

Licensing Barriers to Interstate Mobility in the US: Evidence from Travel Nurses

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Discussion by Ian McCarthy

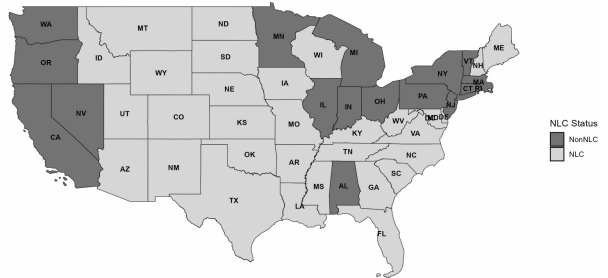
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AHEW 2026

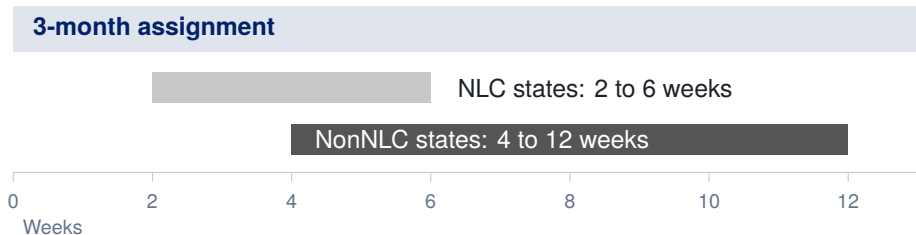
Motivation and Setting

Nurses need a license in each state where they practice

- Every RN needs a license from the state where they practice
- The Nurse Licensure Compact (NLC, since 2000) gives one multistate license valid in every member state
- By 2020, 30 states were in the NLC (light gray) and 20 were not (dark gray)
- The licensing exam is national, but the time and cost of a new state license vary widely



Licensing barriers bind hardest when the need is acute



- On average the barrier looks modest: DePasquale and Stange (2016) find no significant effect of the NLC on nurse labor supply
- A nurse who moves permanently waits once and then works for years, but a travel nurse waits as long for a 3-month job
- In an acute surge the wait binds hardest, and waivers come only after an emergency is declared and take time to work

Travel nurses are how hospitals staff a sudden surge

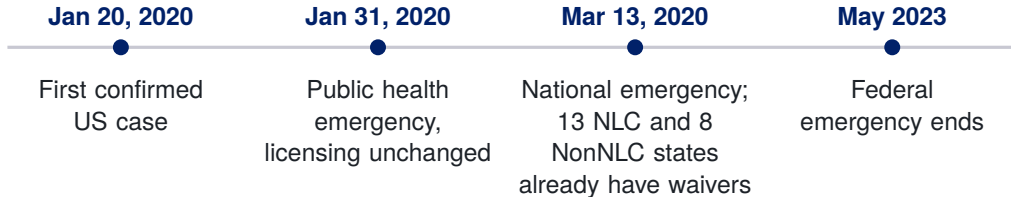
- Hospitals hire travel nurses for temporary assignments, usually 3 to 4 months
- Local surges draw in outside nurses: Harvey and Irma (500+, 2017), NYC (4,000 agency nurses, 2020)
- In an emergency, the weeks a new license takes are weeks the surge goes unstaffed

217%

rise in demand for travel
nurses, November 2020 over
November 2019 (Aya
Healthcare)

Source: HCA Healthcare (2017); New York State Comptroller (2021)

COVID-19 waivers relaxed the barrier from March 2020 to May 2023



- NLC states could move nurses across member states from the start
- NonNLC states relied on in-state nurses until waivers took effect

Nurse labor markets

Does lacking a license keep nurses out?

84%

lower probability of applying

Health effects

Did NonNLC states have higher mortality?

6.4%

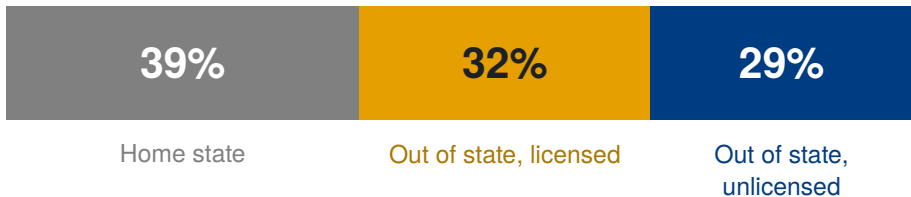
higher deaths per capita in 2020H1

Travel Nurse Applications

Fewer applications go where nurses are unlicensed

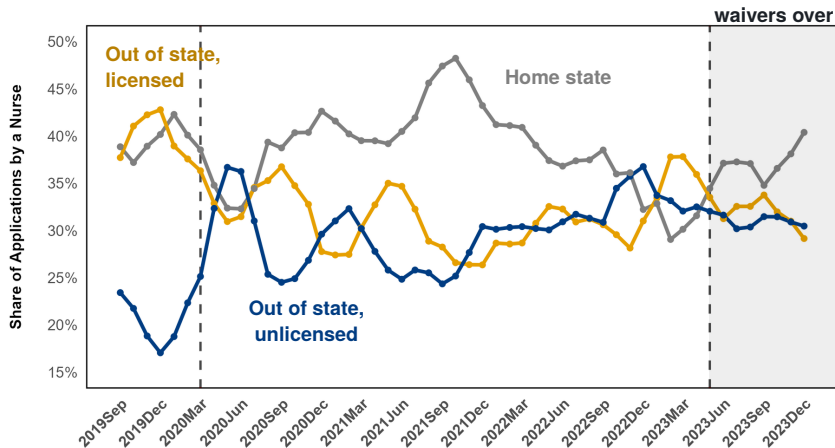
Suggestion

Where a nurse's applications go



Unlicensed out-of-state applications rose after March 2020

Suggestion



Structural Model

Supply: an application choice model

Wanderly applications, 2019H2–2023H2. Logit choice among the counties open to the nurse in that half-year.

$$U_{ict} = \underbrace{\sum_{k,\tau} \beta_{1\tau}^k \text{NonLic}_{is(c)\tau}^k + \beta_2 \log(\text{dist}_{ict}) + \beta_3 \text{Nbr}_{is(c)}}_{\mu_{ict}} + \delta_{ct} + \epsilon_{ict}$$

Supply: an application choice model

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$$U_{ict} = \underbrace{\sum_{k,\tau} \beta_{1\tau}^k \text{NonLic}_{is(c)\tau}^k}_{\text{Out of state, licensed or unlicensed, by half-year (Wanderly licenses)}} + \underbrace{\beta_2 \log(\text{dist}_{ict}) + \beta_3 \text{Nbr}_{is(c)}}_{\mu_{ict}} + \delta_{ct} + \epsilon_{ict}$$

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Out of state, licensed or unlicensed, by half-year (Wanderly licenses)

Home state to county

Neighboring state

Supply: an application choice model

Wanderly applications, 2019H2–2023H2. Logit choice among the counties open to the nurse in that half-year.

$$U_{ict} = \underbrace{\sum_{k,\tau} \beta_{1\tau}^k \text{NonLic}_{is(c)\tau}^k + \beta_2 \log(\text{dist}_{ict}) + \beta_3 \text{Nbr}_{is(c)}}_{\mu_{ict}} + \delta_{ct} + \epsilon_{ict}$$

Everything else about
the county that half-year,
the same for every nurse

Estimation, step 1: the application choice model

$$s_{ict} = \frac{\exp(\mu_{ict} + \delta_{ct})}{\sum_{c'} \exp(\mu_{ic't} + \delta_{c't})}$$

A conditional logit with county-by-half-year fixed effects δ_{ct} , with β and δ_{ct} estimated jointly by maximum likelihood. At each trial β , the likelihood-maximizing δ_{ct} are found by the usual logit inversion,

$$\delta'_{ct} = \delta_{ct} + \ln s_{ct}^{\text{obs}} - \ln s_{ct}(\beta, \delta)$$

which raises δ for any county the model sends too few applications to, and converges to the δ 's that match every county's share.

■ $\hat{\beta}$ the licensing penalty, plus distance and neighboring state

■ $\hat{\delta}_{ct}$ how attractive each county is in each half-year, net of the nurse-specific terms

$$\hat{\delta}_{ct} = \delta_0 + \delta_1 \log(\text{wage}_{ct}) + \delta_2 \log(\text{cases}_{ct}) + \xi_{ct}$$

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Counties post higher pay when unobserved demand is high, so wages are endogenous

$$\hat{\delta}_{ct} = \delta_0 + \delta_1 \log(\text{wage}_{ct}) + \delta_2 \log(\text{cases}_{ct}) + \xi_{ct}$$


A curved purple arrow points from the $\log(\text{wage}_{ct})$ term to the ξ_{ct} term, indicating a relationship or substitution between them.

$$\log(\text{wage}_{ct}) = \alpha_0 + \alpha_c + \alpha_t + \alpha_1 \log(\text{wage}_{nct}^{\text{Allied}}) + \eta_{ct}$$

County and
quarter fixed
effects, in
both stages

Allied wages posted on
Wanderly in neighboring counties
first stage 0.16 (F = 213)

δ_1 : 1.12 (OLS)
→ **2.12** (IV)

$$\hat{\delta}_{ct} = \delta_0 + \delta_1 \log(\text{wage}_{ct}) + \delta_2 \log(\text{cases}_{ct}) + \xi_{ct}$$

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County and
quarter fixed
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Allied wages posted on
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Waivers eased the licensing penalty but never removed it

$$\text{Extra pay needed} = \exp\left(\frac{\beta_{1\tau}^{\text{lic}} - \beta_{1\tau}^{\text{unlic}}}{\delta_1}\right) - 1$$

- The numerator is how much less attractive an unlicensed job is, in utility
- $\delta_1 = 2.12$ is how strongly applications respond to wages
- Their ratio puts the licensing penalty in wage units

Waivers eased the licensing penalty but never removed it

Before the emergency

136%

more pay needed to apply to
a job without a license

Under the waivers

70%

more pay needed to apply to
a job without a license

After May 2023

80%

more pay needed to apply to
a job without a license

Demand: hires are assumed to scale with applications

Suggestion

$$\pi_{ct} = \theta_{ct} L_{ct}^{1-\alpha} - w_{ct} L_{ct}$$

Demand: hires are assumed to scale with applications

Suggestion

$$\pi_{ct} = \theta_{ct} L_{ct}^{1-\alpha} - w_{ct} L_{ct}$$

How productive a
county's nurses are

Demand: hires are assumed to scale with applications

Suggestion

$$\pi_{ct} = \theta_{ct} L_{ct}^{1-\alpha} - w_{ct} L_{ct}$$

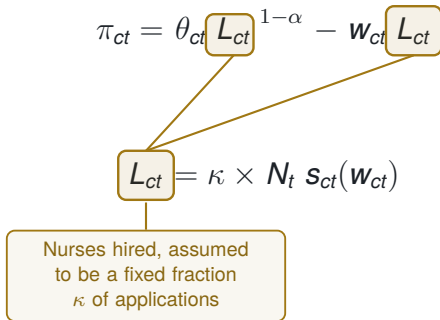
Returns diminish
as more nurses are
hired, with α set to 0.2

Demand: hires are assumed to scale with applications

Suggestion

$$\pi_{ct} = \theta_{ct} L_{ct}^{1-\alpha} - w_{ct} L_{ct}$$

Posted hourly pay,
so this term is the
county's wage bill



$$\pi_{ct} = \theta_{ct} L_{ct}^{1-\alpha} - w_{ct} L_{ct}$$

$$L_{ct} = \kappa \times N_t S_{ct}(w_{ct})$$

All travel nurse applications
in the half-year

$$\pi_{ct} = \theta_{ct} L_{ct}^{1-\alpha} - w_{ct} L_{ct}$$

$$L_{ct} = \kappa \times N_t s_{ct}(w_{ct})$$

The county's share
of them, which rises
with its posted wage

$$\underbrace{(1 - \alpha) \theta_{ct} L_{ct}^{-\alpha}}_{\text{marginal revenue product}} = \underbrace{w_{ct} \left(1 + \frac{1}{\delta_1 (1 - s_{ct})} \right)}_{\text{marginal cost of hiring}}$$

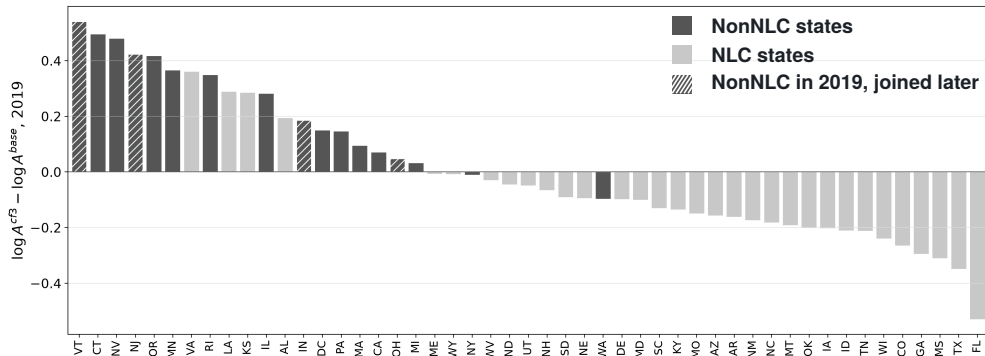
A county posts the wage at which one more nurse just pays for herself. Wages and shares are observed, δ_1 comes from step 2, and α is calibrated at 0.2, so θ_{ct} is the only piece left.

■ θ_{ct} how productive nurse labor is in each county

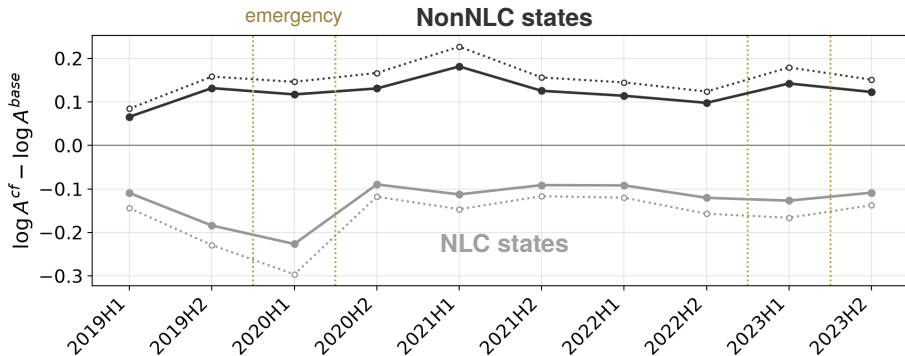
■ **Counterfactual** with $\hat{\beta}$, δ_1 and θ_{ct} fixed, switch off the licensing penalty and re-solve wages and shares

Results and Counterfactuals

Without the barrier, applications would shift mostly toward NonNLC states



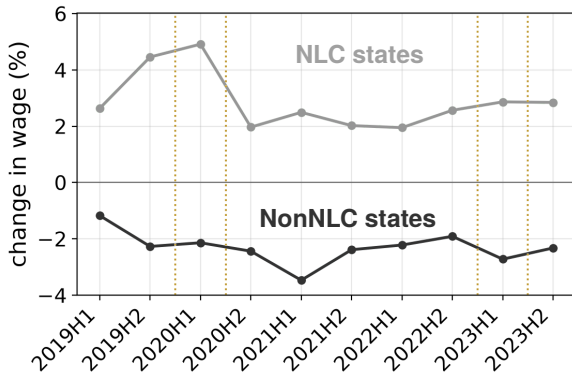
NLC states' advantage from the barrier peaked in 2020H1



Change in log applications without the barrier. Solid: wages re-equilibrate. Dotted: wages held fixed.

The barrier raises NonNLC wages and lowers NLC wages

Suggestion



Change in posted wages from removing the barrier. The wage response is a gap of about 5 points, largest in 2020H1.

Mortality: Border-County Design

$$y_{ct} = \beta_1 \text{NonNLC}_s + \sum_{t \neq 2019H2} \beta_{2t} \text{NonNLC}_s \times \mathbf{1}\{t\} + \beta_3 X_{ct} + \alpha_{p(c)t} + \epsilon_{ct}$$

$$y_{ct} = \beta_1 \text{NonNLC}_s + \sum_{t \neq 2019H2} \beta_{2t} \text{NonNLC}_s \times \mathbf{1}\{t\} + \beta_3 X_{ct} + \alpha_{p(c)t} + \epsilon_{ct}$$

Log deaths per
capita (CDC
WONDER)

$$y_{ct} = \beta_1 \text{NonNLC}_s + \sum_{t \neq 2019H2} \beta_{2t} \text{NonNLC}_s \times \mathbf{1}\{t\} + \beta_3 X_{ct} + \alpha_{p(c)t} + \epsilon_{ct}$$

Log deaths per
capita (CDC
WONDER)

Not in the NLC as
of January 2020

$$y_{ct} = \beta_1 \text{NonNLC}_s + \sum_{t \neq 2019H2} \beta_{2t} \text{NonNLC}_s \times \mathbf{1}\{t\} + \beta_3 X_{ct} + \alpha_{p(c)t} + \epsilon_{ct}$$

Log deaths per capita (CDC WONDER)

Not in the NLC as of January 2020

NonNLC interacted with each half-year, 2019H2 omitted

$$y_{ct} = \beta_1 \text{NonNLC}_s + \sum_{t \neq 2019H2} \beta_{2t} \text{NonNLC}_s \times \mathbf{1}\{t\} + \beta_3 X_{ct} + \alpha_{p(c)t} + \epsilon_{ct}$$

Log deaths per
capita (CDC
WONDER)

Not in the NLC as
of January 2020

NonNLC
interacted with
each half-year,
2019H2 omitted

Cases and
vaccines (CDC);
demographics
(Census)

Comparing neighboring counties across NLC borders

Suggestion

$$y_{ct} = \beta_1 \text{NonNLC}_s + \sum_{t \neq 2019H2} \beta_{2t} \text{NonNLC}_s \times \mathbf{1}\{t\} + \beta_3 X_{ct} + \alpha_{p(c)t} + \epsilon_{ct}$$

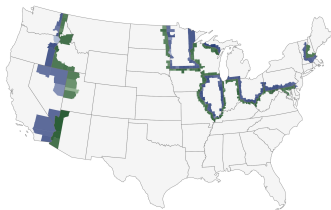
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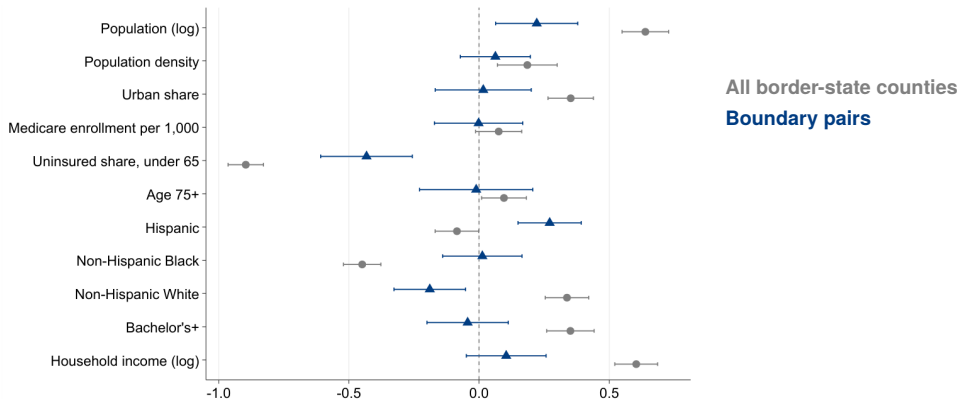
Cases and
vaccines (CDC);
demographics
(Census)

Border-pair
 $\times$ half-year
fixed effects



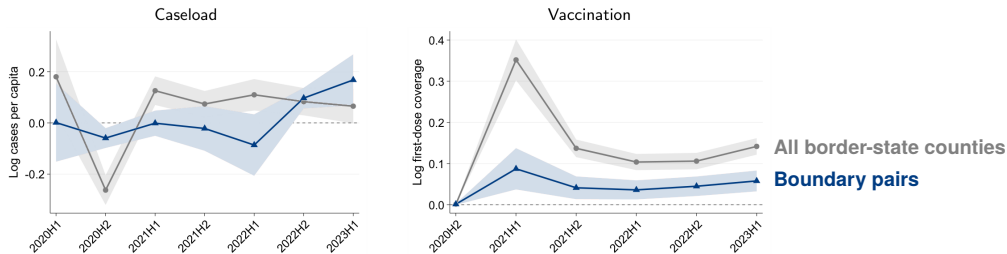
Adjacent counties on opposite sides of an NLC/NonNLC border.

Boundary pairs close most of the demographic gaps



Standardized differences, NonNLC minus NLC. The uninsured gap persists.

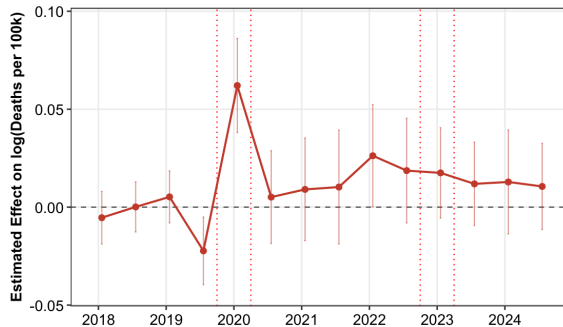
Caseloads line up across the border; a vaccination gap remains



Differences in logs, NonNLC minus NLC, by half-year.

NonNLC border counties had 6.4% higher mortality in 2020H1

Suggestion



- No differential trend in 2018–2019
- 6.4% higher deaths per capita in 2020H1
- Back to zero after, so a one-period gap
- Holds with demographic and COVID-19 controls

Summary

What the paper finds

NURSE LABOR MARKETS

- | **136% more pay** to offset lacking a license, falling to 70% under the waivers
- | **Shift toward NonNLC states** in applications when the barrier is removed
- | **About 5%** wage response, declining after 2020H1

HEALTH

- | **6.4% higher** deaths per capita in NonNLC border counties in 2020H1

Thank You

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Two questions

Nurse labor markets

Health effects

Does licensing

Order of the two questions

84

The application results establish that the licensing barrier reduces nurse supply. Presenting them first would let the mortality results follow as one consequence of that barrier.

lower probability of applying

higher deaths per capita in 2001



mortality?

Fewer applications go where nurses are unlicensed

Where a nurse's applications go

Who applies where they hold no license?

It is odd to apply somewhere you cannot legally work, so these nurses may be unusual in some way. For example, do the same nurses apply to many different places at once? Is there evidence they are not just a particular type of nurse?

Is the composition changing?

Travel nursing roughly tripled from 2019 to 2022, so many of the nurses applying in 2021 were not in the market in 2019. A penalty that eases over these years could then reflect a change in who applies as well as the waivers. The appendix compares Wanderly application counts with national counts of travel nurse assignments. Do the nurses themselves look similar across years, for example in the licenses they hold or their home states?

2019Sep 2019Dec 2020Mar 2020Jun 2020Sep 2020Dec 2021Mar 2021Jun 2021Sep 2021Dec 2022Mar 2022Jun 2022Sep 2022Dec 2023Mar 2023Jun 2023Sep 2023Dec



How sensitive are the wage equivalents to the instrument?

The allied-health wage gives $\delta_1 = 2.12$, and wages the same staffing agencies post in other counties give 1.60. The 136/70/80% wage equivalents use the allied estimate, and a smaller δ_1 implies larger ones. How do the wage equivalents change under the second instrument?

County and
quarter fixed
effects, in
both stages

Allied wages posted on
Wanderly in neighboring counties
first stage 0.16 (F = 213)



Sensitivity to θ and α

- θ_{ct} is held fixed. If the nurses drawn in by removing the barrier differ from those applying now, so does the value of a hire. Since θ is estimated county by county, the θ of comparable NLC counties could stand in for barrier counties.
- α is set at 0.2 from the literature, and the wage adjustment scales with it. How different does the counterfactual look at 0.1 or 0.3?

A county
observe

nurses are



Who is the employer?

- A county with one hospital and a county with five are the same employer here, posting one wage and facing the county's whole application share. Hospital-level wage setting and monopsony power are outside the model.
- Hires may not be proportional to applications. A hospital filling five positions hires five however many apply. Is there a measure of placements to anchor this?

The barrier raises NonNLC wages and lowers NLC wages

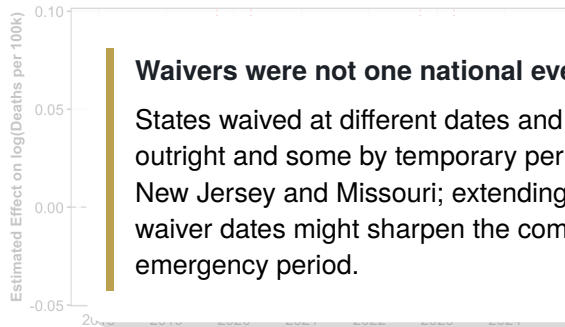


Why do NLC wages move more?

Most of the 5-point gap comes from NLC wages rising rather than NonNLC wages falling, because NLC applications fall more in logs than NonNLC applications rise. With NonNLC states the smaller group, the reverse would seem more natural. How are counties averaged here, and does the asymmetry hold if they are weighted by applications?

Change in posted wages from removing the barrier. The wage response is a gap of about 5 points, largest in 2020H1.

NonNLC border counties had 6.4% higher mortality in 2020H1



Waivers were not one national event

States waived at different dates and in different forms, some outright and some by temporary permit. The appendix contrasts New Jersey and Missouri; extending that to each state's own waiver dates might sharpen the comparison relative to a single emergency period.

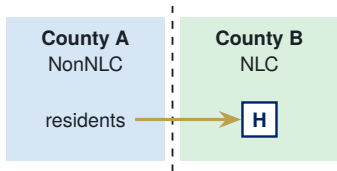
capita in

and

Comparing neighboring counties across NLC borders

Where do border-county residents go to the hospital?

Someone living in a NonNLC county may be treated across the line in an NLC state, where the nurses work under NLC rules, but the paper counts them as NonNLC.



Deaths recorded	A	B
By residence	100	100
By occurrence	50	150

100 deaths a month in each county,
half in the hospital, which is in B

Counted by residence, the gap shrinks toward zero. Counted by where the death occurs, the gap follows the hospitals. Which does the paper use, and how often do patients cross?