

Teams, Peer Effects, Communication, and Coordination

Organizations, Personnel, and Internal Labor Markets
Week 7

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Working together can change production, information, and pressure

Central question

When does working together produce complementarities, learning, congestion, pressure, or free riding?

- A worker can produce less individually because she is helping others.
- Correlated output can reflect shared demand, selection, or common inputs.
- More communication can improve coordination while consuming productive time.
- The relevant comparison must identify what changed and whose costs count.

Week 7 studies lateral relationships. Week 5 owns vertical authority; Week 6 owns careers. Communication and AI enter as focused interventions on joint work.

Learning goals: define the team, exposure, and organizational outcome

- Distinguish complementarity, pressure, learning, common shocks, and team selection.
- Construct directed, time-specific exposure using membership and workflow records.
- Count unique joint output and account for sender as well as recipient costs.
- Define direct, spillover, and assignment-policy targets with explicit support.

Core points

A roster is not an interaction graph. Randomizing access does not randomize peer behavior. Spillovers change the estimand as well as the inference problem.

Research deliverable: a spillover-aware design and exposure map with the actual treatment unit, two mechanisms, independent quality, and worker-welfare endpoints.

Four ledgers connect assignment to unique production

Ledger	Minimum records	Main distinction
Membership	Worker, team/project, role, location, overlap intervals	Planned assignment versus actual attendance
Workflow	Task, input, handoff, dependency, completion, rework	Shared resources versus interpersonal influence
Interaction	Requests, meetings, messages, help, feedback	Opportunity versus realized use
Outcome	Unique deliverables, quality, individual output, worker experience	Member records versus independently produced objects

Keep worker-hour and team-project units connected by an explicit crosswalk. A common supervisor does not establish actual collaboration.

Absence, turnover, and treatment-induced attendance can make realized membership endogenous. Preserve the assignment record.

A directed edge runs from source j to receiver i

$$A_{ijt} = 1 \iff \underbrace{j}_{\text{source}} \longrightarrow \underbrace{i}_{\text{receiver}} \text{ at time } t.$$

- Rows receive influence; columns supply it. Transposing the matrix changes the exposure.
- Reporting, friendship, co-presence, communication, and workflow graphs encode different relationships.
- Being watched by a productive colleague differs from watching that colleague.
- For a message, record sender and recipient. For a handoff, record the input supplier and downstream recipient.

Mas–Moretti (2009) motivates directional observation. An observation graph and an influence graph require an explicit mapping; neither is simply an undirected coworker list.

Time-weighted exposure answers a different question from a list of names

$$E_{it}^a = \frac{\sum_{j \neq i} d_{ijt} a_j^{\text{pre}}}{\sum_{j \neq i} d_{ijt}}, \quad \frac{10(8) + 20(2)}{10 + 20} = 4 \neq \frac{8 + 2}{2} = 5.$$

- d_{ijt} : minutes of relevant overlap; a_j^{pre} : independently measured pre-period peer quality.
- Ten minutes with score 8 and twenty with score 2 give weighted exposure 4, versus an unweighted mean of 5.
- A zero denominator means no eligible peers, not zero-quality peers.
- Report the denominator and test prespecified alternatives: an intervention can change both who overlaps and for how long.

Original arithmetic. The appropriate weighting rule depends on when influence is possible; prior measurement helps timing but does not randomize team formation.

One joint deliverable remains one outcome when copied to member rows

Original accounting example	Recorded value
One project, independently assessed	20
Same score copied onto four member records	20, 20, 20, 20
Unique project value	20, not 80

- Report unique deliverables, quality per deliverable, and total labor input.
- A pair producing one proposal and two individuals producing two proposals require a portfolio evaluation rule.
- Clustering cannot repair a production total that counts the same output four times.

Original duplication diagnostic. Individual productivity, pair output, output per person, and total organizational value are different objects.

A production organizer separates roles, interactions, and coordination

$$Q_g = \sum_{i \in g} a_{i,r_i} e_i + \sum_{\substack{i < j \\ i, j \in g}} \kappa_{ij} e_i e_j - C_g(m_g, \mathcal{D}_g) + \xi_g.$$

- g : team; r_i : worker i 's role; a_{i,r_i} : worker-role productivity; e_i : effort.
- κ_{ij} : technological interaction; m_g : communication; $\mathcal{D}_g$: task dependencies.
- C_g : coordination cost; ξ_g : common shock; Q_g : net team production.
- Positive technological cross-partial derivatives differ from correlated outcomes caused by common demand.

Original teaching organizer, not a claim that all components are jointly identified. A residual labeled “teamwork” is not evidence of a specific mechanism.

Different forms of complementarity imply different assignment questions

Framework	Mechanism	Observable implication to investigate
Becker–Murphy	Specialization gains compete with coordination costs	Handoffs, communication burden, and role-specific knowledge
Kremer's O-ring model	Errors in complementary tasks can destroy final value	Joint quality, task failures, and sorting across complementary roles
Role assignment	Different workers perform different tasks well	Capacity at each stage and the binding bottleneck

Choose the production objective and task structure before interpreting a positive peer coefficient as complementarity.

Becker–Murphy (1992); Kremer (1993). The following bottleneck arithmetic is an original illustration, not a calibrated version of either paper.

The same four workers can produce 17 or 14 through role assignment

Worker	Stage 1 capacity	Stage 2 capacity
A	10	2
B	2	10
C and D, each	7	7

$$AB + CD = \min(10, 10) + \min(7, 7) = 17,$$

$$AC + DB = \min(10, 7) + \min(7, 10) = 14.$$

Original example: each pair assigns one worker to each stage; output is the minimum capacity. Effort and person-hours are fixed. No universal demographic-composition rule follows.

Equal shares can weaken private incentives even without complementarity

$$Q = a \sum_{i=1}^n e_i, \quad u_i = \frac{Q}{n} - \frac{c}{2} e_i^2.$$

$$\frac{a}{n} - ce_i = 0 \Rightarrow e_i^{\text{private}} = \frac{a}{nc}, \quad e_i^{\text{planner}} = \frac{a}{c}.$$

- n workers; $a, c > 0$; nonnegative effort; linear valued output and quadratic effort cost.
- Workers choose independently and receive equal output shares; the planner values output minus all effort costs.
- With $a = 8, c = 2, n = 4$: private effort is 1, planner effort is 4.

Original linear-quadratic benchmark, not the full Holmström (1982) model. Week 4 develops contract design; here the incentive margin is distinct from production complementarity.

Social pressure changes incentives and can impose worker costs

- Mutual monitoring, norms, or disapproval can raise the private cost of low effort.
- Output can rise without changing the physical production technology.
- Helping may reflect altruism, reciprocation, reputation, or enforcement of a norm.
- Pressure can increase exhaustion or reduce autonomy while increasing measured production.

Discriminating evidence

Compare visibility, access to knowledge, task inputs, and reward rules. Record support, workload, stress, and credit alongside output.

Kandel–Lazear (1992). A production gain alone is not a worker-welfare result; peer pressure and technological complementarity are different mechanisms.

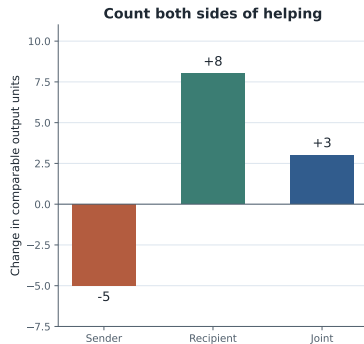
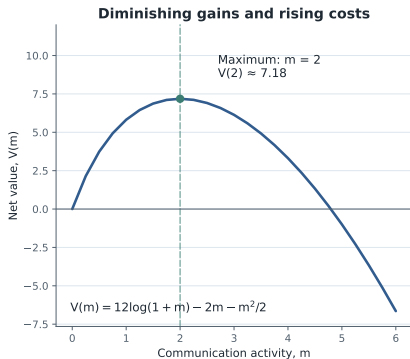
Communication has diminishing benefits and increasing opportunity costs

$$V(m) = b \log(1 + m) - cm - \frac{k}{2}m^2, \quad V'(m) = \frac{b}{1 + m} - c - km.$$

- $m \geq 0$: communication; $b > 0$: benefit; $c \geq 0$: time cost; $k > 0$: congestion.
- An interior optimum requires $b > c$; otherwise the constrained optimum is $m = 0$.
- With $b = 12, c = 2, k = 1$, $V'(2) = 0$ and $V''(m) = -12/(1 + m)^2 - 1 < 0$.
- The unique optimum is $m = 2$, with $V(2) = 12 \log 3 - 6 \simeq 7.18$.
- This objective omits distribution, future learning, rare failures, and external interruptions unless explicitly valued.

Original invented units, not an estimated meeting-time rule. The optimum depends on the specified benefit and cost functions.

Value the sender's lost production as well as the recipient's gain



Separate original synthetic examples: a communication objective and sender-recipient accounting.

Invented units; no published estimate or calibrated recommendation.

Original teaching calculations: communication optimum $m = 2$; sender -5 plus recipient $+8$ gives joint $+3$ comparable units. If units differ, use explicit value weights. Recipient benefit alone is not total net value.

Mas–Moretti uses directional visibility to investigate peer responses

- **Setting:** high-frequency supermarket productivity and coworkers present during shifts.
- **Variation:** staffing overlap and observation geometry, with independently constructed peer productivity.
- **Target:** output responses especially to productive coworkers who can see the focal worker; evidence consistent with social pressure.
- **Limitation:** routine scheduling is not a researcher-run peer lottery; demand, roles, queues, and scheduling institutions matter.

Mas and Moretti (2009), *Peers at Work*, required reading. Directional visibility distinguishes mechanisms in this setting; it does not prove that learning never operates elsewhere.

Experimental co-presence can change effort without shared piece rates

- **Setting:** Falk–Ichino, an envelope-stuffing task.
- **Variation:** working individually versus alongside a peer under pay independent of output.
- **Target:** the response to peer presence in a controlled task environment.
- **Limitation:** this contrast does not separately identify every social motive or establish long-run effects in complex projects.

Interpret the intervention precisely

Co-presence changes the environment. It does not require a technical joint product or compensation tied to a teammate's production.

Falk and Ichino (2006), *Journal of Labor Economics* 24(1):39–57. This is an envelope-stuffing experiment, not a digital-platform intervention.

Friendship, ability, and shared shifts are distinct exposures

- **Setting:** Bandiera–Barankay–Rasul, personnel output linked to friendship information under individual piece rates.
- **Variation:** working with friends of differing measured ability.
- **Target:** social-incentive responses when workers are not directly paid for coworkers' production.
- **Limitation:** friendships and common assignments are not randomized; a social response need not be a production externality.

Bandiera et al. (2010), Social Incentives in the Workplace, distinct from their 2013 team-incentives paper. Herbst–Mas (2015) compares selected lab/field estimates; task and exposure differences still govern transport.

Team adoption can change technology, pay, participation, and composition

- **Setting:** Hamilton–Nickerson–Owan, a garment plant moving from individual to group production and pay.
- **Variation:** team adoption, joining order, and worker participation.
- **Targets:** productivity, selection into teams, and heterogeneity in team performance.
- **Limitation:** production technology, incentives, and voluntary composition change together.

Data needed for a new application

Retain worker histories, planned and realized members, pay rules, task assignment, and who joins when. A before/after team indicator is a bundled intervention.

Hamilton, Nickerson, and Owan (2003). The transition does not isolate a clean technology-only effect.

Repeated randomized compositions reveal contributions beyond solo skills

- **Setting:** Weidmann–Deming, individual tests and team-production tasks.
- **Variation:** repeated randomized assignments of people to teams.
- **Target:** members' contributions to team performance beyond predictions from independently measured individual skills.
- **Limitation:** the estimated contribution belongs to these tasks and assignment rules; it is not automatically a universal social-skill type.

Weidmann and Deming (2021), Team Players, Econometrica, required reading. Repeated composition creates useful comparisons; rankings still contain estimation noise and may miss pair complementarities.

A fixed pair identifies its sum, not each member's contribution

$$Q_{AB} = \alpha_A + \alpha_B + u, \quad (\alpha_A + c) + (\alpha_B - c) = \alpha_A + \alpha_B.$$

- One fixed team's residual cannot uniquely attribute performance to all its members.
- Connected repeated compositions provide additional comparisons under the specified contribution model.
- Construct skill controls independently and validate estimated ranks on held-out rounds, tasks, or combinations.
- Stable pair complementarities can make an additive individual ranking incomplete.

Original identification diagnostic motivated by Weidmann–Deming (2021). Connectedness supports estimation; it does not by itself randomize endogenous team formation.

Social skills can support specialization without being a training treatment

- **Setting:** Deming, broad labor-market evidence and a task-trading model.
- **Variation:** changing returns and employment patterns associated with task and skill requirements.
- **Target:** the role of social skills in coordination and specialization.
- **Limitation:** this is not randomized social-skill training inside a firm.

Bridge from framework to design

Measure which tasks members exchange, the transaction or communication cost, and independent team quality. Do not equate a skill label with a manipulable treatment.

Deming (2017). Use the model to specify an observable implication; use an assignment design to evaluate a particular intervention.

Workflow records can distinguish low effort from restricted inputs

- **Setting:** Hjort, flower-production teams with one upstream supplier and two downstream assemblers.
- **Variation:** rotating roles and coworkers, alongside changes in the institutional environment.
- **Target:** discriminatory allocation of intermediate inputs and its production consequences.
- **Limitation:** final output alone cannot reveal the input received; not every mechanism was assigned in one randomized factorial design.

Hjort (2014). Follow quantity, quality, controller, and recipient at each handoff. The finding concerns behavior under specific institutions, not immutable demographic productivity or a universal diversity rule.

A communication opportunity can help the receiver and interrupt the sender

- **Setting:** Battiston–Blanes i Vidal–Kirchmaier, sequential problem processing between workers.
- **Variation:** face-to-face opportunities varying for reasons external to the immediate task.
- **Targets:** recipient processing and sender time or displaced production.
- **Limitation:** co-location may change other channels; opportunity is not the same treatment as one additional message.

Net-value measurement

Link task difficulty and urgency to both sides of the exchange. Include sender backlog, downstream quality, and future learning.

Battiston, Blanes i Vidal, and Kirchmaier (2021), REStud, required reading. Sender costs are central, not an optional adjustment to recipient gains.

Generating ideas and selecting ideas are different outcomes

- **Setting:** Brucks–Levav, laboratory and field collaboration tasks.
- **Variation:** experimental comparison of virtual and in-person communication.
- **Targets:** creative idea generation and selection among ideas, measured separately.
- **Limitation:** evidence about generating ideas does not establish the effect on every phase of innovative work.

Define the deliverable

Prespecify whether the organization uses all ideas, selects one, or values a diverse portfolio. Keep total labor input and evaluation rules comparable.

Brucks and Levav (2022), Nature. Available materials do not imply unrestricted access to raw media or confidential field records.

Interaction timing can change exploration and the best available solution

- **Setting/variation:** Bernstein–Shore–Lazer, controlled problem solving with constant, intermittent, or absent social influence.
- **Targets:** solution quality, exploration, and convergence.
- **Limitation:** the task does not identify an optimal meeting rhythm for every workplace.

Invented solution portfolio	Mean	Maximum
(2, 2, 10)	$14/3 \simeq 4.67$	10
(6, 6, 6)	6	6

Bernstein, Shore, and Lazer (2018). Original arithmetic: using every solution and selecting a single breakthrough can rank the same portfolios differently.

Wage responses and structural learning are not direct physical output

	Cornelissen–Dustmann–Schönberg	Jarosch–Oberfield–Rossi–Hansberg
Setting	Matched labor-market records across occupations	Linked employer–employee data and a competitive-market model
Variation	Coworker composition and estimated peer productivity	Team composition, wage growth, and model restrictions
Target	Peer-related wage responses	Learning opportunities and their pricing
Limitation	Wages are not scanner output; pay setting and sorting matter	Knowledge flows require structural and equilibrium assumptions

Cornelissen et al. (2017); Jarosch et al. (2021). Distinguish measured moments, structural interpretation, and counterfactual simulations.

Proximity evidence uses different outcome coverage across two episodes

- **Setting:** Emanuel–Harrington–Pallais, differently located software teams within a firm.
- **Variation:** office closures and later return-to-office mandates, analyzed through proximity contrasts and DiD.
- **Targets:** feedback, code quantity, and code quality, with experience-specific responses.

Episode	Measurement boundary
Initial closures	Do not attach the later code-quality variables to this event study
Return-to-office analysis	Code-quality outcomes are available here

Limitation: attendance is not randomized. Within-firm effects do not alone identify national or aggregate effects.

Emanuel, Harrington, and Pallais (2026), published QJE. Treat helper output and colleague learning as separate endpoints.

Digital collaboration structure is an outcome with changing coverage

- **Setting:** Yang et al., electronic communication in a firm moving to remote work.
- **Variation:** changes in work arrangement and communication patterns around the move.
- **Target:** recorded collaboration networks and channels.
- **Limitation:** network structure is not production; missing offline exchange can change measured ties.

Publication and measurement discipline

Use the corrected 2022 issue article. The author correction concerns a Figure 1 legend; it is not a retraction.

Yang et al. (2022) and author correction (2022), Nature Human Behaviour. More siloed traces do not directly measure the output or welfare cost of siloing.

Recorded communication can increase while total interaction falls

Original capture example	Before	After	Change
Online, recorded	10	30	+20
Offline, unrecorded	30	0	-30
Total interactions	40	30	-10

- Channel substitution can mimic a change in network density or activity.
- Audit software changes, meeting capture, informal exchanges, and missing participation.
- Stable software does not guarantee stable coverage of all communication.

Original counterexample, not an empirical claim about Yang et al. Link validation samples to the measurement window before interpreting a trace count as total interaction.

Human–AI teaming is a factorial assignment question

- **Setting:** Dell'Acqua et al., product-development tasks performed individually or in pairs, with or without generative AI.
- **Variation:** factorial field assignment of human teaming and AI access.
- **Targets:** generated ideas, evaluative selection, assessed outputs, and reported emotional experience.
- **Published counts:** 791 randomized completers; 776 with complete post-task surveys.
- **Limitation:** incomplete teams and reassignment require intended/realized grouping to be tracked separately.

Dell'Acqua et al. (2026), The Cybernetic Teammate, *Organization Science* 37(4):1217–1242; online 12 June 2026. Use the published sample, not incompatible earlier working-paper counts.

An additive interaction requires a common outcome scale and unit

$$\Delta_{\text{int}} = \{\mathbb{E}[Q \mid T = 1, Z = 1] - \mathbb{E}[Q \mid T = 0, Z = 1]\} \\ - \{\mathbb{E}[Q \mid T = 1, Z = 0] - \mathbb{E}[Q \mid T = 0, Z = 0]\}.$$

- T : assigned paired work; Z : assigned AI access; Q : a prespecified outcome on a common scale.
- Show all four cells, assignment versus compliance, missing outcomes, and how incomplete pairs enter the analysis.
- A pair consumes more labor input than one individual. Unique pair quality, output per person, and total value differ.
- A nonsignificant difference is not equivalence. A short task does not identify long-run headcount or employment effects.

Teaching contrast motivated by Dell'Acqua et al. (2026). An additive-scale interaction is not universal technological substitution; intended assignment and realized pairing can support different comparisons.

Research opportunities specify the channel and who bears its cost

Proposed intervention	Competing mechanisms	Discriminating data
Access to a help channel	Learning versus interruption	Senders, eligible nonusers, backlog, later skill
Synchronized schedules	Coordination versus attendance volume	Equal total days, actual overlap, quality
Roster rotations	Complementary roles versus general peer quality	Pre-skills, task dependencies, unique output
AI saturation within teams	Direct assistance versus shared knowledge	Untreated coworkers, help time, team deliverables

Randomized access identifies an opportunity-policy effect; realized use and communication remain responses to treatment.

Proposed designs, not claims of empty literatures. Hoffman–Stanton (2025) supplies the broader personnel-economics perspective.

A contemporaneous peer regression faces reflection and common shocks

$$q_{it} = \alpha_i + \lambda_t + \beta \sum_j W_{ijt} q_{jt} + \gamma \sum_j W_{ijt} x_j + u_{it}.$$

- W_{ijt} weights source j for receiver i ; x_j denotes peer attributes; α_i, λ_t are worker and time effects.
- Peer output responds to own behavior, common demand, and resources.
- Leaving out own output from the mean does not remove simultaneity or correlated effects.
- Pre-period attributes improve timing; endogenous group formation remains. Network instruments need a substantive exclusion argument.

Manski (1993). A variance correction or more fixed effects does not identify a causal production externality.

Complete-group demeaning can produce a peer coefficient mechanically

$$\bar{q}_{-i} = \frac{4\bar{q} - q_i}{3}, \quad \bar{q}_{-i} - \bar{q} = -\frac{q_i - \bar{q}}{3}.$$

- Four-person complete group; $\bar{q}$ is its mean and $\bar{q}_{-i}$ the leave-one-out peer mean.
- Regressing own demeaned output on demeaned peer output yields -3 when there is nonzero within-group variation.
- This is algebra, not an estimate of a causal peer-response parameter.
- Use independent peer attributes, justified assignments, and the actual timing of inputs to learn about mechanisms.

Original reflection diagnostic. If all outcomes are identical, both demeaned variables are zero and the slope is undefined.

Excluding oneself from a group mean is insufficient.

An exposure mapping is an economic restriction on interference

$$Y_i(\mathbf{Z}; G^0) = Y_i\{Z_i, E_i(\mathbf{Z}, G^0)\}, \quad \mathcal{E}_i = (Z_i, E_i).$$

- $\mathbf{Z}$: assignment vector; G^0 : fixed pre-intervention graph; E_i : peer exposure; $\mathcal{E}_i$: complete own-plus-peer state.
- Assignments producing the same state must have the same relevant effect on worker i .
- Three treated novices may differ from one treated expert; a share can omit identity, skill, or direction that matters.
- If treatment changes the graph, record that as an outcome and distinguish a fixed-graph target from the broader policy.

Aronow–Samii (2017). A peer-only state is incomplete when own treatment has a direct effect. Exposure weights cannot repair a misspecified mapping.

Exposure-state estimation requires actual assignment probabilities

$$p_i(e) = \Pr\{\mathcal{E}_i = e\}, \quad \hat{\mu}(e) = \frac{1}{N} \sum_{i=1}^N \frac{\mathbf{1}\{\mathcal{E}_i = e\} Y_i}{p_i(e)}.$$

- e denotes a complete exposure state; N is the declared target population.
- Require positive probability for every compared state in that population.
- Enumerate or simulate the actual assignment rule to obtain probabilities.
- Joint exposure probabilities or defensible dependence assumptions are also needed for variance estimation.
- More rows do not identify a contrast whose required state has probability zero.

Horvitz–Thompson construction; Aronow–Samii (2017). The formula addresses unequal exposure probabilities under a valid mapping, not endogenous network formation by itself.

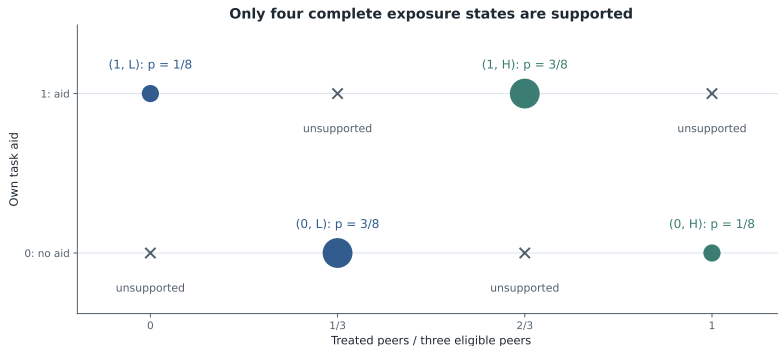
Research Lab: a two-stage lottery assigns teams and recipients

$$\binom{4}{2} \binom{4}{3}^2 \binom{4}{1}^2 = 6 \times 4^4 = 1,536.$$

- Sixteen invented workers in four fixed teams of four; 48 directed, self-excluding within-team edges.
- Stage 1 chooses exactly two high-saturation teams.
- Stage 2 gives three task aids in each high team and one in each low team.
- All legal allocations are equally probable; potential outcomes precede the separately seeded assignment draw.
- All outcomes are observed; cross-team interference is absent by explicit teaching assumption.

Original synthetic design, informed by Baird et al. (2018). It is not an unrestricted eight-of-sixteen lottery and does not replicate any cited paper's protocol.

The lottery supports four complete exposure states



L: one recipient per team. H: three recipients. Two of four teams receive H.

Labels give unconditional probabilities over both assignment stages; marker area also reflects probability.

Original synthetic design • no own-treatment contrast at a fixed peer share

Synthetic fixed-count design: $K_L = 1$, $K_H = 3$; own assignment d implies peer share $(K_s - d)/3$. State probabilities are unconditional over both stages. No exact peer share occurs under both own-treatment states.

Within-saturation recipient comparisons change own and peer exposure

$$Y_i(d, e) = b_i + \tau_i d + \gamma_i e, \quad e = \frac{K_s - d}{3}.$$

$$\mu(1, s) - \mu(0, s) = \bar{\tau} - \frac{\bar{\gamma}}{3}.$$

- In either saturation, becoming a recipient reduces the number of treated peers by one.
- b_i : untreated drift; τ_i : own response; γ_i : peer-share response; bars denote finite-population means.
- The displayed identity relies on this additional synthetic linear response model.
- A small mixed contrast can coexist with beneficial own treatment and beneficial peer exposure.

There is no nonparametric own-treatment contrast holding exact peers fixed in this lottery. Latent response parameters remain instructor-only, not student predictors.

An untreated-peer effect differs from a pooled own-treatment contrast

$$\mu(0, H) - \mu(0, L) = \frac{2}{3}\bar{\gamma} \quad \text{in the teaching response model.}$$

- This spillover contrast changes peer share from $1/3$ to 1 while own treatment stays zero.
- In this symmetric lottery, $\mathbb{E}[e_i \mid d_i = 1] = \mathbb{E}[e_i \mid d_i = 0] = 1/2$ for each worker.
- Peer contributions therefore cancel on average in the unconditional own-treatment contrast; its model target is $\bar{\tau}$.
- This special cancellation does not create observed support at fixed peer exposure, and need not hold under a different design or response model.

Original design diagnostic. Do not manufacture a universal bias claim about every pooled recipient comparison; the within-saturation and unconditional contrasts are different.

A saturation policy changes both own access and peers' access

$$\Delta_{H,L} = \left[\frac{3}{4}\mu(1, H) + \frac{1}{4}\mu(0, H) \right] - \left[\frac{1}{4}\mu(1, L) + \frac{3}{4}\mu(0, L) \right].$$

- High teams assign three of four workers; low teams assign one of four.
- The policy comparison averages over different own-treatment probabilities as well as different peer exposure.
- In the specified linear DGP its finite-population target is $\frac{1}{2}(\bar{\tau} + \bar{\gamma})$.
- The observed estimator equals average high-team outcome minus average low-team outcome in this balanced design.
- It is neither the untreated-peer effect nor the effect of treating everyone instead of nobody.

Baird et al. (2018) supplies the design framework; all counts and response parameters here are original. Other lotteries can create different support with different implementation and power costs.

The global sharp-null reference is separate from the oracle truth audit

Enumeration	Hold fixed or recompute?	Claim supported
Global sharp-null test	Hold observed changes fixed; reassign according to the legal lottery	Test no assignment effect on any worker's outcome
Instructor truth audit	Recompute potential outcomes for every alternative assignment	Verify average HT estimates equal finite-population state means

The global null does not permit arbitrary own effects while testing only zero spillover. Oracle design variance uses all invented potential outcomes; it is not a real-data standard error.

Two-sided Fisher p-values include assignments at least as extreme as observed, including ties. Exactness concerns the stated sharp null, not a general weak-null confidence interval.

There are 1,536 legal allocations but only six policy selections

$$\underbrace{\binom{4}{2}}_{\text{6 high-team selections}} \times \underbrace{4^4}_{\text{256 within-team allocations}} = 1,536.$$

- Under the global sharp null, a team's observed mean is fixed.
- The high-minus-low statistic depends only on which two teams are high; within-team recipient assignments repeat it.
- There are at most six distinct reference values, paired by reversing high and low labels.
- With a nonzero observed statistic, the smallest attainable two-sided p-value is at least $2/6 = 1/3$; ties can make it larger.

Original exact-enumeration diagnostic. Four teams remain four teams. Neither 1,536 allocations nor many worker or message rows create independent team observations.

Dependence corrections address uncertainty, not identification

Observed structure	Inference implementation	Remaining limitation
Team intervention	Respect actual assignment and team shocks	Few teams limit conventional approximations
Rotating members	Track cross-team connections and shared shocks	Nominal team clusters may not be separate
Dyadic outcomes	Allow shared-member covariance across sender and recipient roles	Not arbitrary long-range network dependence
Known small lottery	Enumerate the legal design and state the null	Does not cure missing outcomes or invalid exposure mapping

Cameron–Miller (2015); Aronow–Samii–Assenova (2015). Dyadic or cluster standard errors do not solve reflection, endogenous links, or common-shock confounding.

Quality and worker costs make team performance interpretable

Outcome family	Required records	Interpretation boundary
Production	Unique completions, backlog, input quality, task difficulty	Closed tickets may include reassignment or abandonment
Independent quality	Accepted work, defects, rework, blind scoring	Quantity is not value; rating rubrics can change
Helping and learning	Sender/recipient time, later independent tasks	Persistent assignment can mimic persistent skills
Worker welfare	Workload, support, pressure, credit, missing survey responses	Output or one satisfaction item is not total welfare

Estimate the assigned-policy effect before conditioning on realized messages or help. Those are post-treatment outcomes; a mediation claim requires additional structure or variation.

Original-research resources are entry points with explicit limits

Resource	Possible use	Access or measurement limit
Team Players supplement	Repeated-team data and programs route	Verify archive bytes, license, dependencies, and target
Proximity Dataverse	Article-linked replication deposit	Do not presume confidential raw personnel data are released
Brucks–Levav ResearchBox	Experiments and released materials	Raw field/media confidentiality limits remain
O*NET	Work Context and Activities descriptors	Occupation requirements are not actual coworker edges

Start with the assignment rule and eligible population, then task IDs and interaction opportunities. Pin releases and distinguish metadata access from empirical execution.

The guaranteed route is synthetic. Original archive files, licenses, and estimation code have not been inspected or executed for this exercise.

Reproduce from observable inputs; keep instructor truth separate

Stage	Input or output	Check
Reconstruct exposure	Baseline membership, directed edges, assignment protocol	Rows receive; no self or cross-team edges in this toy graph
Estimate	Observed pre/post scores, four state means, policy contrast	HT equals observed cell mean only under this balanced design
Randomization test	Fixed observed outcomes, 1,536 legal assignments	Global sharp null; coarse six-selection policy statistic
Instructor verification	Latent responses and alternative outcomes	Separate directory; oracle truth never enters student predictors

Standard-library Python, no network or private data required. All 56 starter assertions, deterministic reruns, seed 88771, source compilation, and overwrite refusal are workflow checks, not significance tests.

Diagnose the estimand before interpreting a favorable coefficient

Original diagnostic	Known arithmetic	Lesson
Overlap weighting	4 versus 5	Names and contact time differ
Role assignment	17 versus 14	Fixed people can have different bottlenecks
Shared rewards	Effort 1 versus 4	Incentives differ from technology
Sender / recipient	$-5 + 8 = 3$	Helping has an opportunity cost
Digital capture	Recorded +20; total -10	Coverage can change the sign
Duplicated project	20, not 80	Count joint output once

Also verify communication optimum 2, mean/max ranking, fixed-pair attribution, and reflection. These examples do not calibrate empirical effects from the readings.

Three required readings teach exposure, attribution, and cost accounting

Required reading	Preparation for discussion
Mas–Moretti (2009)	Draw who can see whom; state what scheduling facts support the comparison
Weidmann–Deming (2021)	Explain independent skill measures, repeated compositions, and held-out rank validation
Battiston–Blanes i Vidal–Kirchmaier (2021)	Account for recipient gains, sender time, and displaced production

Use framework excerpts and rotate studies of production, friendship, workflow, creativity, wages, proximity, and human–AI teaming.

Week 7's reading list contains 27 scholarly entries (including one correction), plus four resources. It is a research ladder, not 27 compulsory weekly articles.

Transfer: specify the intervention and draw its exposure map

Two-page proposal plus an exposure diagram

Name the organization, eligible population, membership and interaction boundaries, intervention, actual assignment unit, and complete exposure states.

- State direct, spillover, and policy targets; show the support required for each.
- Preserve planned and realized treatment; describe likely cross-team links and graph changes.
- Give two competing mechanisms, unique joint output, independent quality, and worker-cost endpoints.
- Match inference to the design and state one claim the proposed data cannot establish.

Discussion: hold total in-person days fixed but change teammate overlap. What separates coordination, learning, and social pressure, and who else becomes exposed?

Team value and the worker who creates it need not coincide

- Define the relevant graph and its direction before calculating exposure.
- Separate production complementarity, incentives, information, and common shocks.
- Count unique output and include helping costs, quality, and worker experience.
- Ask what the actual assignment supports; a familiar estimator cannot fill missing exposure states.

Bridge to Week 8

How do wage rules, outside opportunities, retention, and worker voice divide the gains and costs of employment? Team value need not be captured by the worker who creates it.

Carry forward the incidence ledger and exposure map. Week 9 addresses broader work redesign; this week establishes the lateral-production comparison.