

Off-the-Job Learning in Cities

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- Learning in cities is considered as one of the key sources of urban agglomeration that explains a higher wage in cities (Duranton and Puga 2004).
- However, little work has *directly* looked at the learning behavior to investigate urban agglomeration economy.
 - Most works focus on the pattern of urban wage premium to indirectly infer the importance of learning (Glaeser and Maré 2001; De la Roca and Puga 2017; Eckert et al. 2022).
- **This paper: New facts on how people learn in denser or less dense cities**
 - Do people spend more time for learning in cities?
 - What is the objective of learning?
 - What skills do they learn?
 - How do they learn a skill?

Data: the Japanese Time-Use Survey (JTUS)

- I use the Japanese Time-Use Survey data (JTUS, *syakai seikatsu kihon chosa*).
 - Partially similar to American Time-Use Survey, but I mainly focus on a detailed question about learning for a whole year.
- Advantages
 - Distinctively rich information on the *off-the-job* learning.
 - Nationally representative, high response rate, and large sample size (About 200,000–300,000 people in each year).
 - Available for a long time (use 1986, 2006, 2016 for this paper).
- Drawbacks:
 - No panel structure.
 - No question about the *on-the-job* learning (c.f., Charlot and Duranton 2004 for workplace communication)

Key question(s) in the survey

19 Learning, self-education, and training	(1) How many days over the year did you pursue your learning, self-education, and training? (Please choose one from the nine categories shown in the box below)	(2) For what purpose did you pursue your learning, self-education, and training? (Please fill in the circles all applicable answers)				(3) Through which means did you pursue your learning, self-education, and training? (Please fill in the circle all applicable answers)								
<p>*Please indicate the item you aimed to enhance your knowledge or level of culture, or to use for your current work (including acquisition of know-how or qualifications) by pursuing the following activities, excluding those activities at work or school.</p> <p>*Excludes those activities directly related to regular courses in school, or employee training courses.</p> <p>*Includes club activities within or outside school.</p>	<p>0 - None at all</p> <p>1 - 1 to 4 days</p> <p>2 - 5 to 9 days</p> <p>3 - 10 to 19 days (1 day a month)</p> <p>4 - 20 to 29 days (2 or 3 days a month)</p> <p>5 - 40 to 99 days (1 day a week)</p> <p>6 - 100 to 199 days (2 to 3 day a week)</p> <p>7 - 200 days or more (4 days or more a week)</p> <p>8 - Do not know how many days</p>	Self improvement	To gain employment	To use for current work	Other	Classes, Courses or workshop, etc.	Lecture meetings, etc.	Correspondence course	Television or radio	Outside or working hours at workplace	Miscellaneous schools or vocational schools	Vocational training through "Hello Work"	Miscellaneous schools or vocational schools	Other
English language	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other foreign language	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Computing etc.	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Commerce or business	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Caring	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home economics or housework (cooking, sewing, or home management, etc.)	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Humanities, social or natural science (history, economics, mathematics, or biology, etc.)	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Art and culture	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input type="radio"/> 7 <input type="radio"/> 8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please indicate either Yes or No	<input type="radio"/> Yes <input type="radio"/> No													

Please fill out (2) and subsequent questions if you answered 1 or more days.

Time-use question

Learning and urbanity: Regression framework

- How does learning behavior vary with urbanity?
 - Regress learning variables on population density of the municipality in residence.

- I mainly use the linear probability model:

$$y_{ij} = \beta \ln \text{PopDens}_j + \gamma X_i + \epsilon_{ij}. \quad (1)$$

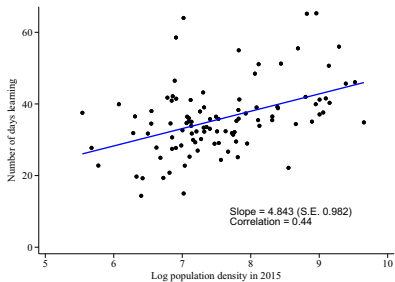
- X_i = sex, age and its square, marital status, educational attainment.
- I do not claim causality and focus on descriptive analysis.
 - In a later analysis, I also address endogeneity concerns for causality to the extent the data allow.

- When y_{ij} is the number of days spent for learning of person i in municipality j , I estimate the following Poisson model to allow for zero learning days:

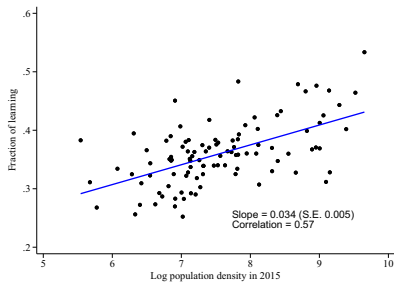
$$y_{ij} = \exp(\beta \ln \text{PopDens}_j + \gamma X_i) + \epsilon_{ij},$$

following Santos Silva and Teneyro (2006).

Learning frequency: Raw data



(a) Number of days learning



(b) Fraction of learning something

Learning frequency: Regression results

- I find that 1% increase in population density is associated with 0.1% increase in learning frequency.

	Number of days learning (1)	Learning for new employment (2)	Learning for current job (3)	Learning for cultivation (4)	Learning for other reason (5)
In population density	0.102 ^a (0.017)	0.008 ^b (0.004)	-0.009 ^b (0.004)	0.026 ^a (0.004)	0.004 (0.005)
Estimation method	PPML	OLS	OLS	OLS	OLS
<i>N</i>	78727	24905	24905	24475	24905
<i>R</i> ²	NA	0.016	0.070	0.032	0.025

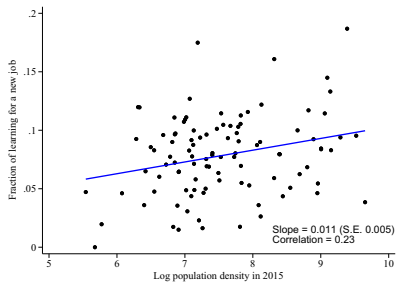
Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

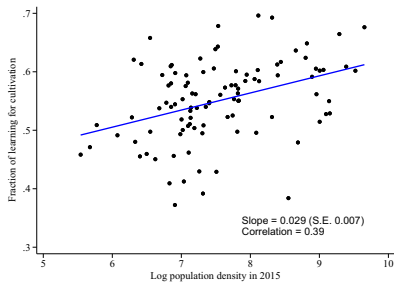
Learning frequency: Implications

- **New microfoundation of urban agglomeration economies:** cities are more productive because people spend more time in improving their skills.
 - Learning quality is higher in cities (e.g., Duranton and Puga 2004), but **learning quantity** as well
- Welfare implication of agglomeration economy is different between quality vs quantity (c.f., Miyauchi 2021).
- Heterogeneity: the effect seems stronger for men and those with low education attainment.
 - Maybe natural as these people would have higher return in improving their skills.

Learning Purpose: Raw data



(c) Fraction of learning for a new job



(d) Fraction of learning for cultivation

Learning purpose: Regression results

- I find that 1% increase in population density is associated with more learning for new job (0.08pp) or cultivation (0.26pp), but less for the current job (-0.09pp).

	Number of days learning (1)	Learning for new employment (2)	Learning for current job (3)	Learning for cultivation (4)	Learning for other reason (5)
In population density	0.102 ^a (0.017)	0.008 ^b (0.004)	-0.009 ^b (0.004)	0.026 ^a (0.004)	0.004 (0.005)
Estimation method	PPML	OLS	OLS	OLS	OLS
<i>N</i>	78727	24905	24905	24475	24905
<i>R</i> ²	NA	0.016	0.070	0.032	0.025

Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

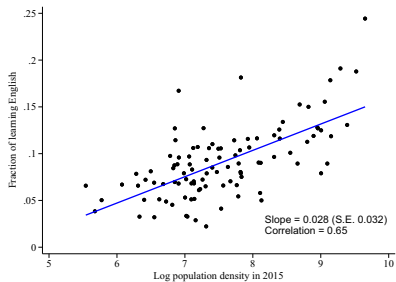
Learning purpose: Implications

- Learning for new jobs in denser cities is consistent with faster transition to better-paying occupations in denser cities (Eckert et al. 2022).
 - A job requires certain set of skills (Autor et al. 2003) and people try to meet them. This incentive is larger when there are more jobs.
- In contrast, learning for current job is less intense in denser cities.
- Highlights a potential complementarity between learning and matching, two key forces of agglomeration economies (Duranton and Puga 2004).

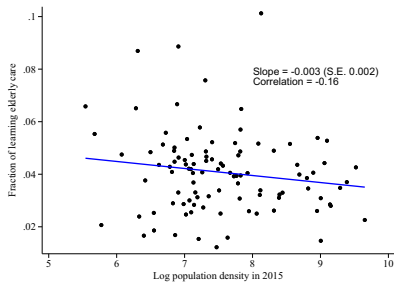
Learning purpose: Implications

- The active cultural investment in denser cities is consistent with the agglomeration of creative activities and industries
 - Mitchell (2019); Tao et al. (2019); Borowiecki and Dahl (2021)
- Learning for cultivating oneself might also be related to endogenous neighborhood quality.
 - People endogenously improve their type on the cultural sophistication.
 - In contrast, it is typically assumed that the neighborhood quality is a function of exogenous characteristics of residents (e.g., Shapiro 2006; Diamond 2016).

Learning subject: Raw data



(e) Fraction of learning English



(f) Fraction of learning elderly care

Learning subject: Regression results

- I find that usually all skills are more likely to be learnt in denser cities.
- But the elderly care is an exception: it is more learned in *less* dense cities.

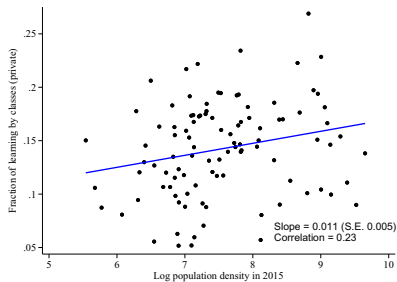
	English (1)	Other foreign language (2)	Computers etc (3)	Commerce and Business (4)	Elderly care (5)
In population density	0.020 ^a (0.002)	0.007 ^a (0.001)	0.010 ^a (0.002)	0.010 ^a (0.002)	-0.004 ^a (0.001)
<i>N</i>	78727	78727	78727	78727	78727
<i>R</i> ²	0.080	0.016	0.027	0.039	0.013
	Housekeeping (6)	Humanities and sciences (7)	Arts and culture (8)	Other (9)	
In population density	0.007 ^a (0.002)	0.004 ^b (0.002)	0.013 ^a (0.002)	0.000 (0.002)	
<i>N</i>	78727	78727	78727	78727	
<i>R</i> ²	0.036	0.050	0.037	0.001	

Cluster-robust standard errors in parentheses

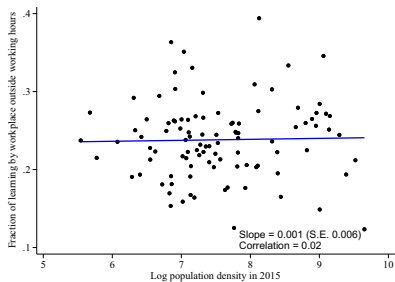
^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

- I interpret the exception of the elderly care as evidence that people respond to local demand conditions in choosing what they learn.
- Rural Japan faces a rapid population aging and the labor demand for the elderly care jobs is high
 - The wage in the elderly care sector relative to other sectors is also better in rural areas (Hanaoka 2015)
- Thus, the high local demand likely overturns the general tendency that any skill is more likely to be learned in denser cities.

Learning method: Raw data



(g) Fraction of learning by private classes



(h) Fraction of learning at workplace outside working hours

Learning method: Regression results

- I find that (although not definitive), denser cities are more likely to use education-market-based methods requiring physical presence, and less likely to use other methods (publicly provided ones etc).

	Classes (public) (1)	Classes (private) (2)	Classes (universities etc) (3)	Lecture meetings (4)	Home-study courses (5)
In population density	-0.009 ^a (0.003)	0.006 ^b (0.003)	-0.001 (0.001)	-0.009 ^a (0.002)	-0.003 (0.002)
<i>N</i>	24304	24905	24905	24905	24905
<i>R</i> ²	0.019	0.021	0.015	0.019	0.007
	TV and radio (6)	Workplace (outside working hours) (7)	Vocational schools etc (8)	Training by employment service center (9)	Other (10)
In population density	0.008 ^b (0.004)	-0.007 ^c (0.004)	0.005 ^a (0.002)	-0.001 ^b (0.001)	0.010 ^b (0.004)
<i>N</i>	24905	24905	24905	24905	24905
<i>R</i> ²	0.026	0.034	0.009	0.004	0.007

Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

- Strong agglomeration economies in the service sector (e.g., Glaeser et al. 2001; Morikawa 2011; Leonardi and Moretti 2022).
- Thus, provision of education services is also advantageous in denser cities.
- Learning is also responding to the supply of learning opportunities.

Are my descriptive estimates also interpretable as causal?

Although my cross-sectional data cannot fully address the endogeneity for causality, available analysis suggests that my results might also be causally interpreted:

- Endogeneity of population density [Tables](#)
 - Using 1920 population as an IV does not change results (Ciccone and Hall 1996; De la Roca and Puga 2017)
- Unobserved individual characteristics (sorting)
 - Using 1986 data, focusing on non-movers does not change results on learning frequency (Charlot and Duranton 2004).
- Oster's (2019) lower bound beta does not change the results.

Robustness checks and additional analysis

- The urban earnings premium in the JTUS data [Table](#)
 - 1% increase in density implies around 0.04% increase in individual earnings, consistent with the literature (Ahlfeldt and Pietrostefani 2019)
- Learning with whom. [Table](#)
 - In denser cities, people learn more alone or with family members, but not with colleagues or other people.
 - Unlike studies emphasizing interactions and knowledge spillovers (e.g., Glaeser 1999; Davis and Dingel 2019), interactions with various people in cities do not seem essential.
- Use the metropolitan area population density (Kanemoto and Tokuoka 2002)
- The JTUS data in a different year (2006)

Conclusion

- A first direct look at the learning behavior and urbanity
 - In contrast to the popular approach (Glaeser and Mare 2001; De la Roca and Puga 2017) of indirectly inferring the importance of learning from wage dynamics.
 - Frequency, purpose, subject, method of off-the-job learning in the Japanese survey data.
- People learn more in denser cities.
- People learn for a new job or for own cultivation in denser cities.
- People respond to local skill demand in choosing what they learn.
- People also respond to the local supply of learning opportunities in selecting how they learn.
- Various implications on learning-based urban agglomeration economies (Duranton and Puga 2004).

Appendix slides

Time-use question

24 Diary

- Please report on you did on each of the two days specified and how much time you spent on each activity, in units of 15 minutes.
- Please draw a horizontal line to specify the activity and persons with you for each 15 minute units.

(1) Select the feature of this day from the categories listed below. Please fill in the circle of appropriate category.

Travel and recreation	Event or festival (half a day)	Business trip or training, etc.	Work at home	Under medical treatment	Holiday or vacation, etc.	Leave for child rearing or taking care of a sick child	Leave to take care of a family member	Other
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

(2) How was the weather on this day?

Fair	Cloudy	Not sunny
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

06

[First Day]

Those who were engaged in more than one activity at the same time should report the main activity.

Morning	Kind of activities	0 o'clock	30	1	30	2	30	3	30	4	30	5	30	6 o'clock	
	1	Sleep													
2	Personal care														2
3	Meals														3
4	Commuting to and from school or work														4
5	Work														5
6	Schoolwork														6
7	Housework														7
8	Caring or nursing														8
9	Child care														9
10	Shopping														10
11	Moving (excluding commuting)														11
12	Watching TV, listening to the radio, reading newspapers or magazines														12
13	Rest and relaxation														13
14	Learning, self-education, and training (except for school work)														14
15	Hobbies and amusements														15
16	Sports														16
17	Volunteer and social activities														17
18	Social life														18
19	Medical examination or treatment														19
20	Other activities														20
Person(s) being together	a Alone														a
	b Family member(s)														b
	c Classmate(s) or colleague(s)														c
	d Other person(s)														d

Back

IV results (frequency and purpose)

	Number of days learning (1)	Learning for new employment (2)	Learning for current job (3)	Learning for cultivation (4)	Learning for other reason (5)
In population density	0.130 ^a (0.027)	0.011 (0.008)	-0.006 (0.008)	0.024 ^a (0.007)	0.021 ^b (0.009)
Estimation method	GMM	2SLS	2SLS	2SLS	2SLS
<i>N</i>	77236	24438	24438	24013	24438
<i>R</i> ²	NA	0.016	0.070	0.032	0.023

Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

Back

IV results (subject)

	English (1)	Other foreign language (2)	Computers etc (3)	Commerce and Business (4)	Elderly care (5)
In population density	0.023 ^a (0.004)	0.010 ^a (0.002)	0.013 ^a (0.003)	0.011 ^a (0.004)	-0.004 ^a (0.001)
<i>N</i>	77236	77236	77236	77236	77236
<i>R</i> ²	0.080	0.016	0.027	0.039	0.013
	Housekeeping (6)	Humanities and sciences (7)	Arts and culture (8)	Other (9)	
In population density	0.012 ^a (0.004)	0.004 (0.003)	0.019 ^a (0.004)	0.002 (0.003)	
<i>N</i>	77236	77236	77236	77326	
<i>R</i> ²	0.036	0.050	0.037	0.007	

Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

IV results (method)

	English (1)	Other foreign language (2)	Computers etc (3)	Commerce and Business (4)	Elderly care (5)
In population density	0.023 ^a (0.004)	0.010 ^a (0.002)	0.013 ^a (0.003)	0.011 ^a (0.004)	-0.004 ^a (0.001)
<i>N</i>	77236	77236	77236	77236	77236
<i>R</i> ²	0.080	0.016	0.027	0.039	0.013
	Housekeeping (6)	Humanities and sciences (7)	Arts and culture (8)	Other (9)	
In population density	0.012 ^a (0.004)	0.004 (0.003)	0.019 ^a (0.004)	0.002 (0.003)	
<i>N</i>	77236	77236	77236	77326	
<i>R</i> ²	0.036	0.050	0.037	0.007	

Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

Urban earnings premium

	ln individual income	
	(1)	(2)
ln population density	0.039 ^a	0.058 ^a
	(0.006)	(0.006)
Method	OLS	PPML
<i>N</i>	66545	67057

Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

	Alone (1)	Family members (2)	Colleagues or classmates (3)	Others (4)
In population density	0.002 ^b (0.001)	0.002 ^b (0.001)	0.0002 (0.0004)	0.0003 (0.0003)
<i>N</i>	154105	154105	154105	154105
<i>R</i> ²	0.010	0.006	0.003	0.003

Cluster-robust standard errors in parentheses

^c $p < 0.1$, ^b $p < 0.05$, ^a $p < 0.01$

Table A.7: Learning with whom