

Measuring the Impact of 15-to-Finish at UNLV

Office of Decision Support
University of Nevada, Las Vegas

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Distinguishing the Impact


- Students already taking 15 or more credit hours
 - Don't expect the policy to impact this group
 - Academic outcomes for this group are very good already.
- Students taking less than 15 and persuaded to take more
 - Retention, Cumulative GPA and credits earned have lagged for the students taking less than 15.
 - There is a concern with the impact on this group of students.
 - Can we measure the impact of the treatment on this group?
 - How can we identify students in this group?

Researcher's Problem

- We are not in a laboratory setting
- We lack a randomized control group
- We do not know who has reacted to the treatment

Time Period	Less than 15	15 or More	Total
2010-2012	6,152 68%	2,885 32%	9,037
2013	1,724 49%	1,812 51%	3,536
2014-2015	2,383 34%	4,647 66%	7,030

No Treatment Group



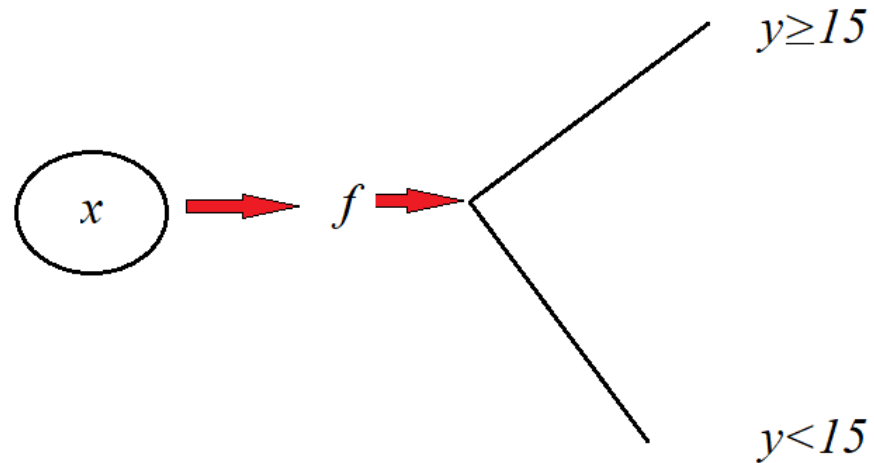
A Synthetic Control Group

A powerful approach for estimating treatment effects in the absence of randomized control groups.

Kathleen T. Li, “Estimating Average Treatment Effects Using a Modified Synthetic Control Method: Theory and Applications,” The Wharton School, University of Pennsylvania, June 20, 2017.

Synthetic Control Group Methodology

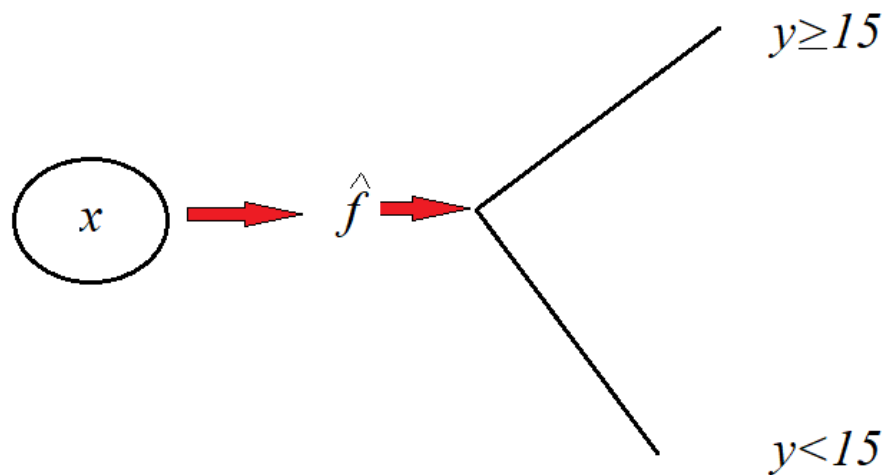
Before the treatment, we suppose there exists a behavioral relationship (f) between student characteristics (x) and the choice of enrolled hours (y).



We use the observed x and y data before the treatment to estimate f . We call this estimate \hat{f} .

Applying the methodology

Given student behavior is untreated, the estimated relationship \hat{f} will provide a reasonable proxy for enrolled credit hours.



Synthetic Control versus Treatment

Control

$$\hat{f}(x_{13-15}) \Rightarrow \hat{y}_{13-15}$$

Treated

$$x_{13-15} \Rightarrow y_{13-15}$$

Provided enrollment behavior in 2013-2015 is consistent with 2010-2012 behavior without Treatment, the mapping provided by \hat{f} is a reasonable proxy for the control.

Enrollment Patterns

- Historical enrollment patterns (2010-2012)

Model Expectation	Less than 15	15 or more
Less than 15	66.2%	29.0%
15 or more	1.8%	2.9%

Low Expectation Fulfilled

Positive Surprise

High Performing

- Train a credit hour enrollment choice model based on the historical data (Censored Regression).
 - Average Treatment Effect – Early Time Period = -0.2422
 - Students took less hours than the model predicted in the early time period.
 - Average Treatment Effect – Late Time Period = +0.7293
 - Students took more hours than the model predicted in the late time period.

Low Expectations Fulfilled Subgroup

Model Expectation	Less than 15	15 or more
Less than 15	66.2%	29.0%
15 or more	1.8%	2.9%

Table 13: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	55.60
Percentage receiving Pell Grant	34.00
Percentage reporting First-Generation	50.10
Percentage enrolled at 2nd Fall Preliminary Census	62.60
Percentage enrolled at 3rd Fall Preliminary Census	49.30
Cohort Size	5985.00

Table 14: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	2.92	3.20	3.40	3.49
Age at first Fall term	18.11	18.41	18.56	18.69
Cum. GPA at 2nd Fall	0.00	2.52	2.03	3.07
Cum. GPA at 3rd Fall	0.00	2.54	2.06	3.08
Cum. Hrs earned at 2nd Fall	0.00	37.00	32.80	52.00
Cum. Hrs earned at 3rd Fall	0.00	48.00	45.43	76.00
SAT Comb. Score (or synthetic)	920.00	1003.33	992.43	1060.00

Table 15: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
AIAKN	21.00	0.40
ASIAN	826.00	13.80
BLACK	585.00	9.80
HISPA	1663.00	27.80
MULTI	519.00	8.70
NONRS	85.00	1.40
PACIF	123.00	2.10
UNKWN	57.00	1.00
WHITE	2106.00	35.20

Positive Surprise Enrollment Subgroup

Model Expectation	Less than 15	15 or more
Less than 15	66.2%	29.0%
15 or more	1.8%	2.9%

Table 1: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	57.40
Percentage receiving Pell Grant	29.90
Percentage reporting First-Generation	44.00
Percentage enrolled at 2nd Fall Preliminary Census	73.70
Percentage enrolled at 3rd Fall Preliminary Census	61.70
Cohort Size	2619.00

Table 2: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	3.00	3.29	3.53	3.57
Age at first Fall term	18.09	18.39	18.49	18.67
Cum. GPA at 2nd Fall	1.85	2.73	2.29	3.23
Cum. GPA at 3rd Fall	1.94	2.78	2.34	3.23
Cum. Hrs earned at 2nd Fall	22.00	49.00	41.18	60.00
Cum. Hrs earned at 3rd Fall	24.00	68.00	57.76	89.00
SAT Comb. Score (or synthetic)	920.00	1003.88	1007.36	1080.00

Table 3: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
AIAKN	6.00	0.20
ASIAN	393.00	15.00
BLACK	201.00	7.70
HISPA	623.00	23.80
MULTI	240.00	9.20
NONRS	80.00	3.10
PACIF	52.00	2.00
UNKWN	23.00	0.90
WHITE	1001.00	38.20

Negative Surprise Enrollment Subgroup

Model Expectation	Less than 15	15 or more
Less than 15	66.2%	29.0%
15 or more	1.8%	2.9%

Table 7: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	55.70
Percentage receiving Pell Grant	25.70
Percentage reporting First-Generation	32.90
Percentage enrolled at 2nd Fall Preliminary Census	96.40
Percentage enrolled at 3rd Fall Preliminary Census	87.40
Cohort Size	167.00

Table 8: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	3.47	3.71	3.66	3.92
Age at first Fall term	18.09	18.32	18.42	18.66
Cum. GPA at 2nd Fall	3.04	3.46	3.36	3.78
Cum. GPA at 3rd Fall	3.03	3.44	3.33	3.76
Cum. Hrs earned at 2nd Fall	68.00	76.00	75.68	82.00
Cum. Hrs earned at 3rd Fall	91.00	105.00	99.41	113.50
SAT Comb. Score (or synthetic)	1070.00	1180.00	1177.74	1280.00

Table 9: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
ASIAN	58.00	34.70
BLACK	1.00	0.60
HISPA	17.00	10.20
MULTI	13.00	7.80
NONRS	6.00	3.60
PACIF	1.00	0.60
UNKWN	4.00	2.40
WHITE	67.00	40.10

High Performing Enrollment Subgroup

Model Expectation	Less than 15	15 or more
Less than 15	66.2%	29.0%
15 or more	1.8%	2.9%

Table 19: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	55.60
Percentage receiving Pell Grant	24.10
Percentage reporting First-Generation	27.80
Percentage enrolled at 2nd Fall Preliminary Census	98.50
Percentage enrolled at 3rd Fall Preliminary Census	94.40
Cohort Size	266.00

Table 20: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	3.36	3.63	3.90	3.85
Age at first Fall term	18.05	18.37	18.46	18.64
Cum. GPA at 2nd Fall	3.02	3.35	3.31	3.66
Cum. GPA at 3rd Fall	3.01	3.33	3.25	3.63
Cum. Hrs earned at 2nd Fall	71.00	79.00	79.53	88.00
Cum. Hrs earned at 3rd Fall	93.00	107.00	102.97	117.75
SAT Comb. Score (or synthetic)	1010.00	1160.00	1148.64	1240.00

Table 21: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
ASIAN	87.00	32.70
BLACK	2.00	0.80
HISPA	28.00	10.50
MULTI	21.00	7.90
NONRS	27.00	10.20
PACIF	4.00	1.50
UNKWN	9.00	3.40
WHITE	88.00	33.10

15-to-Finish

- Pre-Treatment Enrollment Statistics

Model Expectation	Less than 15	15 or more
Less than 15	66.2%	29.0%
15 or more	1.8%	2.9%

- Post-Treatment Enrollment Statistics

Model Expectation	Less than 15	15 or more
Less than 15	37.4%	56.0%
15 or more	1.5%	5.2%

Pre and Post Low Expectations Fulfilled

Concern: Did we move the best of the “Low Expectations Fulfilled” subgroup to the “Positive Surprise” subgroup? If so, we would see a decrease in performance of the “Low Expectations Fulfilled” subgroup after treatment.

Pre-Treatment Subgroup

Table 14: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	2.92	3.20	3.40	3.49
Age at first Fall term	18.11	18.41	18.56	18.69
Cum. GPA at 2nd Fall	0.00	2.52	2.03	3.07
Cum. GPA at 3rd Fall	0.00	2.54	2.06	3.08
Cum. Hrs earned at 2nd Fall	0.00	37.00	32.80	52.00
Cum. Hrs earned at 3rd Fall	0.00	48.00	45.43	76.00
SAT Comb. Score (or synthetic)	920.00	1003.33	992.43	1060.00

Post-Treatment Subgroup

Table 17: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	2.92	3.20	3.20	3.48
Age at first Fall term	18.14	18.45	18.61	18.74
Cum. GPA at 2nd Fall	0.00	2.53	2.05	3.08
Cum. GPA at 3rd Fall	0.33	2.57	2.09	3.11
Cum. Hrs earned at 2nd Fall	0.00	37.00	33.63	53.00
Cum. Hrs earned at 3rd Fall	4.50	50.00	46.77	77.00
SAT Comb. Score (or synthetic)	880.00	990.00	981.64	1070.00

There is no statistical evidence that the better performers stepped up to 15 or more credit hours. There is no drop-off in this subgroup following treatment.

Pre and Post Low Expectations Fulfilled

Concern: Did traditionally disadvantaged groups get “left behind” in the “Low Expectations Fulfilled” subgroup?

Pre-Treatment Subgroup

Table 15: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
AIAKN	21.00	0.40
ASIAN	826.00	13.80
BLACK	585.00	9.80
HISPA	1663.00	27.80
MULTI	519.00	8.70
NONRS	85.00	1.40
PACIF	123.00	2.10
UNKWN	57.00	1.00
WHITE	2106.00	35.20

Post-Treatment Subgroup

Table 18: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
AIAKN	6.00	0.20
ASIAN	571.00	14.50
BLACK	318.00	8.10
HISPA	1246.00	31.60
MULTI	436.00	11.00
NONRS	107.00	2.70
PACIF	49.00	1.20
UNKWN	24.00	0.60
WHITE	1190.00	30.10

There is no statistical evidence that traditionally disadvantaged ethnicities were trapped in this subgroup. The only ethnicity category that grew in the post-treatment subgroup was Non-Resident Aliens. All other ethnicity categories on net left this subgroup post-treatment.

Pre and Post Low Expectations Fulfilled

Concern: Did traditionally disadvantaged groups get “left behind” in the “Low Expectations Fulfilled” subgroup?

Pre-Treatment Subgroup

Table 13: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	55.60
Percentage receiving Pell Grant	34.00
Percentage reporting First-Generation	50.10
Percentage enrolled at 2nd Fall Preliminary Census	62.60
Percentage enrolled at 3rd Fall Preliminary Census	49.30
Cohort Size	5985.00

Post-Treatment Subgroup

Table 16: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	53.00
Percentage receiving Pell Grant	36.10
Percentage reporting First-Generation	50.80
Percentage enrolled at 2nd Fall Preliminary Census	61.70
Percentage enrolled at 3rd Fall Preliminary Census	48.90
Cohort Size	3947.00

This subgroup performed similarly in terms of retention rates, GPA and earned credits pre and post treatment. The good news is that many were moved out of this subgroup to other groupings with better academic outcomes.

Pre and Post Positive Enrollment Surprise

Concern: By moving less-qualified students from enrolling in less than 15 credit hours to enrolling in 15 or more, we will see poorer academic performance in the “Positive Enrollment Surprise” subgroup.

Pre-Treatment Subgroup

Table 2: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	3.00	3.29	3.53	3.57
Age at first Fall term	18.09	18.39	18.49	18.67
Cum. GPA at 2nd Fall	1.85	2.73	2.29	3.23
Cum. GPA at 3rd Fall	1.94	2.78	2.34	3.23
Cum. Hrs earned at 2nd Fall	22.00	49.00	41.18	60.00
Cum. Hrs earned at 3rd Fall	24.00	68.00	57.76	89.00
SAT Comb. Score (or synthetic)	920.00	1003.88	1007.36	1080.00

Post-Treatment Subgroup

Table 5: Summary Statistics

	1st Qu.	Median	Mean	3rd Qu.
High School GPA	3.00	3.28	3.27	3.56
Age at first Fall term	18.10	18.38	18.46	18.67
Cum. GPA at 2nd Fall	1.83	2.76	2.30	3.26
Cum. GPA at 3rd Fall	1.90	2.80	2.34	3.29
Cum. Hrs earned at 2nd Fall	20.00	48.00	40.55	61.00
Cum. Hrs earned at 3rd Fall	22.00	66.00	56.80	89.00
SAT Comb. Score (or synthetic)	900.00	1000.00	995.15	1090.00

There is no statistical evidence that this subgroup experienced poorer academic performance after treatment.

Pre and Post Positive Enrollment Surprise

Concern: Did traditionally disadvantaged groups get “left behind” in the “Low Expectations Fulfilled” subgroup rather than moving to this sub-group?

Pre-Treatment Subgroup

Table 3: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
AIAKN	6.00	0.20
ASIAN	393.00	15.00
BLACK	201.00	7.70
HISPA	623.00	23.80
MULTI	240.00	9.20
NONRS	80.00	3.10
PACIF	52.00	2.00
UNKWN	23.00	0.90
WHITE	1001.00	38.20

Post-Treatment Subgroup

Table 6: IPEDS Ethnicity

IPEDS_Ethnicity	Count	Pct
AIAKN	12.00	0.20
ASIAN	998.00	16.90
BLACK	464.00	7.80
HISPA	1764.00	29.80
MULTI	674.00	11.40
NONRS	116.00	2.00
PACIF	91.00	1.50
UNKWN	22.00	0.40
WHITE	1772.00	30.00

There is statistical evidence to believe that traditionally disadvantaged ethnicities joined this more academically successful subgroup.

Pre and Post Positive Enrollment Surprise

Concern: Did traditionally disadvantaged groups get “left behind” in the “Low Expectations Fulfilled” subgroup rather than moving to this sub-group?

Pre-Treatment Subgroup

Table 1: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	57.40
Percentage receiving Pell Grant	29.90
Percentage reporting First-Generation	44.00
Percentage enrolled at 2nd Fall Preliminary Census	73.70
Percentage enrolled at 3rd Fall Preliminary Census	61.70
Cohort Size	2619.00

Post-Treatment Subgroup

Table 4: Subgroup Statistics

Statistic	Value
Percentage reporting Female Gender	60.70
Percentage receiving Pell Grant	35.10
Percentage reporting First-Generation	50.30
Percentage enrolled at 2nd Fall Preliminary Census	72.00
Percentage enrolled at 3rd Fall Preliminary Census	59.80
Cohort Size	5913.00

There is statistical evidence to believe that Pell recipients and First-Generation students migrated to this higher performing subgroup.

Censored Regression Enrollment Model

$$y_i^* = \beta' x_i + \epsilon_i,$$

where y_i^* is the latent credit hours enrolled variable. We observe y_i (actual enrolled hours) according to:

$$y_i = \begin{cases} 0 & y_i^* < 12 \\ y_i^* & y_i^* \geq 12 \end{cases}$$

Expected Enrollment

$$E[y_i|x_i] = \Phi\left(\frac{\beta'x_i}{\sigma}\right) (\beta'x_i + \sigma\lambda_i),$$

where

$$\lambda_i = \frac{\phi(\beta'x_i/\sigma)}{\Phi(\beta'x_i/\sigma)}.$$

Marginal Effects in Censored Model

$$\frac{\partial E[y^*|x_i]}{\partial x} = \beta.$$

$$\frac{\partial E[y|x_i]}{\partial x} = \beta \times \Phi(y_i^* \geq 12).$$

Estimated Model Coefficients

Table 1: Estimated Coefficients

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	13.25	0.62	21.22	0.00
SEXM	-0.09	0.05	-1.97	0.05
LV_IPEDS_ETHNICASIAN	0.00	0.41	0.01	0.99
LV_IPEDS_ETHNICBLACK	-0.48	0.41	-1.17	0.24
LV_IPEDS_ETHNICHISPA	-0.17	0.41	-0.41	0.68
LV_IPEDS_ETHNICMULTI	-0.01	0.41	-0.03	0.98
LV_IPEDS_ETHNICNONRS	0.38	0.43	0.89	0.37
LV_IPEDS_ETHNICPACIF	-0.07	0.43	-0.15	0.88
LV_IPEDS_ETHNICUNKWN	-0.18	0.46	-0.38	0.70
LV_IPEDS_ETHNICWHITE	0.00	0.41	0.01	0.99
LV_LHS_HSGPA_U	0.00	0.01	0.41	0.68
HIGH_SATC	-0.00	0.00	-0.32	0.75
IS_PELL	-0.00	0.05	-0.09	0.93
First_GenUnknown	-0.32	0.08	-3.89	0.00
First_GenYes	-0.23	0.05	-4.66	0.00
First_Term_Age	-0.07	0.02	-3.38	0.00
TOT_CUMULATIVE	0.10	0.01	10.99	0.00
TOT_TRNSFR	-0.11	0.01	-20.01	0.00
CUM_GPA	-0.35	0.08	-4.44	0.00
I_NO_CUMGPATRUE	1.08	0.22	4.91	0.00
I(TOT_CUMULATIVE * CUM_GPA)	-0.00	0.00	-0.67	0.50
Log(scale)	0.69	0.01	69.11	0.00

Observations:

Total	Left-censored	Uncensored	Right-censored
9037	3096	5941	0

Scale: 1.992

Gaussian distribution

Number of Newton-Raphson Iterations: 3

Log-likelihood: -1.515e+04 on 22 Df

Wald-statistic: 1174 on 20 Df, p-value: < 2.22e-16

The model finds that having earned **previous college hours** is the most significant driver of students enrolling in 15 or more credit hours in the First Fall.

Questions and Discussion



A graphic with the words "Thank You!" written in a large, red, cursive font. The text is slightly shadowed and has a soft glow effect.

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