license in more than one

[6] The Interstate Medical Licensure Compact Commission reported in September 2023 that the first option was the most popular, followed evenly by the second and third options.

IMLC-participating state, and provide telehealth in IMLC-participating states after they have paid the initial $700 upfront cost to obtain a compact license in addition to their regular license. The IMLC gained traction during the pandemic (Adashi et al. 2021), as 8 states joined the IMLC between 2020 and 2022. The compact processed over 8,000 licenses between March 2020 and March 2021, compared with 4,000 licenses between March 2019 and March 2020, and use of the IMLC by physicians to locate in more than one state increased by 47% during the pandemic.[7]

Interstate licensure compacts sit alongside a variety of other reforms to health care markets, and we account for the role of these reforms in our study. Telehealth and telemedicine permit physicians and nurses to provide patient care over the phone or through a video visit instead of requiring in-person visits at a hospital or doctor's office. Telehealth expands the supply of physicians available to patients, and states that permit out-of-state providers to provide telemedicine further increase access to care (Heisler 2013), especially if payment-parity requirements exist within those states. Telehealth access can be even more beneficial for cancer patients (Roberts and Lennes 2022), patients in rural territories (Peterson 2021), patients with chronic conditions (Hoffer-Hawlik 2020), patients with immunocompromised systems (Coker et al. 2019), and patients with behavioral health issues (Goodwin 2021; Choudhury and Plemmons 2023; Nguyen 2023). Since the IMLC became operational in 2017, it has ensured access to specialty care by expanding the market for telehealth and telemedicine across state lines (Roberts and Lennes 2022). During the first

[7] Credentialing Resource Center (April 28, 2021), Interstate Medical Licensure Compact Sees Growth During Pandemic, Retrieved from: *https://www.healthleadersmedia.com/clinical-care/interstate-medical-licensure-compact-sees-growth-during-pandemic*, Accessed on June 05, 2022.

few weeks of 2020, telehealth visits in IMLC-participating states, including patients seeking care for COVID-19 and other medical needs, increased by 50% compared to the same period in 2019 (Koonin 2020).

Scope-of-practice reforms also generally permit nonphysician health care professionals to provide more patient care and can significantly expand access to care. States offering full scope of practice to nurse practitioners have higher access to primary care, especially in underserved areas (Patel et al. 2019; Luo et al. 2021; McMichael and Markowitz 2023), and greater scope of practice through multistate licensing also increases wages for nurses (Kleiner et al. 2016). Expanding scope-of-practice laws for dental assistants increases the wages, productivity, and employment of dental assistants (Xia 2021). Meanwhile, states with more restrictive scope of practice lose nonphysician providers to states with expanded scope of practice (Shakya and Plemmons 2020) and have higher Medicare costs (Timmons 2016). We also consider the role of state physician loan-forgiveness programs, which could incentivize physicians' practice location (Friedman et al. 2016). Other factors are more difficult to account for, such as tort reforms, especially reforms to physician malpractice payments, as the direction of the effect varies by type of reform (Waters et al. 2007). Our paper therefore addresses the effects of the IMLC on physician-practice growth and labor mobility in the context of other ongoing policy changes to the health care workforce.

II. Data and Empirical Approach

A. State-Level Framework and Methods

We use physician location data from the Doctor and Clinician National Downloadable Files from the Centers for Medicare and Medicaid Services, popularly referred to as Physician Compare, from 2014 to 2020. These files contain information about the specialty, credentials, and practice locations of

physicians and other health care professionals, such as nurse practitioners and physician assistants, currently enrolled in Medicare. Each annual data release contains four to seven waves of surveys distributed throughout the year, which we aggregate to the annual level. Our sample ends in 2020 to limit the confounding effects of the temporary state expansions of telehealth, scope of practice, and cross-state licensing recognition that took place in late 2020 and early 2021. For robustness, we also replicate the models excluding 2020 and find consistent results, though with fewer states in the treatment group.

Each provider record is unique and contains a provider-specific National Provider Identifier (NPI). However, many entries are incomplete or inconsistent across years. For example, in one year a respondent may report a credential that they leave blank in subsequent years. Therefore, we make three assumptions to identify the subsamples that are most likely to include physicians and to exclude nonphysicians. First, we exclude all NPIs that ever list as their credential a known nonphysician acronym—for example, CNM, NP, or PA. Second, we identify and exclude a list of nonphysician primary-specialty codes that includes both profession titles and specialties not involved in routine or primary care medicine—for example, registered dietitian, optometry, registered nurse, and chiropractic. Finally, the survey does not report whether a practice location is within the physician's state of residence. We therefore limit the sample to physicians that only had one practice location in 2014, which we identify as their SPL or practice state, and follow these physicians through the entire sample period. We restrict the sample using 2014 as the baseline year, as it is the first year of available data from Physician Compare and the first states joined the IMLC in 2015. We then measure the growth in the number of states in which a given physician

practices in subsequent years relative to the baseline of their primary practice state in 2014. We refer to this primary practice state in 2014 as the resident state, and any other states a physician adds practices to later are designated as nonresident states. Although physicians may have practice locations in multiple states, each physician is observed within their resident state in 2014 and is therefore treated or not treated by the policy changes within that resident state.

In addition, most NPI records do not include credentials, which presents a challenge, as only providers with MD or DO credentials are eligible to participate in the IMLC. This gap is either because the individual did not provide or update the information, they did not hold an advanced degree, or they reported their credential under the primary-specialty category. Since most credentials are unlisted or are not consistent across years, limiting the sample to only providers that listed their credential as MD or DO severely restricts the number of observations and posed a limitation in previous studies (Bindman 2013). Regardless, we repeat all models using this more limited sample for robustness. An additional concern is that some remaining practitioners have individual entries for several departments within a hospital or hospital system. This is often the case for physicians employed by the hospital system who provide a high volume of consultations and in turn may bill Medicare through multiple billing institutions even when only operating within one hospital or location. The two largest categories are specialized surgery and internal medicine. To avoid overrepresentation, these categories are not included in the primary specification but are included in secondary specifications for robustness. We adjust the sample so that each address location only counts as one practice location for each physician, even if the physician consults across departments. The final

sample is also limited to physicians that are present in all sample years. This is a strong assumption that both negates permanent cross-state relocation and limits the total number of physicians within the sample. Only our results' direction and significance should therefore be considered as the sample only represents a fraction of the potential pool of licensees. The remaining sample consists of all likely physicians who had one practice location in 2014. However, the sample is necessarily an undercount of all physicians over the sample period, and our results should therefore be considered as conservative estimates.

We report summary statistics of the truncated data set for the primary specification in Table 1. There are 145,012 unique physicians in the sample, which is limited to physicians with one practice location in 2014 who maintained an active NPI record for the entirety of the sample period. As we use physicians' practice location in 2014 to infer state of residence, and all practitioners in 2014 had one practice location (in their resident state), there are no observations in nonresident states. In the following years, the average number of practice locations grows steadily across the sample, with a majority of the growth occurring within physicians' resident state. Only 2% to 3% of physicians practice in more than one state during our sample period, which is consistent with estimates from the American Medical Association. Among the nonresident states, there is substantial out-of-state practice growth in both treated and untreated states, with most of the growth happening in non-primary residence IMLC states. We therefore estimate whether the policy change within the resident state affected the growth rate of nonresident out-of-state additional practices, whether they are located within other IMLC states, and whether the growth rate differs substantially from the growth rate of nonresident practices in non-IMLC-

participating states, where physicians must go through a higher-cost licensing process.

Although providers are potentially able to work in any state, the licensing procedure differs between IMLC and non-IMLC states. Non-IMLC states have a higher-cost process in which the provider must recomplete the licensure process. IMLC states have a lower-cost process for physicians with current licenses from other IMLC member states. We therefore use four dependent variables to determine the relationship between physician-practice growth and the IMLC policy change. These are the number of practices a physician provides services in within their resident state,[8] the number of practices in nonresident states that a physician provides services in, the count of treated states other than the resident state in which the physician provides services, and the count of untreated nonresident states in which the physician provides services.

States joined the IMLC in waves. States that activated the policy after June 1 in a given year are assigned to the following year of treatment since at least two waves of the Physician Compare data were already collected by this date. Although the join years begin in 2015, the process by which the Federal Bureau of Investigation must certify and implement processes for background checks has led to a delay between states' joining and actively participating in the compact—that is, when physicians can have their license recognized. Although a state may have joined later and become active in the IMLC, we do not include that state in the treatment group if it joined after 2020, as we end the study period prior to the temporary licensing

[8] Practices represent the count of different physical locations where the provider offers services and does not include every department within a hospital or building for which the provider consults or occasionally offers services.

expansions in late 2020. We exclude the District of Columbia from the analysis because the city has a historical tristate physician-license-recognition criterion for substantial equivalence that does not align with the IMLC. Much of the early adoption of IMLC was predominantly in rural states, while some states with large population centers, such as New York and California, have not yet joined. To ensure that an adequate and representative number of physicians are in both the treatment and control groups, Figure 1 depicts the percentage of physicians whose resident state joined the IMLC by year. Nearly one-third of all physicians reside in a state that is treated during the sample period.

To determine whether there are differing trends in the number of states in which a physician practices relative to the policy changes between growth in the physician's resident state and in nonresident states, we first use a difference-in-differences method with staggered policy adoption (Callaway and Sant'anna 2021).[9] The framework is as follows:

$$Location_{irt} = \beta_0 + \beta_1 IMLC_r + \delta Treatment_{rt} + \boldsymbol{X}_{ir} + \lambda_{rt} + \varepsilon_{irt} \quad (1)$$

$Location_{rt}$ refers to the dependent variables. These include counts of practice locations and subsets of treated and untreated nonresident practice locations. $IMLC_r$ represents whether a resident state joined the IMLC. $Treatment_{rt}$ denotes the post-treatment period, after a state began actively participating in the IMLC. Since this model uses multiple periods for staggered policy adoption, the post-treatment period for treated states differs across states and there is not a unique post-treatment variable. To account for this difference, the staggered-policy-adoption model focuses on

[9] As there is limited pre-trend data available, and aggregation bias in treatment timing is unlikely because many of these policies were passed simultaneously but implemented with differential and unexpected timing, it was not necessary to correct the degree of heterogeneity in treatment effects as suggested by de Chaisemartin and D'Haultfuille (2022).

the average treatment effect of the treated rather than the effect of each individual year. $\boldsymbol{X}_{ir}$ controls for physician attributes, including specialty type, and location-specific controls, including whether there are telehealth payment-parity laws, scope-of-practice reforms for nurse practitioners that would affect the amount of competition that physicians face, or a physician loan-forgiveness program. λ_{rt} denotes a vector of state and time fixed effects. We denote the resident state using the subscript *r* rather than the standard *s* for ease of interpretation.

B. Border-County Framework and Methods

The ease of practicing in multiple locations will differ for physicians by whether they reside or practice within driving distance of another state or whether they instead practice within the interior of a state. To account for this difference in type, we employ a cross-border county analysis to determine whether physicians are more likely to practice in nonresident states when their resident state joins the IMLC, and we determine whether this likelihood is substantially different when the shared-border state is an IMLC member and when it is not.

This estimation uses a similar data-cleaning process to that in the state-level analysis, except that here, we crosswalk the ZIP code and state reported by a physician to the county level. This crosswalking process uses ZIP-code-to-county crosswalks available from the US Department of Housing and Urban Development. To accurately crosswalk the sample, we use two constraints. First, if the reported ZIP code crosses state borders, we assume the physician is in the county within the ZIP code that corresponds to the state listed on their NPI forms. Second, if ZIP codes cross multiple counties, we assign the physician to the county that encompasses at least 80% of the ZIP code. Physicians within ZIP codes that do not have a predominant county

of at least 80% represent 0.16% of the sample, and we drop these observations from the sample. For robustness, we replicate this method with cutoffs of 90%, 70%, and simple majority. The results are consistent across cutoff selections. We limit counties within the border sample to those that reside along a state-border pair. Each county is designated as rural or urban, as determined by the US Department of Agriculture. Counties that border an ocean, Canada, or Mexico are considered nonborder interior states for the purpose of our estimation.

The state-level methodology is repeated on subsamples of physicians from border and interior counties to determine whether there is an additional effect of IMLC on physicians for whom there is a lower cost to participating in cross-state practices relative to physicians who are located farther from state borders. The basic model takes the following empirical form of a staggered difference-in-differences model:

$$Location_{icrt} = \beta_0 + \beta_1 IMLC_r + \delta Treatment_{rt} + \boldsymbol{X}_{icr} + \lambda_{crt} + \varepsilon_{cirt} \quad (2)$$

This model is similar to that presented for the state analysis, except that it is limited to physicians whose practice locations are within a border county (repeated for residents of interior countries for comparison) and it contains county-level attributes, including rural-urban status and county demographic information by year, and county-level fixed effects.

III. Results

We first report the effects of the IMLC on changes in total physician-practice growth using the staggered difference-in-differences model from Equation 1 (Table 2). We find a significant increase in physician-practice growth over the sample period, with 0.20 additional practice locations on average for providers whose primary location is within an IMLC state, across all types of states within the sample (IMLC, non-IMLC, and home state). This effect

persists after we account for state telehealth-parity programs, scope-of-practice policies for nonphysician providers, and state physician loan-forgiveness programs. We find the introduction of the IMLC led to 3.15% more physician practices overall. Most of this growth was concentrated in states that joined the IMLC in 2017 and 2018. States that joined in 2019 or 2020 did not see significant growth and in fact may have lost practice locations because of the effects of the COVID-19 pandemic.

We next report results for the primary relationship of interest: out-of-state practice growth within both IMLC and non-IMLC states. As expected, out-of-state growth is much smaller than total practice growth, as many physicians will never choose to offer services within multiple locations, let alone out-of-state. Despite a preference for adding practices in the resident state, there are approximately 0.03 to 0.05 additional out-of-state practices per physician whose primary location is within an IMLC state relative to a physician in a non-IMLC state (Table 3). When we disaggregate growth between treated IMLC states (Table 4) and control states (Table 5), we find that the majority of this growth is within treated states and is primarily driven by early adopters of the IMLC (the 2017 and 2018 cohorts). Surprisingly, there is also growth, though to a lesser extent, within untreated states. This suggests that once the administrative and technical costs for multistate billing and practice have been established, the marginal cost of expanding practices into additional states (even if a licensing fee or application process must be incurred) is substantially reduced and the expansion of the IMLC may encourage more practice growth across all types of states. It could also signify that physicians are collaborating with multistate hospital systems to provide services, consultation, and telehealth services across state lines. These hospital systems may also encourage

physicians to provide services within untreated states and facilitate relicensure.

In addition, although the additional-practice-location growth of physicians from IMLC states includes significant growth across state lines, the IMLC policy change also encourages significant growth in the count of practices within a physician's initial resident state (Table 6). This suggests that physicians may collaborate with multistate hospital systems, or it may reflect the additional potential from the influx of physicians now practicing in the state, with whom they can now collaborate and start practices. These physicians may not have been in our initial sample of NPIs with one practice location in 2014, but we can see the effect of the IMLC on physician mobility across state lines through the expanded labor supply, supporting practice growth in the treated IMLC resident state.

Considering how the IMLC increases the ease with which physicians can practice in other IMLC states, we would expect that individuals who are located close to other IMLC states would have the highest uptake in applications. As discussed above, to test this, we split our sample into two groups: those whose physician practice is in a border county and those whose initial practice is in a nonborder interior county within the state. As noted before, counties that border oceans, Canada, and Mexico are considered nonborder interior counties for the purpose of this estimation. We present these results in Tables 7 through 11, which contain two panels each. Panel A reports the estimates for border counties, and Panel B nonborder counties.

The change in the average number of practices in the years after a state begins actively participating in the IMLC is similar to those at the state level and is not clearly larger for physicians from border versus nonborder

counties (Table 7). Although the effect is similar to the primary-specification results in that it is largely concentrated among the 2017 and 2018 cohorts for both groups, the effect of a state's becoming an active IMLC participant differs for border versus nonborder counties. Physicians within border counties begin working at more additional practices on average, regardless of the IMLC. The effect of introducing the IMLC increases the number of practices more for physicians within nonborder counties on average when compared with physicians in border counties. This disparity makes intuitive sense, as the IMLC eases doctors' ability to work across borders, which is easier and cheaper for physicians located near state borders and many physicians in border counties already were choosing to pay the cost to work in nearby states prior to the policy. In turn, we find that relaxing the ability to practice in other IMLC states has the largest influence on physicians not located in border counties, likely because many doctors on borders were already incurring the cost of running a cross-border practice. We also find no evidence of a significant increase in practice growth for the 2019 and 2020 treatment cohorts, which may be because of the time it takes to establish a new practice, as the final waves of the physician data were collected during the pandemic, when many health protocols and policies went into effect.

After we isolate the sample to include only out-of-state-growth (Table 8), an interesting trend begins to emerge. When considering all out-of-state growth, regardless of the IMLC treatment, physicians in border counties experienced a small and largely insignificant increase in the number of practice locations. Simultaneously, physicians from nonborder counties experienced significant growth in out-of-state practices, even after

accounting for rural or urban status, telehealth parity, scope-of-practice laws, and state physician loan-forgiveness programs.

When separating the effect into treated and untreated out-of-state growth, we find that both the treatment and control groups have similar-magnitude increases in practice locations within other IMLC states in the most restrictive model (Table 9), with physicians whose primary practice is in a border county seeing larger growth in less restrictive versions of the model. This overall effect is surprising because we expected it to be much larger in border counties. Similarly, physicians from border counties show no additional growth in the number of practices within control states (Table 10), while physicians in nonborder counties see large and significant growth of around 0.04 additional practices per physician. This unexpected behavior from border counties may reflect an unconsidered option: that physicians located near state borders were already becoming licensed in other states and practicing across state lines, regardless of their resident state's IMLC status. Conversely, physicians within the interior of the state might not have previously sought out-of-state opportunities or collaborated with multistate hospital systems and would not have done so if not for the introduction of the IMLC, which lowered the initial cost of starting a practice within an IMLC state. Both types of physicians, as with the state-level analysis, saw significant growth within their state when compared to physicians whose initial practice was within a non-IMLC state (Table 11).

IV. Robustness

Our results are robust to several additional specifications. Although we do not report the results here for the sake of brevity, all estimations, models, and data are available and labeled in the online replication package.

First, we repeat the state-level analysis without states that eventually added the IMLC after our sample period. We also repeat the border analysis only for cross-border metropolitan statistical areas and rural populations without easy driving distance to a major metropolitan area. The results' magnitude, direction, and significance in these specifications are in line with the presented results.

For additional insight, we also employ a series of standard difference-in-differences models for each policy-adoption year. The behavior of physicians in states that became active participants in the IMLC in a specific year are compared to the behavior of physicians in states that did not join or become active participants in the IMLC. These models follow the typical structure:

$$Location_{irt} = \beta_0 + \beta_1 IMLC_r + \beta_2 Post_t + \delta Treatment_{rt} + \boldsymbol{X}_i + \lambda_{rt} + \varepsilon_{irt} \quad (3)$$

$Location_{irt}$ represents the dependent variables of interest. $IMLC_r$ is a binary variable equal to 1 if the resident state ever became an active participant in the IMLC. $Post_t$ is a binary variable equal to 1 after the policy change, and 0 otherwise. Since the sample is limited to those states that became active participants in the IMLC in one specific year and the states that either never joined the IMLC, joined the IMLC after our sample period, or joined but are still waiting for it to be implemented, sample sizes differ by cohort. $Treatment_{rt}$ measures any additional effect on the count of practice locations or states in which a physician practices after the policy implementation for states that joined the IMLC. The results are consistent with the trends observed within the staggered-policy-adoption models.

V. Discussion

The overarching pattern in our results illustrates a surprising trend. Although our prior assumption was that the IMLC would predominately be used by and increase cross-state participation between physicians in border counties, our results indicate otherwise. Although physicians on state borders participate in more out-of-state practices in IMLC states, their behavior toward non-IMLC states is relatively unchanged and the estimates are smaller than for the nonborder cases. Physicians in border counties, especially those within a major city or a metropolitan statistical area that crosses state borders, may already be investing in multistate licensure or may work with hospital and insurance systems that provide services in multiple states.

Our results instead show that the largest increase of physicians participating in additional out-of-state practices comes from physicians whose initial location was within an interior county of the state. This increase among physicians from the interior of the state may be due to several factors—for example, they may want to serve the larger potential telehealth market through multiple practices while not physically relocating, or the reduced cost may incentivize physicians who otherwise would not have to become mobile to provide consultation services to a broader set of facilities and practices. The uptake of physician-practice growth in IMLC states may also highlight a trend in hospital administration whereby physicians collaborate with for-profit managers for administrative tasks such as staffing, billing, and supply inventory. The trend in physician practices toward agglomeration may also consolidate health care resources (Matti and Ruseski 2021). If the IMLC lowers the costs to begin services in one additional state, and a physician sets up staffing and billing with a hospital system, this lowers the marginal cost of adding an additional practice. Even if

the physician instead contracts services independently across multiple practice locations, the marginal costs of new licensure still decrease after the initial setup costs. This may incentivize some physicians to continue expanding their practices. While we estimate the rate of growth for physicians from IMLC and non-IMLC states, we leave the investigation of mechanisms to future researchers with more intricate administrative-data resources.

Another overarching trend apparent from our results is that the growth in practice locations, regardless of which type of state they are in, is largely concentrated in the 2017 and 2018 activation cohorts. This likely implies that there is a lagged effect between allowing physicians to apply for recognition of their license and their establishing and offering services. This makes intuitive sense because there are many administrative burdens and technical costs associated with beginning a physician practice, even if it is as an employee of an already-established organization. This suggests that, under normal circumstances, state policy makers and licensure boards should expect to see larger volumes of applications after a two-year window. Unfortunately, this analysis of growth after the two-year window will not be possible when observing the 2019 and 2020 cohorts because of the disruptions to the treatment from temporary licensure recognition and telehealth waivers implemented by states during the pandemic. These waivers and reciprocal agreements created pathways between IMLC and non-IMLC states for practitioners that make it impossible to disaggregate and isolate the effects of the IMLC during this period.

Finally, telehealth payment-parity laws and physician loan-forgiveness programs are highly significant in estimating the rates of out-of-state-practice participation. Telehealth parity appears to be associated with

more out-of-state-practice locations, while physician loan forgiveness is correlated with fewer out-of-state practices. Meanwhile, scope of practice is a relatively weak predictor for practice growth, lending little support to the argument that competition with nurse practitioners heavily influences a physician's decision to offer services within new markets. We strongly suggest future researchers concentrate on accounting for the effects of these policies.

VI. Conclusion

Expanding access to care through physician-practice growth and labor mobility is an important goal for policy reform. In recent years, states have tried to address the shortage of health care professionals due to licensing barriers using interstate licensure compacts. We estimate the effects of the IMLC on physician-practice growth and labor mobility using NPI data prepared from the Physician Compare National Downloadable files and state-policy data from the Interstate Medical Licensure Compact Commission. Our results suggest that state participation in the IMLC leads to greater practice growth and physicians' adding new practice locations in treated states. We find support for the argument that when states recognize licenses in good standing from other states, physicians respond by opening or joining new practices, leading to potential improvements to patient access to care and reduced barriers to entry for physicians across states.

There are some limitations to our study, although our results are robust to several specification tests of our model assumptions. First, we cannot identify the state in which a physician actually lives nor whether they move states or stay in their SPL after the IMLC policy becomes active. However, most physicians use their resident state as their SPL. We similarly cannot identify whether physicians switch their primary practice location or

whether the increase in practice counts represents new practice locations or simply old practices' new association with existing practice locations. Despite these limitations, we do find evidence that physicians are responding to the IMLC policy by practicing in more locations. Even if these practices predated the IMLC or are telehealth locations, more physicians are available in more locations after a state becomes an active member of the IMLC. As we restrict our sample to physicians with only one practice location in 2014, the first year for which data are available and the only year available that predates the first year states joined the IMLC, our results are a conservative estimate of physician-practice growth and likely underestimate the true magnitude of the effect.

States are considering many policy changes to address serious issues in access to care and health care–provider shortages. Some of these policies require significant upfront costs to implement, or they face significant pushback from special interests, and the effects of others, such as malpractice tort reforms, are unclear. The IMLC, and potentially other interstate health care licensure compacts, reduces the costs of physician relicensure between states without putting patients at risk. As more states join the IMLC, it is possible that the compact will soon encompass nearly the whole United States, which could wholly transform patient access to care and address health care–provider shortages simply by opening the door to health care markets between states. Future research could focus on the effects of compacts on costs for patients, the effects on wages and employment for health care providers, and the general effects of reducing barriers to entry across the entire United States.

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TABLES AND FIGURES

Table 1. Mean Values of Practice Locations

Year	Total	State Count	Resident State	Different Treated States	Different Untreated States
2014	1	1	1	0	0
2015	1.62	1.02	1.56	0.02	0.03
2016	1.60	1.03	1.51	0.03	0.05
2017	1.48	1.03	1.37	0.04	0.07
2018	2.03	1.03	1.87	0.07	0.10
2019	1.98	1.03	1.80	0.08	0.11
2020	1.92	1.03	1.72	0.08	0.12

Notes: 145,012 unique NPIs are in the sample each year.

Figure 1. Percentage of Physicians Whose State Joined the IMLC, by Year

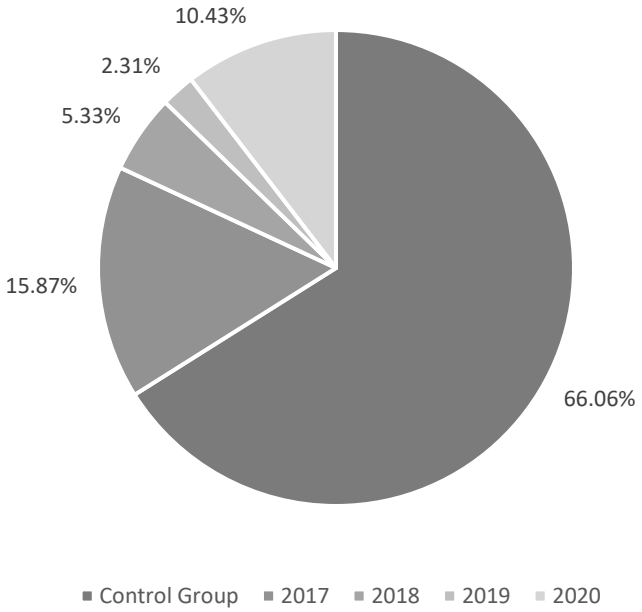

Table 2. State-Level Total Count of Practices

	(1)	(2)	(3)	(4)
ATT	0.2371***	0.1811***	0.1525***	0.2020***
	(0.0149)	(0.0140)	(0.0165)	(0.0219)
2017	0.3357***	0.2284***	0.1926***	0.1580***
	(0.0116)	(0.0193)	(0.0186)	(0.0198)
2018	0.1191***	0.2187***	0.2213***	0.6371***
	(0.0191)	(0.0197)	(0.0195)	(0.0679)
2019	-0.0070	-0.0471	-0.1776	-0.1443
	(0.0199)	(0.0579)	(0.2040)	(0.2490)
2020	-0.0868***	-0.0743***	-0.0622***	-0.0591***
	(0.0133)	(0.0127)	(0.0126)	(0.0126)
Loan Forgiveness	No	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes
Full NP Scope	No	No	No	Yes
Observations	1,024,373	1,024,373	1,024,373	1,024,373

Table 3. State-Level Count of Additional Practices in All Other States

	(1)	(2)	(3)	(4)
ATT	0.0324***	0.0340***	0.0405***	0.0539***
	(0.0048)	(0.0053)	(0.0066)	(0.0099)
2017	0.0389***	0.0387***	0.0378***	0.0391***
	(0.0066)	(0.0072)	(0.0073)	(0.0082)
2018	0.0263***	0.0289***	0.0292***	0.0835***
	(0.0075)	(0.0073)	(0.0072)	(0.0313)
2019	0.0140*	0.0380	0.1851**	0.2513**
	(0.0082)	(0.0237)	(0.0843)	(0.1029)
2020	0.0102	0.0098	0.0100	0.0100
	(0.0068)	(0.0068)	(0.0068)	(0.0069)
Loan Forgiveness	No	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes
Full NP Scope	No	No	No	Yes
Observations	1,024,373	1,024,373	1,024,373	1,024,373

Table 4. State-Level Count of Additional Practices in Treated States

	(1)	(2)	(3)	(4)
ATT	0.0197***	0.0189***	0.0209***	0.0272***
	(0.0023)	(0.0024)	(0.0036)	(0.0049)
2017	0.0261***	0.0250***	0.0256***	0.0268***
	(0.0031)	(0.0032)	(0.0032)	(0.0032)
2018	0.0119***	0.0145***	0.01467***	0.0457***
	(0.0045)	(0.0045)	(0.0045)	(0.0160)
2019	-0.0010	-0.0057	0.0204	0.0259
	(0.0055)	(0.0158)	(0.0564)	(0.0688)
2020	0.0010	0.0076	0.0010	0.0013
	(0.0028)	(0.0029)	(0.0028)	(0.0028)
Loan Forgiveness	No	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes
Full NP Scope	No	No	No	Yes
Observations	1,024,373	1,024,373	1,024,373	1,024,373

Table 5. State-Level Count of Additional Practices in Untreated States

	(1)	(2)	(3)	(4)
ATT	0.0128***	0.0151***	0.0197***	0.0267***
	(0.0042)	(0.0047)	(0.0056)	(0.0088)
2017	0.0128**	0.0141**	0.0122*	0.0124
	(0.0059)	(0.0065)	(0.0065)	(0.0076)
2018	0.0143**	0.0144**	0.0146**	0.0379
	(0.0059)	(0.0060)	(0.0058)	(0.0275)
2019	0.0150**	0.0437**	0.1648***	0.2254***
	(0.0062)	(0.0180)	(0.0643)	(0.0785)
2020	0.0093	0.0091	0.0090	0.0087
	(0.0062)	(0.0062)	(0.0063)	(0.0063)
Loan Forgiveness	No	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes
Full NP Scope	No	No	No	Yes
Observations	1,024,373	1,024,373	1,024,373	1,024,373

Table 6. State-Level Count of Additional Practices in Same States

	(1)	(2)	(3)	(4)
ATT	0.2047***	0.1472***	0.1119***	0.1481***
	(0.0143)	(0.0132)	(0.0154)	(0.0199)
2017	0.2968***	0.1897***	0.1548***	0.1188***
	(0.0202)	(0.0181)	(0.0173)	(0.0182)
2018	0.0928***	0.1898***	0.1920***	0.5536***
	(0.0183)	(0.0186)	(0.0188)	(0.0622)
2019	-0.0210	-0.0851	-0.3628*	-0.3955**
	(0.0185)	(0.0537)	(0.1889)	(0.2306)
2020	-0.0971***	-0.0842***	-0.0723***	-0.0691***
	(0.0116)	(0.0110)	(0.0108)	(0.0108)
Loan Forgiveness	No	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes
Full NP Scope	No	No	No	Yes
Observations	1,024,373	1,024,373	1,024,373	1,024,373

Table 7. County-Level Total Count of Practices

A. Primary Location in Border County					
	(1)	(2)	(3)	(4)	(5)
ATT	0.2015***	0.1742***	0.1852***	0.2547***	0.2472***
	(0.0217)	(0.0284)	(0.0266)	(0.0287)	(0.0304)
2017	0.2216***	0.1763***	0.1724***	0.1589***	0.1541***
	(0.0274)	(0.0356)	(0.0294)	(0.0282)	(0.0285)
2018	0.2999***	0.3225***	0.2958***	0.7928***	0.7484***
	(0.0372)	(0.0375)	(0.0367)	(0.0840)	(0.1197)
2019	-0.0343	0.0183	0.2876	0.5849**	0.6967**
	(0.0305)	(0.1161)	(0.2342)	(0.2870)	(0.2911)
2020	0.0268	0.0507**	0.0669***	0.0651***	0.0594**
	(0.0215)	(0.0220)	(0.0239)	(0.0239)	(0.0237)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP Scope	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	350,558	350,558	350,558	350,558	350,558
B. Primary Location in Nonborder County					
	(6)	(7)	(8)	(9)	(10)
ATT	0.2318***	0.2305***	0.1845***	0.2315***	0.2096***
	(0.0183)	(0.0175)	(0.0212)	(0.0333)	(0.0373)
2017	0.3849***	0.3208***	0.2710***	0.2070***	0.2385***
	(0.0278)	(0.0261)	(0.0248)	(0.0285)	(0.0392)
2018	0.0552**	0.2039***	0.2253***	0.6432***	0.4083***
	(0.0223)	(0.0235)	(0.0237)	(0.1052)	(0.1064)
2019	0.0293	0.0283	-0.4376	-0.5004	-0.3092
	(0.0258)	(0.0671)	(0.3178)	(0.3867)	(0.3862)
2020	-0.1343***	-0.0848***	-0.0862***	-0.0878***	-0.0824***
	(0.0166)	(0.0151)	(0.0152)	(0.0152)	(0.0155)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP SOP	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	673,815	673,815	673,815	673,815	673,815

Table 8. County-Level Count of Additional Practices in All Other States

A. Primary Location in Border County					
	(1)	(2)	(3)	(4)	(5)
ATT	0.0248***	0.0227*	0.0234**	0.0284**	0.0221
	(0.0097)	(0.0116)	(0.0111)	(0.0127)	(0.0139)
2017	0.0278**	0.0236	0.0180	0.0206	0.01978
	(0.0123)	(0.0145)	(0.0125)	(0.0132)	(0.0132)
2018	0.0326**	0.0144	0.0342**	0.0643*	0.0171
	(0.1495)	(0.0460)	(0.0150)	(0.0373)	(0.0634)
2019	0.0015	0.0143	0.0954	0.0912	0.0770
	(0.0122)	(0.0460)	(0.0927)	(0.1134)	(0.1136)
2020	-0.0002	0.0011	0.0064	0.0067	0.0100
	(0.0104)	(0.0106)	(0.0116)	(0.0117)	(0.0118)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP Scope	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	350,558	350,558	350,558	350,558	350,558
B. *Primary Location in Nonborder County*					
	(6)	(7)	(8)	(9)	(10)
ATT	0.0336***	0.0354***	0.0428***	0.0642***	0.0653***
	(0.0047)	(0.0050)	(0.0077)	(0.0136)	(0.0134)
2017	0.0409***	0.0406***	0.0396***	0.0387***	0.0383***
	(0.0066)	(0.0069)	(0.0072)	(0.0096)	(0.0085)
2018	0.0266***	0.0314***	0.0318***	0.1185***	0.1261***
	(0.0082)	(0.0085)	(0.0081)	(0.0422)	(0.0433)
2019	0.0214*	0.0458	0.2386*	0.3152*	0.3088*
	(0.0111)	(0.0287)	(0.1380)	(0.1679)	(0.1680)
2020	0.0145*	0.0136	0.0137	0.1389	0.01413*
	(0.0084)	(0.0086)	(0.0086)	(0.0086)	(0.0085)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP SOP	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	673,815	673,815	673,815	673,815	673,815

Table 9. County-Level Count of Additional Practices in Treated States

A. Primary Location in Border County					
	(1)	(2)	(3)	(4)	(5)
ATT	0.0251***	0.0200***	0.0225***	0.0264***	0.0218***
	(0.0042)	(0.0049)	(0.0060)	(0.0070)	(0.0084)
2017	0.0297***	0.0243***	0.0256***	0.0277***	0.0273***
	(0.0052)	(0.0057)	(0.0059)	(0.0059)	(0.0059)
2018	0.0291***	0.0312***	0.0315***	0.0686***	0.0324
	(0.0102)	(0.0102)	(0.0103)	(0.0262)	(0.0485)
2019	-0.0095	-0.0339	-0.0114	-0.0409	-0.0513
	(0.0084)	(0.0318)	(0.0641)	(0.0784)	(0.0786)
2020	-0.0023	-0.0008	0.0026	0.0028	0.0045
	(0.0058)	(0.0061)	(0.0073)	(0.0073)	(0.0073)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP Scope	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	350,558	350,558	350,558	350,558	350,558
B. *Primary Location in Nonborder County*					
	(6)	(7)	(8)	(9)	(10)
ATT	0.0147***	0.0151***	0.0172***	0.0202***	0.0219***
	(0.0026)	(0.0027)	(0.0046)	(0.0073)	(0.0074)
2017	0.0208***	0.0201***	0.0207***	0.0198***	0.0219***
	(0.0038)	(0.0038)	(0.0038)	(0.0039)	(0.0040)
2018	0.0067	0.0096**	0.0096**	0.0206	0.0224
	(0.0048)	(0.0049)	(0.0049)	(0.0241)	(0.0242)
2019	0.0060	0.0108	0.0524	0.0802	0.0810
	(0.0071)	(0.0186)	(0.0892)	(0.1085)	(0.1086)
2020	0.0022	0.0020	0.0020	0.0025	0.0025
	(0.0032)	(0.0032)	(0.0032)	(0.0032)	(0.0032)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP SOP	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	673,815	673,815	673,815	673,815	673,815

Table 10. County-Level Count of Additional Practices in Untreated States

A. Primary Location in Border County					
	(1)	(2)	(3)	(4)	(5)
ATT	-0.0003	0.0027	0.0009	0.0020	0.0003
	(0.0088)	(0.0106)	(0.0095)	(0.0108)	(0.0111)
2017	-0.0019	-0.0008	-0.0076	-0.0071	0.0076
	(0.0112)	(0.0134)	(0.0111)	(0.0119)	(0.0119)
2018	0.0035	0.0031	0.0027	-0.0043	-0.0153
	(0.1160)	(0.0117)	(0.0117)	(0.0275)	(0.0363)
2019	0.0110	0.0482	0.1069	0.1324	0.1284
	(0.0093)	(0.0348)	(0.0701)	(0.0858)	(0.0858)
2020	0.0021	0.0019	0.0037	0.0038	0.0054
	(0.0086)	(0.0086)	(0.0091)	(0.0092)	(0.0093)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP Scope	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	350,558	350,558	350,558	350,558	350,558
B. *Primary Location in Nonborder County*					
	(6)	(7)	(8)	(9)	(10)
ATT	0.0189***	0.0202***	0.0255***	0.0439***	0.0434***
	(0.0039)	(0.0042)	(0.0062)	(0.0116)	(0.0114)
2017	0.0202***	0.0205***	0.0189***	0.0189**	0.0165**
	(0.0054)	(0.0058)	(0.0061)	(0.0088)	(0.0075)
2018	0.0200***	0.0219***	0.0222***	0.0980***	0.1038***
	(0.0054)	(0.0071)	(0.0067)	(0.0353)	(0.0366)
2019	0.0154*	0.0350	0.1815*	0.2350*	0.2278*
	(0.0085)	(0.0221)	(0.1062)	(0.1291)	(0.1295)
2020	0.0122	0.0116	0.0117	0.0114	0.0117
	(0.0079)	(0.0080)	(0.0080)	(0.0080)	(0.0080)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP SOP	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	673,815	673,815	673,815	673,815	673,815

Table 11. County-Level Count of Additional Practices in Same States

A. Primary Location in Border County					
	(1)	(2)	(3)	(4)	(5)
ATT	0.1767***	0.1515***	0.1618***	0.2173***	0.2251***
	(0.0197)	(0.0262)	(0.0245)	(0.0261)	(0.0272)
2017	0.1938***	0.1527***	0.1544***	0.1383***	0.1343***
	(0.0248)	(0.0329)	(0.0271)	(0.0254)	(0.0258)
2018	0.2674***	0.2881***	0.2644***	0.7286***	0.7677***
	(0.0354)	(0.0358)	(0.0349)	(0.0802)	(0.1003)
2019	-0.0358	0.0040	0.1921	0.4937*	0.6197**
	(0.2768)	(0.1050)	(0.2119)	(0.2598)	(0.2652)
2020	0.0270	0.0496**	0.0605***	0.0584***	0.0494**
	(0.0191)	(0.0196)	(0.0219)	(0.0213)	(0.0210)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP Scope	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	350,558	350,558	350,558	350,558	350,558
B. *Primary Location in Nonborder County*					
	(6)	(7)	(8)	(9)	(10)
ATT	0.1982***	0.1952***	0.1419***	0.1674***	0.1443***
	(0.0179)	(0.0170)	(0.0204)	(0.0314)	(0.0355)
2017	0.3440***	0.2802***	0.2315***	0.1683***	0.2002***
	(0.0273)	(0.02552)	(0.0241)	(0.0270)	(0.0382)
2018	0.0286	0.1725***	0.1935***	0.5246***	0.2822***
	(0.0214)	(0.0226)	(0.0230)	(0.0996)	(0.1000)
2019	0.0079	-0.0175	-0.6715**	-0.8156**	-0.6180*
	(0.0246)	(0.0639)	(0.3025)	(0.3681)	(0.3675)
2020	-0.1488***	-0.0984***	-0.1000***	-0.1017***	-0.0965***
	(0.0145)	(0.0128)	(0.0128)	(0.0129)	(0.0132)
Loan Forgiveness	No	Yes	Yes	Yes	Yes
Telehealth Parity	No	No	Yes	Yes	Yes
Full NP SOP	No	No	No	Yes	Yes
Urban-Rural Codes	No	No	No	No	Yes
Observations	673,815	673,815	673,815	673,815	673,815