

# Peer Pressure and Manager Pressure in Organisations

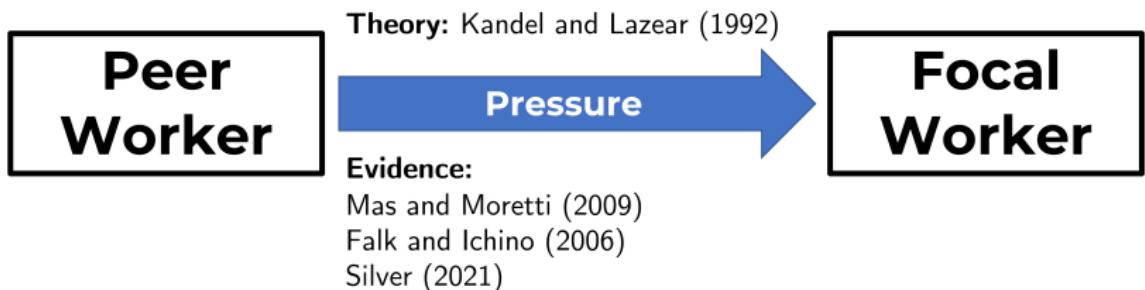
Diego Battiston (University of Edinburgh)

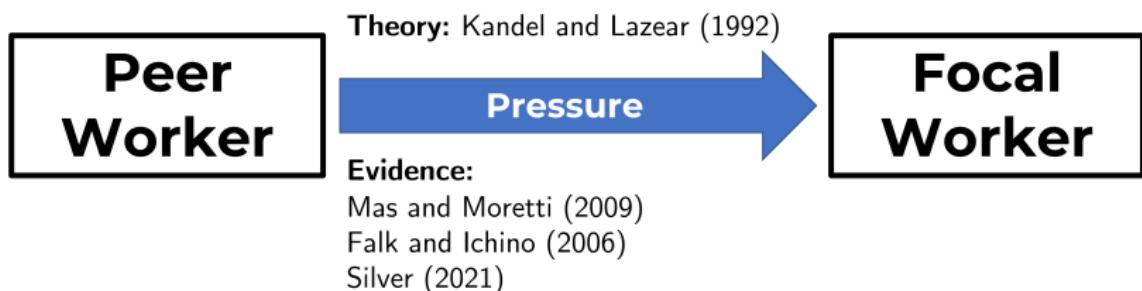
Jordi Blanes i Vidal (LSE)

Tom Kirchmaier (CBS and CEP)

Katalin Szemerédi (Corvinus, Budapest)

October 31, 2023



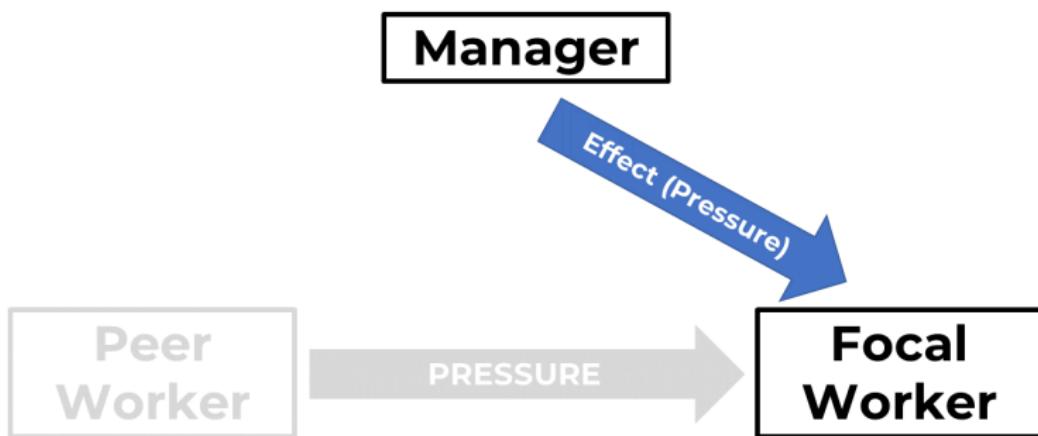


## Mechanism?

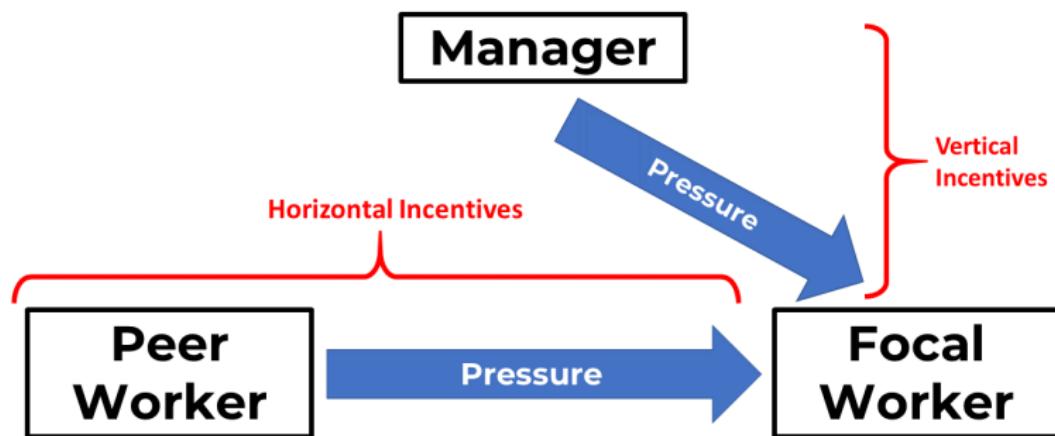
- Kandel and Lazear (1992): guilt, shame, norms...
- Mas and Moretti (2009): "*If a worker is slow, other workers may impose a cost on her, for example, by reporting her to management(...).*"

## Managers Matter

Lazear et al. (2015), Hoffman and Tadelis (2020), Frederiksen et al. (2020),  
Adhvaryu et al. (2022), Fenizia (2022)



## How do Peer Pressure and Manager Pressure Interact?



- Unlikely to be independent mechanisms
- Substitutes, Complements?... not obvious

## This Paper:

- Effect of **presence** of nearby peers on worker's productivity
- Mechanism: peer matters because it provides/improves manager's signal about worker's productivity
- Message: managers shape the horizontal incentives between workers

## Why do we care?

- Optimal design of working spaces, shifts, teams
  - e.g: we simulate alternative seating arrangements and find large productivity gains
- Working-from-home, hybrid working
  - missing peer-pressure
  - effect may depend on existing vertical incentives
  - important for office based jobs and public sector
- Understanding why does peer pressure arise

# 999 Call Handling Room - Manchester Police



## (Team) Production Technology



▶ details

## Team Production Technology

- Handlers take calls from common queue
  - free-riding with all contemporaneous handlers
  - handler sets 'ready status' for taking calls
- Managers imperfectly observe effort
- Peers on adjacent desks observe effort

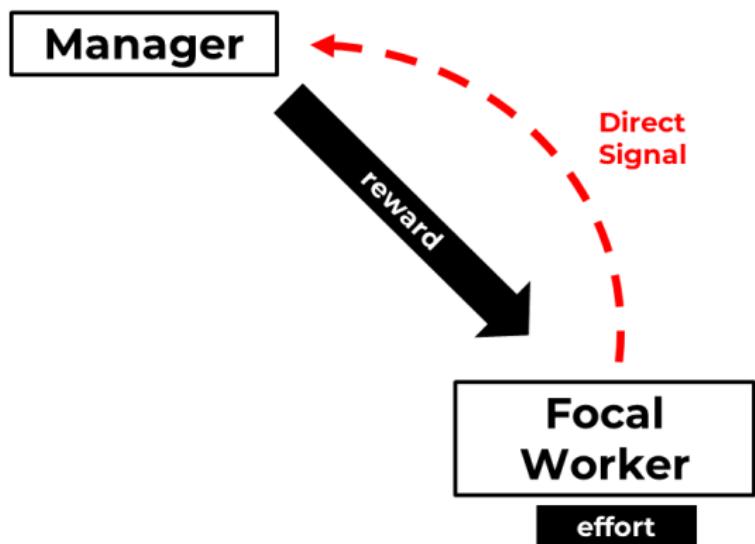
## Team Production Technology

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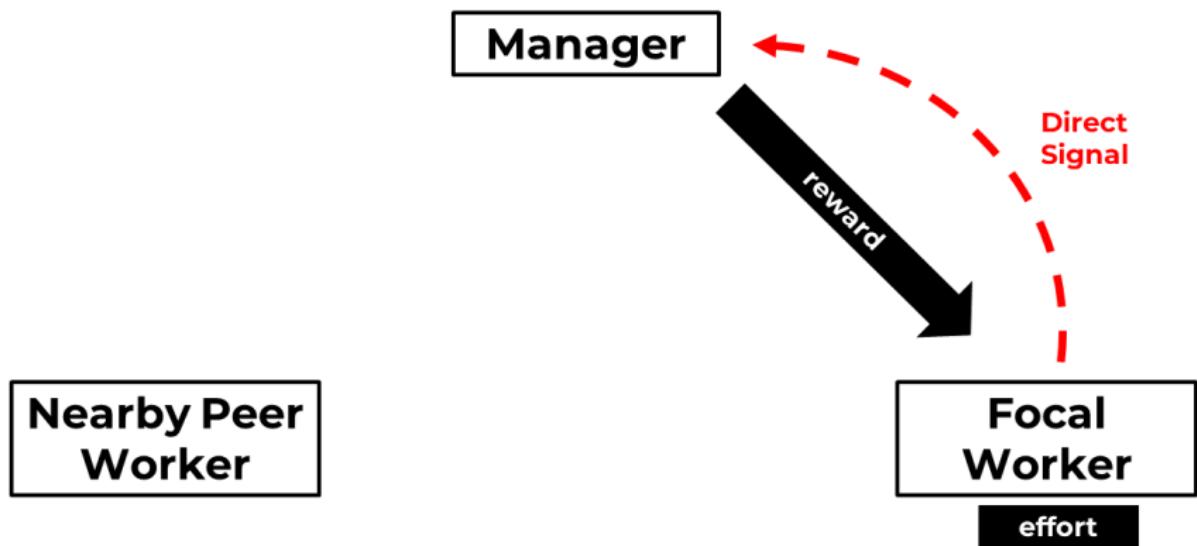
## Measures of Performance

- Number of calls answered
- Also:
  - Time on the phone
  - Call 'quality' (e.g. time to arrive to the incident)

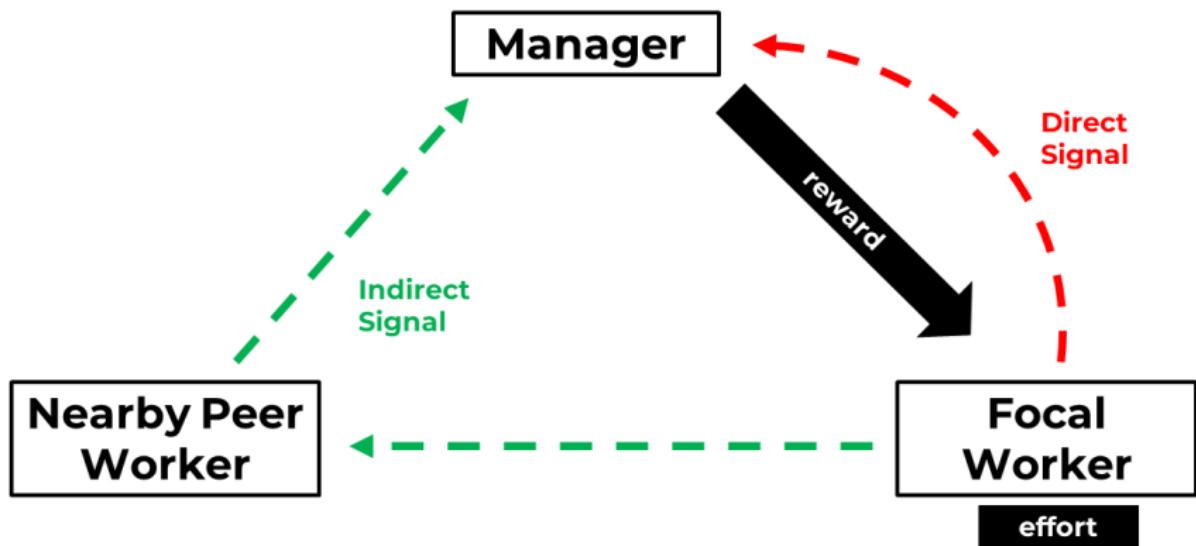
## Conceptual Framework (math details in paper)



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### Predictions:

- ① peer presence increases productivity
- ② peer effect stronger when manager's direct signal is weaker
- ③ peer effect stronger when peer/manager information link is stronger

## Plan for Today

- ① identify peer effects (i.e. having peers closeby)
  - properly
  - robustness/heterogeneity
  - effects on 'quality'
- ② mechanism/relation with manager pressure (predictions 2 and 3)
- ③ simulations and discussion

## Empirical Strategy:

Occupation of Adjacent Seats → Productivity of Worker

### Identification:

- Seating is:
  - endogenous (hot-desk)
  - but fixed within a shift

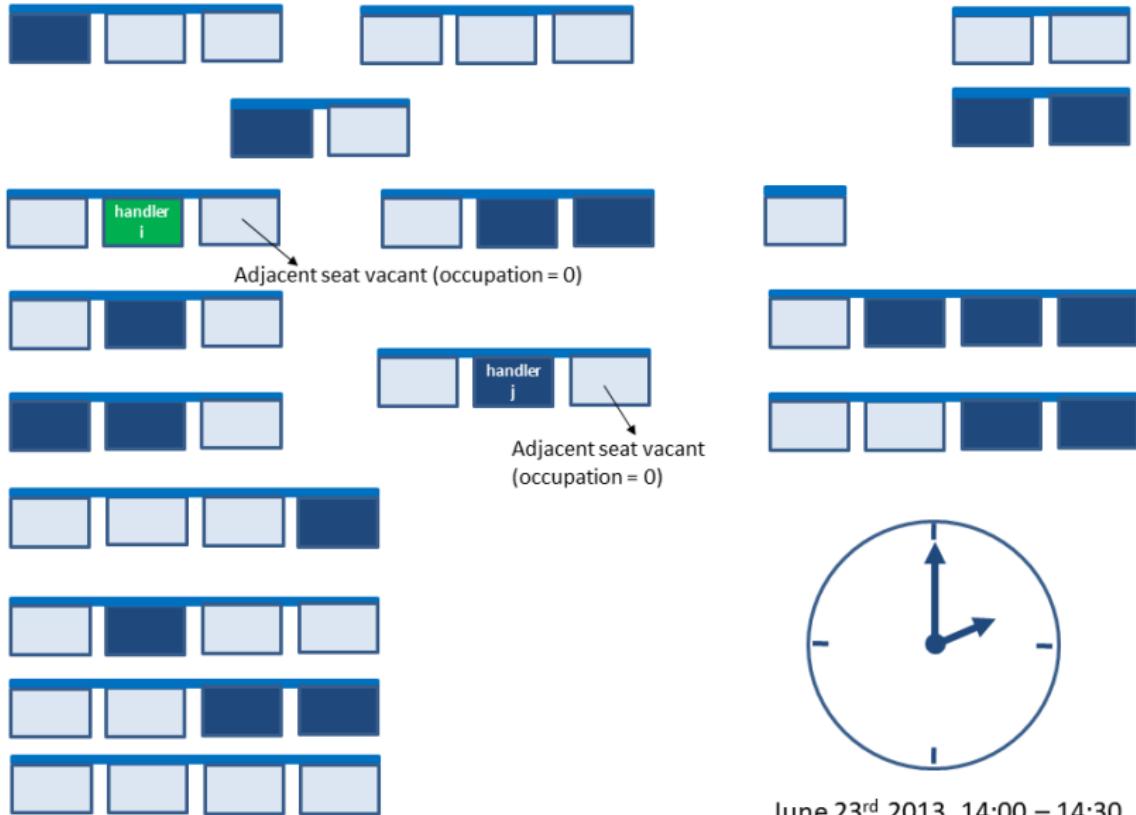
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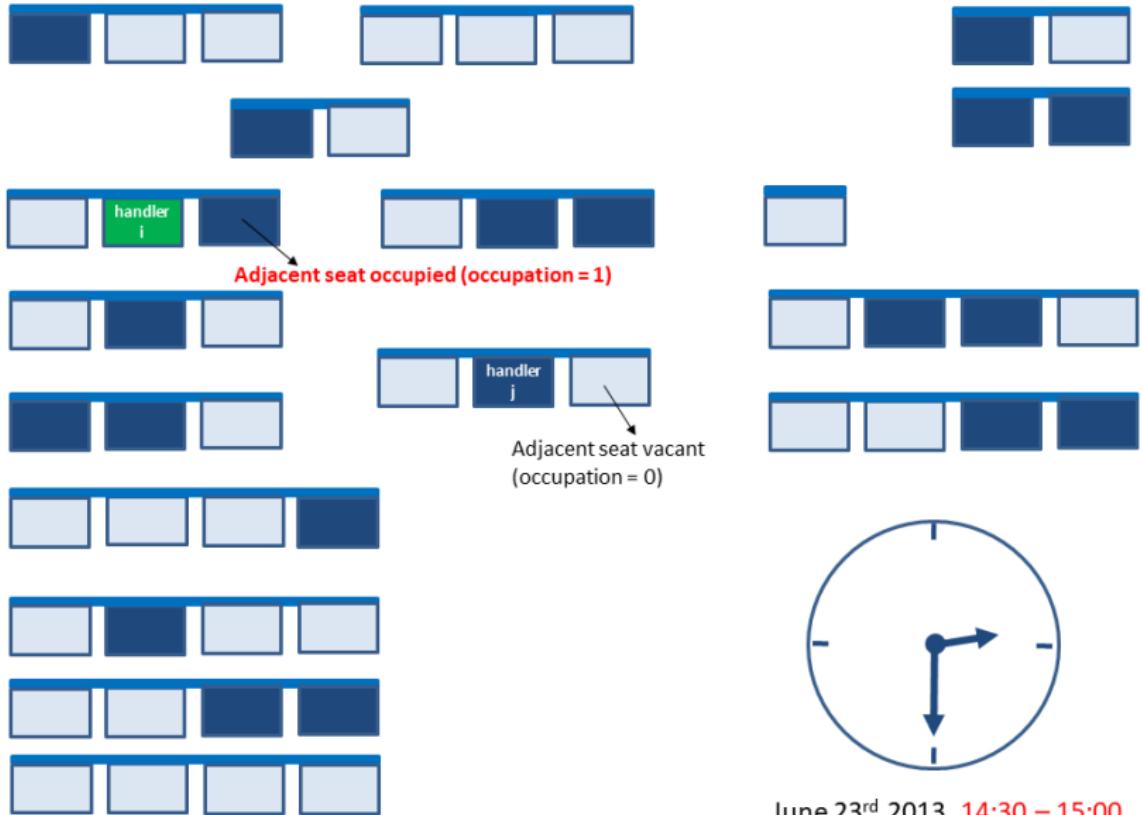
### Identification:

- Seating is:
  - endogenous (hot-desk)
  - but fixed within a shift
- Exploit high-frequency (e.g. 30mins) variation in occupation of adjacent seats
  - within handler-shift variation
  - absorb common shocks at granular time level

# The Effect of Having Peers: Occupation of Adjacent Seats



## The Effect of Having Peers: Occupation of Adjacent Seats



June 23<sup>rd</sup> 2013, 14:30 – 15:00

**Panel of individual  $i \times$  shift  $s \times$  half-hour  $r$  periods:**

$$y_{isr} = + \epsilon_{isr}$$

**Panel of individual  $i \times$  shift  $s \times$  half-hour  $r$  periods:**

$$y_{isr} = \beta Occupied_{isr} + \epsilon_{isr}$$

- $Occupied_{isr} \in [0, 2]$ : average occupation of adjacent(s) seat(s)

**Panel of individual  $i \times$  shift  $s \times$  half-hour  $r$  periods:**

$$y_{isr} = \beta Occupied_{isr} + \gamma_{is} + \epsilon_{isr}$$

- $Occupied_{isr} \in [0, 2]$ : average occupation of adjacent(s) seat(s)
- $\gamma_{is}$ : individual-shift effect

**Panel of individual  $i \times$  shift  $s \times$  half-hour  $r$  periods:**

$$y_{isr} = \beta Occupied_{isr} + \gamma_{is} + \lambda_{t(isr)} + \epsilon_{isr}$$

- $Occupied_{isr} \in [0, 2]$ : average occupation of adjacent(s) seat(s)
- $\gamma_{is}$ : individual-shift effect
- $\lambda_{t(isr)}$ : time (year  $\times$  month  $\times$  day  $\times$  half-hour) effect

**Panel of individual  $i \times$  shift  $s \times$  half-hour  $r$  periods:**

$$y_{isr} = \beta Occupied_{isr} + \gamma_{is} + \lambda_{t(isr)} + \theta_r + \epsilon_{isr}$$

- $Occupied_{isr} \in [0, 2]$ : average occupation of adjacent(s) seat(s)
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- $\theta_r$ : half-hour-within-individual-shift effect

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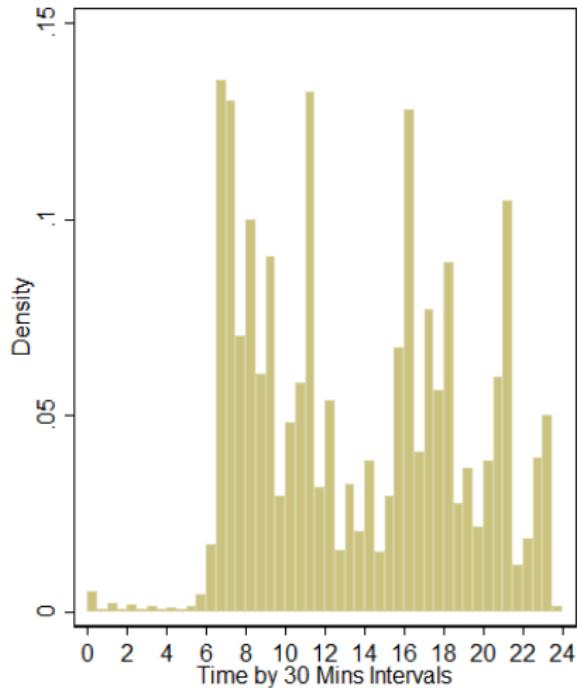
In first differences within individual-shift:

$$\Delta y_{isr} = \beta \Delta Occupied_{isr} + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

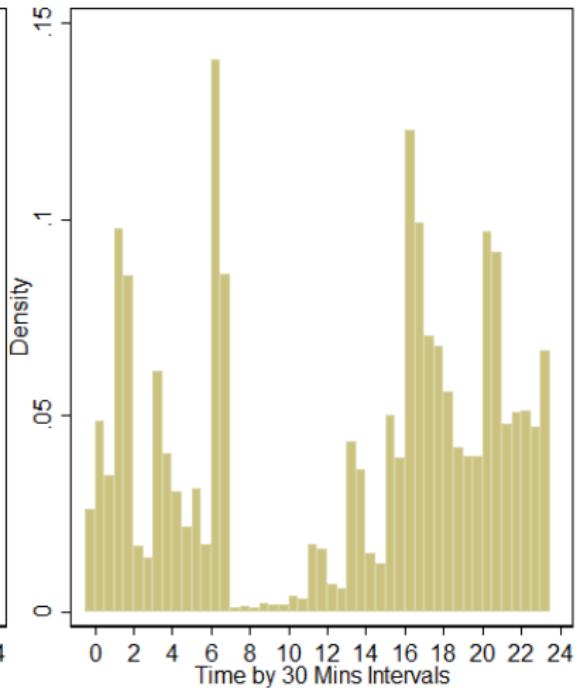
# Handlers Start/End their Shifts at all Times of the Day

## Distribution of Shift Hours

Starting Time



Ending Time



**Identification assumption:** Occupation of adjacent seats orthogonal to within-individual-shift/across-half-hour shocks.

E.g: arriving peer doesn't sit next to a handler that is to become more productive at half-hour  $t$

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### Supporting Evidence:

- Leads/lags in baseline regression (check pre-trends)
- Leads/lags in calls characteristics (placebo)
- Balance tests

## Data:

- Feb2012 - Nov2014
- 71,000 shifts
- 350 handlers
- 2 million calls

## Descriptive:

- ▶ Available and Occupied Seats
- ▶  $\Delta$  Occupied
- ▶ Outcomes

## Baseline Regression:

$$\Delta y_{isr} = \beta \Delta Occupied_{isr} + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

The Effect of Occupation of Adjacent  
Desks on Handler Productivity

VARIABLES	(1) $\Delta \text{ LogCalls}$	(2) $\Delta \text{ LogPhone}$
$\Delta \text{ Occupied}$	.04*** (.002)	.06*** (.003)
N	1,120,501	1,120,501

Controls = Half-Hour FE, Shift Half-Hour FE, Minutes Worked During Half-Hour

Dataset in first-differences within handler/shift

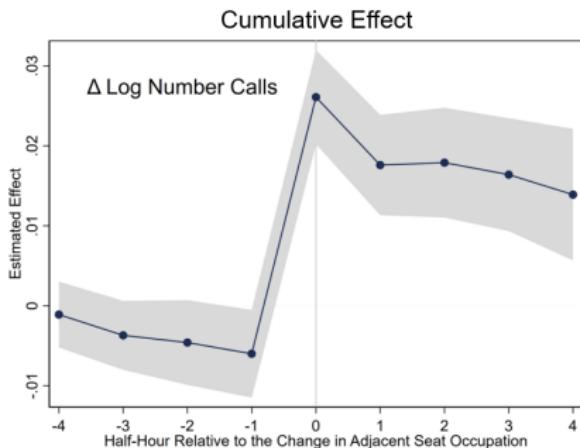
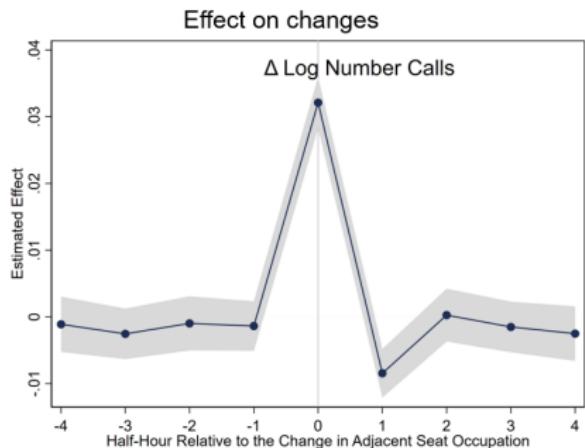
S.E. clustered at handler/shift level

## Baseline Regression with Leads and Lags

$$\Delta y_{isr} = \sum_{j=-4}^{j=4} \beta_j \Delta Occupied_{i(r-j)} + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

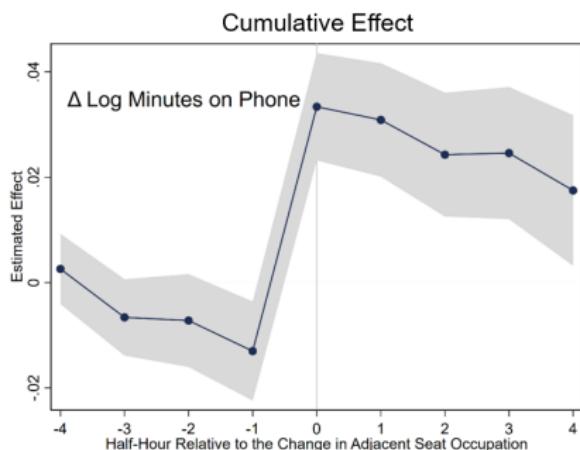
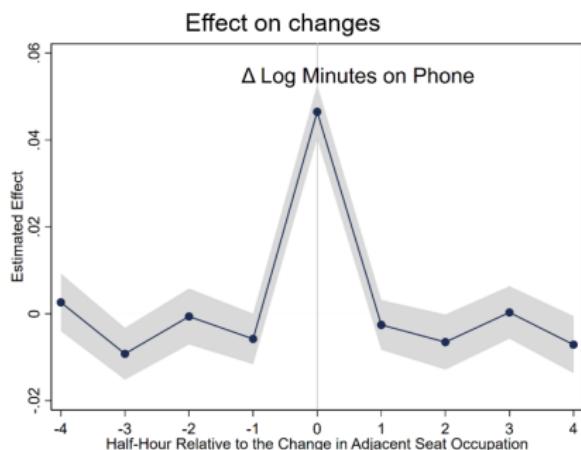
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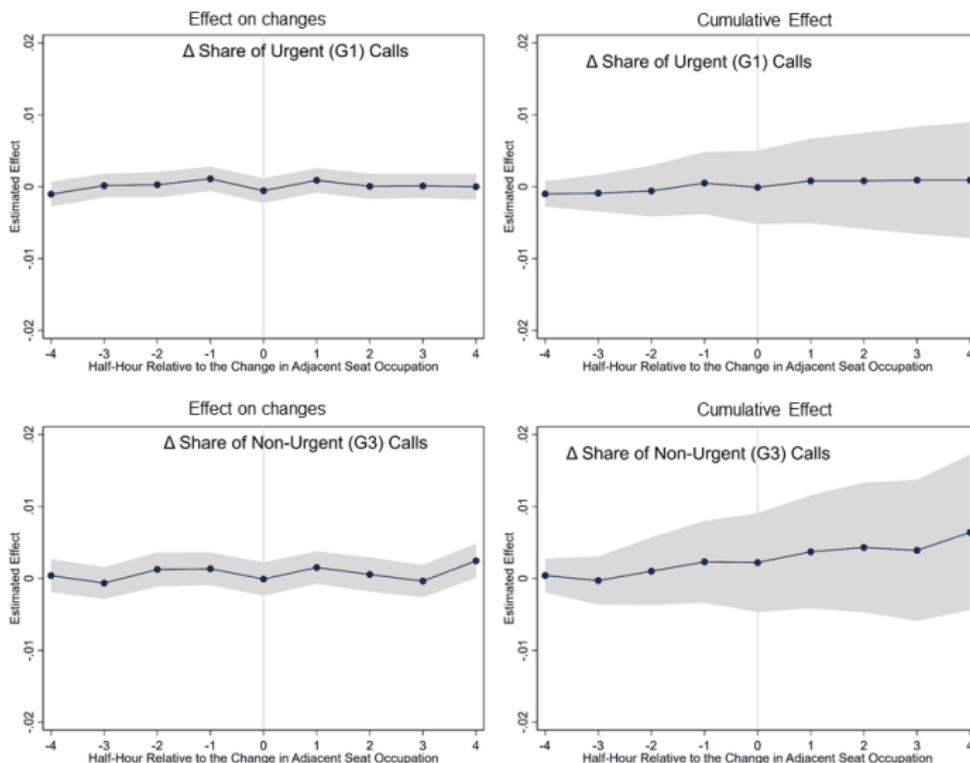


## Placebo Test using Characteristics of Calls received

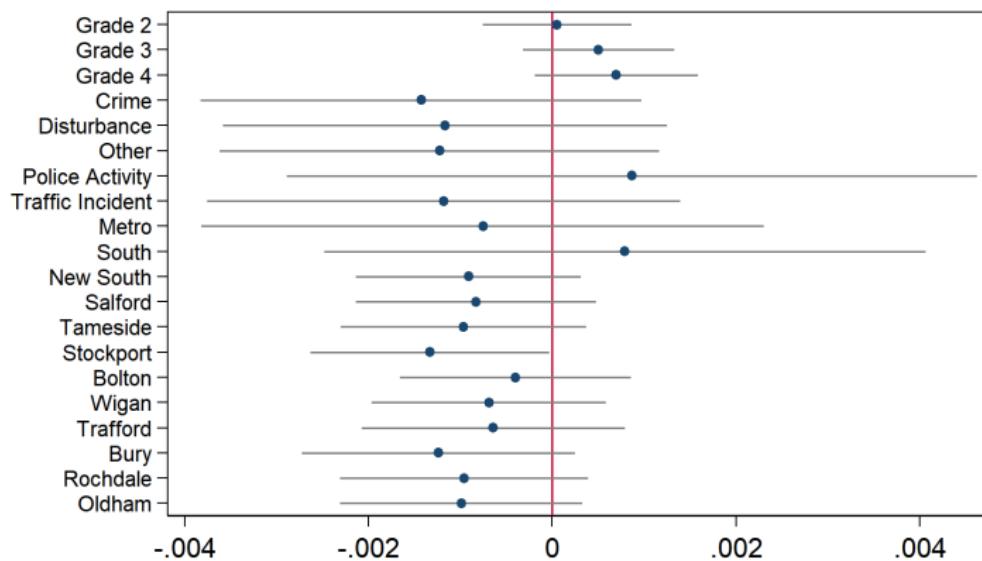
$$\Delta z_{isr} = \sum_{j=-4}^{j=4} \beta_j \Delta Occupied_{i(r-j)} + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

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$$\Delta z_{isr} = \sum_{j=-4}^{j=4} \beta_j \Delta Occupied_{i(r-j)} + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$



## Balance Test: Characteristics of the calls



Regression at the call level. N = 2022385

Dependent variable = change in the number of neighbouring seats occupied in the half-hour

RHS variables are displayed in the vertical axis.

F Joint significance = .66

## Summary of heterogeneous results

- ➊ both for increases and decreases in occupation 
- ➋ most individual-level effects are positive 
  - for focus handler
  - spillovers created when arriving/leaving
- ➌ weaker effects for occupation of front/behind row 
- ➍ stronger effects when 
  - similar experience
  - arriving peer high productivity
  - co-located prior to 2012

 additional robustness

## Quality

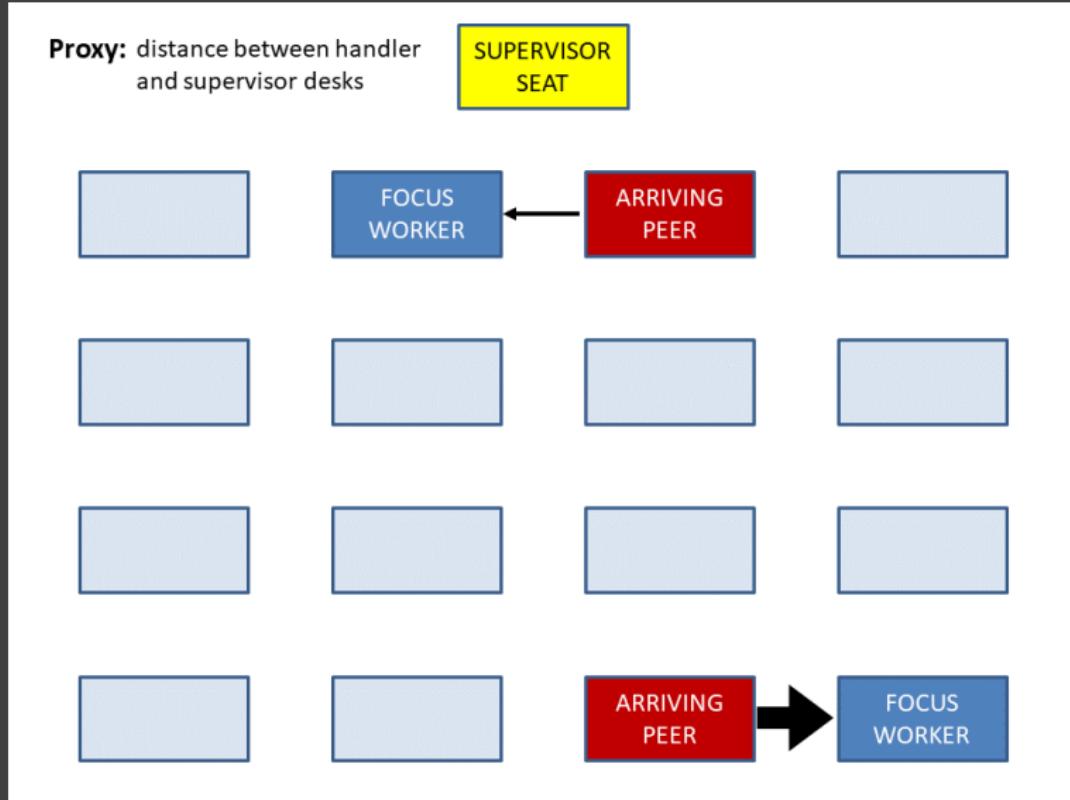
Effects on Quality of Work

Dependent Variable:	(1)	(2)	(3)	(4)
	$\Delta \log$ Average Call Duration	$\Delta \log$ Allocation Time	$\Delta \log$ Response Time	$\Delta \log$ Clearance Dummy
$\Delta$ Occupied	.005 (.0029)	.02 (.0165)	.012 (.0124)	-.026 (.0327)
N	908,253	355,363	351,023	9,625

## Plan for Today

- ① identify peer effects
  - properly
  - robustness/heterogeneity
  - effects on 'quality'
- ② mechanism/relation with manager pressure (predictions 2 and 3)
- ③ simulations and discussion

## Prediction 2: stronger peer effects when manager gets a weaker direct signal



## Effect by distance to closest supervisor

$$\Delta y_{isr} = \beta \Delta Occup_{isr} + \alpha (\Delta Occup_{isr} \times Distance_{is}) + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

Dependent Variable:	(1) Δ Log Phone	(2) Δ Log Calls	(3) Δ Log Phone	(4) Δ Log Calls
Δ Occupied	-.001 (.0134)	-.001 (.0081)		
Δ Occupied × Log Distance to Supervisor	.026*** (.0064)	.016*** (.0038)	.025*** (.0074)	.016*** (.0045)
Δ Occupied × Focus Handler F.E.	No	No	Yes	Yes
Δ Occupied × Time (Half-Hour) F.E.	No	No	Yes	Yes
N	982,861	982,861	982,861	982,861

► Non-Parametric

## Controlling for selection:

$$\Delta y_{isr} = \alpha(\Delta Occup_{isr} \times Distance_{is}) + \beta_i(\Delta Occup_{isr} \times \eta_i) \\ + \gamma_i(\Delta Occup_{isr} \times \lambda_t) + \theta_r + \Delta \epsilon_{isr}$$

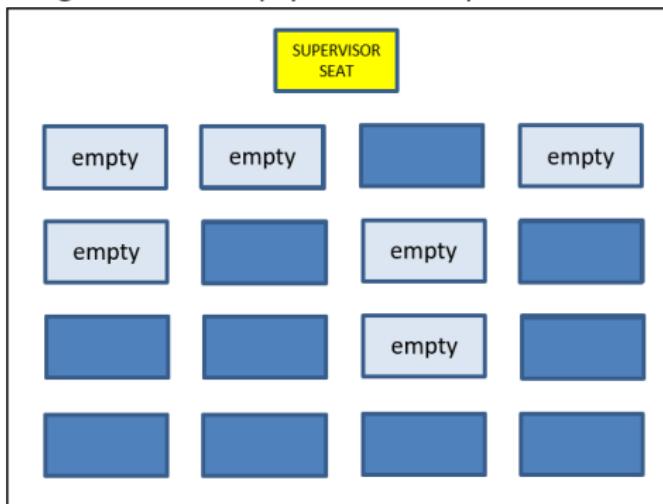
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N	982,861	982,861	982,861	982,861

► Non-Parametric

## Instrument for distance:

- avg distance of **free seats** at the time handler starts her shift
- intuition: seat choice constrained by free seats → idiosyncratic

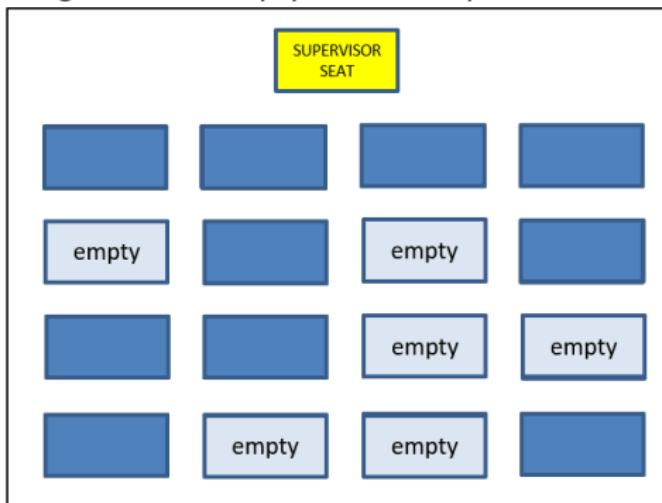
Avg. distance empty desks to supervisor = 2.4



## Instrument for distance:

- avg distance of **free seats** at the time handler starts her shift
- intuition: seat choice constrained by free seats → idiosyncratic

Avg. distance empty desks to supervisor = **3.7**



## Effect by distance to closest supervisor

2SLS results:

	First Stage		Second Stage	
	(1)	(2)	(3)	
Dependent Variable:	$\Delta \text{ Occupied} \times \text{Log Distance to Supervisor}$	$\Delta \text{ Log Phone}$	$\Delta \text{ Log Calls}$	
$\Delta \text{ Occupied} \times \text{Log Av. Distance Free Seats}$	1.572*** (.0478)			
$\Delta \text{ Occupied} \times \text{Log Distance to Supervisor}$		.072*** (.0304)	.051*** (.0184)	
$\Delta \text{ Occupied} \times \text{Focus Handler F.E.}$	Yes	Yes	Yes	
$\Delta \text{ Occupied} \times \text{Time (Half-Hour) F.E.}$	Yes	Yes	Yes	
Kleibergen-Paap F	2666.66			

Prediction 3: stronger peer effects if manager/peer link is stronger

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## What do Managers do? Two Functions

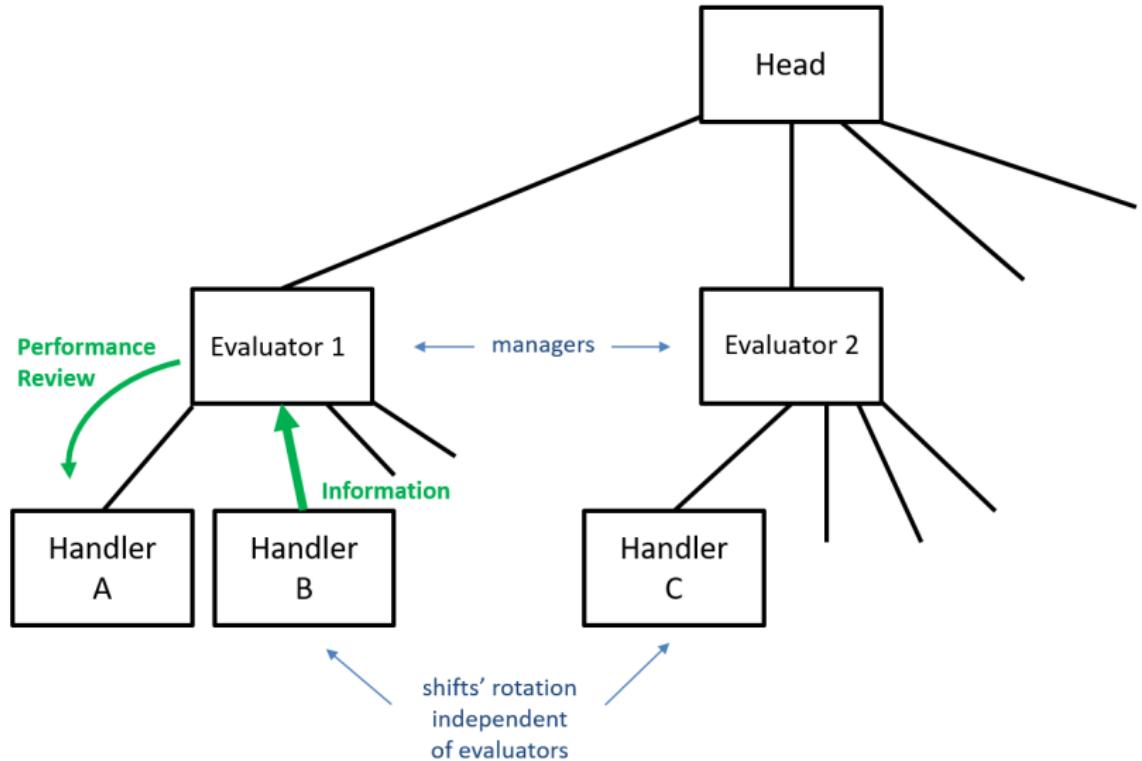
Supervisors:

- in the room
- monitor visually
- solve hard problems

Evaluators:

- undertake performance review (plus mentoring, advice)
- requires 'hard' and 'soft' information
- regular meetings with handlers

## Co-evaluated Handlers



## Effect by evaluator affiliation of peer

	$\Delta \text{ LogCalls}$				
	(1)	(2)	(3)	(4)	(5)
$\Delta \text{ Occ}$		.033*** (.002)			
$\Delta (\text{Occ} \times \text{Co-Evaluated})$		.02*** (.006)	.018*** (.006)		
$\Delta \text{ Occ}$ interacted with:					
Focus Handler FE	NO		YES		

## Effect by evaluator affiliation of peer

	$\Delta \text{ LogCalls}$				
	(1)	(2)	(3)	(4)	(5)
$\Delta \text{ Occ}$	.033*** (.002)				
$\Delta (\text{Occ} \times \text{Future Co-Evaluated})$			-.006 (.012)		
$\Delta (\text{Occ} \times \text{Current Co-Evaluated})$	.02*** (.006)	.018*** (.006)	.017*** (.006)		
$\Delta (\text{Occ} \times \text{Past Co-Evaluated})$				-.009 (.008)	

$\Delta \text{ Occ}$  interacted with:

Focus Handler FE	NO	YES	YES
------------------	----	-----	-----

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$\Delta \text{ Occ}$	.033*** (.002)				
$\Delta (\text{Occ} \times \text{Future Co-Evaluated})$			-.006 (.012)		
$\Delta (\text{Occ} \times \text{Current Co-Evaluated})$	.02*** (.006)	.018*** (.006)	.017*** (.006)	.018** (.009)	
$\Delta (\text{Occ} \times \text{Past Co-Evaluated})$			-.009 (.008)	-.011 (.011)	

$\Delta \text{ Occ}$  interacted with:

Focus Handler FE	NO	YES	YES	NO
Focus/Peer Pair FE	NO	NO	NO	YES

For same pair of focus-arriving handlers:  
Stronger effects in periods when they share the evaluator

## Effect by evaluator affiliation of peer

	$\Delta \text{ LogCalls}$				
	(1)	(2)	(3)	(4)	(5)
$\Delta \text{ Occ}$		.033*** (.002)			
$\Delta (\text{Occ} \times \text{Future Co-Evaluated})$			-.006 (.012)		
$\Delta (\text{Occ} \times \text{Current Co-Evaluated})$	.02*** (.006)	.018*** (.006)	.017*** (.006)	.018** (.009)	.017** (.01)
$\Delta (\text{Occ} \times \text{Past Co-Evaluated})$			-.009 (.008)	-.011 (.011)	-.014 (.011)
$\Delta (\text{Occ} \times \text{N Past Interactions})$					.006*** (.001)
<hr/>					
$\Delta \text{ Occ}$ interacted with:					
Focus Handler FE	NO	YES	YES	NO	NO
Focus/Peer Pair FE	NO	NO	NO	YES	YES

**Additional Channel:** Effects beyond adjacent desks. It may be easier to evaluate handlers working at the same time

- Exploit variation in the share of co-evaluated peers in the room
- Scheduled weeks in advance
  - i.e. orthogonal to idiosyncratic shocks at handler-30mins level

## Share of Co-Evaluated Peers in the Room

	$\Delta \text{ LogCalls}$			
	(1)	(2)	(3)	(4)
$\Delta$ Share Current Co-Evaluated in the Room	.115*** (.0305)			
$\Delta$ Share Past Co-Evaluated in the Room	.002 (.0272)			
$\Delta$ Share Future Co-Evaluated in the Room	.012 (.0271)			

$\Delta$  Occ interacted with:

Focus Handler FE	NO
Focus/Peer Pair FE	NO

## Share of Co-Evaluated Peers in the Room

	$\Delta \text{ LogCalls}$			
	(1)	(2)	(3)	(4)
$\Delta$ Share Current Co-Evaluated in the Room	.115*** (.0305)	.134*** (.0305)	.134*** (.0305)	.125*** (.0317)
$\Delta$ Share Past Co-Evaluated in the Room	.002 (.0272)	.001 (.0272)	.002 (.0272)	0 (.0283)
$\Delta$ Share Future Co-Evaluated in the Room	.012 (.0271)	.014 (.027)	.013 (.027)	.018 (.0283)
$\Delta$ Occupied		.033*** (.0021)		
$\Delta$ Occupied $\times$ Current Co-Evaluated		.021*** (.0062)	.018*** (.0064)	.02** (.0091)
<hr/>				
$\Delta$ Occ interacted with:				
Focus Handler FE	NO	NO	YES	NO
Focus/Peer Pair FE	NO	NO	NO	YES

orthogonal to the effect of occupation of adjacent desk by co-evaluated

## Plan for Today

- ① identify peer effects
  - properly
  - robustness/heterogeneity
  - effects on 'quality'
- ② mechanism/relation with manager pressure
- ③ simulations and discussion

## Simulating Alternative Seating/Shift Arrangements

**Use estimated peer effects to simulate:**

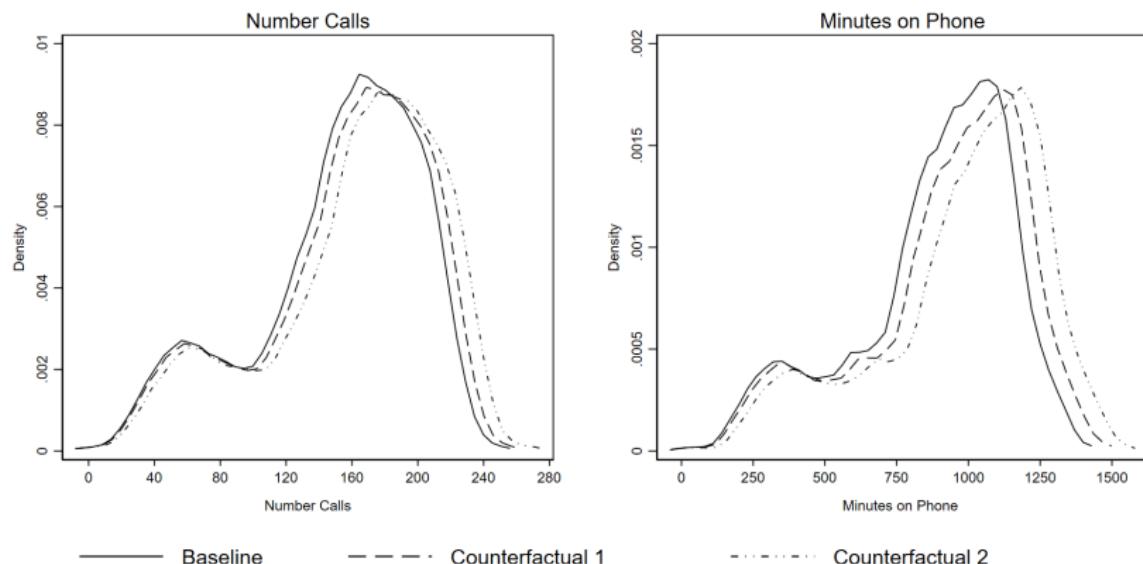
- ① Maximize occupation of adjacent seats
- ② Change shifts to maximize overlap in co-evaluated peers

Mixed-integer programming problem: Approximate solution with heuristic algorithms

## Simulating Alternative Seating/Shift Arrangements

Simulated Average Productivity Changes		
	Counterfactual 1:	Counterfactual 2:
Hourly change (%) in:	Increasing Horizontal Incentives	+ Leveraging Vertical Relations
Minutes on Phone	4.84*** (0.31)	11.98*** (2.98)
Number of Calls	2.88*** (0.17)	7.64*** (1.94)

## Simulating Alternative Seating and Shifts Arrangements

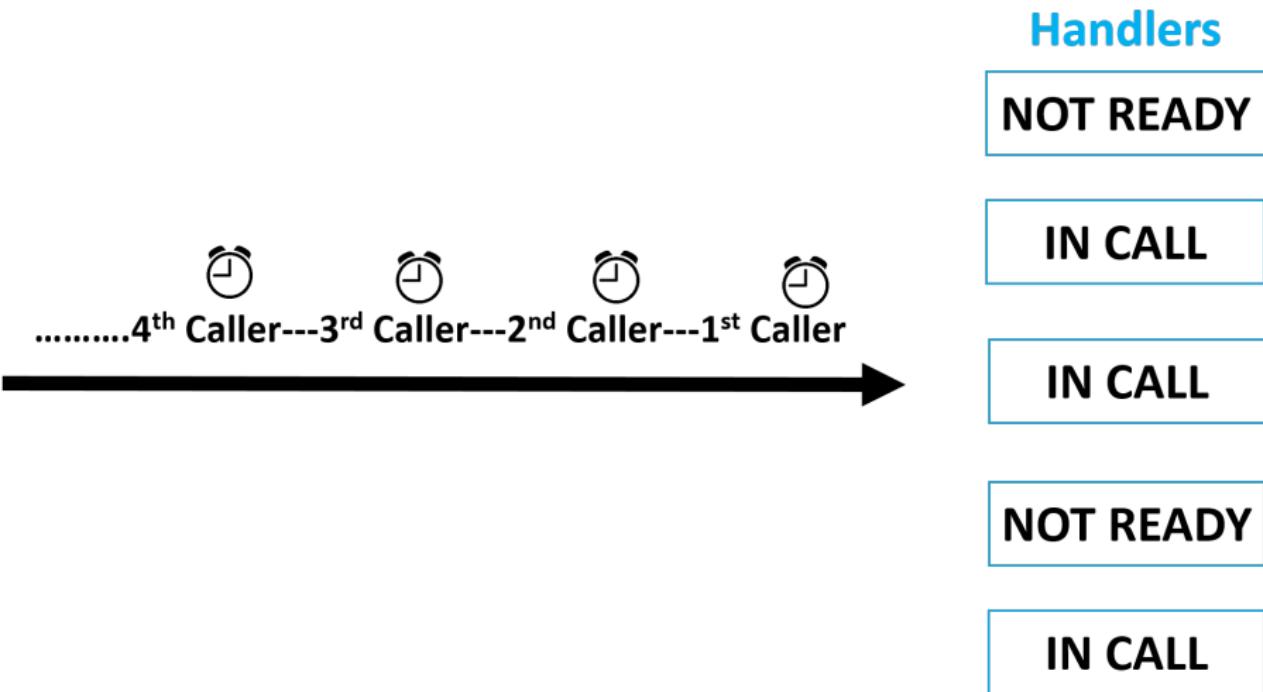


## Final Remarks:

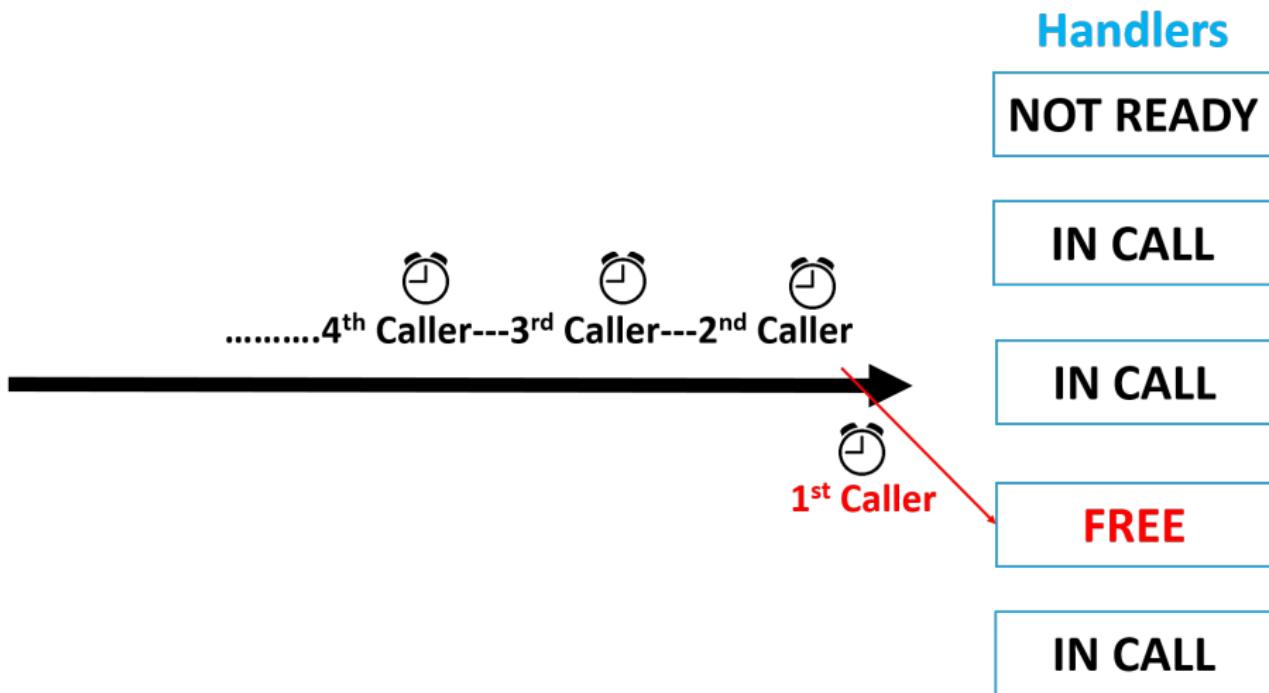
- Working with peers closeby:
  - positive effects despite potential for distraction/noise
- Peer pressure is related to manager pressure
  - substitute for direct monitoring
  - driven (at least partly) by manager pressure
- Policy implications
  - workplace design and hierarchical structure matters for productivity
  - e.g. potential productivity gains by changing seat arrangement
  - working from home?
- Caution: paper is silent about e.g. workers' satisfaction

## Additional Slides

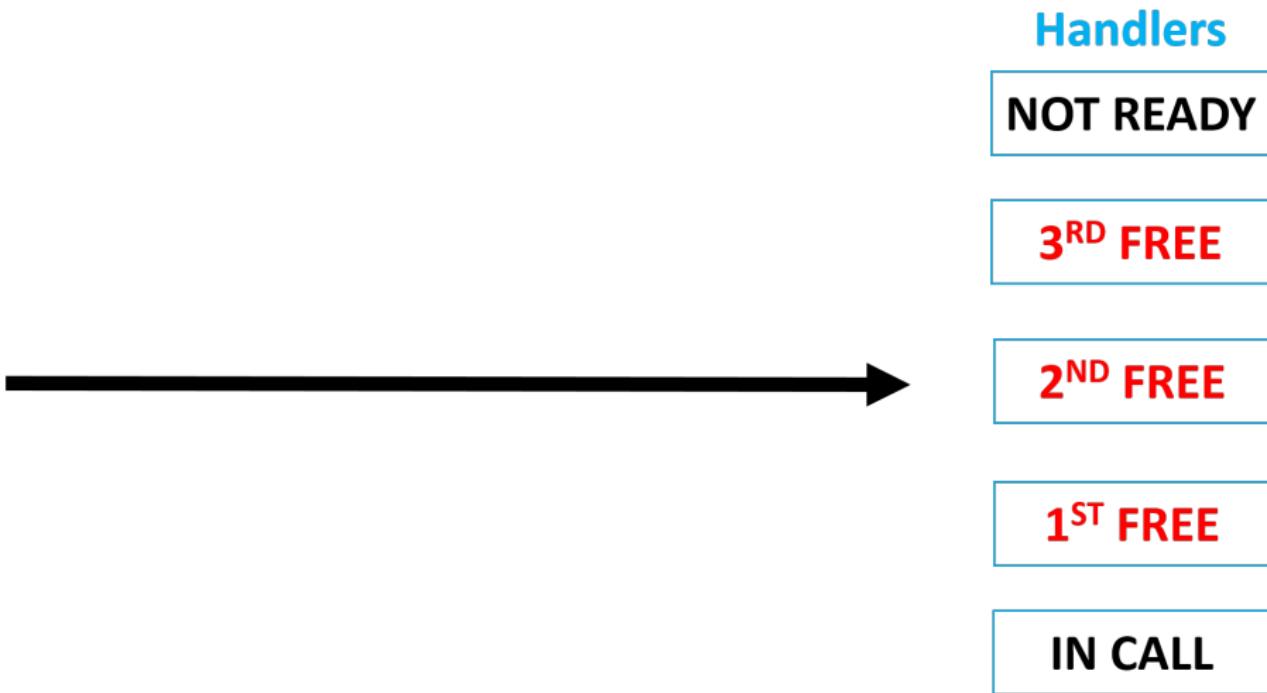
## Team Production (Free-Riding)



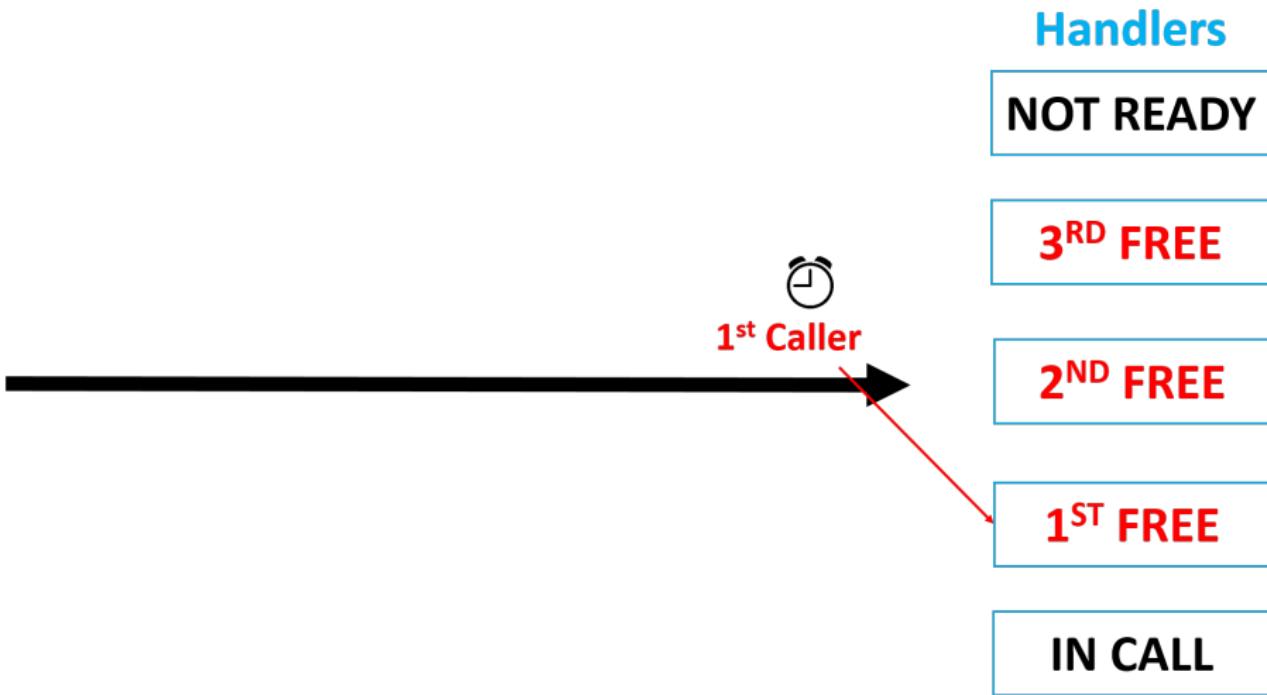
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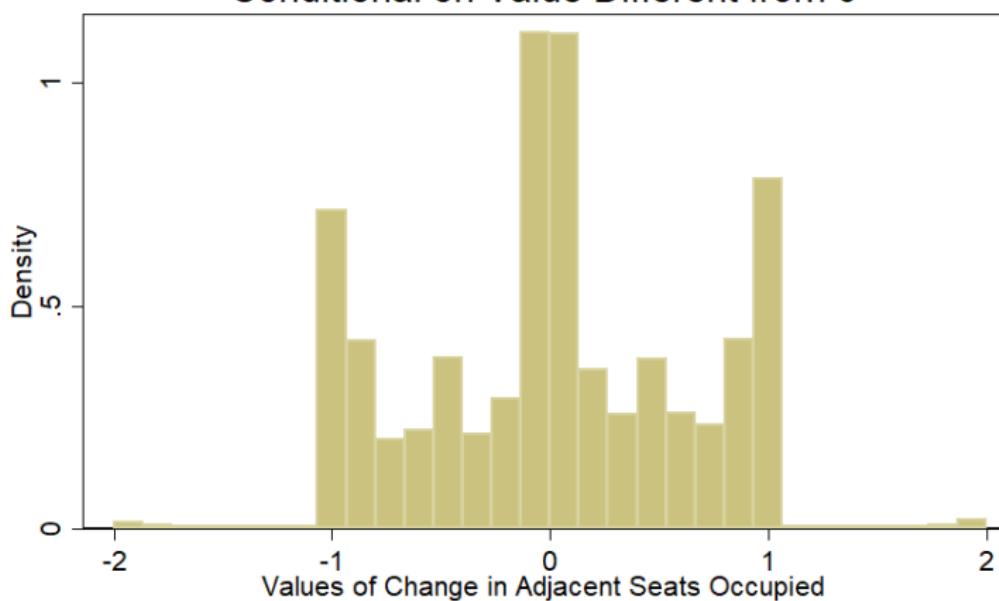


## Observations by Existing/Occupied Adjacent Seats

Number of Occupied Seats	Number of Adjacent Seats				Total
	0	1	2		
0	7,646	230,145	39,410		277,201
1	0	610,825	137,732		748,557
2	0	0	143,166		143,166
Total	7,646	840,970	320,308		1,168,924

▶ Back

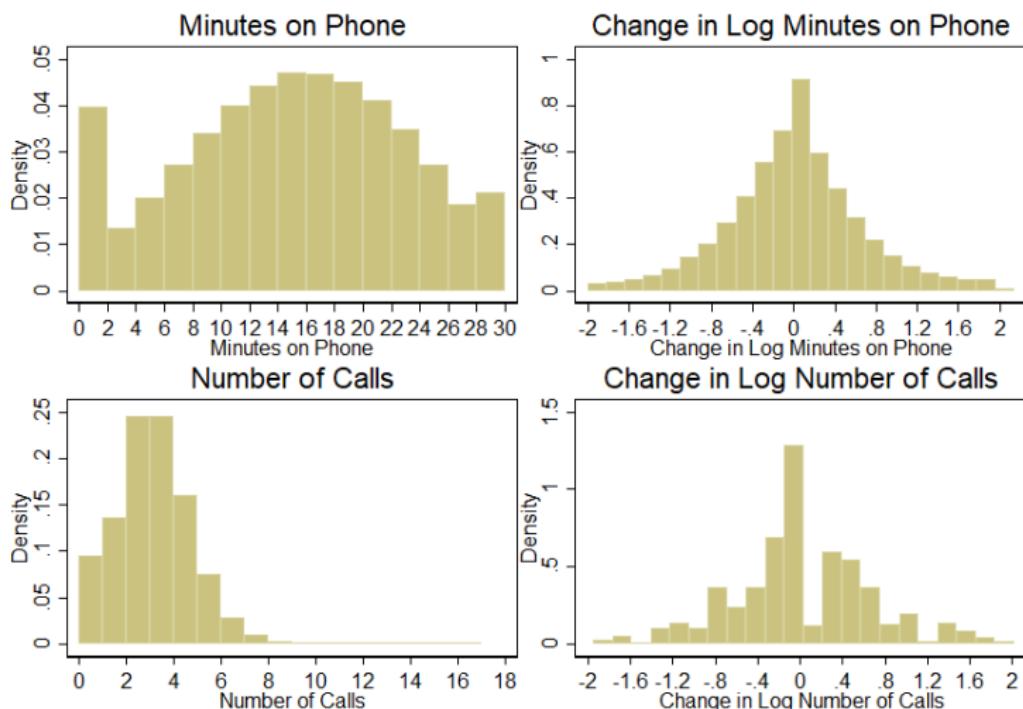
## Distribution of Change in Adjacent Seats Occupied Conditional on Value Different from 0



88% of observations have a value of 0.

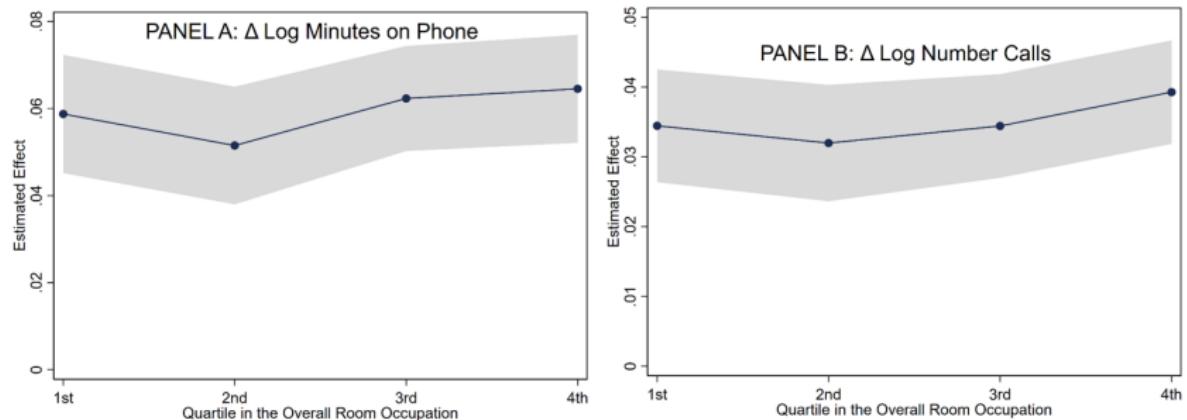
The histogram displays the distribution of the variable for the remaining observations.

## Distribution of Outcome Variables



## Additional Test: Similar results when handlers have less seat choices

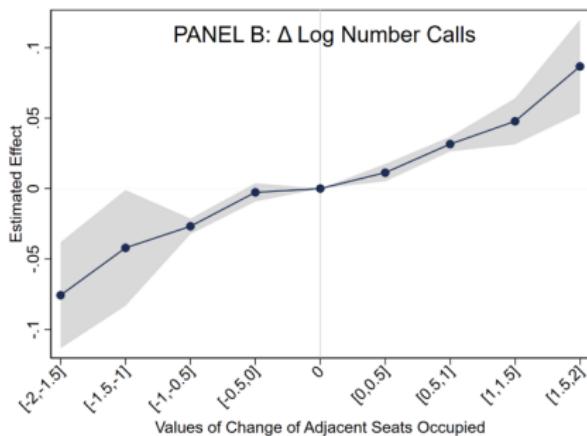
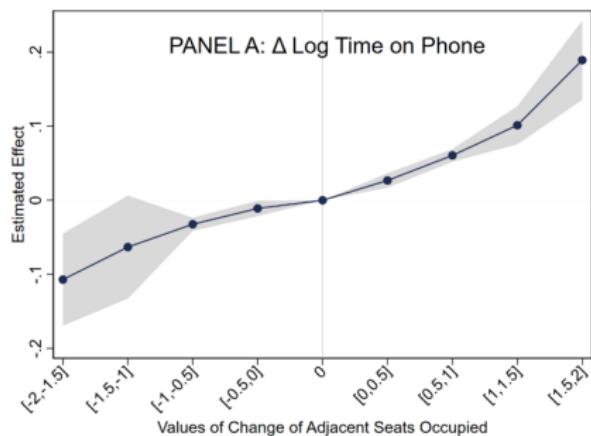
Effects by Room Occupation



## Baseline Regression with Asymmetric Effects (Non-Parametric)

$$\Delta y_{isr} = \sum_{j=1}^9 \beta_j \Delta Occupied Dummy J_{isr} + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

Increases vs. Decreases in Occupation



▶ Positive vs Negative

▶ back

## Baseline Regression with Asymmetric Effects

Seats Becoming Free vs Becoming Occupied

VARIABLES	(1) Δ LogPhone	(2) Δ LogCalls
Δ Occupied × ( $\Delta$ Occupied > 0)	.078*** (.004)	.04*** (.003)
Δ Occupied × ( $\Delta$ Occupied < 0)	.04*** (.005)	.03*** (.003)
p-value ( $\Delta < 0 = \Delta > 0$ )	.000	.007
r2	.34	.27
N	1120501	1120501

Controls = Half-Hour FE, Shift Half-Hour FE, Minutes Worked During Half-Hour

Dataset in first-differences within handler/shift

S.E. clustered at handler/shift level

▶ back

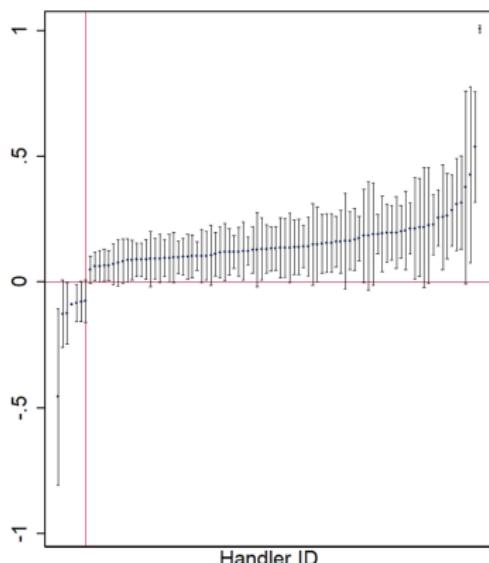
## Calculating Individual $i$ (Focus Worker) Effects

$$\Delta y_{isr} = \beta_i (\Delta Occupied_{isr} \times \eta_i) + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

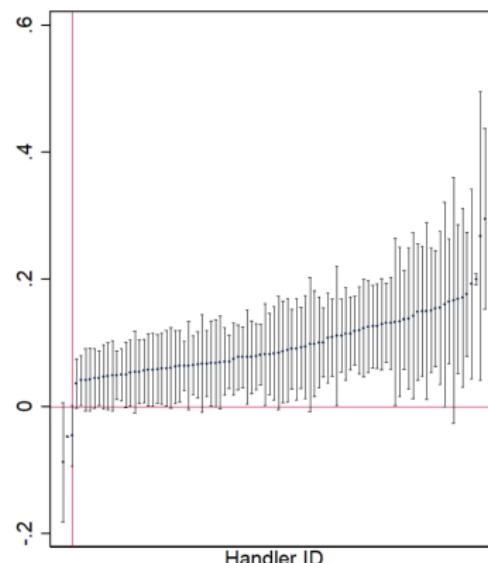
### Estimated Individual-Level Effects

Only  $\beta_i$  significant at 10%

$\Delta LogPhone$



$\Delta LogCalls$



## Calculating Individual $j$ (Peer Spillover) Effects

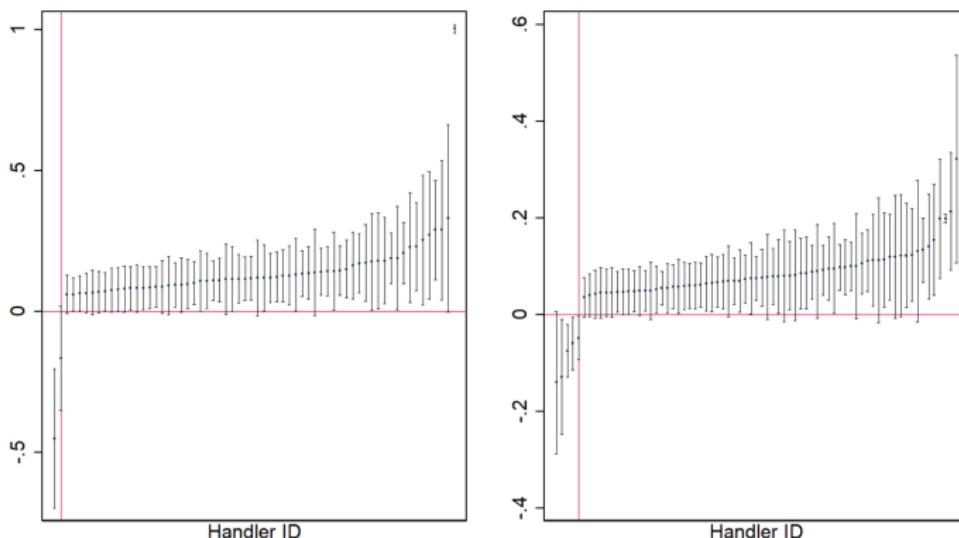
$$\Delta y_{isr} = \beta_j (\Delta Occupied_{isr} \times \eta_{j(isr)}) + \lambda_{t(isr)} + \theta_r + \Delta \epsilon_{isr}$$

Estimated Average Spillover on Co-Workers

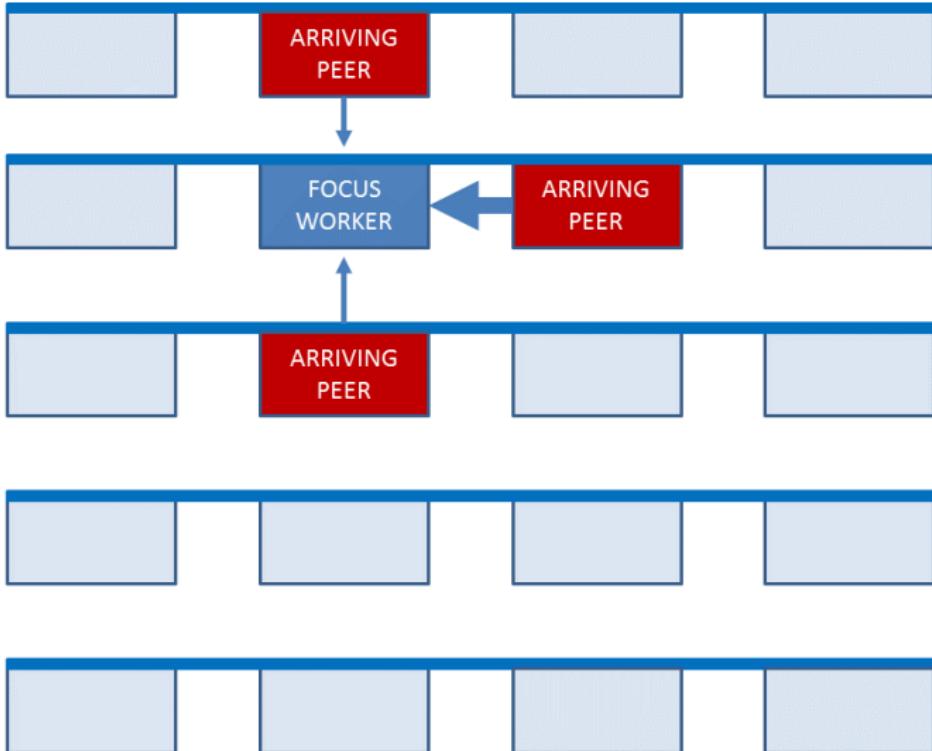
Only  $\beta_j$  significant at 10%

$\Delta LogPhone$

$\Delta LogCalls$



# Sanity Check: Visibility of Peer Matters



### Effect of Occupation of Adjacent vs Non-Adjacent Seats

VARIABLES	(1) Δ LogCalls	(2) Δ LogPhone
Δ Adjacent	.035*** (.002)	.06*** (.0034)
Δ Behind Row	.009*** (.002)	.016*** (.0033)
Δ Front Row	.004 (.0028)	.012*** (.0047)
p-value ( $\Delta \text{ Adj} = \Delta \text{ Vic}$ )	.000	.000
p-value ( $\Delta \text{ Vic} = \Delta \text{ Fro}$ )	.152	.452
r <sup>2</sup>	.27	.34
N	1120501	1120501

▶ back

## Heterogenous Effects By Focus Handler Characteristics

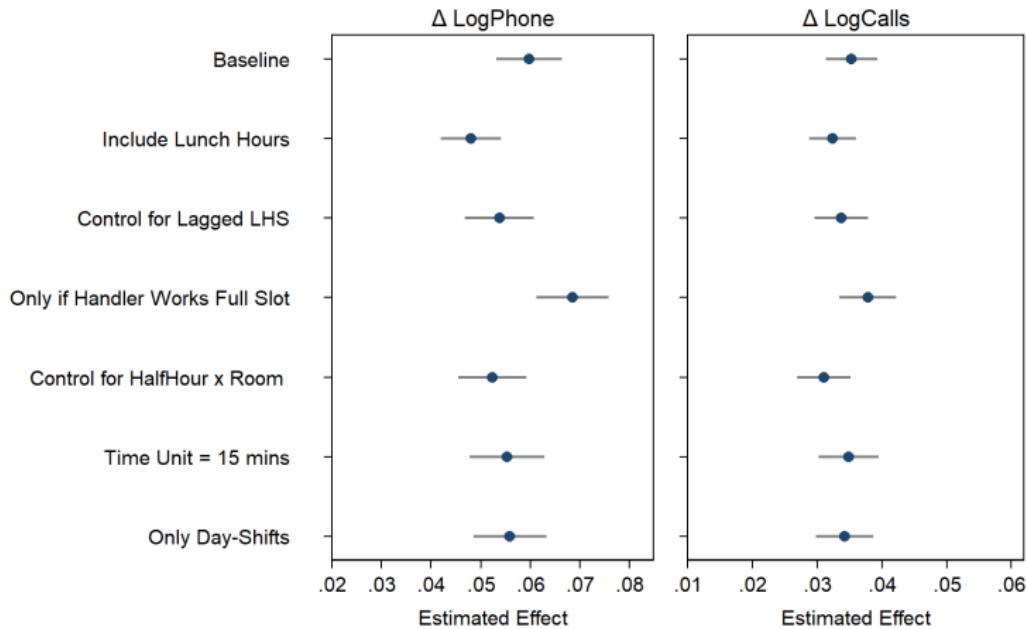
VARIABLES	(1) Δ LogPhone	(2) Δ LogCalls	(3) Δ LogPhone	(4) Δ LogCalls
ΔOccupied	.028** (.012)	.012* (.007)		
ΔOcc x Female	.001 (.007)	-.003 (.004)		
ΔOcc x AvgProductivity	.007 (.007)	-.002 (.004)		
ΔOcc x LogExperience	-.017*** (.004)	-.007*** (.002)	-.008 (.022)	.001 (.013)
ΔOcc x LogIncomingCalls	.034*** (.006)	.024*** (.003)	.029*** (.006)	.02*** (.003)
IndivFE X ΔOccupied	NO	NO	YES	YES
r <sup>2</sup>	.34	.34	.34	.34
N	1113720	1113720	1113720	1113720

**Heterogenous Effects**  
By Peer Handler Characteristics

VARIABLES	(1) $\Delta$ LogPhone	(2) $\Delta$ LogCalls	(3) $\Delta$ LogPhone	(4) $\Delta$ LogCalls
$\Delta$ Occupied	.055*** (.008)	.036*** (.005)		
$\Delta$ Occ x High Experience	.004 (.015)	.008 (.009)	.006 (.015)	.01 (.009)
$\Delta$ Occ x High Productivity	-.005 (.009)	-.01 (.006)	-.007 (.01)	-.005 (.007)
$\Delta$ Occ x Experience Diffs	-.003*** (.001)	-.002*** (.001)	-.004*** (.001)	-.002*** (.001)
$\Delta$ Occ x Productivity Diffs	.03 (.019)	.046*** (.018)	.029 (.024)	.022 (.024)
$\Delta$ Occ x Same Gender	.008 (.008)	0 (.005)	.009 (.009)	.005 (.005)
$\Delta$ Occ x Co-located in 2011	.037* (.021)	.017 (.013)	.062*** (.024)	.024* (.014)
IndivFE X $\Delta$ Occupied	NO	NO	YES	YES
r2	.32	.32	.32	.32
N	1043114	1043114	1043114	1043114

## Robustness

### Effect of Change in Adjacent Seats Occupied

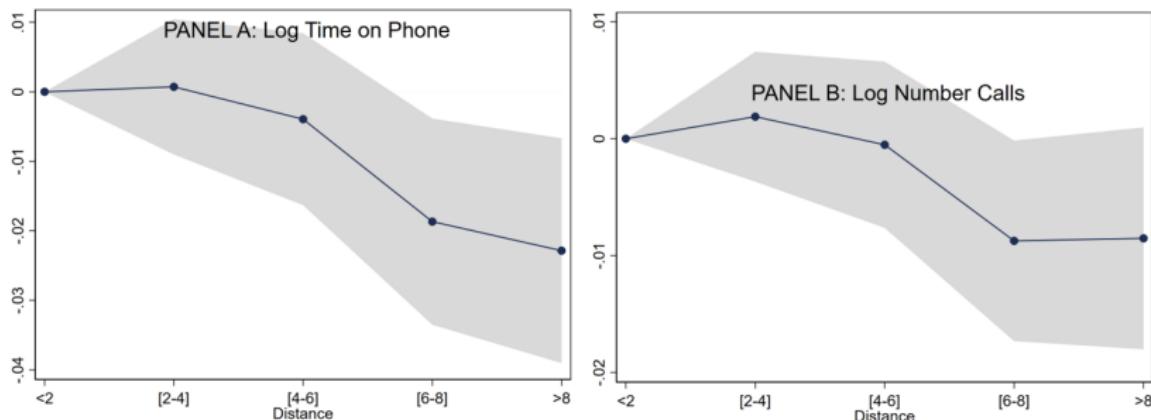


## Prediction 2: stronger peer effects when manager gets a weaker direct signal

- **proxy:** distance handler-supervisor desks
- **validation:** a handler is less productive when sits far from supervisors

$$y_{isr} = \alpha Distance_{is} + \eta_i + \lambda_{t(isr)} + \theta_r + \epsilon_{isr}$$

Productivity vs. Distance to Supervisors

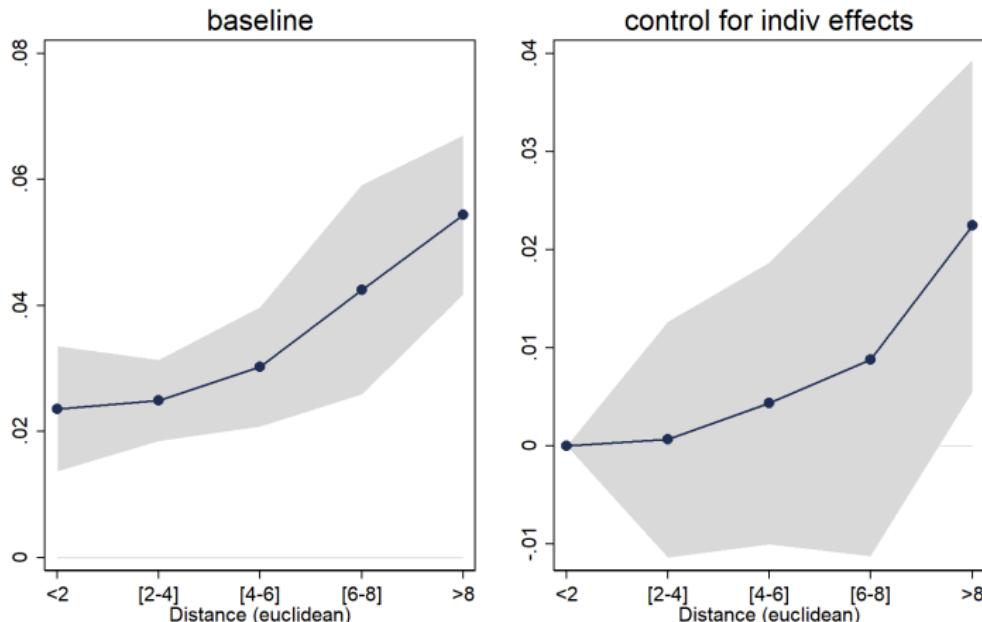


### Effect of Distance to Closest Supervisor Position

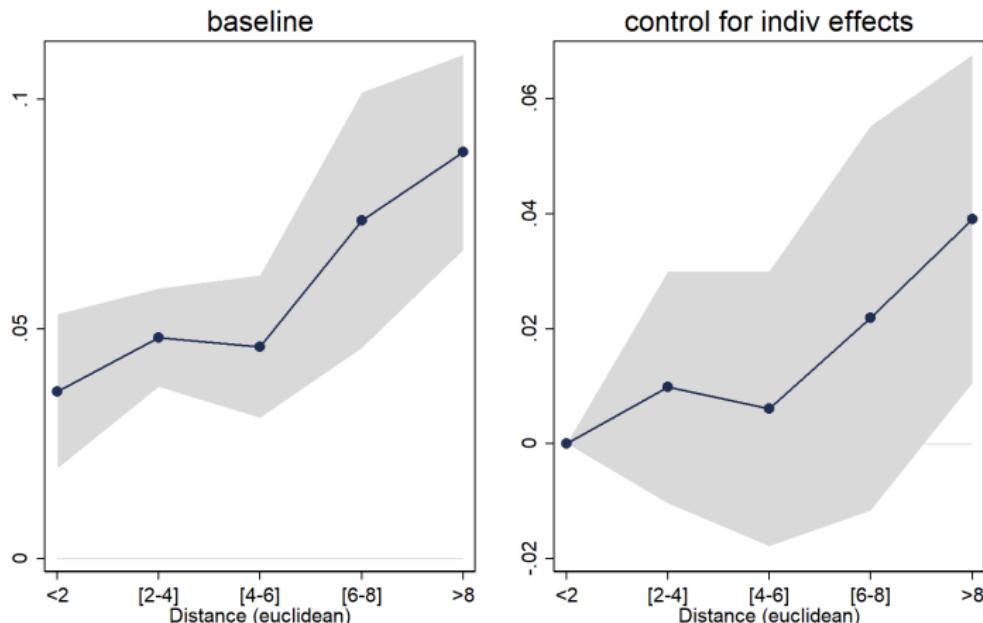
VARIABLES	(1)	(2)	(3)
	$\Delta \text{ LogPhone}$	$\Delta \text{ LogPhone}$	$\Delta \text{ LogPhone}$
$\Delta \text{ Occ}$	-.006 (.0154)		
$\Delta \text{ Occ} \times (\log) \text{ Distance to Supervisor}$	.025*** (.0065)	.018*** (.0069)	.021*** (.0076)
$\Delta \text{ Occ} \times \text{Indiv FE}$	NO	YES	YES
$\Delta \text{ Occ} \times \text{HalfHour FE}$	NO	NO	YES
r2	.34	.34	.37
N	982777	982777	982777

▶ back

## Estimated Effect by Distance to Closest Supervision Position $\Delta \text{LogCalls}$



## Estimated Effect by Distance to Closest Supervision Position $\Delta \text{LogPhone}$



## Allocation of handlers to evaluators

### Balance of Co-Evaluated vs. Non Co-Evaluated Pairs

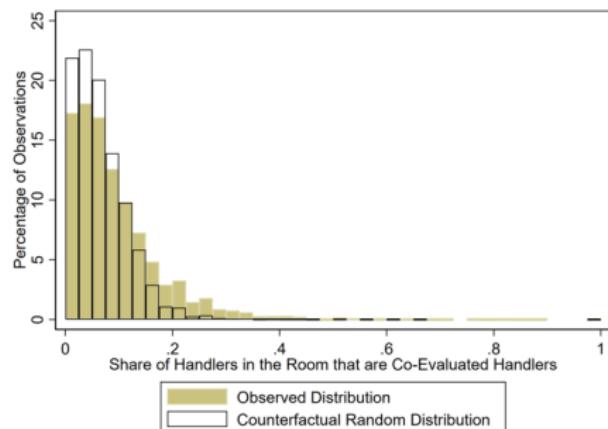
$$Charack_{ijt} = \psi CoEvaluated_{ijt} + \theta_i + \lambda_j + \pi_t + \epsilon_{ijt}$$

	(1)	(2)
--	-----	-----

Same Gender	-.011 (.019)	-.001 (.002)
Difference in Age	-.026 (.017)	-.002 (.002)
Difference in Experience	-.037* (.021)	-.004 (.003)
Average Distance Within Room	-.004 (.012)	0 (.001)
Overlap in the Night Shifts	-.017 (.011)	-.003 (.002)
Overlap in the Morning Shifts	-.005 (.009)	0 (.001)
Difference in Share of Urgent Calls	-.013 (.011)	-.001 (.001)
Difference in Number of Hours Worked	-.02 (.013)	-.001 (.001)
Difference in Share of Time with Adjacent Seats Occupied	.003 (.008)	.001 (.001)
First Handler Fixed Effects	Yes	Yes
Second Handler Fixed Effects	Yes	Yes
Year/Semester Fixed Effects	Yes	Yes
F-Statistic Coefficients Jointly Equal to Zero	1.16	

(2) is a single regression of a co-evaluated dummy on pair's characteristics

### Co-Evaluated shift overlapping



## Effect by evaluator affiliation of peer - Time on the Phone

	$\Delta \text{ LogPhone}$				
	(1)	(2)	(3)	(4)	(5)
$\Delta \text{ Occ}$		.057*** (.0036)			
$\Delta (\text{Occ} \times \text{Future Co-Evaluated})$			-.013 (.0207)		
$\Delta (\text{Occ} \times \text{Current Co-Evaluated})$	.027*** (.0103)	.029*** (.0106)	.027*** (.0107)	.029* (.0153)	.029* (.0153)
$\Delta (\text{Occ} \times \text{Past Co-Evaluated})$			-.023* (.0124)	-.017 (.0185)	-.022 (.0185)
$\Delta (\text{Occ} \times \text{N Past Interactions})$					.011*** (.0015)

$\Delta \text{ Occ}$  interacted with:

Focus Handler FE	NO	YES	YES	YES	YES
Focus/Peer Pair FE	NO	NO	NO	YES	YES

## Share of Co-Evaluated Peers in the Room - Time on the Phone

	$\Delta \text{LogPhone}$			
	(1)	(2)	(3)	(4)
$\Delta$ Share Current Co-Evaluated in the Room	.183*** (.0493)	.215*** (.0492)	.215*** (.0492)	.215*** (.0512)
$\Delta$ Share Past Co-Evaluated in the Room	-.008 (.0422)	-.009 (.0422)	-.007 (.0422)	.001 (.044)
$\Delta$ Share Future Co-Evaluated in the Room	-.028 (.0425)	-.025 (.0425)	-.026 (.0425)	-.023 (.0447)
$\Delta$ Occupied		.057*** (.0036)		
$\Delta$ Occupied $\times$ Current Co-Evaluated		.028*** (.0103)	.03*** (.0106)	.033** (.0153)
<hr/>				
$\Delta$ Occ interacted with:				
Focus Handler FE	NO	NO	YES	NO
Focus/Peer Pair FE	NO	NO	NO	YES

## Summary of Findings:

- F1 Positive effect (for almost all handlers) of occupation of adjacent seat
- F2 Stronger effects when far from supervisors
- F3 Stronger effects for pairs with same evaluator

## Alternative mechanisms:

- ① Relative Evaluation
- ② Pro-social preferences. Motivation if friends around
- ③ Adjacent peers are reference points
- ④ Knowledge spillovers
- ⑤ Help from peers
- ⑥ Conformity to norm. Collusion
- ⑦ Convex cost of effort

## Mech 1: Relative Evaluation

- conceptually very similar mechanism (signal "passively" transmitted, but handler cares about the signal)
- Does not explain F2 (overlap of evaluators-evaluatees very small. Can't be visual comparison.)

## Mech 2: Pro-social preferences. Motivation if friends around

- F1: effects very similar even when few available seats (i.e. when can't sit next to friends)
- Does not explain F2
- Does not explain F3
  - co-evaluated  $\perp$  friends
  - effect within the same focus-peer pair
  - unchanged when controlling for  $\Delta Occ \times NInteractions$

### Mech 3: Adjacent Peers are Reference Points

- many handlers should adjust effort downwards
- Does not explain F2

## Mech 4: Knowledge Spillovers

- makes no sense with 30 minutes variation

## Mech 5: Adjacent Peers can Help

- tasks are parallel, little scope for help
- odds are the peer is busy

## Mech 6: Conformity to Norm - Collusion

- predicts a reduction in effort

## Mech 7: F2 predicted by convex cost of effort

- model assumes this, still predicts F2
- not true if we interact with proxies of baseline effort (e.g. calls per handler, occupation of room, etc.)

