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Heterogeneous Effect of Peer Relationship on Non-Local Students' Academic Performance and Mental Health

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ABSTRACT
This paper studies what effect a poor peer relationship will have on students' academic performance and mental health. By using regression analysis based on the data provided by China Education Panel Survey(CEPS), this paper finds that non-local shanghai students are particularly vulnerable to poor peer relationship. Poor peer relationship has detrimental effects on both local and non-local students' academic performance and mental health condition. Additionally, we find out that poor peer relationship will damage non-local student's academic performance and mental health condition even more.

Keywords: *Peer relationship, Non-local student, Mental health, Academic performance*

1. INTRODUCTION

Developing good relationships with peers is vital for the mental health of students[1]. Peer relationship can be defined as the interaction of children of the same of similar age.[2]. There have been many studies related to the correlation between peer relationship, academic performance and mental health. Some researches have been focused on gender and peer relationship[3] while others have studied the influence of a specific deficiency in cognitive ability will have on student's peer relationship and mental health[1]. The previous study on CEPS has also focused on parent-student relationship on students' academic and mental development[4]. However, there are few quantitative analysis on the causality between peer relationship and non-local student's academic performance and mental condition and this will be the main focus of this paper.

According to Tinto's theory of student departure[5], the promotion of students' education performance is dependent on students' successful integration within the school environment. Using this theory as a basis, we would like to analyze three major hypotheses:

Are non-local students particularly vulnerable to poor peer relationships?

Will poor peer relationships damage students' academic performance and mental health?

Is there any heterogeneous effect of peer relationship on non-local students particularly?

Shanghai is a special city that has a very high proportion of non-local and floating students[6]. This special feature is particularly interesting to investigate since heterogeneous student parties will enable us to study the heterogeneous effect of peer relationship on different student parties[4].

2. DATASET AND VARIABLES

2.1. Dataset

The dataset we use is from the China Education Panel Survey(CEPS) which is generated by the National Survey Research Center at Renmin University of China. This dataset is a national and longitudinal study of Chinese junior high school students. The survey was distributed in the 2013-2014 academic year so this is a cross-sectional dataset. Participants are either in grade nine or seven. The survey adopts a stratified sampling design with probability proportional to student size. In this paper, Shanghai students' data are specifically analyzed which are randomly selected based on schools. In total, there are 1916 students, 155 classes and 40 schools all based in Shanghai. The responses are self-reported by students, parents and teachers. We merged relevant data together into one merged dataset

so that we can control for individual/family/class specific fixed effects later.

2.2. Main Variable and of Interest

The main variable we are interested in is the variable'Poor Peer Relationship'. It is difficult to get an objective measure of peer relationship so we adopt a subjective approach. We use the question "are most of my classmates being nice to me? " to indirectly measure this variable. Students who respond strongly/somewhat disagree are labelled with 'poor peer relationship', while students who respond strongly/somewhat agree are not labelled to that. Though there are questions that measure peer relationships more directly, such as 'how many friends do you have, many students tend to give very unrealistic results such as "99/66/88" so we give up using this measure.

2.3. Other Variables of Interest:

Table 1 Definition of Variables

Variables	Definitions
Outcome Variables	
Chinese	Chinese Standardized Test Results
Mathematics	Mathematics Standardized Test Results
English	English Standardized Test Results
Cognitive Ability	Cognitive Test Score
Depression	1 = Depression 0 = Otherwise
Unhappy	1 = Unhappy 0 = Otherwise
Future Confidence	1 = Confident about Future 0 = Otherwise
Poor peer relationship	1 = Unfriendly Classmates 0 = Otherwise
Student Characteristics	
Cognitive Ability	Cognitive Test Result
Male Student	1 = Male 0 = Female
Age	Age of Student(year)
Han Ethnicity	1 = Han Ethinicity 0 = Other Ethnicity
Non-local	1 = Non-local student 0 = local student
Agricultural Hukou	1 = Non-urban Hukou 0 = Urban Hukou
Ranking Below Average	1 = Academic Ranking below average 0 = Otherwise
Attend Class Activities	1 = Frequently attend class activities 0 = Otherwise
Attended Kindergarten	1 = Student attended Kindergarten 0 = Otherwise
Academic Ranking	Ranking in primary school based on grades
Mother's education level	Mother's level of education(years)
Father's education level	Father's level of education(years)
Able to express opinions clearly	1 = Able to express opinions clearly in primary school 0 = Otherwise
Able to respond quickly	1 = Able to respond quickly in primary school 0 = otherwise
Only Child	1 = Only Child 0 = More than one child
Economic Condition: Above Avg.	1 = Above Average Economic Condition 0 = Otherwise
Mental health specific Variables	
Teacher Hate	1 = Usually punished by teacher 0 = Otherwise
Parent High Expectation	1 = Parents expect their child to be top student 0 = Otherwise
Stress of Expectation	1 = Feel stressful about parents' expectation 0 = Otherwise

It is obvious to see that students experiencing poor peer relationship has lower academic results, cognitive ability and worse mental health. However, this tables does not show any causal relation between being 'non-local' and peer relationship. To see whether there are causal effects among them, rigorous regression analysis is required. Also, this table fails to explain what are the key determinants of peer relationship.

3. EMPIRICAL METHOD AND RESULT

3.1. Determinants of Poor Peer Relationship

The first empirical model we will use is:

$$P_{isc} = \alpha + \gamma Nonlocal_{isc} + \delta S^{p}_{isc} + \eta_{sc} + \epsilon^{p}_{isc} \qquad (1)$$

where Pisc represents whether student i from school s and class c holds poor peer relationship. γ is our coefficient of interest which captures the influence of being a non-local student on likelihood of having poor peer relationship. δSpisc is a vector for the student

characteristics and family environment that are particularly relevant to Pisc . Those characteristics include gender, age, academic ranking, family economic condition, ability to express opinions and ability to respond quickly. εpisc controls for class fixed effect which includes class size, peer environment and teachers.

We believe the selection bias is not serious for our analysis since we have controlled individual's baseline academic and non-cognitive outcome related to emotional intelligence.[7] It is unsurprising that being friendly to classmates and active in participating class activities reduce the chance of facing poor peer relationship since they provide more channels of positive peer interaction[8]. The coefficient we are more interested in is the variable 'non-local'. The coefficient is negative and statistically significant with considerable magnitude. These results show that being a non-local student in Shanghai makes students 7 percent more likely to face poor peer relationship. On the other hand, the non-significant negative coefficient of variable 'Able to express opinions clearly' and variable 'Able to respond quickly' does not provide strong empirical evidence for other researchers' outcome that social-intellectual ability will strengthen students' peer relationship[1]. However, our finding does not contradict other researchers' finding and the coefficient of 'Able to express opinions clearly' is statistically significant at 10 percent level. This regression concludes that our finding is at least in line (though it does not strongly support) with what Tinto's theory predicts. What's more, the outcome also provides a positive answer for our first hypothesis - Non-local students are more vulnerable to face poor peer relationship.

Variables	Poor peer relationship
Friendly	-0.135***
	(0.016)
Attend Class Activities	-0.118***
	(0.018)
Male	0.020
	(0.016)
Non-local	0.070***
	(0.018)
Ranking Below Average	0.110***
	(0.018)
Able to express opinions clearly	-0.037
	(0.021)
Able to respond quickly	-0.025
	(0.021)
Economic Condition: Above Average	-0.002
	(0.026)
_cons	0.270***
	(0.024)
N	1799
R^2	0.205

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1 Regression 1

3.2. Effect of Poor Peer Relationship on Academic Results

The second empirical model we will use is:

$$Y_{isc} = \beta + \lambda P_{isc} + \gamma Nonlocal_{isc} + \theta(Nonlocal_{isc} * P_{ics}) + \delta S^{y}_{isc} + \eta_{sc} + \epsilon^{y}_{isc} \quad (2)$$

Yisc is student's i's academic result in core subjects(Chinese, maths and English). Syisc is a vector for the student characteristics and family environment that is particularly relevant to Yisc. Unlike δSpisc, more academic-related variables are included here and they are mostly linked to primary school. As discussed above, we do not add the variable 'ranking below average' into our regressors due to the problem of reverse causality. Instead, we control for academic ranking in primary school since junior high school's test results cannot affect student's ranking in primary school, so as other primary school variables. λ, γ and θ are coefficient of interest. λ captures the effect of 'poor peer relationship' on students' academic performance while γ captures the effect of being a non-local student. More than studying their effects separately, we also introduce the interaction term (Nonlocalisc*Pisc) which enables us to navigate whether non-local student will suffer even more from a worse peer environment. This interaction effect is captured by the coefficient θ. Finally, εyisc controls for class fixed effect.

From regression 2 we can observe that a bad peer environment will reduce student's academic result in all three core subjects with magnitude of 2.211,2.947 and 1.679 respectively. All three coefficient are statistically significant (though the significance level for English test result is weaker). Thus we can conclude that poor peer relationship will hurt student's academic performance[9]. What's more, the negative coefficient of the interaction between 'non-local' and 'poor peer relationship' implies that for non-local students, the detrimental effect of poor peer relationship will be more severe. For instance, the marginal effect of poor peer relationship for non-local students' Chinese test result will be -2.211-2.399*(Nonlocalisc*Pisc). That is, this negative effect on Chinese test results will be more than double for non-local students than for local students. However, although the coefficient of θ is -2.200, the result is not statistically significant. Thus, we do not have strong empirical evidence to conclude non-local students will face more severe negative effect for English study.

	(1)	(2)	(3)
Variables	Chinese	Mathematics	English
Cognitive Ability	1.891***	3.104***	2.193***
	(0.294)	(0.303)	(0.277)
Poor Peer Relationship	-2.211**	-2.947***	-1.679*
	(0.718)	(0.740)	(0.677)
Non-local	0.517	1.293*	0.971
	(0.560)	(0.576)	(0.527)
Non-local*Peer Discrimination	-2.399*	-2.524*	-2.200
	(1.216)	(1.253)	(1.146)
Male	-4.284***	0.586	-3.664***
	(0.405)	(0.416)	(0.381)
Age	-0.419	-0.582	-0.506
	(0.354)	(0.365)	(0.334)
Han ethnicity	1.349	1.306	1.213
	(1.484)	(1.504)	(1.398)
Agricultural Hukou	0.213	-0.443	-0.417
	(0.551)	(0.567)	(0.519)
Attended Kindergarten	0.236	0.767	-0.385
	(0.558)	(0.574)	(0.525)
Academic Ranking in primary school	-0.418***	-0.349***	-0.448***
	(0.021)	(0.021)	(0.020)
Able to express opinions clearly	-0.278	-1.173*	0.184
	(0.554)	(0.570)	(0.521)
Able to respond quickly	-1.169*	-0.822	-1.407*
	(0.595)	(0.613)	(0.560)
Able to learn quickly	0.683	2.197***	1.981***
	(0.579)	(0.597)	(0.546)
Only Child	0.374	-1.143*	-0.691
	(0.543)	(0.559)	(0.512)
Mum's education level	-1.119*	-0.633	-0.381
	(0.493)	(0.508)	(0.464)
Father's education level	0.808	0.571	0.579
	(0.489)	(0.504)	(0.460)
Economic Condition: Above Average	-0.554	-1.121	-0.686
	(0.681)	(0.701)	(0.641)
_cons	82.777***	81.850***	84.771***
	(5.488)	(5.653)	(5.170)
N	1552	1554	1553
R^2	0.411	0.378	0.458

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 2 Regression 2

Comparing those effects to positive effects generated by cognitive ability, we can observe that for Chinese study, poor peer relationship's negative effects even outweigh the unit effects of students' cognitive ability. For Mathematics and English, experiencing tough relationship in class almost cancels out student's marginal effct of cognitive talent. If students are non-local based and hold poor peer relationship, they will still under-perform academically than local students who are able to build a satisfactory bond with their cohort even if they hold higher cognitive ability by one unit.

3.3. Effect of Poor Peer Relationship on Mental Health

The final model we will use to analyze the effect of Pisc on mental health is:

$$H_{isc} = \pi + \mu P_{isc} + \delta S^h_{isc} + \eta_{sc} + \epsilon^h_{isc} \quad (3)$$

The output variable shows whether students are experiencing unhappiness/depression for a specific student i. It also expresses student's confidence about the future. Shisc captures a set of controls which specifically related to student's mental health, such as teachers' altitude, parents' expectation and stress about this expectation. Again, we control for the class fixed effect. μ captures the coefficient of our interest which illustrates how poor relationship will affect students' mental health condition. Again, εhisc captures the class fixed effect.

The regression shows that a bad peer relationship will cause a higher likelihood of feeling unhappy, depressed and reduces the future confidence of the student. However, unlike the previous results, non-local student does not bear additional negative effect when compared to local ones since the coefficient is not statistically significant. After studying the general effect of peer relationship on general student population, we become curious about whether there exists a heterogeneous effect of peer relationship among different groups of students. Gaining insights from other papers in this field, we can do a panel study to see the heterogeneous effect of peer relationship on students based on different Hukou Status and grade.

We observe the heterogeneous effect by creating a new dataset that drops out all observations for non-local==1 and runs the first regression. Then, drop out all observations for non-local==0 from the baseline dataset and get the second regression results. Finally, put two regressions together to compare their differences. We follow the same procedure for grade's heterogeneous effect.

From the table we can see that, surprisingly, local students are experiencing a higher likelihood of facing depression when poor relationship == 1. Local students also perceive a greater decrease in future confidence compared to non-local ones. These differences indicate that poor peer relationship appears to be a more severe mental health problem for local students. On the other side, we could observe that more mature teenagers (in grade 9) bear greater mental health problems when they failed to build a good relationship with other students. This could be explained by that grade 9 students faces greater pressure since they are closer to 'Gaokao' thus friendship is particularly important for them to release pressure. Conversely, poor peer interaction reduces younger teenagers(in grade 7) future confidence while this effect is not statistically significant for grade 9 students.

	(1)	(2)	(3)
Variables	unhappy	dep	fcon
Poor Peer Relationship	0.151***	0.124***	-0.101***
	(0.026)	(0.024)	(0.029)
Non-local	-0.026	-0.002	0.012
	(0.019)	(0.017)	(0.021)
Nonlocal*PoorPeerRelationship	0.047	-0.024	-0.030
	(0.044)	(0.039)	(0.048)
Teacher Hate	0.144***	0.078***	-0.068*
	(0.024)	(0.021)	(0.026)
Parent High Expectation	-0.001	-0.004	0.025
	(0.017)	(0.015)	(0.019)
Stress of Expectation	0.050**	0.042**	-0.122***
	(0.016)	(0.014)	(0.017)
Ranking Below Average	0.031	0.006	-0.173***
	(0.018)	(0.016)	(0.020)
Male Student	0.009	0.008	0.056***
	(0.015)	(0.013)	(0.016)
Age	0.019	0.010	-0.023
	(0.013)	(0.011)	(0.014)
Only Child	-0.003	-0.022	-0.013
	(0.019)	(0.017)	(0.021)
Economic Condition: Above Average	-0.034	-0.033	0.032
	(0.025)	(0.022)	(0.027)
_cons	-0.216	-0.067	1.265***
	(0.180)	(0.162)	(0.199)
N	1803	1803	1811
R^2	0.117	0.081	0.180

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 3 Regression 3

Heterogeneous Effect of Poor Peer Relationship

	(1)	(2)	(3)
Groups	Unhappy	Depression	Future Confidence
Grade 7	0.125***	0.114***	-0.102**
	(0.032)	(0.027)	(0.034)
Grade 9	0.203***	0.143**	-0.100
	(0.046)	(0.045)	(0.052)
Local	0.168***	0.141***	-0.132***
	(0.027)	(0.024)	(0.029)
Non-local	0.179***	0.051	-0.096*
	(0.037)	(0.033)	(0.044)

Figure 4 Heterogrneous Effect of Poor Peer Relationship

4. CONCLUSION

This paper analyzes the impact of peer relationship on academic achievement and mental health of Shanghai students specifically and the main finding is poor peer relationship will hurt students' academic performance and mental health condition. Students tend to perform less will in mathematics and English test if they don't have good peer relationship and they also tend to be more vulnerable to depression and a lack of future confidence. Alongside those findings, we also figure out that non-local students are more likely to experience poor peer relationship and this encourages us to explore whether this effect is heterogeneous among different student groups. We have explored additional detrimental effects on academic performance applied to non-local students, while worse mental health condition problems occur more often for senior and local-based students.

The main limitation of this research is that the data type is cross-sectional so we can't control for time fixed effect which can be implemented by panel data. Thus our results may suffer from non-time varying variables which we can't observe and thus can't be controlled by us. Also, since we use the data from Shanghai specifically, the number of observations tend to be

smaller. This will increase the standard error of our estimates and make our results less significant and representative. This dataset does not provide a concise estimate of students' social-intellectual ability as well which makes our estimates less concise. However, we still get quite significant results for us to draw valid conclusion so this problem is less severe compared to the data type problem.

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