

# The Unintended Effects of an Intensive Margin Reform to Student Loans on Educational Attainment

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# Outline

- 1 Motivation and Background
- 2 Data and Empirical Strategy
- 3 Results for Immediate Enrollment
- 4 Conclusions

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# Motivation and Background

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- A growing interest in the effects of financial aid on educational attainment (Dynarski et al., 2022) in a context of increased student debt burden and high default rates.
- There is a need to revise student loan programs, but the literature has mainly focused on the extensive margin (i.e., program introduction). Evidence on the intensive margin (i.e., program reform) is scarce.

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- The Chilean case provides a unique opportunity: (i) similar to the US system while admission determinants are fully observed, and (ii) sizable intensive margin changes to student loans in 2012. Additionally, (iii) comprehensive administrative records.
- **This paper analyzes the consequences for higher education enrollment, persistence and retention of a Chilean student loan reform that reduced the interest rate.**

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- The Chilean case provides a unique opportunity: (i) similar to the US system while admission determinants are fully observed, and (ii) sizable intensive margin changes to student loans in 2012. Additionally, (iii) comprehensive administrative records.
- **This paper analyzes the consequences for higher education enrollment, persistence and retention of a Chilean student loan reform that reduced the interest rate.**
- Main contributions: One of the first to evaluate a reform that loosens financial constraints through the intensive margin, studying compositional effects, and documenting striking unintended consequences with important policy implications.

# Background

- Universities (5-6 yr) and Vocational Institutions (2-4 yr) where tuition fees imply an important financial burden: 40% ( $\approx$  3000 \$USD) and 20% ( $\approx$  1500 \$USD) of median income respectively.
- Students rely on government grants. In 2015, 58% had some form of aid.
- One in every three students has a CAE loan.
- Introduced in 2006 and initially granted with market conditions.

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- One in every three students has a CAE loan.
- Introduced in 2006 and initially granted with market conditions.
- The 2012 reform intended to improve repayments.
  - Decrease of the interest rate from approx 6% average to a fixed 2%.
  - Repayments now contingent on income with a cap of 10%.
  - The possibility to delay repayments in case of unemployment.



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# Data and Empirical Strategy

# Data

- Public administrative records for all high school graduates in period 2007-2015 from public and voucher schools that registered to take the PSU (over 1.5 million of observations).
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- Repeated cross-sections: 9 cohorts observed over the first two years after high school graduation.
- We focus on:
  1. Immediate Enrollment
  2. Two-year Enrollment (persistence)
  3. Second-year Dropout (retention)
- We also observe and control for a rich set of student, school, and program level characteristics.

► Descriptive Stats

# Identification Strategies

- We exploit the loan's academic eligibility conditions and the timing of the reform:
  - CAE eligibility:  $\text{PSU}[150 - 850] \geq 475$  or  $\text{GPA}[1.0 - 7.0] \geq 5.3$ .
  - Exposure: cohorts  $\geq 2012$ .

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- Standard Diff-in-Diff model for repeated cross-sectional data: Eligible vs non-eligible and exposed vs non-exposed. Treatment occurs at a single point in time and control units are never treated.
- We complement the analysis with a Diff-in-Disc design: PSU test score as running variable with a 475 cutoff, separately for exposed and non-exposed cohorts. The effect is given by the difference between these two discontinuities.

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# Results for Immediate Enrollment

# Effects for Immediate Enrollment (DiD)

	HES			Universities			Vocational		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eligible × exposed	0.002 (0.004)	0.002 (0.004)	0.000 (0.003)	0.025*** (0.004)	0.026*** (0.004)	0.024*** (0.004)	-0.023*** (0.003)	-0.024*** (0.003)	-0.024*** (0.003)
Exposed	0.062*** (0.003)	0.068*** (0.007)	0.075*** (0.006)	-0.013*** (0.001)	-0.035*** (0.007)	-0.031*** (0.007)	0.075*** (0.003)	0.103*** (0.004)	0.106*** (0.004)
Eligible	0.258*** (0.003)	0.258*** (0.003)	0.240*** (0.003)	0.290*** (0.003)	0.290*** (0.003)	0.271*** (0.003)	-0.032*** (0.002)	-0.032*** (0.002)	-0.031*** (0.002)
Cohort effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Control variables	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,497,379	1,497,379	1,497,379	1,497,379	1,497,379	1,497,379	1,497,379	1,497,379	1,497,379
Control group size	620,206	620,206	620,206	620,206	620,206	620,206	620,206	620,206	620,206
Outcome mean	0.533	0.533	0.533	0.356	0.356	0.356	0.177	0.177	0.177

- Null overall effect, with a diversion effect from V. to U. of 2.5 pp. (15,500 students approx).
- In relative terms: 7 percent increase in U. and a 14 percent decrease in V.



# Effects for Immediate Enrollment (DiD)

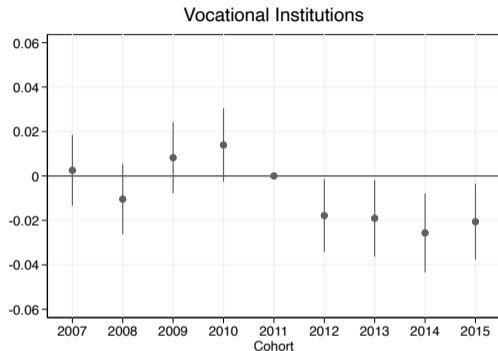
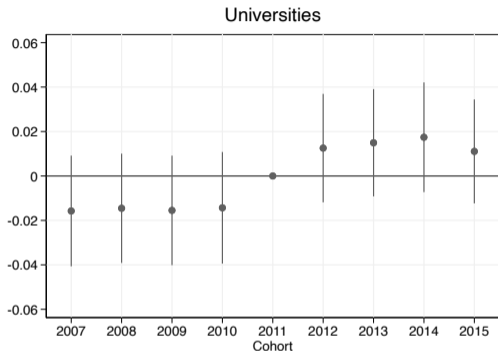
▶ Parallel Trends

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Eligible	0.258*** (0.003)	0.258*** (0.003)	0.240*** (0.003)	0.290*** (0.003)	0.290*** (0.003)	0.271*** (0.003)	-0.032*** (0.002)	-0.032*** (0.002)	-0.031*** (0.002)
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- Null overall effect, with a diversion effect from V. to U. of 2.5 pp. (15,500 students approx).
- In relative terms: 7 percent increase in U. and a 14 percent decrease in V.
- Mechanism: implicit subsidy for U. (Angrist et al. 2016, NBER).
- Potentially negative long-term effects (Rodríguez et al. 2016, JHR; Aguirre 2021, JPubE).

▶ Other outcomes

# Dynamics of the Effect on Immediate Enrollment



- A sharp change in the coefficients following the reform.
- Stable effects with a small decrease in magnitude in 2015 (when the free-tuition program was announced).
- Testing for differential pre-trends: for every year before reform we cannot reject the null hypothesis of non-significance.

# Results from Alternative Identification Strategy

	All students			GPA < 5.3		
	HES (1)	Universities (2)	Vocational (3)	HES (4)	Universities (5)	Vocational (6)
Difference	0.013** (0.006)	0.025*** (0.006)	-0.007 (0.006)	0.003 (0.012)	0.023** (0.010)	-0.022* (0.011)
Exposed	0.074*** (0.004)	0.127*** (0.005)	-0.048*** (0.005)	0.062*** (0.009)	0.084*** (0.007)	-0.024*** (0.009)
Unexposed	0.061*** (0.004)	0.102*** (0.004)	-0.040*** (0.004)	0.059*** (0.008)	0.061*** (0.007)	-0.002 (0.007)
Bandwidth						
<i>Exposed</i>	51.257	36.629	41.201	48.882	47.259	43.601
<i>Unexposed</i>	51.142	40.393	51.088	45.712	48.539	55.572

- Here we exploit the same source of exogenous variation but employ different identification assumptions and a different empirical method. [▶ Density test](#)
- Same diversion effect on immediate enrollment.
- Consistent results for other outcomes. [▶ Details](#)

# Heterogeneity: Student Sex

	HES			Universities			Vocational		
	Female (1)	Male (2)	Difference (3)	Female (4)	Male (5)	Difference (6)	Female (7)	Male (8)	Difference (9)
Immediate Enrollment	-0.009** (0.004)	0.005 (0.005)	-0.013** (0.005)	0.022*** (0.005)	0.022*** (0.006)	-0.000 (0.006)	-0.030*** (0.004)	-0.017*** (0.004)	-0.013*** (0.005)
Two-Year Enrollment	0.010** (0.004)	0.021*** (0.005)	-0.011* (0.006)	0.020*** (0.005)	0.017** (0.007)	0.003 (0.007)	-0.012*** (0.003)	0.001 (0.003)	-0.013*** (0.004)
Second-Year Dropout	-0.006 (0.005)	-0.012** (0.005)	0.006 (0.007)	-0.021* (0.011)	-0.041*** (0.011)	0.021 (0.015)	-0.007 (0.006)	-0.012** (0.006)	0.004 (0.008)

- Immediate enrollment: no difference in U. while stronger effect for females in V. (-0.030\*\*\* vs -0.017\*\*\*)
- Males: non-significant overall effect (0.005). 2.2 pp. increase in U. at the expense of 1.7 pp. decrease in V.
- Females: 3.0 pp. decrease in V. not fully compensated by 2.2 pp. increase in U. → 0.9 pp. overall decrease. Possibly explained by delayed enrollment since U. eligibility is harder to attain and they score lower in the PSU.

# Heterogeneity: School Type

	HES			Universities			Vocational		
	Public (1)	Voucher (2)	Difference (3)	Public (4)	Voucher (5)	Difference (6)	Public (7)	Voucher (8)	Difference (9)
Immediate Enrollment	0.003 (0.006)	-0.000 (0.004)	0.003 (0.007)	0.008 (0.008)	0.029*** (0.005)	-0.021** (0.009)	-0.005 (0.005)	-0.030*** (0.004)	0.024*** (0.006)
Two-Year Enrollment	0.012* (0.006)	0.023*** (0.004)	-0.011 (0.008)	0.005 (0.008)	0.026*** (0.005)	-0.021** (0.010)	0.004 (0.004)	-0.007** (0.003)	0.011** (0.005)
Second-Year Dropout	-0.001 (0.006)	-0.016*** (0.005)	0.015* (0.008)	-0.033** (0.014)	-0.034*** (0.009)	0.001 (0.017)	0.001 (0.007)	-0.018*** (0.005)	0.018** (0.009)

- Immediate enrollment: diversion effect entirely driven by voucher school students with no effect in public schools.
- General lack of response by public school students might be explained because:
  - They attain lower scores.
  - They tend to be poorer.

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- Results are remarkably robust to alternative Diff-in-Disc identification strategy, lending additional credibility to our DiD main approach.
- Ultimately, the reform does not enhance access to tertiary education beyond a compositional effect across institutions that might entail long-term effects.
- If anything, access for female students worsens since they appear to delay their enrollment decisions.
- Moreover, the diversion effect could backfire on the intended objective of improving repayment rates by increasing students' debt burden.
- Another unintended effect: a reform that should benefit economically disadvantaged students ends up not reaching them (null results for public school students).



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- Another unintended effect: a reform that should benefit economically disadvantaged students ends up not reaching them (null results for public school students).

This is a cautionary tale carrying important lessons for policymakers on the unexpected consequences of reforms introducing intensive margin changes to student loan programs.

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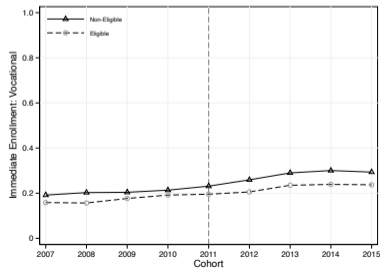
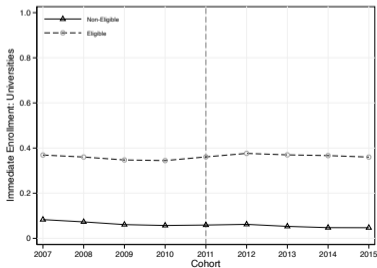
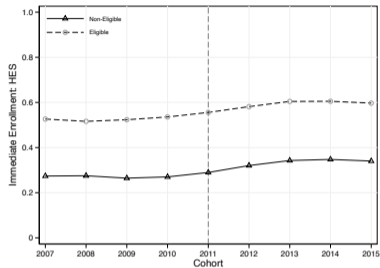
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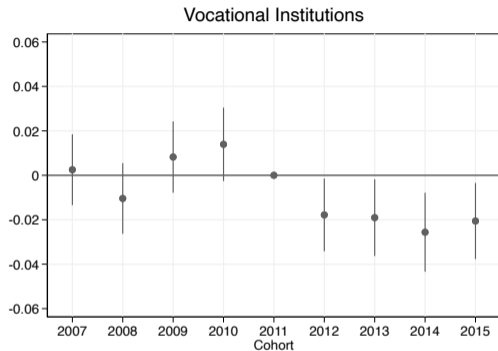
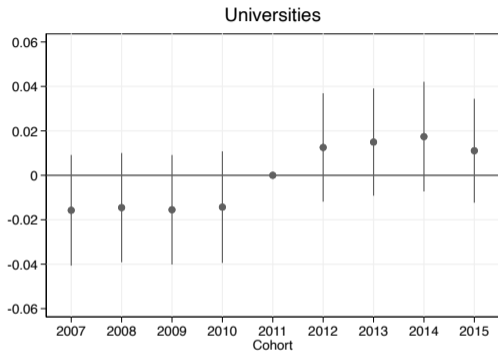
# Descriptives

	HES Application Process Cohort									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	Pooled
Immediate Enrollment	0.464	0.463	0.464	0.475	0.494	0.521	0.547	0.552	0.549	0.505
Two-Year Enrollment	0.398	0.402	0.406	0.412	0.425	0.454	0.473	0.478		0.432
Second-Year Dropout	0.143	0.131	0.122	0.131	0.138	0.129	0.135	0.132		0.132
Eligible	0.755	0.780	0.768	0.772	0.767	0.769	0.781	0.794	0.814	0.778
PSU	475.759	475.829	475.638	473.877	476.538	475.305	476.784	477.304	479.135	476.263
GPA	5.567	5.601	5.582	5.584	5.579	5.593	5.609	5.641	5.681	5.605
Female	0.540	0.546	0.536	0.531	0.526	0.534	0.531	0.532	0.528	0.533
Public School	0.442	0.422	0.422	0.420	0.405	0.360	0.362	0.364	0.365	0.394
Observations	140,142	143,399	167,166	175,526	180,774	167,409	173,111	173,168	176,684	1,497,379

# Immediate Enrollment Trends by Eligibility



# Dynamics of the Effect on Immediate Enrollment



- A sharp change in the coefficients following the reform.
- Stable effects with a small decrease in magnitude in 2015 (when the free-tuition program was announced).
- Testing for differential pre-trends: for every year before reform we cannot reject the null hypothesis of non-significance.

## Effects on Persistence and Retention (DiD)

- A 2 pp. effect on overall two-year enrollment, driven by U. two-year enrollment.
- Two-year U. enrollment 2 pp. (7%) effect results from the increase in immediate enrollment and a 3.5 pp. (32%) decrease in second-year dropout.
- In contrast, null two-year V. enrollment effect results from the decrease in immediate enrollment that is offset by a reduction in second-year dropout of 0.8 pp. (4%).
- Two mechanisms: sorting enrollment effect (Rodríguez et al. 2016, JHR) and perverse institutional incentive (Rau et al. 2013, NBER).

# Effects on Two-Year Enrollment (DiD)

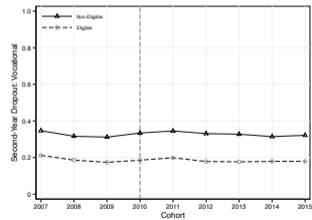
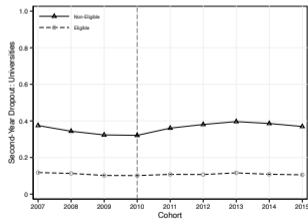
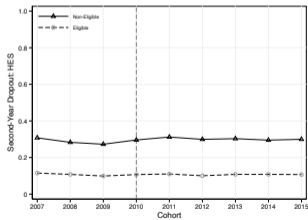
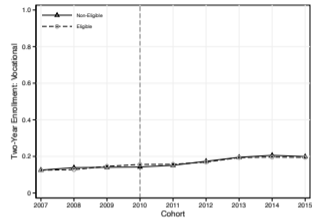
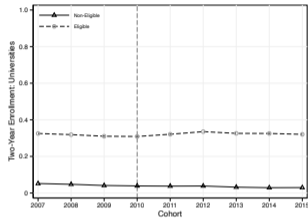
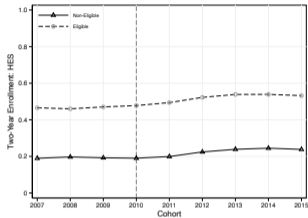
	HES			Universities			Vocational		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Eligible × exposed (2nd year)	0.021*** (0.004)	0.020*** (0.004)	0.018*** (0.004)	0.022*** (0.005)	0.021*** (0.005)	0.020*** (0.005)	-0.004 (0.003)	-0.005* (0.003)	-0.005** (0.003)
Exposed (2nd year)	0.034*** (0.003)	0.054*** (0.007)	0.063*** (0.007)	-0.010*** (0.001)	-0.022*** (0.007)	-0.017** (0.007)	0.043*** (0.002)	0.077*** (0.004)	0.082*** (0.004)
Eligible	0.277*** (0.003)	0.277*** (0.003)	0.255*** (0.003)	0.271*** (0.003)	0.271*** (0.003)	0.251*** (0.004)	0.003 (0.002)	0.003 (0.002)	0.001 (0.002)
Cohort effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Control variables	No	No	Yes	No	No	Yes	No	No	Yes
Observations	1,318,892	1,318,892	1,318,892	1,318,910	1,318,910	1,318,910	1,320,677	1,320,677	1,320,677
Control group size	480,876	480,876	480,876	480,879	480,879	480,879	481,614	481,614	481,614
Outcome mean	0.469	0.469	0.469	0.315	0.315	0.315	0.140	0.140	0.140

# Effects on Second-Year Dropout (DiD)

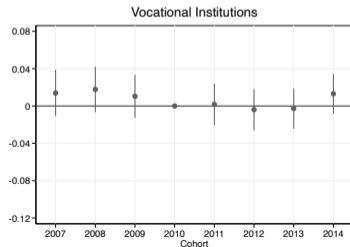
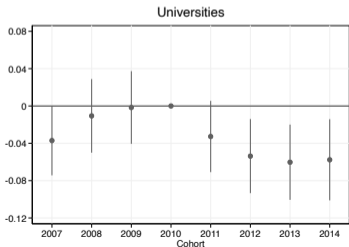
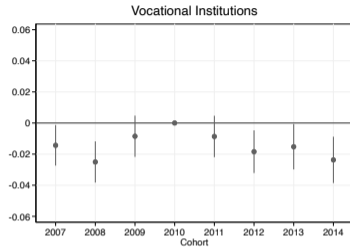
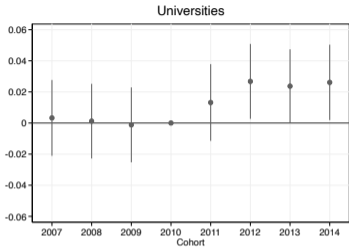
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Exposed (2nd year)	0.012*** (0.004)	0.003 (0.005)	0.013*** (0.005)	0.037*** (0.008)	0.026*** (0.008)	0.047*** (0.008)	0.002 (0.004)	-0.027*** (0.006)	0.006 (0.006)
Eligible	-0.183*** (0.003)	-0.183*** (0.003)	-0.130*** (0.003)	-0.235*** (0.005)	-0.233*** (0.005)	-0.175*** (0.005)	-0.139*** (0.003)	-0.139*** (0.003)	-0.115*** (0.003)
Cohort effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Control variables	No	No	Yes	No	No	Yes	No	No	Yes
Observations	657,479	657,479	644,831	386,140	386,140	374,422	272,124	272,124	271,154
Control group size	252,544	252,544	252,544	169,930	169,930	169,930	82,957	82,957	82,957
Outcome mean	0.107	0.107	0.107	0.108	0.108	0.108	0.188	0.188	0.188



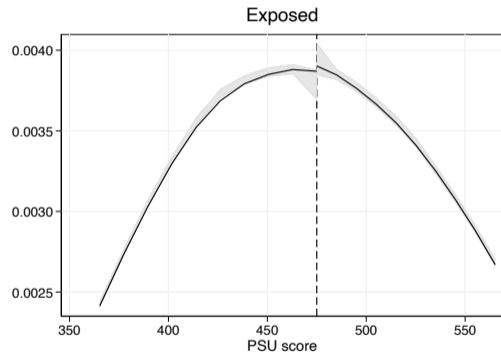
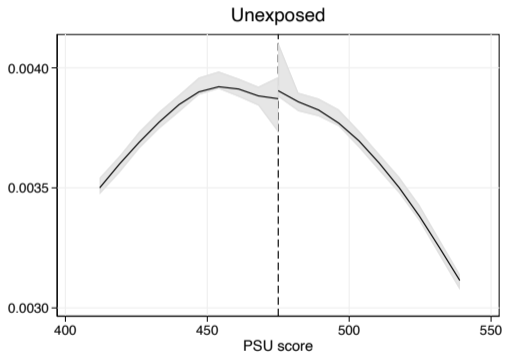
# Persistence and Retention Trends by Eligibility



# Dynamics of the Effect on Persistence and Retention



# PSU Density Test



# Effects on Two-Year Enrollment (Diff-in-Disc)

	All students			GPA < 5.3		
	HES (1)	Universities (2)	Vocational (3)	HES (4)	Universities (5)	Vocational (6)
Difference	0.025*** (0.006)	0.025*** (0.006)	-0.002 (0.006)	0.042*** (0.013)	0.030*** (0.009)	0.007 (0.011)
Exposed	0.076*** (0.004)	0.107*** (0.004)	-0.038*** (0.005)	0.080*** (0.008)	0.072*** (0.006)	0.000 (0.008)
Unexposed	0.051*** (0.005)	0.082*** (0.004)	-0.036*** (0.004)	0.039*** (0.010)	0.042*** (0.007)	-0.007 (0.007)
Bandwidth						
<i>Exposed</i>	58.077	37.934	38.461	64.812	51.634	48.703
<i>Unexposed</i>	50.111	43.226	44.051	38.730	43.832	48.974
Observations						
<i>Exposed</i>	133,494	88,264	89,627	38,607	31,115	29,424
<i>Unexposed</i>	107,266	92,890	94,706	23,653	26,707	29,759

# Effects on Second-Year Dropout (Diff-in-Disc)

	All students			GPA < 5.3		
	HES (1)	Universities (2)	Vocational (3)	HES (4)	Universities (5)	Vocational (6)
Difference	-0.002 (0.006)	0.003 (0.011)	-0.010 (0.009)	-0.017 (0.014)	-0.000 (0.025)	-0.043* (0.023)
Exposed	-0.008* (0.004)	-0.017** (0.008)	0.002 (0.006)	-0.029*** (0.010)	-0.009 (0.018)	-0.038** (0.016)
Unexposed	-0.005 (0.004)	-0.020*** (0.008)	0.012 (0.007)	-0.012 (0.010)	-0.009 (0.017)	0.005 (0.016)
Bandwidth						
<i>Exposed</i>	54.348	51.297	46.782	50.644	54.499	31.156
<i>Unexposed</i>	59.024	53.361	50.914	51.482	45.883	40.089
Observations						
<i>Exposed</i>	69,669	30,248	32,749	15,517	6,386	5,968
<i>Unexposed</i>	61,304	27,849	26,649	14,229	5,728	6,197