

**Appendix Table I. Main Industries of Employment Among Non-Tenure track Faculty before Being Employed in College**

Two Year Colleges		Four Year Colleges	
<b><i>Humanities</i></b>	<b>521</b>	<b><i>Humanities</i></b>	<b>457</b>
Elementary and Secondary Schools	34.74%	Elementary and Secondary Schools	22.98%
Health care and Social Assistance	8.02%	Junior Colleges	3.50%
Retail Trade	6.75%	Newspaper Publishers	3.06%
Other	50.49%	Other	70.46%
<b><i>Social Sciences</i></b>	<b>381</b>	<b><i>Social Sciences</i></b>	<b>227</b>
Elementary and Secondary Schools	19.69%	Elementary and Secondary Schools	19.63%
Health care and Social Assistance	23.55%	General Medical and Surgical Hospitals	5.48%
Public Administration	6.10%	Other Individual and Family Services	5.48%
		Outpatient Mental Health and Substance Abuse Center	5.02%
Other	50.66%	Other	64.39%
<b><i>Math/Natural Science</i></b>	<b>335</b>	<b><i>Math/Natural Science</i></b>	<b>179</b>
Elementary and Secondary Schools	30.15%	Elementary and Secondary Schools	27.93%
General Medical and Surgical Hospitals	6.27%	General Medical and Surgical Hospitals	6.15%
Other	63.58%	Other	65.92%
<b><i>Computer, Information, and Engineering</i></b>	<b>291</b>	<b><i>Computer, Information, and Engineering</i></b>	<b>162</b>
Elementary and Secondary Schools	11.68%	Elementary and Secondary Schools	8.02%
		Junior Colleges	7.41%
Other	88.32%	Other	84.57%
<b><i>Health</i></b>	<b>527</b>	<b><i>Health</i></b>	<b>400</b>
General Medical and Surgical Hospitals	46.49%	General Medical and Surgical Hospitals	49.75%
Offices of Physicians	6.64%	Offices of Physicians	6.25%
Ambulance Services	4.93%	Offices of Dentists	3.50%
Elementary and Secondary Schools	3.80%		
Nursing Care Facilities	2.28%	Other	40.50%
Other	35.86%	<b><i>Business</i></b>	<b>194</b>
<b><i>Business</i></b>	<b>323</b>	Commercial Banking	6.45%
Elementary and Secondary Schools	10.12%	Offices of Lawyers	5.38%
Warehouse Clubs and Supercenters	4.33%		
Commercial Banking	3.41%	Other	88.17%
Other	82.14%	<b><i>Education and Childcare</i></b>	<b>316</b>
<b><i>Education and Childcare</i></b>	<b>224</b>	Elementary and Secondary Schools	65.51%
Elementary and Secondary Schools	52.68%	Other	34.49%
Other	47.32%	<b><i>Other</i></b>	<b>403</b>
<b><i>Other</i></b>	<b>719</b>	Elementary and Secondary Schools	15.14%
Elementary and Secondary Schools	14.05%	Junior Colleges	5.71%
Executive and Legislative Offices	8.48%	Executive and Legislative Offices	5.71%
Offices of Lawyers	2.78%	Other	73.44%
Other	74.69%		

Note: Data used to create this table includes temporary adjunct and long-term non-tenure instructors who ever worked in non-college positions before they started college teaching positions. Non-tenure track faculty excluded from this table include: 1) temporary adjunct and long-term non-tenure instructors who had never worked in non-college positions before they started teaching in a college (13% of all non-tenure track faculty in two-year and 36% in four-year); 2) temporary adjunct and long-term non-tenure instructors who worked in non-college positions before 2001 and therefore could not be observed in the labor market dataset available to us (26% of all non-tenure track faculty in two-year and 30% in four-year). Finally, any industries with fewer than 10 instructors are not presented in the Table.

**Appendix Table II. Results of Models Controlling College-introductory-course-term Fixed Effects**

**Panel A: Impact of Different Types of Instructors on Introductory Course Performance**

	(1)	(2)	(3)	(4)	(5)	(6)
	Two-year colleges			Four-year colleges		
	Persist to the end of the course	Pass the course	Grade	Persist to the end of the course	Pass the course	Grade
Temporary adjunct	0.0131*** (0.0023)	0.0176*** (0.0027)	0.1450*** (0.0109)	0.0161*** (0.0017)	0.0263*** (0.0023)	0.1839*** (0.0109)
Tenure track instructor				-0.0044*** (0.0001)	-0.0140*** (0.0001)	-0.0958*** (0.0006)
Tenured instructor				-0.0134*** (0.0018)	-0.0230*** (0.0023)	-0.1702*** (0.0106)
Sample mean	0.84	0.72	2.19 (1.58)	0.91	0.81	2.47 (1.45)
Observations	324,883	324,883	324,883	730,408	730,408	730,408
R-squared	0.4704	0.5484	0.6292	0.3523	0.4764	0.6245

Note: Base group for both two-year and four-year colleges are long-term non-tenure faculty. All models control for student individual fixed effects and college-introductory-course-term fixed effects. Other controls include whether the subject was student's initial declared major with an indicator for missing major declaration, the student's age when taking the introductory course and course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, and other students' average high school GPA in the course section. Standard errors are three-way clustered at the student, college-subject, and term level. Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Panel B. Impact of Different Types of Instructors in Introductory Courses on Subsequent Enrollment in the Subject Area**

	(1)	(2)	(3)	(4)	(5)	(6)
	Two-year colleges			Four-year colleges		
	Take additional course	Take additional course and pass	Average grade of the second class	Take additional course	Take additional course and pass	Average grade of the second class
Temporary adjunct	-0.0136*** (0.0043)	-0.0094*** (0.0036)	0.0057 (0.0068)	-0.0086*** (0.0032)	-0.0063** (0.0028)	0.0172*** (0.0047)
Tenure track instructor				0.0068* (0.0040)	0.0051 (0.0040)	-0.0007 (0.0070)
Tenured instructor				0.0060* (0.0031)	0.0038 (0.0034)	-0.0176*** (0.0049)
Sample mean	0.37	0.27	2.23 (0.59)	0.43	0.36	2.44 (0.62)
Observations	324,883	324,883	128,563	730,408	730,408	306,479
R-squared	0.4948	0.4533	0.6701	0.4408	0.4096	0.6825

Note: The base group for all regressions is long-term non-tenure faculty. All models control for student individual fixed effects, college-introductory course-term fixed effects. Other controls include whether the subject was student's initial declared major with an indicator for missing major declaration, the student's age when taking the introductory course and course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, and other students' average high school GPA in the course section. Standard errors are three-way clustered at the student, college-subject, and term level. Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Panel C. Impact of Different Types of Instructors in Introductory Courses on Subsequent Course Grades in the Subject Area**

	(1)	(2)	(3)	(4)	(5)	(6)
	Two-year colleges			Four-year colleges		
	Persist to the end of the course	Pass the course	Grade	Persist to the end of the course	Pass the course	Grade
Temporary adjunct	0.0041 (0.0064)	-0.0050 (0.0069)	-0.0361* (0.0219)	-0.0046* (0.0026)	-0.0094*** (0.0031)	-0.0326*** (0.0099)
Tenure track instructor				0.0010 (0.0024)	-0.0053* (0.0029)	-0.0172* (0.0093)
Tenured instructor				0.0009 (0.0033)	0.0019 (0.0038)	0.0051 (0.0116)
Sample mean	0.84	0.73	2.21 (1.57)	0.90	0.82	2.48 (1.45)
Observations	128,563	128,563	128,563	306,479	306,479	306,479
R-squared	0.8037	0.8318	0.8711	0.5937	0.6626	0.7690

Note: The base group for all regressions is long-term non-tenure faculty. All models control student individual fixed effects, college-introductory course-term fixed effects, and next-college- -course-section fixed effects. Other controls include whether the subject was student's initial declared major with an indicator for missing major declaration, the student's age when taking the introductory course and course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, and other students' average high school GPA in the course section. Standard errors are three-way clustered at the student, college-subject, and term level. Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Appendix Table III. Results of Models Only Including Course-Term without Selection on Types of Instructors**

**Panel A: Impact of Different Types of Instructors on Introductory Course Performance**

	(1)	(2)	(3)	(4)	(5)	(6)
	Two-year colleges			Four-year colleges		
	Persist to the end of the course	Pass the course	Grade	Persist to the end of the course	Pass the course	Grade
Temporary adjunct	0.0140*** (0.0047)	0.0122** (0.0058)	0.0925*** (0.0223)	0.0026 (0.0040)	0.0075 (0.0050)	0.0490** (0.0224)
Tenure track instructor				-0.0033 (0.0042)	-0.0098* (0.0054)	-0.1011*** (0.0239)
Tenured instructor				-0.0106*** (0.0036)	-0.0139*** (0.0052)	-0.1506*** (0.0218)
Observations	138,732	138,732	138,732	212,548	212,548	212,548
R-squared	0.4854	0.5506	0.6318	0.4286	0.5127	0.6507

Note: The sample includes the introductory courses offering only one type of instructors. Base group for both two-year and four-year colleges are long-term non-tenure faculty. All models control for student individual fixed effects and college-introductory course fixed effects. Other controls for all models include the student's age when taking the introductory course, course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, other students' average high school GPA in the course section, as well as whether the course is within student's declared major with an indicator for missing major declaration. Standard errors are two-way clustered at the student and college-subject level. Classes on pass fail grading system are excluded. Robust standard errors in parentheses:\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Panel B. Impact of Different Types of Instructors in Introductory Courses on Subsequent Enrollment in the Subject Area**

	(3) Two-year colleges				(6) Four-year colleges			
	(1) Take additional course	(2) Take additional course and pass	Average pass rate of the next course	Average grade of the next course	(4) Take additional course	(5) Take additional course and pass	Average pass rate of the next course	Average grade of the next course
Temporary adjunct	-0.0039 (0.0063)	-0.0006 (0.0060)	0.0153** (0.0066)	0.0061 (0.0135)	-0.0082** (0.0044)	-0.0074* (0.0044)	0.0059* (0.0031)	0.0183** (0.0083)
Tenure track instructor					0.0100 (0.0062)	0.0156** (0.0061)	-0.0012 (0.0032)	-0.0129 (0.0122)
Tenured instructor					0.0130*** (0.0046)	0.0109** (0.0048)	-0.0031 (0.0029)	-0.0201** (0.0090)
Observations	80,033	80,033	20,136	20,136	218,361	218,361	74,836	74,836
R-squared	0.6298	0.5922	0.6447	0.7638	0.5649	0.5340	0.6002	0.7471

Note: The sample includes students whose introductory course in a subject area offering only one type of instructors during the term they took the course. The base group for all regressions is long-term non-tenure faculty. All models control for student individual fixed effects and college-introductory course fixed effects. Other controls include whether the subject was student's initial declared major with an indicator for missing major declaration, the student's age when taking the introductory course and course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, and other students' average high school GPA in the course section. Standard errors are two-way clustered at the student and college-subject level. Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Appendix Table IV. Impact of Different Types of Instructors on Introductory Course Performance: Grade Distribution**

Outcome	(1) Grade: A or equivalent	(2) Grade: B or better	(3) Grade: C or better	(4) Grade: D or better	(5) Grade given Persistence
<i>Two-year Colleges</i>					
Temporary adjunct	0.0489*** (0.0057)	0.0419*** (0.0050)	0.0261*** (0.0037)	0.0183*** (0.0033)	0.1314*** (0.0145)
Observations	324,883	324,883	324,883	324,883	271,415
R-squared	0.4853	0.5096	0.5081	0.5031	0.6137
<i>Four-year Colleges</i>					
Temporary adjunct	0.0511*** (0.0072)	0.0486*** (0.0052)	0.0349*** (0.0038)	0.0226*** (0.0029)	0.1448*** (0.0147)
Tenure track instructor	-0.0355*** (0.0070)	-0.0315*** (0.0067)	-0.0191*** (0.0053)	-0.0137*** (0.0042)	-0.0945*** (0.0182)
Tenured instructor	-0.0568*** (0.0055)	-0.0566*** (0.0056)	-0.0351*** (0.0047)	-0.0217*** (0.0036)	-0.1572*** (0.0149)
Observations	730,408	730,408	730,408	730,408	664,499
R-squared	0.4914	0.5009	0.4679	0.4473	0.6172
Student FE	YES	YES	YES	YES	YES
College-intro-course FE	YES	YES	YES	YES	YES

Note: The base group for all regressions is long-term non-tenure faculty. All regressions control for whether the subject was student's initial declared major with an indicator for missing major declaration, the student's age when taking the introductory course and course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, and other students' average high school GPA in the course section. Standard errors are two-way clustered at the student and college-subject level. Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Appendix Table V. Impact of Different Types of Instructors in Introductory Courses on Subsequent Course Grades: Grade Distribution**

Outcome	(1) Grade: A or equivalent	(2) Grade: B or better	(3) Grade: C or better	(4) Grade: D or better	(5) Grade given Persistence
	<i>Two-year Colleges</i>				
Temporary adjunct	-0.0136** (0.0056)	-0.0048 (0.0065)	-0.0014 (0.0058)	-0.0003 (0.0056)	-0.0531*** (0.0176)
Observations	128,563	128,563	128,563	128,563	107,791
R-squared	0.7974	0.7978	0.7842	0.7783	0.8649
	<i>Four-year Colleges</i>				
Temporary adjunct	-0.0042 (0.0033)	-0.0039 (0.0035)	-0.0074*** (0.0028)	-0.0075*** (0.0027)	-0.0123 (0.0080)
Tenure track instructor	-0.0024 (0.0030)	0.0017 (0.0032)	-0.0015 (0.0029)	-0.0010 (0.0027)	-0.0082 (0.0070)
Tenured instructor	-0.0025 (0.0033)	0.0086** (0.0040)	0.0056 (0.0036)	0.0045 (0.0033)	0.0173* (0.0089)
Observations	306,479	306,479	306,479	306,479	277,131
R-squared	0.6957	0.6819	0.6490	0.6297	0.7703
Student FE	YES	YES	YES	YES	YES
College-intro-course FE	YES	YES	YES	YES	YES
Next-college-course-section FE	YES	YES	YES	YES	YES

Note: The base group for all regressions is long-term non-tenure faculty. All regressions control for whether the subject was student's initial declared major with an indicator for missing major declaration, the student's age when taking the introductory course and course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, and other students' average high school GPA in the course section. Standard errors are two-way clustered at the student and college-subject level. Robust standard errors in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1



**Appendix Table VI. Results of First Stage IV Regressions (Probability of Taking the First Course in a Subject Area with Different Types of Instructors)**

Outcome	<i>Two-year Colleges</i>		<i>Four-year Colleges</i>	
	Temporary adjunct	Temporary adjunct	Tenure track instructors	Tenured instructors
<i>A. First stage for introductory course grade &amp; subsequent course enrollment</i>				
Variation of proportion: temporary adjunct	0.3373*** (0.0313)	0.7498*** (0.0937)	-0.0013 (0.0300)	0.0044 (0.0491)
Variation of proportion: tenure track		0.1047** (0.0515)	0.4733*** (0.0486)	0.1498*** (0.0402)
Variation of proportion: tenured		0.1279*** (0.0364)	0.0788** (0.0282)	0.5205*** (0.0401)
F-statistics	116.06	23.61	35.55	60.82
Observations	324,883	730,408	730,408	730,408
R-squared	0.4653	0.3253	0.3209	0.3644
<i>B. First stage for next course grade</i>				
Variation of proportion: temporary adjunct	0.1765*** (0.0258)	0.4923*** (0.0459)	0.0456* (0.0247)	0.0282 (0.0274)
Variation of proportion: tenure track		0.0633** (0.0280)	0.3581*** (0.0424)	0.1839*** (0.0417)
Variation of proportion: tenured		0.0687** (0.0243)	0.0935* (0.0320)	0.4847*** (0.0402)
F-statistics	46.97	38.55	26.82	54.47
Observations	128,563	306,479	306,479	306,479
R-squared	0.6615	0.3901	0.3772	0.5191

Note: The base group for all regressions is long-term non-tenure track faculty. All regressions control for students' characteristics listed in Table 5 and college-introductory-course fixed effects. Other controls include whether the student entered college in fall and whether the subject was his/her initial declared major with an indicator of missing major declaration. Standard errors are clustered at college-subject level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Appendix Table VII. Robustness Tests on Alternative Ways to Construct the Instrumental Variable**

**Panel A: Impact of Different Types of Instructors in Introductory Courses on Subsequent Course Enrollment: Robustness Check of Table 10**

	(1) Two-year Colleges	(2)	(3)	(4) Four-year Colleges	(5)	(6)
	Outcome: Take a second course in the subject area					
	IV: variation in sections taught by different instructors	IV: variation in enrollment with different instructors	IV: variation in instructor headcount	IV: variation in sections taught by different instructors	IV: variation in enrollment with different instructors	IV: variation in instructor headcount
Temporary adjunct	-0.1196*** (0.0410)	-0.0949*** (0.0338)	-0.0322 (0.0423)	-0.3199*** (0.0528)	-0.1406*** (0.0437)	-0.2002*** (0.0372)
Tenure track instructor				0.0865 (0.0631)	0.2258*** (0.0609)	0.0734* (0.0450)
Tenured instructor				0.0432 (0.0520)	0.1669** (0.0657)	0.0071 (0.0454)
Sample mean	0.37			0.43		
Observations	324,883	324,883	324,883	730,408	730,408	730,408
R-squared	0.1726	0.1733	0.1761	0.1907	0.2132	0.2178

Note: The base group for all regressions is long-term non-tenure faculty. All models control for student characteristics listed in Table 5. All models in this table control for college-by-introductory course FE. The IV for models in column (1) and (4) present the results from Table 10 on students' probability of taking additional courses, where the IV is constructed using the fluctuation in the proportion of course sections taught by different types of instructors. Column (2) and (4) construct the IV as the fluctuation in the proportion of total course enrollment by different types of instructors. Column (3) and (6) construct the IV as the fluctuation in the headcounts of different types of instructors in each department. Standard errors are clustered at the college level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Panel B: Impact of Different Types of Instructors during the First Term on Enrollment Persistence: Robustness Check of Table 8**

	(1)	(2)	(3)	(4)	(5)	(6)
	Two-year Colleges			Four-year Colleges		
	Outcome: Persist into the 2 <sup>nd</sup> academic term					
	IV: variation in sections taught by different instructors	IV: variation in enrollment with different instructors	IV: variation in instructor headcount	IV: variation in sections taught by different instructors	IV: variation in enrollment with different instructors	IV: variation in instructor headcount
<i>Key Predictors: % of credits taken with different type of faculty during the 1<sup>st</sup> term (multiplied by 10)</i>						
Temporary adjunct	-0.0140*** (0.0053)	-0.0056* (0.0032)	-0.0154** (0.0069)	-0.0015 (0.0204)	0.0027 (0.0028)	0.0051 (0.0102)
Tenure track instructor				0.0013 (0.0044)	-0.0057 (0.0074)	-0.0162 (0.0256)
Tenured instructor				-0.0037 (0.0038)	0.0010 (0.054)	-0.0151 (0.0231)
Sample mean		0.60			0.79	
Observations	68,692	68,692	68,692	87,212	87,212	87,212
R-squared	0.0494	0.0662	0.0530	0.0731	0.0683	0.0466

Note: The base group for all regressions is long-term non-tenure faculty. All models control for student characteristics listed in Table 5. All models in this table control for college-course set FE, i.e. fixed effects for the set of courses student took in the first term of enrollment in a particular college. For example, one course set could be Econ 101 and Math 101 at college X; another course set could be English 101, Math 101, and Biology 101 at college Y. The IV for models in column (1) and (4) present the results from Table 8 for the course set FE + IV model where the IV is constructed using the fluctuation in the proportion of course sections taught by different types of instructors. Column (2) and (4) construct the IV as the fluctuation in the proportion of total enrollment by different types of instructors over time. Column (3) and (6) construct the IV as the fluctuation in the headcount of different types of instructors in each department. Standard errors are clustered at the college level: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## Appendix Table VIII. Robustness Checks by Dropping All Career Enders

### Panel A: Impact of Different Types of Instructors on Introductory Course Performance

	(1)	(2)	(3)	(4)	(5)	(6)
	Two-year colleges			Four-year colleges		
	Persist to the end of the course	Pass the course	Grade	Persist to the end of the course	Pass the course	Grade
Temporary adjunct	0.0128*** (0.0033)	0.0172*** (0.0027)	0.1412*** (0.0110)	0.0165*** (0.0017)	0.0267*** (0.0023)	0.1842*** (0.0109)
Tenure track instructor				-0.0039 (0.0024)	-0.0130*** (0.0023)	-0.0941*** (0.0140)
Tenured instructor				-0.0129*** (0.0018)	-0.0229 (0.0275)	-0.1724*** (0.0106)
Observations	321,259	321,259	321,259	711,587	711,587	711,587
R-squared	0.4701	0.5481	0.6288	0.3524	0.4767	0.6247

Note: The sample includes the introductory courses that student took with faculty who first started teaching younger than 55-year old. Base group for both two-year and four-year colleges are long-term non-tenure faculty. All models control for student individual fixed effects and college-introductory course fixed effects. Other controls for all models include the student's age when taking the introductory course, course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, other students' average high school GPA in the course section, as well as whether the course is within student's declared major with an indicator for missing major declaration. Standard errors are two-way clustered at the student and college-subject level. Classes on pass fail grading system are excluded. Robust standard errors in parentheses:\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

**Panel B. Impact of Different Types of Instructors in Introductory Courses on Subsequent Enrollment in the Subject Area**

	(1)	(2)	(3)		(4)	(5)	(6)	
			Two-year colleges				Four-year colleges	
	Take additional course	Take additional course and pass	Average pass rate of the next course	Average grade of the next course	Take additional course	Take additional course and pass	Average pass rate of the next course	Average grade of the next course
Temporary adjunct	-0.0122*** (0.0042)	-0.0069* (0.0039)	0.0033 (0.0027)	0.0022 (0.0063)	-0.0083*** (0.0031)	-0.0100*** (0.0032)	0.0002 (0.0014)	0.0147*** (0.0048)
Tenure track instructor					0.0064 (0.0041)	0.0071* (0.0041)	-0.0008 (0.0016)	-0.0025 (0.0073)
Tenured instructor					0.0058* (0.0032)	0.0040 (0.0031)	-0.0014 (0.0013)	-0.0184*** (0.0051)
Observations	321,259	321,259	116,480	116,480	711,587	711,587	305,536	305,536
R-squared	0.5111	0.4667	0.5228	0.6819	0.4506	0.4182	0.4849	0.6856

Note: The sample includes the introductory courses that student took with faculty who first started teaching younger than 55-year old. The base group for all regressions is long-term non-tenure faculty. All models control for student individual fixed effects and college-introductory course fixed effects fixed effects. Other controls include whether the subject was student's initial declared major with an indicator for missing major declaration, the student's age when taking the introductory course and course section characteristics of the introductory course including enrollment size, delivery method, term taking the course, and other students' average high school GPA in the course section. Standard errors are two-way clustered at the student and college-subject level. Robust standard errors in parentheses: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.