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Social Networks and the Choice of Major at University

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Motivation

- **Student behavior**
 - Achievement (grades, attainment)
 - Choice (elective courses, major)
- **Choice of major is important**
 - affects positions on job market and future career
- **Do peers matter for major choice?**
- **What peers are the most important?**

Literature

- **Sacerdote (2001), selective US college:** no significant influence of a dorm roommate on major choice (but effect on fraternity membership)
- **Arcidiacono and Nicholson (2005), US medical schools:** if friends choose a major with high future salary, student also chooses high-paid major
- **Lyle (2007), US military academy:** choice of major (and decision to continue military career) are affected by peers
- **Han and Li (2009), college in China:** no peer effects from dorm neighbors on decision to continue studies (but female roommates have correlated outcomes of membership in the Communist Party)
- **DeGiorgi, Pellizzari, Redaelli (2010), Bocconi university:** choice of a major - economics or management - affected by classmates
- **Ost (2010), elite research university:** choice of a major in physics is influenced by friends

Peer identification problem

Who is a peer?

- Students from the same year cohort?
 - 100 to 200 students
- Group mates?
 - 20 to 30 students
- Friends?
 - 1 to 10 students
- Study helpers?
 - 1 to 5 students
- Individual social ties data may help to identify peer group

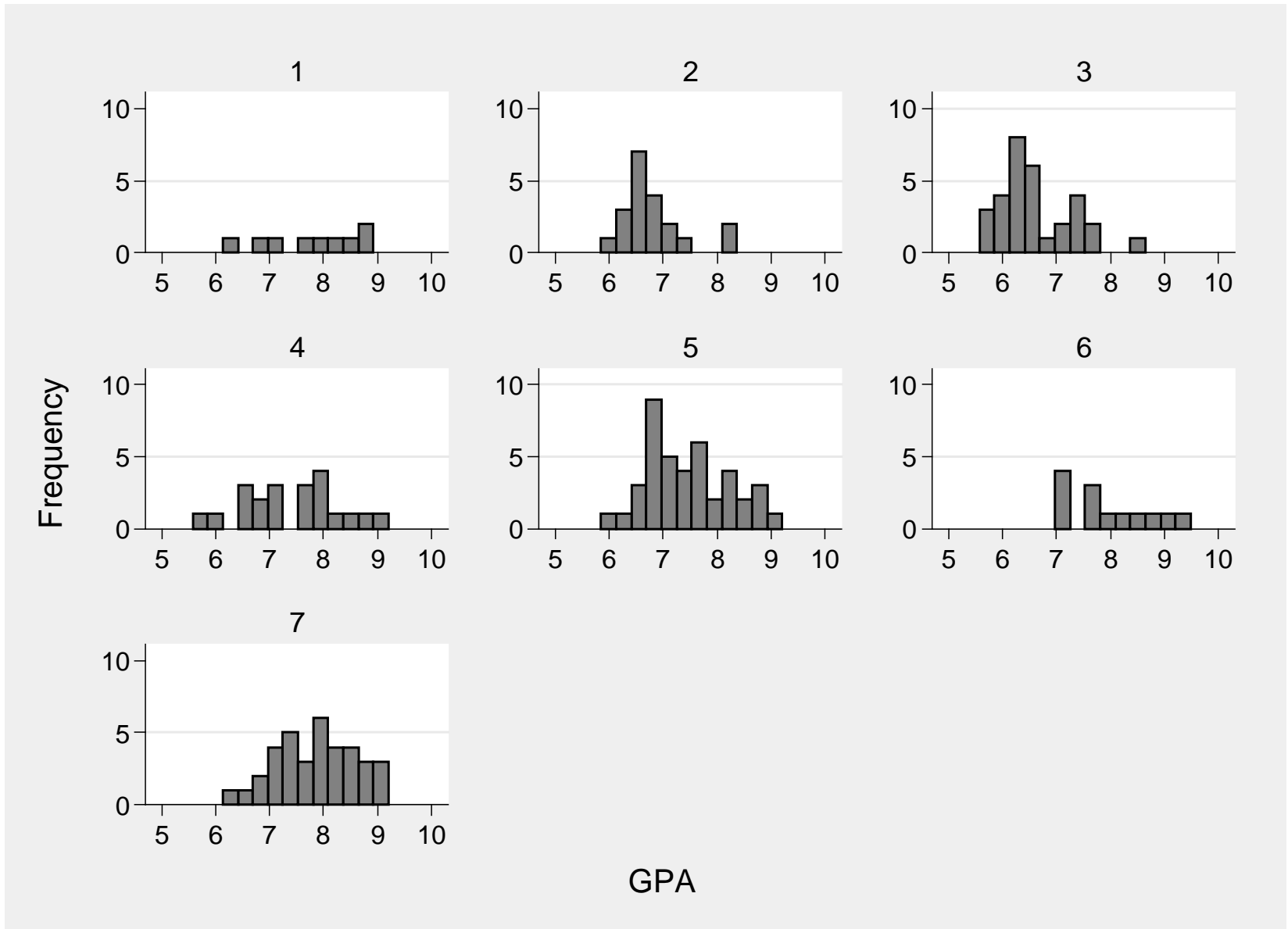
Context of the study and data description

- We use data on social ties and choice of major of 3rd year (2011-2012) students studying at Economics department in HSE
- Data on social ties were gathered in the middle of students' 3rd year by questionnaire survey
 - up to 5 fellows with whom student spend most of time (friends)
 - up to 5 fellows whom student address for help in studies (study helpers)

Context of the study and data description

- At the end of the 3rd year students have to choose one of seven majors:
 - 1 – Math methods of economic analysis.
 - 2 – Banks and banking business,
 - 3 – Applied economics,
 - 4 – Risk management and insurance,
 - 5 – Financial accounting and stock market,
 - 6 – Economic modeling and economic politics,
 - 7 – Economics and finances of firms

GPA distribution for different majors



Methodology

- We test a hypothesis about the independence of major choice
 - probability that any two students choose majors i and j is equal to the product of the probabilities:

$$P_{ij} = P_{i+}P_{+j}$$

- Sample analogues are relative frequencies

$$P_{ij} = \frac{n_{ij}}{n}, P_{i+} = \frac{n_{i+}}{n}, P_{+j} = \frac{n_{+j}}{n}$$

sign “+” indicates summing over this index

Methodology

- Pearson chi-square test of independence

$$X^2 = \sum_{i=1}^7 \sum_{j=1}^7 \frac{(n_{ij} - n_{ij}^e)^2}{n_{ij}^e}$$

- Cohen kappa measures excess of observed agreed choice probability (p) over choice agreed by chance (p_e)

$$\kappa = \frac{p - p_e}{1 - p_e}$$

Methodology

- Logistic regression

$$P_{ij}(s_i = s_j | \mathbf{X}_{ij}) = \frac{1}{1 + \exp(-\mathbf{X}'_{ij} \boldsymbol{\beta})}, \quad i = 1, \dots, n, \quad j = 1, \dots, n, \quad i \neq j$$

- Dependent variable is probability of choice agreement by students i and j
- Explanatory variables are characteristics of j and i

Influence or selection?

- Do peers affect choice or students who choose the same major form ties?
 - Social connections have been forming during since the 1st year of study
 - Choice of major takes place in the end of the 3rd year **after** students got to know specific features of different majors
 - Many majors to choose that are rather similar
- We interpret correlation as influence

Agreement of friends' choice

Major	$\left(\frac{\text{number of actual agreed choices}}{\text{number of choices agreed by chance}} - 1 \right) \cdot 100\%$
1	87,5%
2	66,7%
3	50,5%
4	57,1%
5	56,3%
6	91,5%
7	63,4%

Testing independence of major choice

	Estimate	P-value
<i>Full sample (n=622), friendship ties</i>		
χ^2 (36)	90.60	<0.1%
Kappa	0.120	<0.1%
<i>Full sample (n=641), study help ties</i>		
χ^2 (36)	99.50	<0.1%
Kappa	0.115	<0.1%

Testing independence of major choice (friendship ties)

	Estimate	P-value
<i>Students with mutual friendship ties (n=368)</i>		
χ^2 (36)	80.31	<0.1%
Kappa	0.150	<0.1%
<i>Students with non-mutual friendship ties (n=254)</i>		
χ^2 (36)	58.10	1.1%
Kappa	0.078	0.02%

Testing independence of major choice

	friendship ties		study help ties	
	Estimate	P-value	Estimate	P-value
<i>Students with GPA higher than median</i>				
χ^2 (36)	64.93	0.2%	59.49	0.8%
Kappa	0.137	<0.1%	0.12	<0.1%
	<i>n=322</i>		<i>n=313</i>	
<i>Students with GPA lower than median</i>				
χ^2 (36)	46.37	11.5%	66.22	0.2%
Kappa	0.077	0.14%	0.086	<0.1%
	<i>n=300</i>		<i>n=328</i>	

Testing independence of major choice

	friendship ties		study help ties	
	Estimate	P-value	Estimate	P-value
Females				
χ^2 (36)	71.67	<0.1%	76.86	<0.1%
Kappa	0.114	<0.1%	0.117	<0.1%
	<i>n=300</i>		<i>n=312</i>	
Males				
χ^2 (36)	67.24	0.1%	57.32	1.3%
Kappa	0.124	<0.1%	0.110	<0.1%
	<i>n=322</i>		<i>n=329</i>	

Testing independence of major choice (friendship ties)

	Estimate	P-value
<i>Students with in-degree centrality higher than median (n=322)</i>		
χ^2 (36)	88.66	<0.1%
Kappa	0.149	<0.1%
<i>Students with in-degree centrality lower than median (n=285)</i>		
χ^2 (36)	46.28	11.7%
Kappa	0.060	2.3%

Testing independence of major choice (mix of friendship and study help ties)

	Estimate	P-value
<i>Friends-assistants (n=357)</i>		
χ^2 (36)	92.36	<0.1%
Kappa	0.153	<0.1%
<i>Friends-not assistants (n=265)</i>		
χ^2 (36)	39.64	31.1%
Kappa	0.067	<1%
<i>Assistants-not friends (n=284)</i>		
χ^2 (36)	52.91	3.4%
Kappa	0.069	<1%

Testing independence of major choice (groupmates with similar GPA)

Similar GPA means rank difference within 3

	Estimate	P-value
<i>Groupmates with similar GPA (n=918)</i>		
χ^2 (36)	98.51	<0.1%
Kappa	0.093	<0.1%
<i>Groupmates with similar GPA, except friends (n=758)</i>		
χ^2 (36)	71.37	<0.1%
Kappa	0.074	<0.1%
<i>Groupmates-friends with similar GPA (n=160)</i>		
χ^2 (36)	67.74	0.1%
Kappa	0.182	<0.1%

Logit model estimation

	(1)	(2)	(3)	(4)
Reciprocal friend	0.737*** (0.116)			
Non-reciprocal friend	0.416*** (0.150)			
Friend of student with GPA below median		0.441*** (0.138)		
Not-friend of student with GPA above median		0.0472 (0.0319)		
Friend of student with GPA above median		0.809*** (0.125)		
Not-helper of student with GPA above median			0.0448 (0.0319)	
Helper of student with GPA below median			0.383*** (0.137)	
Helper of student with GPA above median			0.823*** (0.123)	
Not-friend & Helper				0.372*** (0.143)
Friend & Not-helper				0.398*** (0.148)
Friend & Helper				0.762*** (0.117)
N	29756	29756	29756	29756
pseudo R ²	0.002	0.002	0.002	0.002

Logit model estimation

	(5)	(6)
Friend or helper from the other group	0.656** (0.284)	
Not-friend or not-helper from the same group	0.053 (0.048)	
Friend or helper from the same group	0.782*** (0.128)	
Friend or helper with not similar GPA from the same group		0.701*** (0.140)
Not-friend or not-helper with similar GPA from the same group		0.463*** (0.083)
Friend or helper with similar GPA from the same group		0.937*** (0.213)
Constant	-1.652*** (0.017)	-1.660*** (0.016)
N	29756	29756
pseudo R ²	0.001	0.003

Summary

- We find moderate but statistically significant peers effects in major choice
 - The strongest effect is from friends who are also study helpers and have similar (and high) academic achievement
 - Mutual friendship ties have stronger impact than non-mutual ties
 - Groupmates with similar academic achievements matter