

```

.
. // *****
. // LP0.8852 In-class exercise solutions
. // Last updated: September 15, 2021
. // *****
.
. // Lalonde (1986) NSW experiment data -- add nonexperimental control group
. // from CPS and PSID and use matching estimators for comparison.
.
. // original source of data: http://users.nber.org/~rdehejia/data/nswdata2.html
.
. // *****
. // Question 1
. // *****
. // Begin with the Lalonde NSW data, estimate treatment effect from the RCT,
. // and examine balance in pre-treatment covariates. The treatment effect is
. // about $1800 and there are no statistically significant differences in the
. // covariates.
.
. use https://github.com/spcorcor18/LP0-8852/raw/main/data/nsw_dw.dta, clear
. tabulate treat

```

treat	Freq.	Percent	Cum.
0	260	58.43	58.43
1	185	41.57	100.00
Total	445	100.00	

```

. reg re78 treat

```

Source	SS	df	MS	Number of obs =	445
Model	348013183	1	348013183	F(1, 443) =	8.04
Residual	1.9178e+10	443	43290369.3	Prob > F =	0.0048
Total	1.9526e+10	444	43976681.9	R-squared =	0.0178
				Adj R-squared =	0.0156
				Root MSE =	6579.5

```

.

```

re78	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
treat	1794.342	632.8534	2.84	0.005	550.5745 3038.11
_cons	4554.801	408.0459	11.16	0.000	3752.855 5356.747

```

. ttest re78, by(treat)
Two-sample t test with equal variances

```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]
0	260	4554.801	340.0931	5483.836	3885.102 5224.501
1	185	6349.144	578.4229	7867.402	5207.949 7490.338
combined	445	5300.764	314.3629	6631.492	4682.94 5918.588
diff		-1794.342	632.8534		-3038.11 -550.5745

```

. diff = mean(0) - mean(1)
. t = -2.8353
Ho: diff = 0
Ha: diff < 0
Pr(T < t) = 0.0024
Ha: diff != 0
Pr(|T| > |t|) = 0.0048
Ha: diff > 0
Pr(T > t) = 0.9976
.

```

```
. foreach j in re74 re75 educ age black {
  2.   display in red "Variable: 'j'"
  3.   ttest 'j', by(treat)
  4. }
```

Variable: re74

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	260	2107.027	352.7489	5687.906	1412.406	2801.648
1	185	2095.574	359.2715	4886.62	1386.752	2804.395
combined	445	2102.265	254.2582	5363.582	1602.566	2601.964
diff		11.45296	516.478		-1003.598	1026.504

```
diff = mean(0) - mean(1)                                t = 0.0222
Ho: diff = 0                                           degrees of freedom = 443
Ha: diff < 0                                Ha: diff != 0                                Ha: diff > 0
Pr(T < t) = 0.5088                Pr(|T| > |t|) = 0.9823                Pr(T > t) = 0.4912
```

Variable: re75

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	260	1266.909	192.4388	3102.982	887.9652	1645.853
1	185	1532.055	236.684	3219.251	1065.092	1999.019
combined	445	1377.138	149.3699	3150.961	1083.579	1670.698
diff		-265.1463	303.1555		-860.9479	330.6553

```
diff = mean(0) - mean(1)                                t = -0.8746
Ho: diff = 0                                           degrees of freedom = 443
Ha: diff < 0                                Ha: diff != 0                                Ha: diff > 0
Pr(T < t) = 0.1911                Pr(|T| > |t|) = 0.3823                Pr(T > t) = 0.8089
```

Variable: educ

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	260	10.08846	.1001162	1.614325	9.891316	10.28561
1	185	10.34595	.1478259	2.01065	10.05429	10.6376
combined	445	10.19551	.0849546	1.792119	10.02854	10.36247
diff		-.2574844	.1721353		-.5957877	.0808189

```
diff = mean(0) - mean(1)                                t = -1.4958
Ho: diff = 0                                           degrees of freedom = 443
Ha: diff < 0                                Ha: diff != 0                                Ha: diff > 0
Pr(T < t) = 0.0677                Pr(|T| > |t|) = 0.1354                Pr(T > t) = 0.9323
```

Variable: age

Two-sample t test with equal variances

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	260	25.05385	.4377027	7.057745	24.19194	25.91576
1	185	25.81622	.5260475	7.155019	24.77836	26.85408

```

-----
diff = mean(0) - mean(1)                                t = -1.1166
Ho: diff = 0                                           degrees of freedom = 443
Ha: diff < 0                                Ha: diff != 0                Ha: diff > 0
Pr(T < t) = 0.1324                Pr(|T| > |t|) = 0.2648                Pr(T > t) = 0.8676
Variable: black
Two-sample t test with equal variances

```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]	
0	260	.8269231	.0235073	.3790434	.7806334	.8732128
1	185	.8432432	.0268028	.3645579	.7903629	.8961236
combined	445	.8337079	.0176706	.3727617	.7989795	.8684363
diff		-.0163202	.0358862		-.0868484	.0542081

```

-----
diff = mean(0) - mean(1)                                t = -0.4548
Ho: diff = 0                                           degrees of freedom = 443
Ha: diff < 0                                Ha: diff != 0                Ha: diff > 0
Pr(T < t) = 0.3247                Pr(|T| > |t|) = 0.6495                Pr(T > t) = 0.6753

```

```

.
.
. // *****
. // Question 2-3
. // *****
. // Append CPS and PSID data to NSW
. // sort order can matter so set seed and sort by a random number
.
. set seed 1234
. use https://github.com/spcorcor18/LP0-8852/raw/main/data/nsw_dw.dta, clear
.
. //keep only treated cases for matching
. drop if treat==0
(260 observations deleted)
.
. //append CPS and PSID data
. append using https://github.com/spcorcor18/LP0-8852/raw/main/data/cps_controls.dta
. append using https://github.com/spcorcor18/LP0-8852/raw/main/data/psid_controls.dta
. gen randno=runiform()
. sort randno
.
. // There are NO missing values. As shown below, approximately 1% of the individuals
. // in this new dataset received the job training.
. nmissing
. tabulate treat

```

treat	Freq.	Percent	Cum.
0	18,482	99.01	99.01
1	185	0.99	100.00
Total	18,667	100.00	

```

-----
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. // *****
. // Question 4
. // *****
. // OLS estimation of treatment effect. From a simple regression the estimated
. // treatment effect is -$9401. With controls, the estimate is a statisically

```

. // insignificant \$694.

.

. reg re78 treat

Source	SS	df	MS	Number of obs	=	18,667
				F(1, 18665)	=	137.41
Model	1.6189e+10	1	1.6189e+10	Prob > F	=	0.0000
Residual	2.1989e+12	18,665	117808350	R-squared	=	0.0073
				Adj R-squared	=	0.0073
Total	2.2151e+12	18,666	118669314	Root MSE	=	10854

re78	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
treat	-9401.156	801.9826	-11.72	0.000	-10973.12 -7829.198
_cons	15750.3	79.83872	197.28	0.000	15593.81 15906.79

. reg re78 treat age educ re74 re75 black hispanic

Source	SS	df	MS	Number of obs	=	18,667
				F(7, 18659)	=	2827.20
Model	1.1401e+12	7	1.6288e+11	Prob > F	=	0.0000
Residual	1.0749e+12	18,659	57610259.8	R-squared	=	0.5147
				Adj R-squared	=	0.5145
Total	2.2151e+12	18,666	118669314	Root MSE	=	7590.1

re78	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
treat	694.4718	581.5147	1.19	0.232	-445.3499 1834.294
age	-107.7605	5.583006	-19.30	0.000	-118.7037 -96.81731
education	174.0493	20.41862	8.52	0.000	134.027 214.0717
re74	.2973522	.0110596	26.89	0.000	.2756744 .31903
re75	.5122447	.0110987	46.15	0.000	.4904903 .5339991
black	-375.6897	190.5701	-1.97	0.049	-749.2245 -2.154943
hispanic	-36.19585	228.2196	-0.16	0.874	-483.5272 411.1355
_cons	5546.975	328.007	16.91	0.000	4904.051 6189.898

.

.

. // *****

. // Question 5

. // *****

. // Nearest neighbor matching based on covariates. The ATT estimate is \$1183,
. // though statistically insignificant. The six covariates are reasonably well
. // balanced.

.

. teffects nnmatch (re78 age educ re74 re75 black hispanic) (treat) , ematch(black hispani
> c) atet

Treatment-effects estimation	Number of obs	=	18,667
Estimator : nearest-neighbor matching	Matches: requested	=	1
Outcome model : matching	min	=	1
Distance metric: Mahalanobis	max	=	11

re78	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
ATET					
treat					
(1 vs 0)	1183.108	799.5484	1.48	0.139	-383.9781 2750.194

```
. tebalance summarize
note: refitting the model using the generate() option
```

Covariate balance summary

	Raw	Matched
Number of obs =	18,667	370
Treated obs =	185	185
Control obs =	18,482	185

	Standardized differences		Variance ratio	
	Raw	Matched	Raw	Matched
age	-.8231627	-.00746	.4246761	.9514048
education	-.678676	-.0299704	.4805954	1.055727
re74	-1.564616	-.0438096	.2234521	.8173661
re75	-1.708969	-.0568394	.100935	.8075727
black	2.244677	0	1.511774	1
hispanic	-.0298023	0	.9030251	1

```
.
.
. // *****
. // Question 6
. // *****
. // Estimate propensity score model using psmatch2
. // (a) There are 185 treated observations (_treat==1)
. // (b) See results below. There are 141 matched untreated cases: the number of
. // cases where treat==0 and the _weight is non-missing. 29 untreated cases
. // were used more than once (_weight ranging from 2-5)
. // (c) Stata shows ALL observations on the support _support==1. This is somewhat
. // misleading since the distributions of propensity scores (below) do not
. // suggest high overlap between the treated and untreated cases.
. // In practice, the value of this variable depends on the size of the
. // caliper you set. If you don't set a caliper, then all untreated
. // observations qualify for the common support.
```

```
. *ssc install psmatch2, replace
```

```
. psmatch2 treat age educ black hispanic re74 re75
```

```
Probit regression      Number of obs      =      18,667
                       LR chi2(6)          =      961.39
                       Prob > chi2         =      0.0000
Log likelihood = -557.00449      Pseudo R2      =      0.4632
```

treat	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
age	-.0214808	.0042631	-5.04	0.000	-.0298363	-.0131253
education	-.0389598	.0153021	-2.55	0.011	-.0689513	-.0089683
black	1.805159	.099743	18.10	0.000	1.609666	2.000652
hispanic	.7002437	.1553272	4.51	0.000	.3958079	1.00468
re74	-.000029	.0000112	-2.60	0.009	-.0000509	-7.12e-06
re75	-.0000963	.0000141	-6.82	0.000	-.000124	-.0000686
_cons	-1.440575	.2284972	-6.30	0.000	-1.888421	-.9927291

Note: 1741 failures and 0 successes completely determined.

```
. summ _*
      Variable |      Obs      Mean    Std. Dev.      Min      Max
-----+-----
```

_pscore	18,667	.0098904	.0417357	5.3e-107	.4140345
_treated	18,667	.0099105	.0990598	0	1
_support	18,667	1	0	1	1
_weight	326	1.134969	.5024903	1	5
_id	18,667	9334	5388.843	1	18667

```
-----+-----
      _n1 |      185    17878.88    1116.577    11502    18481
      _nn |    18,667    .0099105    .0990598      0      1
      _pdif |      185    .0002539    .0006262      0    .0075836
```

```
. summ age-re75 if treat==1
```

```
      Variable |      Obs      Mean    Std. Dev.      Min      Max
-----+-----
```

age	185	25.81622	7.155019	17	48
education	185	10.34595	2.01065	4	16
black	185	.8432432	.3645579	0	1
hispanic	185	.0594595	.2371244	0	1
married	185	.1891892	.3927217	0	1

```
-----+-----
      nodegree |      185    .7081081    .4558666      0      1
      re74 |      185    2095.574    4886.62      0    35040.07
      re75 |      185    1532.055    3219.251      0    25142.24
```

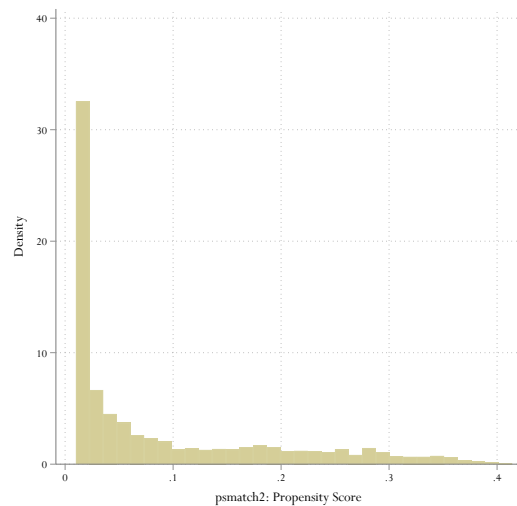
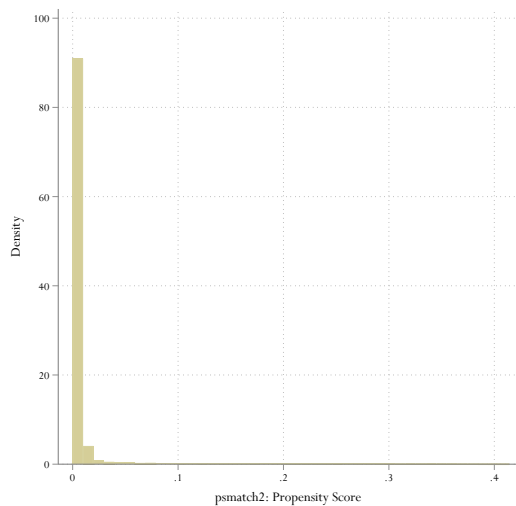
```
. table treat _weight, row col
```

```
-----+-----
      |      psmatch2: weight of matched controls
      treat |      1      2      3      4      5      Total
-----+-----
```

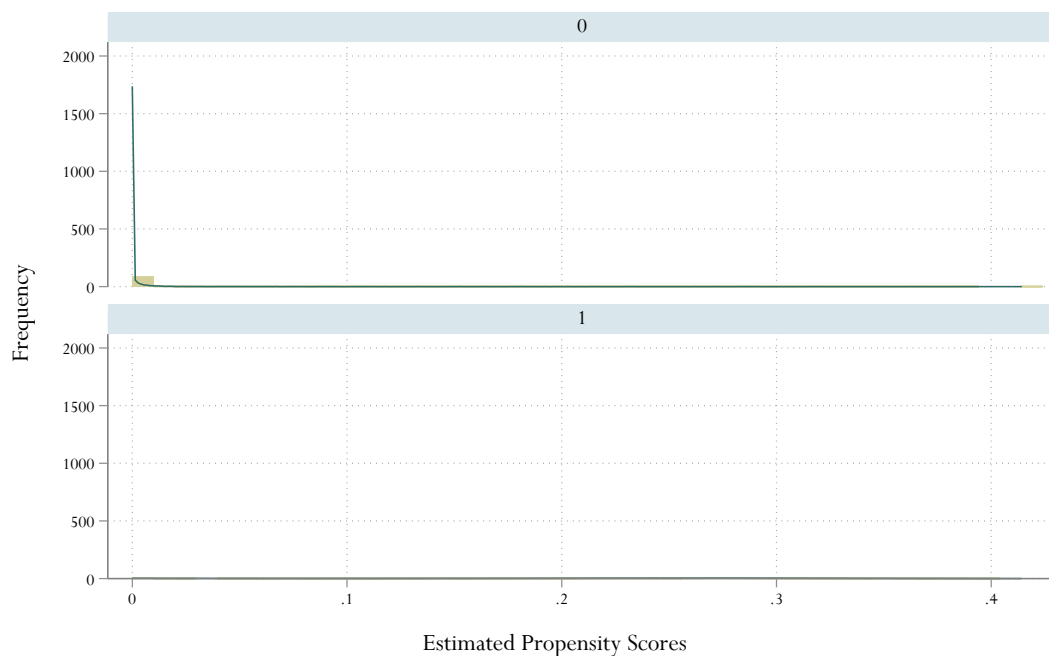
0	112	19	7	1	2	141
1	185					185
Total	297	19	7	1	2	326

```
.
.
. // *****
. // Question 7
. // *****
. // Distribution of propensity scores
. // The histograms are shown below. The one on the right is restricted to
. // observations with propensity scores >0.01. This is a large dataset with lots
. // of untreated observations with very low propensities for treatment (participating
. // in a job training program). As such, the histogram on the left is dominated
. // by these low-propensity cases.
```

```
.
. histogram _pscore , name(pscore1, replace) nodraw
(bin=42, start=5.25e-107, width=.00985796)
. histogram _pscore if _pscore>0.01, name(pscore2, replace) nodraw
(bin=32, start=.01000149, width=.01262603)
. graph combine pscore1 pscore2, ysize(4) xsize(8) name(q7, replace)
. graph export q7.pdf, name(q7) as(pdf) replace
(file q7.pdf written in PDF format)
```



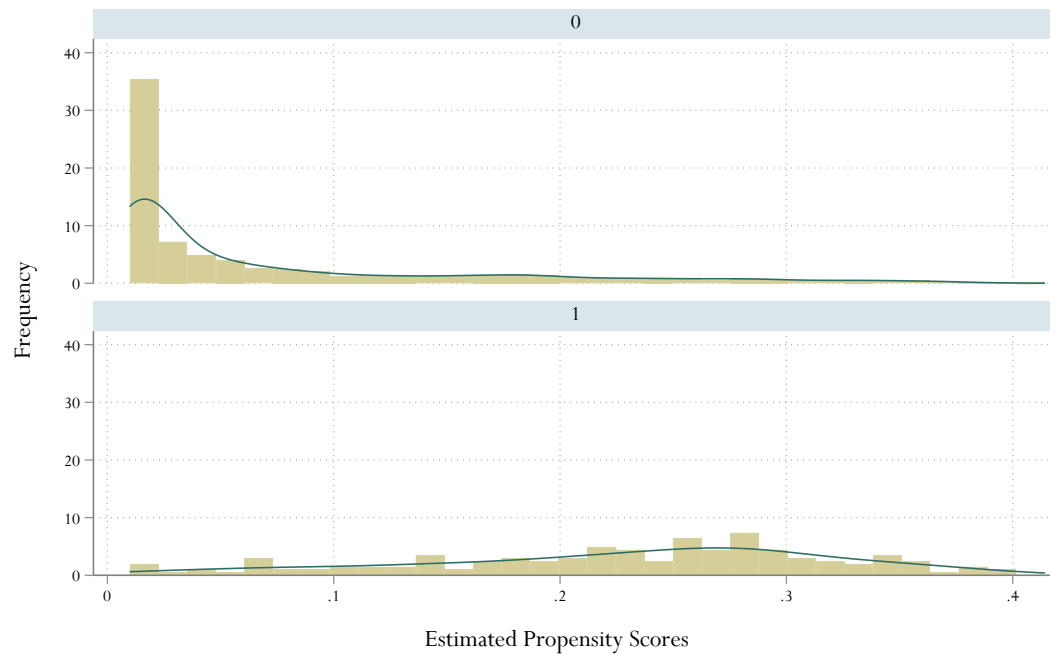
```
.
.
. // *****
. // Question 8
. // *****
. // Distribution of propensity scores--separately for treated and untreated.
. // Two versions are shown below: (1) overlapping histograms for the full sample,
. // and (2) overlapping histograms for the matched sample. In both cases it is
. // apparent that there is sufficient common support in the matched sample.
.
. histogram _pscore, kdensity kdenopts(gaussian) by(treat, cols(1) legend(off)) ///
> ytitle(Frequency) xtitle(Estimated Propensity Scores) name(q8a, replace)
. graph export q8a.pdf, name(q8a) as(pdf) replace
(file q8a.pdf written in PDF format)
```



Graphs by treat

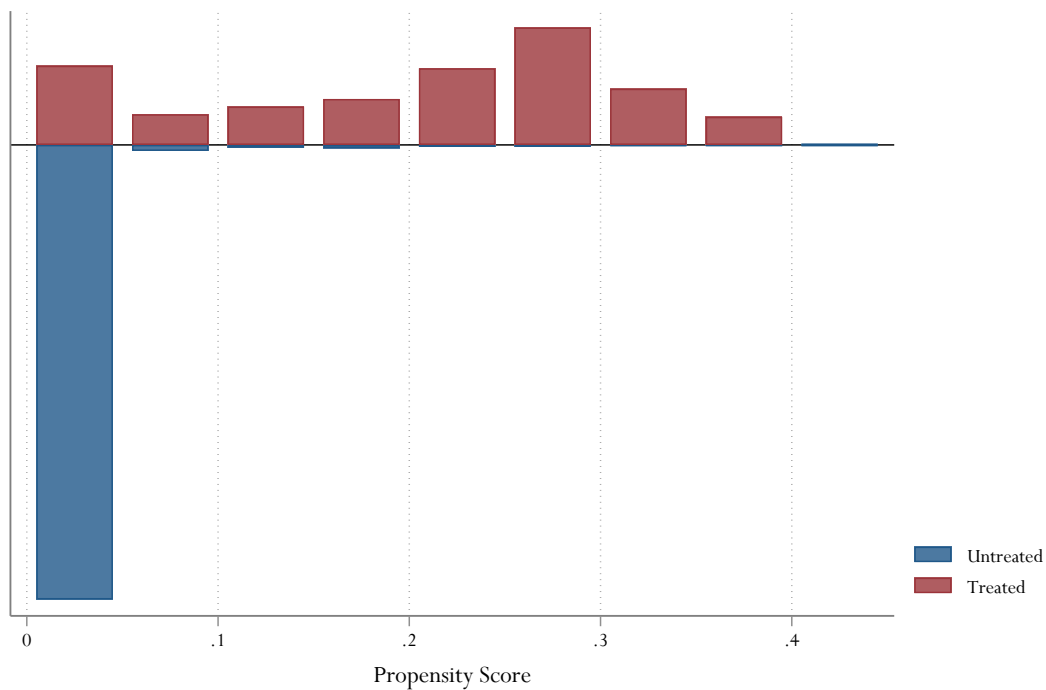
```
.
. histogram _pscore if _pscore>0.01, kdensity kdenopts(gaussian) by(treat, cols(1) legend(
> off)) /// ytitle(Frequency) xtitle(Estimated Propensity Scores) name(q8b, replace
> )
```

```
. graph export q8b.pdf, name(q8b) as(pdf) replace
(file q8b.pdf written in PDF format)
```



Graphs by treat

```
.
. psgraph
. graph export q8c.pdf, as(pdf) replace
(file q8c.pdf written in PDF format)
```



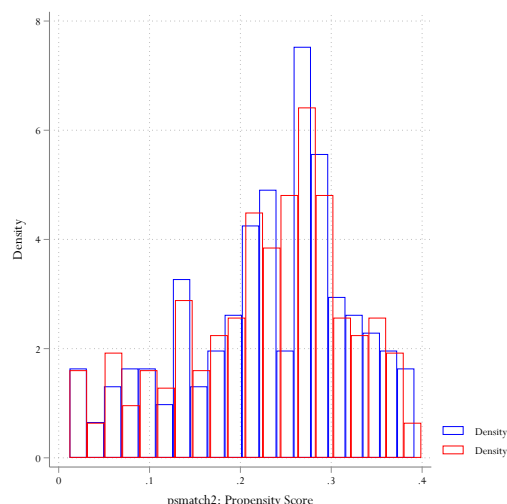
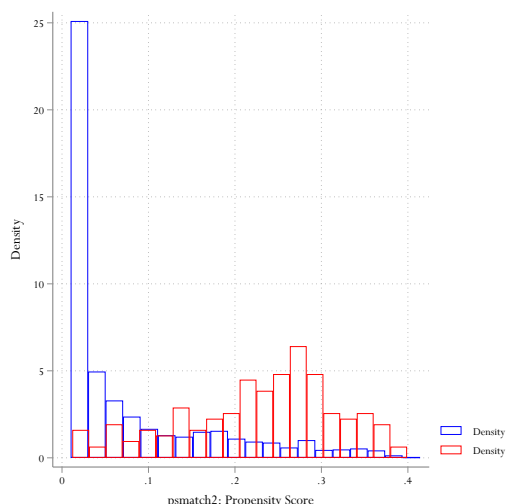
```
.
. // all cases with _pscore>0.01 (omit those on common support but very tiny p-score)
. twoway (histogram _pscore if treat==0 & _pscore>0.01, /// bin(20) fcolor(none) lcolor(
> blue)) (histogram _pscore if treat==1 & _pscore>0.01, /// bin(20) fcolor(none) lcolor(
> red)), name(pscore3, replace) nodraw
.
```



```

. // matched sample
. twoway (histogram _pscore if treat==0 & _pscore>0.01 [fweight = _weight], /// bin(20)
> fcolor(none) lcolor(blue)) (histogram _pscore if treat==1 & _pscore>0.01, /// bin(20)
> fcolor(none) lcolor(red)), name(pscore4, replace) nodraw
.
. graph combine pscore3 pscore4, ysize(4) xsize(8) name(q8d, replace)
. graph export q8d.pdf, name(q8d) as(pdf) replace
(file q8d.pdf written in PDF format)

```



```

.
. // only uses nonmissing weights (185 + 185)
. tabulate treat [fweight=_weight]

```

treat	Freq.	Percent	Cum.
0	185	50.00	50.00
1	185	50.00	100.00
Total	370	100.00	

```

.
.
. // *****
. // Question 9
. // *****
. // Use pstest to check balance on covariates.
. // Results below. Note "% bias" is a standardized measure of the difference in
. // treated and control means. (The difference in the sample means as a percentage
. // of the square root of the average of the sample variances in the two groups).
. // The education variable has the largest % bias, and the variance of re74t is
. // nearly twice as large in the treatment group. One might be able to obtain better
. // balance through different specifications of the propensity score model.
.

```

```
. pstest age educ black hispanic re74 re75
```

Variable	Mean			t-test			V(T)/ V(C)
	Treated	Control	%bias	t	p> t		
age	25.816	24.989	8.9	0.95	0.342		0.58*
education	10.346	10.811	-18.6	-1.95	0.053		0.62*
black	.84324	.84865	-1.6	-0.14	0.886		.
hispanic	.05946	.03784	8.9	0.97	0.335		.
re74	2095.6	1748.8	4.3	0.79	0.433		1.96*
re75	1532.1	1577.8	-0.6	-0.14	0.891		1.03

```
* if variance ratio outside [0.75; 1.34]
```

Ps	R2	LR	chi2	p>chi2	MeanBias	MedBias	B	R	%Var
0.013		6.66	0.354		7.2	6.6	27.0*	0.69	75

```
* if B>25%, R outside [0.5; 2]
```

```
. // note: J Hill has ado file called psbal2 that tests balance
```

```
. // looking at %bias measure
```

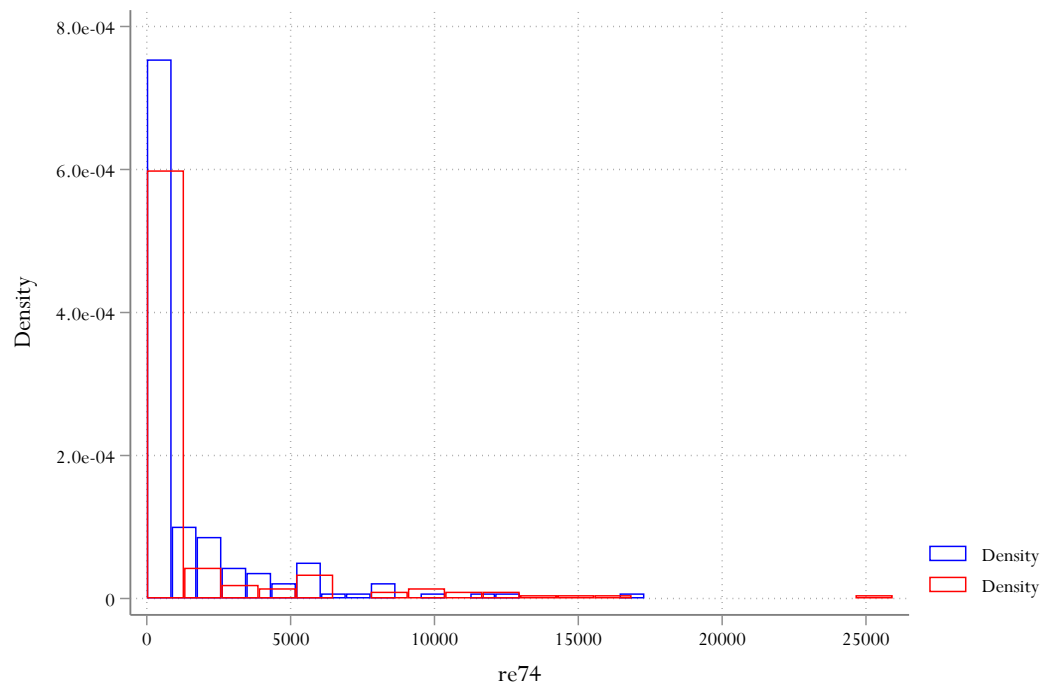
```
. tabstat age [aweight=_weight], by(treat) stat(n mean sd var)
```

```
Summary for variables: age
```

```
by categories of: treat
```

treat	N	mean	sd	variance
0	141	24.98919	9.426982	88.86799
1	185	25.81622	7.155019	51.1943
Total	326	25.4027	8.364404	69.96325

```
.
. twoway (histogram re74 if treat==0 & _pscore>0.01 [fweight = _weight], /// bin(20) fco
> lor(none) lcolor(blue)) (histogram re74 if treat==1 & _pscore>0.01, /// bin(20) fcolor
> (none) lcolor(red)), name(q9, replace)
. graph export q9.pdf, name(q9) as(pdf) replace
(file q9.pdf written in PDF format)
```



```

.
.
. // *****
. // Question 10
. // *****
. // Request ATT
. // Results shown below. We estimate a $1,001 average treatment effect on the
. // treated, based on nearest neighbor matching. The estimate is statistically
. // insignificant
.

```

```
. psmatch2 treat age educ black hispanic re74 re75, outcome(re78)
Probit regression                                Number of obs   =    18,667
                                                LR chi2(6)         =    961.39
                                                Prob > chi2        =    0.0000
Log likelihood = -557.00449                    Pseudo R2         =    0.4632
```

treat	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
age	-.0214808	.0042631	-5.04	0.000	-.0298363	-.0131253
education	-.0389598	.0153021	-2.55	0.011	-.0689513	-.0089683
black	1.805159	.099743	18.10	0.000	1.609666	2.000652
hispanic	.7002437	.1553272	4.51	0.000	.3958079	1.00468
re74	-.000029	.0000112	-2.60	0.009	-.0000509	-7.12e-06
re75	-.0000963	.0000141	-6.82	0.000	-.000124	-.0000686
_cons	-1.440575	.2284972	-6.30	0.000	-1.888421	-.9927291

Note: 1741 failures and 0 successes completely determined.

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
re78	Unmatched	6349.1435	15750.3	-9401.15648	801.982612	-11.72
	ATT	6349.1435	5348.17206	1000.97144	843.589786	1.19

Note: S.E. does not take into account that the propensity score is estimated.

```
| psmatch2:
psmatch2: | Common
Treatment | support
assignment | On suppor | Total
```

Untreated	18,482	18,482
Treated	185	185
Total	18,667	18,667

```
.
. // NOTE the sort order of data can affect results when using NN matching on
. // a pscore estimated with categorical variables (or when there are untreated
. // with identical propensity scores).
```

```
.
. // *****
. // Question 11
. // *****
. // Regression of re78 on treatment for the matched sample; use _weight
. // notice same estimate here as (10), though se is different
.
```

```
. regress re78 treat [pw=_weight]
```

```
(sum of wgt is 370)
```

```
Linear regression
```

```
Number of obs      =      326
F(1, 324)           =      1.50
Prob > F            =      0.2220
R-squared           =      0.0049
Root MSE           =     7118.3
```

```
-----+-----
            |               Robust
            |               Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
    treat |      1000.971   818.1017     1.22   0.222   -608.4904   2610.433
    _cons |      5348.172   578.3352     9.25   0.000   4210.406   6485.938
-----+-----
```

```
.
.
. // *****
. // Question 12
. // *****
. // additional adjustment with covariates/
. // Results below. The estimated treatment effect of 694 is smaller than that in
. // (7) and (8). This is not surprising, since without the weights the full sample
. // is used and the implicit comparison group is different.
```

```
. regress re78 treat age educ black hisp re74 re75 [pw=_weight]
```

```
(sum of wgt is 370)
```

```
Linear regression
```

```
Number of obs      =      326
F(7, 318)          =      3.01
Prob > F            =      0.0045
R-squared           =      0.0540
Root MSE           =     7005.7
```

```
-----+-----
            |               Robust
            |               Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----
    treat |      1125.901   816.2738     1.38   0.169   -480.0786   2731.881
      age |     -14.74167   43.68931    -0.34   0.736   -100.6983    71.21496
education |      382.5702   164.7606     2.32   0.021    58.41162   706.7287
   black |      912.4068   954.7889     0.96   0.340   -966.0945   2790.908
hispanic |      2428.593   1800.801     1.35   0.178   -1114.395   5971.582
    re74 |       .0910807   .1860516     0.49   0.625   -.2749669   .4571284
    re75 |       .3072306   .1693179     1.81   0.071   -.0258941   .6403553
    _cons |       70.42204   2619.099     0.03   0.979   -5082.529   5223.373
-----+-----
```

```
.
.
. // *****
. // Question 13
. // *****
. // bootstrap standard errors
.
. bootstrap att=r(att), rep(1000): psmatch2 treat age educ black hispanic re74 re75, outco
> me(re78)
```

```
(running psmatch2 on estimation sample)
```

```
Bootstrap replications (1000)
```

```
-----+----- 1 -----+----- 2 -----+----- 3 -----+----- 4 -----+----- 5
..... 50
..... 100
..... 150
```

```

..... 200
..... 250
..... 300
..... 350
..... 400
..... 450
..... 500
..... 550
..... 600
..... 650
..... 700
..... 750
..... 800
..... 850
..... 900
..... 950
..... 1000

```

```

Bootstrap results      Number of obs      =      18,667
                        Replications        =       1,000

```

```

command:  psmatch2 treat age educ black hispanic re74 re75,
           outcome(re78)

```

```

att:  r(att)

```

	Observed	Bootstrap			Normal-based	
	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
att	1000.971	951.4764	1.05	0.293	-863.8881	2865.831

```

.
.
. // *****
. // Question 14
. // *****
. // try 5 nearest neighbors
.

```

```
. psmatch2 treat age educ black hisp re74 re75, outcome(re78) neighbor(5)
Probit regression
Number of obs      =      18,667
LR chi2(6)         =      961.39
Prob > chi2        =      0.0000
Pseudo R2         =      0.4632
Log likelihood = -557.00449
```

treat	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
age	-.0214808	.0042631	-5.04	0.000	-.0298363	-.0131253
education	-.0389598	.0153021	-2.55	0.011	-.0689513	-.0089683
black	1.805159	.099743	18.10	0.000	1.609666	2.000652
hispanic	.7002437	.1553272	4.51	0.000	.3958079	1.00468
re74	-.000029	.0000112	-2.60	0.009	-.0000509	-7.12e-06
re75	-.0000963	.0000141	-6.82	0.000	-.000124	-.0000686
_cons	-1.440575	.2284972	-6.30	0.000	-1.888421	-.9927291

Note: 1741 failures and 0 successes completely determined.

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
re78	Unmatched	6349.1435	15750.3	-9401.15648	801.982612	-11.72
	ATT	6349.1435	5231.44282	1117.70068	700.8897	1.59

Note: S.E. does not take into account that the propensity score is estimated.

```
| psmatch2:
psmatch2: | Common
Treatment | support
assignment | On suppor | Total
```

Untreated	18,482	18,482
Treated	185	185
Total	18,667	18,667

```
.
.
. // *****
. // Question 15
. // *****
. // teffects for comparison (note different number of nearest neighbors)
.
. teffects psmatch (re78) (treat age educ black hispanic re74 re75, probit), atet gen(mvar
> )
```

```
Treatment-effects estimation      Number of obs      =      18,667
Estimator      : propensity-score matching      Matches: requested =      1
Outcome model  : matching                      min =      1
Treatment model: probit                      max =      11
```

re78	Coef.	AI Robust Std. Err.	z	P> z	[95% Conf. Interval]	
ATET						
treat						
(1 vs 0)	1144.298	785.1507	1.46	0.145	-394.5695	2683.165

```
. predict ps
(option te assumed; treatment effects)
```

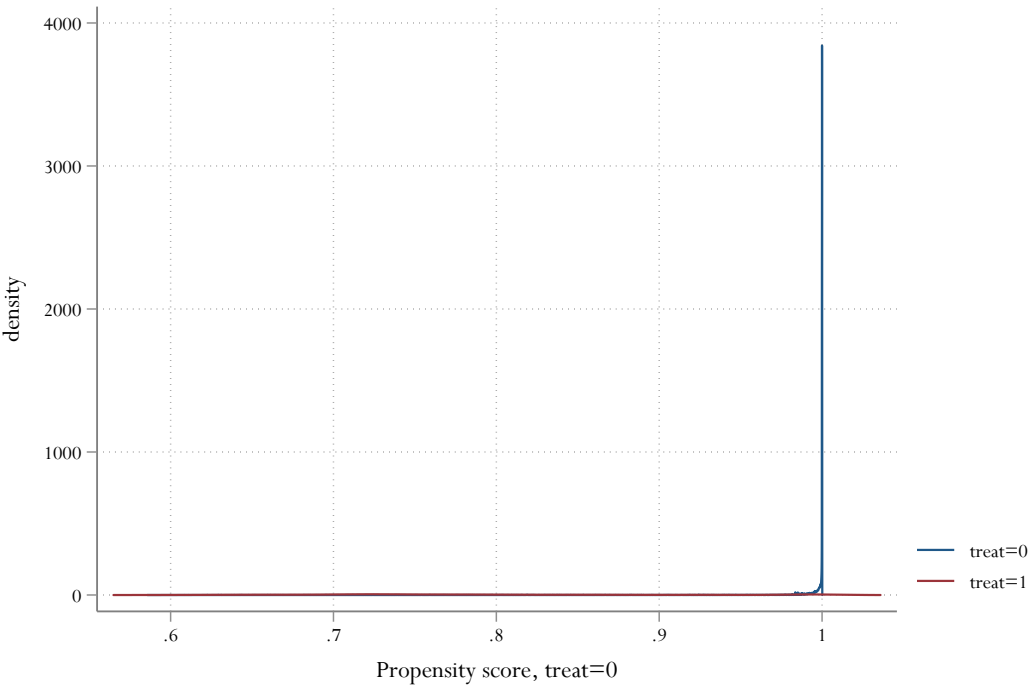
```
. tebalance summarize
Covariate balance summary
```

		Raw	Matched

Number of obs =		18,667	370
Treated obs =		185	185
Control obs =		18,482	185

	Standardized differences	Variance ratio	
		Raw	Matched
	-----	-----	-----
age	-.8231627 .0988799	.4246761	.57705
education	-.678676 -.2022441	.4805954	.6196875
black	2.244677 -.0149333	1.511774	1.029117
hispanic	-.0298023 .1003586	.9030251	1.536116
re74	-1.564616 .0816721	.2234521	1.962441
re75	-1.708969 -.0143082	.100935	1.028518

```
. teffects overlap
. graph export q15.pdf, as(pdf) replace
(file q15.pdf written in PDF format)
```



```
.
. capture log close
```