Assignment 6 Packet

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Question 1.a

See Table 1 and Table 2.

Table 1: Descriptive Statistics

	Percentile Score	Free Lunch
K	46.5	0.481
	11.9	0.500
1	46.3	0.516
	17.8	0.500
2	46.8	0.513
	15.4	0.500
3	41.6	0.504
	13.6	0.500

Table 2: Add caption

White/Asian	Age in 1985	Attrition Rate
0.632	5.721	0.483
0.482	0.567	0.500

Question 1.b

See Table 3.

Question 1.c

See Table 4 and Table 5.

Table 3: Comparison Of Mean Characeristics of Treatments And Controls

A. Students who entered STAR in kindergarten

Variable	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.467	0.474	0.499	5870	0.118
White/Asian	0.686	0.679	0.662	5891	0.245
Age in 1985	5.516	5.507	5.512	5887	0.758
Attrition Rate	0.486	0.516	0.529	5894	0.027
Class Size	15.379	22.400	23.204	5894	0.000
percentile Score	47.961	45.912	45.945	5470	0.000

B. Students who entered STAR in first grade

Variable	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.591	0.628	0.616	2094	0.479
White/Asian	0.617	0.557	0.644	2135	0.001
Age in 1985	5.855	5.925	5.950	2127	0.051
Attrition Rate	0.531	0.516	0.471	2159	0.077
Class Size	15.897	22.709	23.423	2159	0.000
percentile Score	44.273	40.320	43.467	2036	0.000

C. Students who entered STAR in second grade

Variable	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.652	0.632	0.647	1467	0.815
White/Asian	0.574	0.576	0.483	1464	0.002
Age in 1985	5.959	5.994	6.018	1542	0.441
Attrition Rate	0.377	0.341	0.350	1549	0.539
Class Size	15.490	23.733	23.653	1549	0.000
percentile Score	44.428	43.339	42.024	1182	0.085

D. Students who entered STAR in Third grade

Variable	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.609	0.650	0.680	1108	0.140
White/Asian	0.663	0.586	0.574	1163	0.028
Age in 1985	6.040	6.000	6.085	1166	0.244
Attrition Rate	0.000	0.000	0.000	13	.
Class Size	15.994	24.031	24.340	1181	0.000
percentile Score	39.357	38.196	36.549	942	0.027

Table 4

	Teacher is White	Teacher is Master	Teacher Experience
K	0.836	0.646	9.25
	0.370	0.478	5.80
1	0.826	0.418	11.61
	0.379	0.493	8.92
2	0.796	0.424	13.17
	0.403	0.494	8.65
3	0.791	0.428	13.95
	0.406	0.495	8.63

Table 5: Comparison Of Mean Characeristics of Teachers

A. Students who entered STAR in kindergarten					
	Small	Regular	Regular/Aide	N	Joint P-Value
Teacher is White	0.859	0.801	0.850	5833	0.000
Teacher is Master	0.318	0.358	0.372	5894	0.002
Teacher Experience	8.9	9.1	9.7	5873.0	0.000
B. Students who entered STAR in first grade					
Teacher is White	0.810	0.779	0.800	2141	0.369
Teacher is Master	0.020	0.000	0.014	2159	0.000
Teacher Experience	13.1	10.0	12.2	2155.0	0.000
C. Students who entered STAR in second grade					
Teacher is White	0.783	0.738	0.711	1549	0.052
Teacher is Master	0.012	0.018	0.017	1549	0.763
Teacher Experience	12.6	12.4	13.4	1526.0	0.139
D. Students who entered STAR in Third grade					
Teacher is White	0.764	0.757	0.716	1180	0.257
Teacher is Master	0.017	0.010	0.029	1181	0.105
Teacher Experience	13.7	13.4	15.9	1181.0	0.000

Question 1.d

See Table 6.

Question 2.a

From Table 6 we can see that under many cases the null hypothesis is rejected, which means that among different class sizes there are characteristic differences that may imply there exists potential sample selection bias.

Question 2.b

See Table 7.

Question 2.c

From Table 7 we can observe that after control the school, the null hypothesis is less likely rejected, which support the argument that the class size selection are randomly assigned within schools.

Question 3.a

See Table 8 and 9.

Question 3.b

From Table 8 and 9 we can see that small class has big and significant improvement on students' test score compared to regular classes. While full job aided classes has a moderate and non-significant effect.

Question 3.c

From Table 8 and 9 we can see that small class has big and significant improvement on students' test score compared to regular classes. While full job aided classes has a moderate and non-significant effect.

Question 3.d

As more covariates are added into the model, we can see a reduction in the level of effects, except the kindergarten case. However, it doesn't drop dramatically as covariates increase and we can see that the results are still significant. Therefore we cannot support selection of observations.

Question 3.e

According to Professor Lindo's lecture, the noisy measure will usually make the estimates be biased towards zero. We call it an attenuation bias.

Table 6: Add caption

A. Students who entered STAR in kindergarten

	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.441	0.449	0.450	16105	0.000
White/Asian	0.710	0.695	0.717	16488	0.227
Age in 1985	5.523	5.514	5.523	16484	0.013
Attrition Rate	0.269	0.336	0.309	16491	0.015
Class Size	15.452	22.797	23.489	16491	0.000
percentile Score	48.943	46.223	46.824	15684	0.019
Teacher is White	0.828	0.828	0.844	16386	0.384
Teacher is Master	0.114	0.141	0.151	16491	0.342
Teacher Experience	11.466	10.808	12.119	16444	0.005

B. Students who entered STAR in first grade

	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.581	0.616	0.592	4479	0.114
White/Asian	0.611	0.581	0.647	4627	0.001
Age in 1985	5.895	5.961	5.983	4617	0.007
Attrition Rate	0.288	0.338	0.288	4651	0.198
Class Size	15.766	23.146	23.777	4651	0.003
percentile Score	42.850	39.977	42.281	4241	0.110
Teacher is White	0.797	0.781	0.819	4633	0.324
Teacher is Master	0.010	0.005	0.019	4651	0.130
Teacher Experience	13.543	11.476	13.488	4642	0.070

C. Students who entered STAR in second grade

	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.635	0.613	0.632	2417	0.132
White/Asian	0.573	0.600	0.482	2459	0.544
Age in 1985	5.996	6.002	6.028	2536	0.897
Attrition Rate	0.222	0.217	0.208	2545	0.881
Class Size	15.513	23.720	23.974	2545	0.027
percentile Score	42.711	41.921	40.015	2063	0.099
Teacher is White	0.752	0.732	0.706	2545	0.382
Teacher is Master	0.009	0.016	0.017	2545	0.290
Teacher Experience	13.075	12.829	14.208	2522	0.212

D. Students who entered STAR in Third grade

	Small	Regular	Regular/Aide	N	Joint P-Value
Free lunch	0.609	0.650	0.680	1108	.
White/Asian	0.663	0.586	0.574	1163	.
Age in 1985	6.040	6.000	6.085	1166	.
Attrition Rate	0.000	0.000	0.000	13	.
Class Size	15.994	24.031	24.340	1181	.
percentile Score	39.357	38.196	36.549	942	.
Teacher is White	0.764	0.7575	0.716	1180	.
Teacher is Master	0.017	0.010	0.029	1181	.
Teacher Experience	13.719	13.381	15.946	1181	.

Table 7: Add caption

A. Students who entered STAR in kindergarten

	Control for School	Small	Regular	Regular/Aide	Joint P-Value
Free lunch	-0.004	0.589	0.592	0.600	0.460
White/Asian	0.007	0.424	0.419	0.427	0.696
Age in 1985	0.000	5.506	5.497	5.505	0.010
Attrition Rate	-0.002	0.365	0.430	0.408	0.020
Class Size	0.007	15.152	22.507	23.184	0.000
percentile Score	0.070	46.047	43.414	43.862	0.011
Teacher is White	0.004	0.669	0.675	0.683	0.440
Teacher is Master	0.001	0.085	0.114	0.122	0.384
Teacher Experience	-0.011	11.942	11.269	12.604	0.012

B. Students who entered STAR in first grade

	Control for School	Small	Regular	Regular/Aide	Joint P-Value
Free lunch	-0.003	0.679	0.716	0.698	0.153
White/Asian	0.007	0.354	0.323	0.371	0.009
Age in 1985	0.000	5.888	5.954	5.976	0.007
Attrition Rate	-0.002	0.356	0.406	0.361	0.211
Class Size	0.006	15.516	22.895	23.509	0.003
percentile Score	0.082	39.663	36.788	38.865	0.120
Teacher is White	0.004	0.648	0.631	0.658	0.462
Teacher is Master	0.000	-0.005	-0.010	0.003	0.133
Teacher Experience	-0.029	14.679	12.618	14.712	0.081

C. Students who entered STAR in second grade

	Control for School	Small	Regular	Regular/Aide	Joint P-Value
Free lunch	-0.005	0.815	0.791	0.803	0.172
White/Asian	0.008	0.270	0.303	0.194	0.359
Age in 1985	-0.002	6.082	6.086	6.111	0.918
Attrition Rate	0.000	0.224	0.219	0.210	0.881
Class Size	0.000	15.520	23.727	23.981	0.027
percentile Score	0.133	37.781	37.101	35.447	0.151
Teacher is White	0.005	0.560	0.542	0.521	0.405
Teacher is Master	0.001	-0.016	-0.008	-0.007	0.248
Teacher Experience	-0.016	13.658	13.404	14.774	0.199

D. Students who entered STAR in Third grade

	Control for School	Small	Regular	Regular/Aide	Joint P-Value
Free lunch	-0.002	0.709	0.742	0.771	.
White/Asian	0.008	0.341	0.292	0.279	.
Age in 1985	-0.001	6.081	6.038	6.123	.
Attrition Rate	0.000	0.000	0.000	0.000	.
Class Size	0.004	15.844	23.893	24.201	.
percentile Score	0.066	36.739	35.786	34.039	.
Teacher is White	0.004	0.579	0.588	0.546	.
Teacher is Master	0.001	-0.022	-0.026	-0.007	.
Teacher Experience	-0.031	15.010	14.562	17.137	.

Table 8: Add caption

	(1)	(2)	(3)	(4)
	A. Kindergarten			
Small class	2.049***	2.032***	2.052***	2.071***
	(5.10)	(5.06)	(5.33)	(5.37)
Regular/Aide class	0.0332	0.0500	0.194	0.109
	(0.09)	(0.13)	(0.53)	(0.29)
School Control		0.0219**	-0.0141	-0.0113
		(3.10)	(-1.95)	(-1.56)
White/Asian			2.245***	2.713***
			(5.81)	(6.51)
Girl			2.194***	2.125***
			(7.10)	(6.88)
Free Lunch			-5.653***	-5.574***
			(-16.38)	(-16.15)
White Teacher				-1.654***
				(-3.44)
Master				-0.650
				(-1.93)
Teacher Experience				0.195***
				(7.06)
_cons	45.91***	45.04***	46.52***	45.97***
	(167.76)	(114.62)	(90.07)	(75.23)
N	5470	5470	5452	5410

	B. First Grade			
	(1)	(2)	(3)	(4)
	percent	percent	percent	percent
Small class	5.838***	5.655***	4.786***	4.625***
	(10.46)	(10.24)	(9.34)	(8.96)
Regular/Aide class	2.369***	1.934***	1.583**	1.411**
	(4.45)	(3.66)	(3.21)	(2.83)
School Control		0.115***	0.0346***	0.0390***
		(11.71)	(3.58)	(3.97)
White/Asian			7.026***	7.133***
			(13.76)	(12.70)
Girl			2.267***	2.284***
			(5.47)	(5.51)
Free Lunch			-10.03***	-10.09***
			(-21.85)	(-21.90)
White Teacher				-0.495
				(-0.78)
Master				-0.579
				(-0.27)
Teacher Experience				0.0659**
				(2.76)
_cons	43.82***	39.31***	42.33***	41.86***
	(119.96)	(74.47)	(62.89)	(50.35)
N	6173	6173	6022	6010

7

t statistics in parentheses
="* p¡0.05   ** p¡0.01   *** p¡0.001"

Table 9: Add caption

	C. Second Grade			
	(1)	(2)	(3)	(4)
	percent	percent	percent	percent
Small class	3.507***	3.328***	2.888***	2.825***
	(6.83)	(6.56)	(6.13)	(5.99)
Regular/Aide class	0.811	0.578	0.841	0.720
	(1.67)	(1.20)	(1.88)	(1.59)
School Control		0.110***	0.0269**	0.0234**
		(12.36)	(3.06)	(2.63)
White/Asian			7.762***	7.290***
			(16.97)	(14.92)
Girl			2.093***	2.129***
			(5.58)	(5.66)
Free Lunch			-7.405***	-7.386***
			(-17.64)	(-17.53)
White Teacher				1.315*
				(2.55)
Master				2.532
				(1.68)
Teacher Experience				0.0377
				(1.70)
_cons	45.52***	41.22***	42.19***	41.11***
	(129.94)	(84.03)	(67.91)	(55.41)
N	5649	5649	5404	5370

	D. Third Grade			
	(1)	(2)	(3)	(4)
Small class	2.579***	2.443***	2.016***	1.986***
	(5.66)	(5.42)	(4.72)	(4.64)
Regular/Aide class	-0.189	-0.374	-0.171	-0.241
	(-0.43)	(-0.86)	(-0.41)	(-0.58)
School Control		0.0878***	0.0311***	0.0311***
		(11.30)	(3.93)	(3.88)
White/Asian			4.830***	4.421***
			(11.46)	(9.38)
Girl			1.596***	1.562***
			(4.74)	(4.64)
Free Lunch			-6.806***	-6.794***
			(-18.17)	(-18.08)
White Teacher				1.144*
				(2.34)
Master				1.557
				(1.16)
Teacher Experience				0.0443*
				(2.21)
_cons	40.86***	37.37***	39.05***	37.80***
	(124.46)	(83.43)	(68.24)	(52.49)
N	5638	5638	5468	5455

8

t statistics in parentheses
="* p¡0.05   ** p¡0.01   *** p¡0.001"

Question 4.a

From Table 10 we can see that the initial class type and current class type are highly correlated.

Table 10: Add caption

	(1)	(2)	(3)	(4)
			Class Type	
Initial Class	0.736***	0.737***	0.740***	0.739***
	(134.50)	(134.75)	(134.41)	(133.95)
Control of School		0.00113***	0.000893***	0.000968***
		(5.92)	(4.34)	(4.68)
White/Asia			0.0295**	0.0236
			(2.58)	(1.89)
Girl			-0.00443	-0.00423
			(-0.50)	(-0.47)
Free Lunch			0.0284**	0.0283**
			(2.86)	(2.84)
White Teacher				-0.000874
				(-0.06)
Master				0.0696***
				(5.33)
Teacher Experience				0.00328***
				(5.77)
_cons	0.493***	0.444***	0.415***	0.373***
	(41.06)	(30.53)	(23.18)	(18.10)
N	16491	16491	16104	16026

t statistics in parentheses
="* p¡0.05   ** p¡0.01   *** p¡0.001"

Question 4.c

From Table 11 and 12 we can see that the after adopting a 2 stage least square method to rule out potential endogenous problems, we still can see a significant effect of class size on students' scores. This makes us more optimistic about our conclusion.

Question 4.d

"To interpret this model as yielding the causal effect of current class size on achievement, it is necessary to assume that initial class assignment only affects

Table 11: Add caption

	Percentile Score			
	(1)	(2)	(3)	(4)

A. Students who entered STAR in kindergarten

	(1)	(2)	(3)	(4)
Class Size	-0.444***	-0.432***	-0.388***	-0.384***
	(-13.94)	(-13.69)	(-13.00)	(-12.87)
Control of School		0.0865***	0.0204***	0.0203***
		(20.04)	(4.71)	(4.65)
White/Asian			5.448***	5.308***
			(23.69)	(21.17)
Girl			2.044***	2.045***
			(11.02)	(10.99)
Free Lunch			-7.510***	-7.519***
			(-36.35)	(-36.27)
White Teacher				0.321
				(1.18)
Master				0.534
				(1.69)
Teacher Experience				0.0271*
				(2.40)
_cons	54.63***	50.87***	51.71***	51.11***
	(81.04)	(74.25)	(75.74)	(71.39)
N	22930	22930	22346	22245

	(1)	(2)	(3)	(4)

B. Students who entered STAR in first grade

	(1)	(2)	(3)	(4)
Class Size	-0.444***	-0.432***	-0.388***	-0.384***
	(-13.94)	(-13.69)	(-13.00)	(-12.87)
Control of School		0.0865***	0.0204***	0.0203***
		(20.04)	(4.71)	(4.65)
White/Asian			5.448***	5.308***
			(23.69)	(21.17)
Girl			2.044***	2.045***
			(11.02)	(10.99)
Free Lunch			-7.510***	-7.519***
			(-36.35)	(-36.27)
White Teacher				0.321
				(1.18)
Master				0.534
				(1.69)
Teacher Experience				0.0271*
				(2.40)
_cons	54.63***10	50.87***	51.71***	51.11***
	(81.04)	(74.25)	(75.74)	(71.39)
N	22930	22930	22346	22245

t statistics in parentheses
=”* p¡0.05   ** p¡0.01   *** p¡0.001”

Table 12: Add caption

	(1)	(2)	(3)	(4)
C.Students who entered STAR in second grade				
Class Size	-0.444***	-0.432***	-0.388***	-0.384***
	(-13.94)	(-13.69)	(-13.00)	(-12.87)
Control of School		0.0865***	0.0204***	0.0203***
		(20.04)	(4.71)	(4.65)
White/Asian			5.448***	5.308***
			(23.69)	(21.17)
Girl			2.044***	2.045***
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Free Lunch			-7.510***	-7.519***
			(-36.35)	(-36.27)
White Teacher				0.321
				(1.18)
Master				0.534
				(1.69)
Teacher Experience				0.0271*
				(2.40)
_cons	54.63***	50.87***	51.71***	51.11***
	(81.04)	(74.25)	(75.74)	(71.39)
N	22930	22930	22346	22245
	(1)	(2)	(3)	(4)
D. Students who entered STAR in Third grade				
Class Size	-0.444***	-0.432***	-0.388***	-0.384***
	(-13.94)	(-13.69)	(-13.00)	(-12.87)
Control of School		0.0865***	0.0204***	0.0203***
		(20.04)	(4.71)	(4.65)
White/Asian			5.448***	5.308***
			(23.69)	(21.17)
Girl			2.044***	2.045***
			(11.02)	(10.99)
Free Lunch			-7.510***	-7.519***
			(-36.35)	(-36.27)
White Teacher				0.321
				(1.18)
Master				0.534
				(1.69)
Teacher Experience				0.0271*
				(2.40)
_cons	54.63***	50.87***	51.71***	51.11***
	(81.04)	(74.25)	(75.74)	(71.39)
N	22930	22930	22346	22245

t statistics in parentheses
="* p¡0.05   ** p¡0.01   *** p¡0.001"

current test scores by affecting current class size. If previous class sizes affect current performance,initial assignment will be correlated with the error term in" the instrumental variable equation.