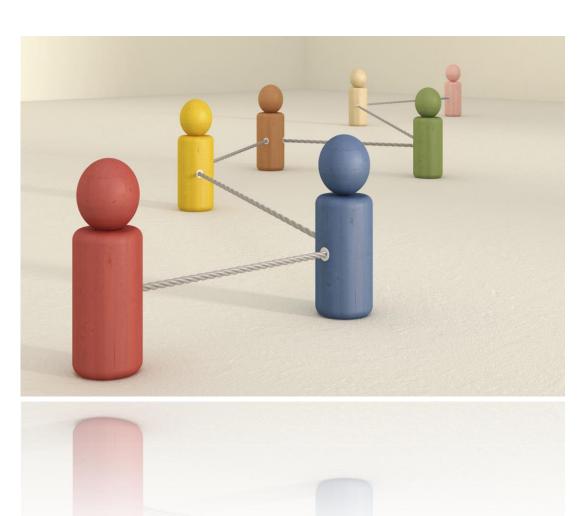
Office at Offsite: How Temporary Colocation Shapes Communication in All-remote Organizations

Remote Work Conference (Stanford), September 2023

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All-remote organizations

- All-remote organizations: no physical office or dedicated space for workers to meet face-to-face (Choudhury, Crowston, Dahlander, and Raghuram, 2020)
- Work performed remotely with workers spread across globe and often communicating asynchronously (Rhymer 2023)

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Challenge in All-Remote Organizations: Fostering connections between heterogeneous workers

- AROs can recruit globally and access more culturally and demographically diverse workers (Hsu & Tambe, 2022)
- However, cultural and demographic diversity may also strain communication and lead to the emergence of siloes (Adler, 1997; Bettenhausen & Murnighan, 1991)
- Particularly salient for AROs that rely on asynchronous and text-based communication (Sproull and Kiesler 2005; Willis and Todorov 2006; Daft and Lengel 1986; Orlikowski 2002; Hansen 1999; Hinds and Mortensen 2005)

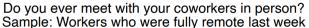


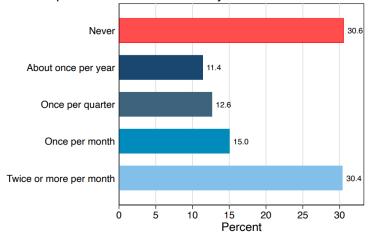
The role of temporary in-person colocation

- One way to foster connections between (diverse) employees is through temporary colocation
- Survey evidence suggests that fully-remote workers meet their coworkers in person regularly
- Yet, we know little about the impact of temporary colocation on connections between (diverse) workers

45% of Workers Who Were Fully Remote During the Previous Week Meet Their Coworkers *In Person* At Least <u>Monthly</u>







Source: Responses to the questions:

 Do you ever meet with your coworkers in person?

Notes: We ask the question above to anyone who reported working from home on all days worked in the reference week of the survey. The figure plots the distribution across the response options on the left, after excluding those who say "I have no coworkers." The sample covers the May 2023 wave of the SWAA. We re-weight the sample of US residents aged 20 to 64 earning \$10,000 or more in a prior year to match CPS shares by age-sex-education-earnings cells.

N = 965

(Barrero, Jose Maria, Nicholas Bloom, and Steven J. Davis, 2021. "Why working from home will stick," National Bureau of Economic Research Working Paper 28731)

Research Question

Does temporary colocation impact subsequent online communication among fully-remote workers, particularly workers spanning demographic boundaries?

Preview of findings

- Temporary colocation is associated with an increase in subsequent online communication between pairs of workers
- 2. However, the effects are most pronounced for workers who share similar demographic characteristics
- 3. Even brief episodes of constrained temporary colocation (colocation in smaller group settings) can help bridge demographic differences that colocation in large groups does not

Empirical setting

- A fully remote firm
- Software development
- Est. in 2011
- 281 employees (in 2019)



Empirical setting

- A fully remote firm
- Software development
- Est. in 2011
- 281 employees (in 2019)
- 17 countries
- 21 time zones
- 163 locations







Data

- Descriptive data for all 281 workers active in the firm between at the time of the in-person retreat (January 2020):
 - Name, gender, country, city location, job title (seniority), department, joining date (tenure)
- Slack communications for company-wide "general" channel
 - For discussing projects relevant across teams and socializing
- Information on January 2020 retreat attendance
 - Attendance at the retreat, duration of stay, flight to and from the retreat, and cab composition to and from the airport



Main measures and unit of analysis

- We convert our data to the dyad unit of analysis, creating 39,340 dyads for all possible pairwise combinations of workers
- Our dependent variable (DV) tracks Slack connections between employees both before and after the retreat (78,680 observations)
- Independent variables:
 - Attendance at retreat
 - Demographic differences (based on Gender, Ethnicity, and Country of residence)
 - Sharing of cabs to and from the airport (conditional on not sharing the same flight)



Identification strategy

Attendance is not randomly assigned

- Quasi-exogenously assigned cab rides:
 - Treatment: sharing a cab to and/or from the airport at the retreat, but NOT sharing a flight
 - Cab rides organized to group passengers on flights that landed within 10-20mins arrival time window
- An extensive battery of controls at the dyad level:
 - Pre-retreat interaction on Slack, how many times (if any) the dyad met at prior retreats, differences in gender, ethnicity, language, country, city, time zone, department, seniority, and tenure, as well as average time zone location, tenure, and seniority

Table 3 – Dyad-level Descriptive Statistics

	Pre-	retreat	Post-re	treat	Difference
	Obs.	Mean	Obs.	Mean	
Interaction (DV)	39,340	0.022	39,340	0.046	0.024***
Variable	Obs	Mean	Std. Dev.	Min	Max
# Times Met Before Retreat	39,340	0.49	.81	0	5
Time Zone Distance (hrs)	39,340	3.54	3.35	0	12
Avg. Time Diff to Orlando (hrs)	39,340	0.347	3.11	-5	17
Average Slack Activity	39,340	13.22	11.32	0	87.5
Demographic Differences	39,340	1.25	.87	0	3
Different Gender	39,340	0.43	.49	0	1
Diff Ethnicity	39,340	0.36	.48	0	1
Different Nationality	39,340	0.47	.50	0	1
Shared Taxi	32,148	0.03	.18	0	1

Table 2 - Balance Tests

	(1) Retreat Attendance	(2) Taxi Sharing
VARIABLES	All Employees	Retreat Attendees
	0.0774	0.000
Interaction on General Channel	0.077*	-0.008
D	(0.045)	(0.006)
Different Gender	-0.035	0.001
	(0.028)	(0.002)
Diff Origin (Region)	-0.055	0.002
	(0.046)	(0.004)
Different Nationality	-0.029	-0.014**
	(0.049)	(0.006)
Time Zone Distance (hrs)	-0.006	-0.003***
	(0.005)	(0.001)
Avg. Time Diff to Orlando (hrs)	0.010	0.001
	(0.007)	(0.001)
Seniority Distance	-0.003	-0.001
	(0.010)	(0.001)
Average Seniority	-0.003	0.003
	(0.034)	(0.004)
Tenure Distance (yrs)	-0.001	0.001
	(0.011)	(0.001)
Average Tenure (yrs)	0.029	0.000
	(0.026)	(0.003)
Different Department	0.008	-0.002
•	(0.015)	(0.004)
Co-Attended Prior Retreats	0.028	0.006
	(0.043)	(0.005)
Average Slack Activity	-0.001	0.000
	(0.002)	(0.000)
Constant	0.845***	0.037***
	(0.080)	(0.009)
Observations	39,340	32,131
R-squared	0.022	0.005

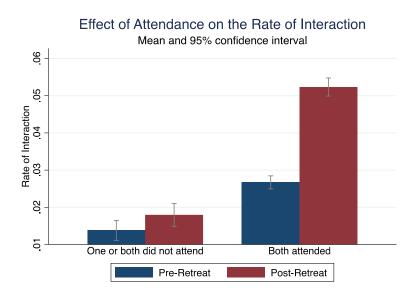
Standard errors adjusted for dyad clusters using dyadclust command.

*** p<0.01 ** p<0.05 * p<0.1

Baseline result

 Attending the retreat is associated with an increase in the likelihood of a dyad interacting online

Equation (1) Interaction_{it} =
$$\alpha + \beta * Post_t + \gamma * Both attended retreat_i + $\delta * Post_t * Both attended retreat_i + controls + \epsilon_{it}$$$





Effect of Attendance on demographically dissimilar dyads

• (Equation 2) Interaction $_{it} = \alpha + \beta * Post_t + \gamma * Both Attended Retreat_i + \delta * Post_t *$ Both Attended Retreat $_i + \theta * Demographic Differences_i + \mu * Post_t * Demographic Differences_i + \pi * Both Attended Retreat_i * Dyad Heterogeneity<math>_i + \rho * Both Attended Retreat_i * Post *$ Demographic Differences $_i + controls + \epsilon_{it}$

Index of Demographic Differences:

- (1) Different gender
- (2) Different ethnicity
- (3) Different country of residence



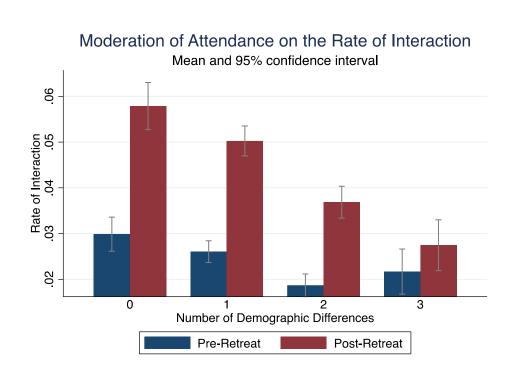
Table 6: Tests of Hypotheses 1 and 2 - Direct Effects of Retreat Attendance and Moderation by Demographic Differences

VARIABLES	(1) Interaction	(2) Interaction	(3) Interaction	(4) Interaction	(5) Interaction All	(6) Interaction
	Employees	Employees	Employees	Employees	Employees	Employees
Co-Attended Retreat	0.021*** (0.005)	0.010* (0.006)	0.009 (0.008)	0.011 (0.008)	0.009 (0.008)	0.009 (0.010)
Post	0.024*** (0.005)	0.006 (0.005)	0.004 (0.007)	0.003	0.004	-0.001 (0.010)
Co-Attended Retreat * Post	(orosa)	0.022*** (0.007)	0.021** (0.009)	0.031***	0.032*** (0.009)	0.040*** (0.012)
Diff. Gender	0.002 (0.003)	0.002 (0.003)	-0.004 (0.006)	0.002 (0.003)	0.002 (0.003)	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
Diff. Ethnicity	-0.014***	-0.014***	-0.014***	-0.007	-0.014***	
Diff. Nationality	(0.005) 0.003 (0.008)	(0.005) 0.003 (0.008)	(0.005) 0.003 (0.008)	(0.006) 0.003 (0.008)	(0.005) 0.007 (0.007)	
Post* Diff. Gender	(0.000)	(0.000)	0.005	(0.000)	(0.007)	
Co-Attended Retreat* Diff. Gender			0.003 (0.006)			
Post*Co-Attended Retreat* Diff. Gender			0.002			
Post* Diff. Ethnicity			(0.008)	0.006 (0.008)		
Co-Attended Retreat* Diff. Ethnicity				(0.000)		
Post* Co-Attended Retreat* Diff. Ethnicity				-0.025** (0.011)		
Post* Diff. Nationality					(0.005)	
Co-Attended Retreat* Diff. Nationality					0.003	
Post* Co-Attended Retreat* Diff. Nationality					-0.022** (0.010)	
Demographic Diff.					(11111)	-0.002 (0.004)
Post*Demographic Diff.						0.005
Co-Attended Retreat*Demographic Diff.						(0.002)
Post* Co-Attended Retreat*Demographic Diff.						-0.014** (0.006)
# Times Met Before Retreat	0.012*** (0.004)	0.012*** (0.004)	0.012*** (0.004)	0.012*** (0.004)	0.012*** (0.004)	0.012*** (0.004)
Time Zone Distance (hrs)	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
Avg. Time Diff to Orlando (hrs)	(0.001) -0.003*** (0.001)	(0.001) -0.003*** (0.001)	(0.001) -0.003*** (0.001)	(0.001) -0.003*** (0.001)	(0.001) -0.003*** (0.001)	(0.001) -0.003*** (0.001)
Average Slack Activity	0.001**** (0.000)	0.001**** (0.000)	0.001)	0.001)	0.001)**** (0.000)	0.001****
Same Department	0.005*	0.005*	0.005*	0.005*	0.005*	0.005*
Seniority Distance	0.000	0.000	0.000	0.000	0.000	0.000
M. Mariner and A. Mar	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Tenure Distance (yrs)	0.000	0.000	0.000	0.000	0.000	0.000
Constant	(0.002) -0.013*	(0.002) -0.004	(0.002)	(0.002)	(0.002) -0.006	(0.002)
Constant	(0.008)	(0.008)	(0.009)	(0.009)	(0.009)	(0.010)
Observations R-squared	78,680 0.020	78,680 0.021	78,680 0.021	78,680 0.021	78,680 0.021	78,680 0.020

Standard errors adjusted for dyad clusters using dyadclust command.

*** p<0.01 ** p<0.05 * p<0.1

Effect of Attendance on demographically dissimilar dyads



Post	-0.001
	(0.010)
Both Attended Retreat	0.009
	(0.010)
Post*Both Attended Retreat	0.040***
	(0.012)
Demographic Differences	-0.002
	(0.004)
Post*Demographic Differences	0.005
	(0.005)
Both Attended Retreat*Demographic Differences	0.002
	(0.004)
Post*Both Attended Retreat*Demographic Differences	-0.014**
	(0.006)
Constant	-0.003
	(0.012)

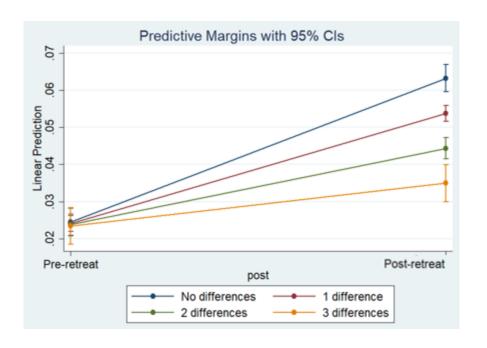
Standard errors adjusted for dyad clusters using dyadclust command.

*** p<0.01 ** p<0.05 * p<0.1

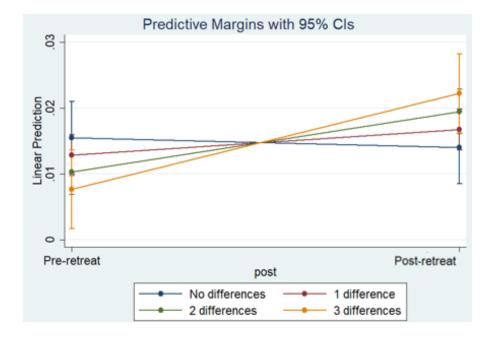


Effect of Attendance on demographically dissimilar dyads

For dyads of attendees (n= 64,262)

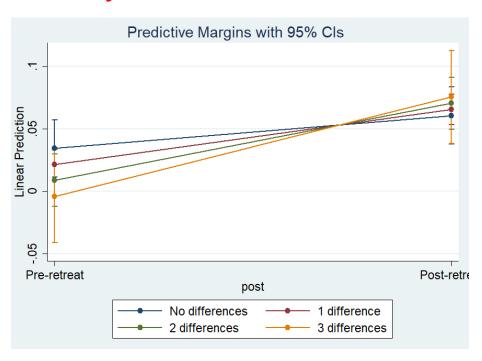


For dyads with at least one non-attendee (n= 14,418)

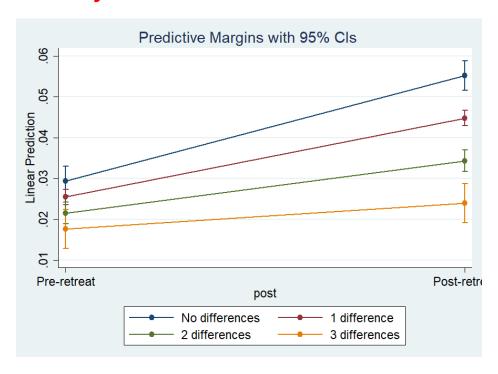


Effect of constrained micro interactions on moderating effect of demographic differences

Dyads that shared a cab



Dyads that did not share a cab



Effect of constrained micro interactions on moderating effect of demographic differences

Post	-0.001
	(0.010)
Same cab but not flight	-0.019
	(0.011)
Post*Both Attended Retreat	0.040***
	(0.012)
Demographic Differences	-0.006
	(0.005)
Same cab but not flight*Demographic Differences	0.005
	(0.004)
Post*Both Attended Retreat*Same cab but not flight	-0.009
	(0.018)
Post*Both Attended Retreat*Demographic Differences	-0.015**
	(0.006)
Post*Both Attended Retreat*Demographic Differences*Same cab but not flight	0.031***
	(0.010)
Constant	-0.003
	(0.012)

Table OS4 – Continuous number of interactions on the general channel

	(1)
	# of Interactions
	General Channel
VARIABLES	All Employees
Post	-0.007
	(0.016)
Co-Attended Retreat	0.020
	(0.018)
Post*Co-Attended Retreat	0.063***
	(0.022)
Demographic Diff.	-0.002
0 1	(0.005)
Post*Demographic Diff.	0.007
O	(0.006)
Co-Attended Retreat*Demographic Diff.	-0.001
	(0.005)
Post* Co-Attended Retreat*Demographic Diff.	-0.021**
BOUNTES AND	(0.009)
# Times Met Before Retreat	0.022***
	(0.008)
Time Zone Distance (hrs)	0.000
	(0.001)
Avg. Time Diff to Orlando (hrs)	-0.005***
Constitution Const	(0.002)
Average Slack Activity	0.002***
,	(0.001)
Same Department	0.012*
	(0.006)
Seniority Distance	-0.000
AND THE PERSON NAMED IN COLUMN TWO	(0.003)
Tenure Distance (yrs)	-0.000
(2) (2) (2) (2) (3) (3) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4	(0.003)
Constant	-0.013
	(0.017)
Observations	79,885
R-squared	0.014

Standard errors adjusted for dyad clusters using dyadclust command. *** p<0.01 ** p<0.05 * p<0.1

Table 11: OLS Estimates of Pre-retreat Interaction & Performance

	(1)	(2)	(3)	
	Pre-Retreat	Pre-Retreat	Pre-Retreat	
	Performance	Performance	Performance	
VARIABLES	All Employees	All Employees	All Employees	
Ties to Diff. Genders	0.088*	3645 - XV	25% 600	
	(0.048)			
Γies to Diff. Nationalities		0.038		
		(0.046)		
lies to Diff. Ethnicities		F 50	0.123*	
			(0.065)	
Constant	2.895***	2.876***	2.887***	
	(0.158)	(0.158)	(0.158)	
Observations	203	203	203	
R-squared	0.157	0.152	0.161	
Department FE	Yes	Yes	Yes	
l'imezone FE	Yes	Yes	Yes	
Controls	Yes	Yes	Yes	
Name Origin FE	Yes	Yes	Yes	

Robust standard errors in parentheses are clustered by seniority*department. *** p<0.01 ** p<0.05 * p<0.1



Summary of findings

- Temporary colocation is associated with more online communication between pairs of workers
- This effect is **driven by** an increase in online communication between **pairs of workers** who are demographically similar
- Brief episodes of constrained temporary colocation reverse this effect, such that they increase communication more for pairs of workers who are demographically dissimilar



Implications

- Our research points to importance of "Liminal Spaces", spaces that foster short, voluntary, informal, in-person interactions, in fostering connections.
- Implications for how in-person days should be organized at organizations that have adopted hybrid work models.

 Future research needed on how heterogeneity of venues (downtown office, suburban office, retreat, gym) affects quality of in-person interactions.



Thank you!

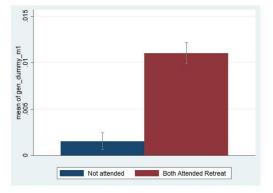


Appendix

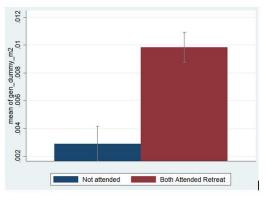
+

	same_cab	gen_dummy	<u>both</u> _2020	diff_gender	times_met	time_dist	avg_time	social_act	same_dept	seniority	distance
same_cab	1.0000										
gen_dummy	0.0089	1.0000									
<u>both_</u> 2020	0.0719	0.0497	1.0000								
diff_gender	-0.0026	0.0008	-0.0519	1.0000					1		3
times met	0.0392	0.0754	0.0628	-0.0448	1.0000				15		8
time_dist	-0.0542	-0.0384	-0.0271	-0.0189	-0.1074	1.0000		7	15		×.
avg_time	-0.0293	-0.0496	0.0157	-0.0190	-0.0889	0.6985	1.0000				×.
social_act	0.0033	0.0685	-0.0183	0.0007	0.1501	0.1758	0.1816	1.0000	1		*
same_dept	0.0058	0.0223	-0.0024	-0.0289	0.1180	0.0115	0.0289	0.0791	1.0000		*
senionity	0.0050	-0.0037	-0.0064	-0.0262	-0.0365	-0.0622	-0.0798	-0.0919	-0.0720	1.0000	3
distance	0.0123	0.0025	0.0495	-0.0415	-0.0199	-0.0357	-0.0065	-0.0311	0.0213	0.0369	1.0000

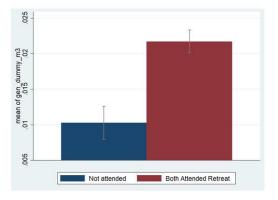
After one month



After 2 months



After 3 months



```
Table 9
    identical dyad, did not share call but co-attended retreat
     Pre = 0.009.
    Post = -0.001 + 0.009 + 0.040
    morease = (0.049)
    Identical dyad, co-attended of shared cats.
   fost = \frac{-0.001}{-0.009} + 0.040 - 0.022 + 0.001 + 0.017
 Inorcere = -0.001 + 0.040 + 0.001 - 0.009
  Increase = (0.031)
  Dyad with one difference, co-attended & Shared cont
   Pre = 0.009 - 0.022 + 0.017 - 0.006 + 0.002.
 Post = -0.001 7 0.009 + 0.040 -0.022 + 0.001
        +0.017 -0.009 -0.006 +0.005 +0.002
         -0.015 -0.005 -0.001 +0.031
Increase = 0,001 + 0,040 + 0,001-0.009
               +0.005 - 0.015 -0.005 +0.031
       = 0.040 - 0.009 - 0.015 + 0.031.
            10.047.
```

Attendance: Demographic Moderators

	(1)	(2)	(3)
	Interaction	Interaction	Interaction
VARIABLES	All Employees	All Employees	All Employees
Different Gender	-0.002	0.003	0.003
	(0.006)	(0.003)	(0.003)
Diff Origin (Region)	-0.012**	-0.007	-0.012**
	(0.005)	(0.006)	(0.005)
Different Language	0.003	0.003	0.003
0 0	(0.008)	(0.008)	(0.008)
Different Country Location	0.006	0.006	0.009
	(0.008)	(0.008)	(0.007)
Post	0.004	0.003	0.004
	(0.007)	(0.007)	(0.006)
Both Attended Retreat	0.008	0.009	0.007
	(0.008)	(0.008)	(0.008)
Post * Both Attended Retreat	0.022**	0.031***	0.033***
John Michael Refrest	(0.009)	(0.009)	(0.009)
Post * Different Gender	0.005	(0.007)	(0.007)
Different Gender	(0.007)		
Both Attended Retreat * Different Gender	0.003		
Both Attended Retreat - Different Gender	(0.007)		
Post * Both Attended Retreat * Different Gender	0.007)		
Post " Both Attended Retreat " Different Gender			
Doot & Different Opinion Dooing	(0.008)	0.006	
Post * Different Origin Region			
D. J. A 1. I.D D'. C O ' D'		(0.008)	
Both Attended Retreat * Different Origin Region		0.002	
		(0.008)	
Post * Both Attended Retreat * Different Origin Region		-0.025**	
D + D144		(0.011)	
Post * Different Country			0.005
			(0.006)
Both Attended Retreat * Different Country			0.004
			(0.006)
Post * Both Attended Retreat * Different Country			-0.022**
			(0.010)
Constant	0.008	0.003	0.004
	(0.012)	(0.013)	(0.013)
Observations	78,695	78,695	78,695
Controls	Yes	Yes	Yes
R-squared	0.017 ers using dyadclust command.	<u>ш</u> н Д•₽ 1√8 а	ви <u>я 1040£15 в</u> всно

Standard errors adjusted for dyad clusters using dyadclust command.

*** p<0.01 ** p<0.05 * p<0.1

Sharing a Cab: Demographic Moderators

	(1)	(2)	(3)
	Interaction	Interaction	Interaction
VARIABLES	Retreat Attendees	Retreat Attendees	Retreat Attendees
Diff. O. I	0.004	0.004	0.004
Different Gender	0.001	0.004	0.004
	(0.004)	(0.004)	(0.004)
Diff Origin (Region)	-0.014**	-0.004	-0.014**
	(0.006)	(0.006)	(0.006)
Different Language	0.004	0.004	0.004
	(0.009)	(0.009)	(0.009)
Different Country Location	0.005	0.005	0.013
	(0.009)	(0.009)	(0.008)
Post	0.026***	0.035***	0.036***
	(0.006)	(0.007)	(0.007)
Same Cab, Not Flight	-0.007	-0.006	-0.013**
	(0.007)	(0.007)	(0.006)
Post * Same Cab, Not Flight	0.001	0.005	0.024
, 0	(0.011)	(0.014)	(0.022)
Same Cab, Not Flight * Different Gender	-0.007	()	(3 33 3)
S S, 1 100 - 100 - 110	(0.010)		
Post * Same Cab, Not Flight * Different Gender	0.041**		
Tost Same Cab, Not Fight Different Gender	(0.018)		
Same Cab, Not Flight * Different Origin Region	(0.016)	-0.011	
Same Cab, Not Fight Different Origin Region			
D. *C. Cl.M. El'.L. *D'C C.'. D. '		(0.010)	
Post * Same Cab, Not Flight * Different Origin Region		0.041**	
		(0.019)	
Same Cab, Not Flight * Different Country			0.012
			(0.011)
Post * Same Cab, Not Flight * Different Country			-0.017
			(0.029)
Constant	0.015	0.010	0.010
	(0.013)	(0.013)	(0.013)
Observations	64,276	64,276	64,276
Controls	Yes	Yes	Yes
R-squared	0.015	HARVARD	в и s i w E ¹ 5 s s с н о

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Pre and post-retreat Interaction Baselines by demographic characteristic

Pre-retreat:

		Same		Diff	erent	Difference
		Obs.	Mean	Obs.	Mean	
Heterogeneity in Demographics	Gender	23229	0.026	17145	0.023	-0.003*
	Origin Region	26004	0.028	14370	0.019	-0.009***
	Country of residence	21366	0.026	19008	0.024	-0.002

Post-retreat:

		Same		Diff	erent	Difference
		Obs.	Mean	Obs.	Mean	
Heterogeneity in Demographics	Gender	22791	0.045	16829	0.048	0.003
	Origin Region	25521	0.054	14099	0.031	-0.023***
	Country of residence	20954	0.053	18666	0.039	-0.014***

Pre-retreat Interaction & Performance

Mean rating: 3.177 St. Deviation: 0.410

VARIABLES	(1) Pre-Retreat Performance All Employees	(2) Pre-Retreat Performance All Employees	(3) Pre-Retreat Performance All Employees				
				Ties to Diff. Genders	0.088*		
					(0.048)		
				Ties to Diff. Countries	(0.040)	0.038	
	(0.046)						
Ties to Diff. Origins		/ /	0.123*				
			(0.065)				
Constant	2.895***	2.876***	2.887***				
	(0.158)	(0.158)	(0.158)				
Observations	281	281	281				
R-squared	0.157	0.152	0.161				
Department FE	Yes	Yes	Yes				
Timezone FE	Yes	Yes	Yes				
Controls	Yes	Yes	Yes				
Name Origin FE	Yes	Yes	Yes				