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Does happiness matter? The effect of teacher job satisfaction on college enrollment rates

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Abstract

Using data from the Schools and Staffing Survey, this study implements multiple estimation methods to determine the effect of teacher job satisfaction on the college enrollment rates. The findings indicate a positive relationship between the average level of teacher job satisfaction within a school and college enrollment rates. Teacher job satisfaction is inversely related to diversity in opinion regarding job attributes. Thus, the results suggest that reforms aimed at increasing teacher job satisfaction may improve student outcomes.

1. Introduction

Private enterprises often seek ways to increase their workers' job satisfaction in an effort to increase their productivity. The driving idea behind this behavior is that happier people will be more motivated and will exert greater effort to do their work well and vice versa. Economists have documented this positive relationship between job satisfaction and productivity in the private sector (Mangione and Quinn 1975, Petty, McGee and Cavender 1984, Patterson, Warr and West 2004, Borgogni, et al. 2010, Riketta 2008, Kube, Marechal and Puppe 2013, Oswald, Proto, and Sgroi 2015). Few economists, however, have investigated the effect of teacher job satisfaction on productivity in the education sector. Those that have have documented positive relationships between teacher job satisfaction and attitudes on student test scores (Ostroff 1992, Palardy and Rumberger 2008); however, test scores are not associated with economic gains and labor market success later in life. A student outcome that is linked to economic gains and labor market success is the college enrollment rate: in 2017, the median weekly earnings of high school dropouts in the United States were $520, compared to $712 for high school graduates and to $1,173 for college graduates with a Bachelor's degree (Torpey 2018).

Numerous non-economic studies have investigated the impact of teacher attitudes on students and have found that happier teachers may have better relationships with students (Karcher, Davis III and Powell 2002, Anderson, et al. 2004). Good relationships with teachers positively affect college participation (Plank and Jordan 2001). Simultaneously, teachers with greater satisfaction may be more motivated and enthusiastic, providing higher quality instruction (Kunter, et al. 2008) and potentially increasing student motivation (Patrick, Hisley and Kempler 2000, Moe, Pazzaglia and Ronconi 2010). Thus, schools with more satisfied teachers may be those where teachers are more likely to engage with students; to provide them with support, information, and encouragement to attend college; and to advise students beyond their classroom or discipline. Students may be encouraged or inspired by their teachers to apply to and enroll in four-year colleges. Finally, the encouragement and support from their teachers may also alleviate some of the fear of not being successful in college.

This study uses multiple estimation methods and restricted-use data from the 2007-2008 Schools and Staffing Survey (SASS) to analyze how teacher job satisfaction in the public-school system affects the four-year college enrollment rate. Because job satisfaction may be endogenous, in addition to traditional ordinary least squares (OLS), this paper also uses an instrumental variables approach with a novel set of instruments, the variance of teachers' responses to questions regarding job characteristics, to identify the impact of satisfaction.

Overall job satisfaction can be disaggregated into intrinsic and extrinsic components which individuals value differentially to arrive at a composite measure of overall job satisfaction (Kalleberg 1977). Intrinsic factors reflect the worker's desire to be stimulated by the job and to be able to use his skills, including developing and using one's abilities and seeing results. Extrinsic measures include convenience and financial aspects, relationships with co-workers, career opportunities, recognition, and resource adequacy. Men value the extrinsic aspects of work, while women value intrinsic aspects (Clark 2001). Workers value interpersonal relationships, job content, and income (Clark 2005). Borgogni et al. (2010) corroborate that management, colleagues, and workers' immediate supervisors are strong predictors of job satisfaction.

Findings in the education sector suggest that communication between teachers and principals increases job satisfaction (Bridges and Hallinan 1978, Forsyth and Hoy 1978, Little 1982). Teachers like strong principal leadership as well as a well-organized and orderly

environment in which they have average levels of control (Lee, Dedrick and Smith 1991). Similarly, a lack of autonomy and emotional exhaustion have a negative influence on satisfaction (Skaalvik and Skaalvik 2009).

OLS and two-stage least squares (2SLS) estimates indicate a positive relationship between increases in the average level of teacher job satisfaction within a school and graduating seniors' college enrollment rates. In particular, OLS results suggest that a one standard deviation increase in the average level of job satisfaction at a school is associated with an increase in the college enrollment rate of 1.3 percentage points. The 2SLS estimation supports this finding and suggests that a one standard deviation increase in the average level of teacher job satisfaction increases the college enrollment rate of its graduates by roughly 2.4-2.5 percentage points.

This study therefore contributes to the current literature by expanding upon the relationship between job satisfaction and productivity in the education sector. It links job satisfaction to student outcomes, and it addresses the potential endogeneity of satisfaction by using a unique set of instruments to identify the effect of satisfaction on student outcomes at the secondary school level. To my knowledge, this is the first paper to investigate the effects of teacher job satisfaction on college enrollment rates.

2. Data

The data come from the restricted-use 2007-2008 Schools and Staffing Survey (SASS), a stratified probability proportional to size survey[1]. It is composed of a series of questionnaires at the teacher, school, principal, and district levels. Teachers are sampled from the responding schools at a rate of one to twenty teachers per school.

Since the outcome of interest is the percentage of graduating seniors who enroll in four-year institutions, this study utilizes only schools that had seniors the previous year (2006-2007). The final sample is 2890 schools[2]. Table I provides descriptive statistics[3].

The college enrollment rate is the percentage of graduating seniors who enrolled in a four-year college. The average college enrollment rate in the full sample is roughly 45.6% with a standard deviation of 24.7% (Table I). For the subsample with at least three teachers responding, it is 46.6% with a standard deviation of 24.1%. Thus, the sample in this study has a slightly higher 4-year immediate college enrollment rate than the national average of 43.1% in 2007 (US Department of Education 2019).

The teacher survey contains a series of questions about the teacher's demographic characteristics, educational attainment, years of teaching experience, and certification status. It also contains questions about the teacher's perceptions of the school climate and about her attitude towards teaching and her school.

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[1] The SASS was administered every 4 years between 1987-2011. The 2007-2008 SASS is used in this study as this is the most recent data that was not impacted by the Great Recession.
[2] All sample sizes are rounded to the nearest 10 for confidentiality purposes. The subsample with at least 3 teachers responding is 2680 public high schools.
[3] Summary statistics for the subsample of schools with at least three teachers responding are similar to the full sample and are available upon request.

Table I. Summary Statistics

Variable	n	Mean	Std. Dev.	Min	Max
Pct. Seniors Graduating	2890	89.94	16.740	1	100
Pct. Seniors Enrolling in 4-year College	2890	45.64	24.713	0	100
Ave. Teacher Satisfaction	2890	3.46	0.380	1.4	4
Ave. Teacher Satisfaction (Taught Grades 11-12)	2710	3.46	0.372	1.67	4
Ave. Teacher College-based Quality	2890	1.7	0.64	0	4.67
Ave. Teacher Yrs Teaching	2890	14.0	5.13	1.5	37.75
Pct. Teachers BA Education	2890	73.2	23.04	0	100
Pct. Teachers MA	2890	47.6	27.67	0	100
Pct. Teachers Regular Teaching Certificate	2890	88.3	16.20	0	100
Pct. Teachers Other Teaching Certificate	2890	10.3	14.80	0	100
Pct. Teachers Hispanic	2890	3.6	10.82	0	100
Pct. Teachers Black	2890	6.2	15.60	0	100
Pct. Teachers Other Ethnicity	2890	2.5	8.48	0	97.06
Pct. Teachers Female	2890	59.3	23.21	0	100
Ave. Teacher Age	2890	43.0	5.56	24.5	63.5
Log Ave. School Pay	2890	10.77	0.215	10.0	11.63
Pct. Teachers in Union	2890	69.7	31.47	0	100
Pct. Teachers Part Time	2890	6.2	9.16	0	100
Pct. Students LEP	2890	3.7	10.35	0	100
Pct. Students IEP	2890	8.4	11.83	0	100
Pct. Students Hispanic	2890	10.2	18.07	0	100
Pct. Students Black	2890	13.2	22.94	0	100
Pct. Students Other Ethnicity	2890	7.1	17.08	0	100
Pct. Students Male	2890	50.8	9.88	0	100
Pct. Students Migrant	2890	1.2	6.43	0	98.21
Pct. Students on Reduced Price Lunch	2890	38.4	26.36	0	100
Charter School (=1)	2890	0.03	0.161	0	1
School's Total Enrollment	2890	855	715	12	5300
Student Teacher Ratio	2890	14.1	5.40	1.9	59.43
School's Average Daily Attendance Rate	2890	92.1	11.06	0	100
School for Problem Children (=1)	2890	0.04	0.199	0	1
School has Admissions Requirement (=1)	2890	0.22	0.417	0	1
School has Specialized Instruction (=1)	2890	0.23	0.418	0	1
School Received Title 1 (=1)	2890	0.32	0.467	0	1
School has Special Program Emphasis (=1)	2890	0.02	0.153	0	1
School is SPED School (=1)	2890	0.02	0.138	0	1
School is Vocational/Technical School (=1)	2890	0.03	0.162	0	1
School is Alternative School (=1)	2890	0.06	0.239	0	1
Hours/day	2890	6.42	0.777	1	10
Number of Days per Year	2890	178.8	7.84	100	259
School Organization: Divided (=1)	2890	0.14	0.342	0	1
School Organization: Loop (=1)	2890	0.13	0.335	0	1
School Organization: Multi Age (=1)	2890	0.40	0.490	0	1

School Schedule: Block Schedule (=1)	2890	0.43	0.495	0	1
School Schedule: 12 month (=1)	2890	0.14	0.347	0	1
School's Urbanicity: City (=1)	2890	0.17	0.377	0	1
School's Urbanicity: Suburban (=1)	2890	0.18	0.388	0	1

SOURCE: U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Teacher Questionnaire"2007-08; and U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Questionnaire"2007-08.

Among the teachers responding in the final sample, 59% of respondents are female, and the majority is white (Table I). The average respondent is 43 years old with 14 years of teaching experience. Roughly 48% have a Master's degree, and 88.3% have a regular teaching certificate. Thus, this sample looks very similar to the overall population of secondary teachers in 2007-2008 who were 59% female, 83% white, with 14 years of teaching experience, and with 54% having a post-baccalaureate degree[4] and 87% having a regular teaching certificate (Aud et al. 2010). Teachers included in the analysis were those who taught at a school with seniors the previous year, regardless of grade level taught. Ninety percent of the respondents taught in grades 9-12. Of the remaining 10%, 36% taught at the middle school level. As a robustness check, this paper also investigates the impact of satisfaction of only teachers who taught grades 11 and/or 12.

The perception and attitude questions are based on a scale of 1-4, and the average school-level response is an aggregation of the teachers' responses. The measure of teacher job satisfaction is based on the question "I am generally satisfied with being a teacher at this school", with 1 representing "Strongly Disagree" and 4 representing "Strongly Agree". The average level of teacher job satisfaction is 3.46, with a standard deviation of 0.38[5] (Table 1). The minimum school level of satisfaction is 1.4, while the maximum is 4.0.

The school survey contains information regarding student demographics; numbers of staff and faculty; school programs, organization, and structure; and whether the school had students in grades 9-12. On average, schools' enrollment is roughly 842 students, with an average student – teacher ratio of roughly 14 to one. The average daily attendance rate is 92%. Roughly 10% of students are Hispanic, while 13.5 % are black. Thirty-eight percent are on reduced-price lunch. Thus, the average school in this sample is slightly larger and less diverse than the average high school in 2007-2008. The average high school had an enrollment of 816[6] (Snyder and Dillow 2010) and an average daily attendance rate of 91.1% (Snyder and Dillow, 2012), with roughly 17% black and 21.2% Hispanic students (Aud, Fox, and KewalRamani, 2010), and 42.9% eligible for reduced-price lunch (Snyder and Dillow 2010).

Nearly a quarter of schools have admissions requirements and specialized instruction, and nearly one-third have students who received Title 1 benefits. On average, the school day is roughly 6.4 hours, and schools are in session an average of 179 days per year. Thus, the overall sample of schools in this survey is quite similar to average secondary schools nationwide.

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[4] The report includes the percentage with a post-baccalaureate degree, including master's or doctorate degrees or education specialist or professional diploma and first-professional degrees, which is why the national number may be slightly higher.
[5] The average level of job satisfaction for the subpopulation of schools with at least 3 teachers responding to the SASS is 3.46 with a standard deviation of 0.36. Summary statistics for the subsample are available upon request.
[6] Regular public schools had an average enrollment of 816, whereas all secondary schools had an average of 706 including special/vocational schools. Since the vast majority of schools in this sample are regular, the comparison to regular high schools is most appropriate. Sources regarding racial composition of public-school students pooled all elementary and secondary schools together, which may explain some of the differences in racial composition of the schools.

3. Empirical strategy

To identify the effect of teacher job satisfaction on student outcomes, this study first estimates the following OLS equation:

$$CE_s = \beta_0 + \beta_1 Sat_s + T_s\theta + C_s\gamma + I_s\tau + D_s\delta + \varepsilon_s \tag{1}$$

where *CE* is the percent of graduates from school s who enrolled in a four-year college immediately following graduation. *Sat* is the average level of teacher satisfaction at the school. *T* is a vector of average teacher characteristics at the school, including the competitiveness level of the teachers' undergraduate institutions (as ranked by Barron's in the year closest to when the teachers entered college); the number of years of experience and its square[7]; the percentage whose Bachelor's is in education; the percentage with a Master's Degree; the percentages who have a regular, other, or no state certificate; the percentage who are white, Hispanic, black, or other ethnicities; the percentage who are female; age and its square; log yearly earnings; the percentage who are unionized; and the percentage who are part time.

The vector *C* contains student demographics, including the percentage of students who are limited-English proficient; on an individualized education plan on free or reduced-price lunch; who are white, Hispanic, black, or other ethnicities; who are male; and who are migrants.

I is a vector of school characteristics, including the percentage of seniors who graduated the year before, a charter school indicator, enrollment and its square, the student-teacher ratio, and the average daily attendance rate. *I* also includes interactions of student and teacher ethnicities as well as programmatic characteristics such specialized instruction, admissions requirements, and school type. Finally, *I* contains information regarding the organizational structure of the school, hours per day and its square; days per year and its square; scheduling; age grouping; and indicators for the school's urbanicity.

D represents a vector of state fixed effects. As educational policy varies significantly by state, excluding state effects would lead to omitted variable bias. ε_s is a random error term.

Since the outcome of interest is a school-level variable, this study estimates equation (1) using one observation per school (full sample). The teacher characteristics are school-level aggregates of the teacher responses to the SASS questionnaires. To capture variation within a school, this study also estimates equation (1) using only schools with at least three respondents.

One may worry that estimating equation (1) by OLS may result in biased estimates, due to the likely endogeneity of teacher satisfaction. The endogeneity stems from reverse causality and simultaneity: teachers who work at more successful schools may be happier. These teachers may be teaching better and/or more motivated students at baseline, and reduced stress generates higher levels of job satisfaction. One method to address endogeneity is to use an instrumental variables approach: to identify a set of instruments that predicts teacher job satisfaction but does not affect the college enrollment rate and is uncorrelated with the error term. If these requirements are satisfied, then instruments can be used to predict satisfaction. Since the instruments are only associated with satisfaction and not the error term, only the part of satisfaction that is uncorrelated with the error term will be predicted, hence purging the model of the potential endogeneity. These

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[7] Polynomial terms were included for variables for which there may be increasing or decreasing returns. For example, teachers may improve their teaching over time, but at a decreasing rate. Teachers who may have been in a system for decades may have "stale" teaching techniques that are "outdated." Conversely, teachers may improve teaching over time at an increasing rate, as teachers may be able to more quickly pick up on techniques that help students and to identify more quickly when a method or technique is not helping.

predictions can then be used to estimate equation (1).

The SASS asked teachers to respond to a variety of questions pertaining to various aspects about their jobs. This study identified four questions pertaining to intrinsic and extrinsic factors related to satisfaction. These include their level of agreement with if "staff members are recognized for a job well done" and if the principal "enforces school rules for student conduct and backs me up when I need it", as well their perceptions the amount of control have over "selecting textbooks and other instructional materials" and over "disciplining students". The variances of the teachers' responses to these questions are the instruments in this study.

To be valid instruments, these measures must be correlated with satisfaction but not with college enrollment. The teachers' views on recognition for work and on a supportive principal are included because if teachers feel support and believe they are appreciated and not criticized, they will be happier. Furthermore, actual recognition for good work inspires teachers and makes them happier in their jobs. However, teachers may have different perceptions of adequate recognition and support which are uncorrelated to student outcomes and to their coworkers.

The variables relating to the teachers' views of control over various aspects of their jobs reflect the intrinsic aspects of job satisfaction. Having autonomy and control increases job satisfaction (Skaalvik and Skaalvik 2009). Thus, increased perceived control may increase satisfaction, resulting in happier and better teachers.

One may argue that these aspects of teaching may be correlated to the overall success of a school, but the correlation is unclear at best. A strong school may allow teachers much or little autonomy. If the school is strong because the students follow a rigorous and uniform curriculum, teachers will have little autonomy. If it is strong because students follow a rigorous and flexible curriculum allowing for innovation, teachers will have much autonomy. Similarly, principals may support and recognize teachers in strong schools to continue to motivate them or it may be more difficult to get recognition in a very good school due to competition. In a weaker school, principals may support and recognize teachers at an even greater level to motivate them, or they may not have adequate resources to do so. Therefore, as each individual school is a unique entity, so too are the policies of the principals and administration. The key is that each of these aspects of teaching influences a teacher's job satisfaction, and teachers weight these aspects differentially to arrive at their own level of job satisfaction.

The instruments themselves are the variances of the teacher responses, that is, how much teachers within a school share similar viewpoints. While using an average to predict an average may violate orthogonality conditions in that perhaps the averages themselves may influence teacher effort that in turn may influence student outcomes, the second moment, e.g., the variances, gives an extra degree of exogeneity. The variances reflect the differences in the opinions and viewpoints that the teachers have regarding various job attributes that affect satisfaction. Larger variances indicate more disagreement about job attributes, while smaller ones reflect more agreement. Therefore, the variances are picking up the differences of opinion in a workplace regarding the workplace characteristics that may affect job satisfaction. Thus, the variances of the responses are not correlated with student outcomes because the student outcomes depend on overall satisfaction within a school, not the variances of some of its determinants, which are individually weighted to arrive at individual levels of satisfaction. Furthermore, the variances reflect the social experience in a workplace, which also affects satisfaction, reinforcing the appropriateness of the variances as instruments.

The quality of the identification strategy hinges on whether the instruments are important determinants of the level of teacher job satisfaction. Table II presents a table of the correlations

of the instruments with satisfaction and the college enrollment rate. The correlations indicate that the instruments are not weak and that there is a relationship between the instruments and job satisfaction. The low values may indicate a loss of efficiency when instrumenting.

Table II. Correlation of instruments and average teacher satisfaction

	Ave Satisfaction	Var Tchr Agreement: Staff Recognized	Var Tchr Agreement: Principal Supports	Var Control Material	Var Control Discipline
Ave Satisfaction	1.00				
Var Tchr Agreement: Staff Recognized	-0.2064	1.00			
Var Tchr Agreement: Principal Support	-0.3227	0.2916	1.00		
Var Control over Material	-0.0927	0.0689	0.0572	1.00	
Var Control over Discipline	-0.2407	0.1527	0.2129	0.1583	1.00

This study uses multiple instruments for a variety of reasons. First, individuals value different dimensions of jobs differentially and weight these aspects individually to arrive at a single, composite measure of satisfaction (Kalleberg 1977). Next, more instruments are likely to increase the ability of the first stage regression to capture the part of satisfaction that exogenously affects college enrollment rates. Finally, using multiple instruments over identifies the system, enabling tests of the orthogonality assumptions associated with the instruments.

I explicitly test the first stage relationship between the instruments and satisfaction using the following equation:

$$Sat_s = \alpha_0 + A_s\rho + T_s\theta + C_s\gamma + I_s\tau + D_s\delta + \upsilon_s \tag{2}$$

This is a regression of the average level of teacher satisfaction at school s on the exogenous instruments contained in vector A (the variance of teachers' responses within a school to questions pertaining to their perceptions of various aspects of their jobs that affect overall job satisfaction), as well as the teacher, student, and institution controls from equation (1).

Table III presents the results of equation (2). In addition to the theoretical arguments for the instruments, the first stage results indicate that the identification strategy is sound, the model is overidentified, the instruments are not weak, and that the results are valid and consistent.

Each of the instruments is significant at the 1% level, conditional on all controls from the main equation. The estimates on the instruments suggest that increases in the variance of teacher responses to questions about their autonomy and their beliefs about their schools are associated with decreases in the average level of teacher job satisfaction. This suggests that differences in opinion among teachers is a negative determinant of job satisfaction. This aligns with the idea that company culture can influence job satisfaction. Whether workers are satisfied or dissatisfied with their jobs, generally they will be happier if their co-workers share similar opinions. People who are very satisfied with certain job attributes will be less happy if their coworkers are not satisfied

and vice versa. This concept corresponds to a sense of belonging and "fitting in," and is similar to findings that relative position, either with respect to income or consumption, influences job satisfaction (Card et al. 2012) and overall satisfaction (Luttmer 2005). Thus, increases in diversity of opinion within a workplace decrease the average level of satisfaction.

Table III. First stage results

	College Enrollment	
	All Schools	3+ Obs/School
Var Teacher Agreement Staff Recognized	-0.0831***	-0.0817***
	(0.0156)	(0.0161)
Var Teacher Agreement Principal Support	-0.1708***	-0.1801***
	(0.0161)	(0.0155)
Variance of Control over Material	-0.0275**	-0.0313***
	(0.0112)	(0.0118)
Variance of Control over Discipline	-0.1386***	-0.1512***
	(0.0234)	(0.0232)
2nd Stage Controls	Yes	Yes
Observations	2890	2680
Adjusted R-squared	0.2047	0.2151
F-test	79.95	83.87
Hansen's J statistic	3.83	5.44
Hansen's J p-value	0.28	0.14

SOURCE: U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Teacher Questionnaire"2007-08; and U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Questionnaire"2007-08.

An F-test on the excluded instruments is above critical values proposed by Staiger and Stock (1997) and Stock and Yogo (2005) for both samples, suggesting that the instruments are not weak and explain a significant portion of satisfaction, even after controlling for the exogenous variables in the main equation. Similarly, Hansen's J statistic is insignificant across all specifications for both outcomes, confirming the model is overidentified and the empirical strategy is valid.

4. Results

Table IV presents the results of estimating equation (1) by OLS. Columns 1 and 2 present the OLS results for the full sample of schools and for schools with at least three teachers responding, respectively.

In general, the results indicate that the controls exhibit the expected signs, supporting the validity of the model[8]. With respect to policy-relevant controls debated amongst policy makers,

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[8] Tables containing the full set of controls are available upon request. For brevity, regression tables include key variables of interest.

greater student-teacher ratios are generally associated with lower college enrollment rates. Charter school graduates are 6.3-6.5 percentage points more likely to enroll in a four-year college than those graduating from a traditional public school.

Table IV. OLS estimates of teacher satisfaction on college enrollment rates

	All Schools	3+ Obs/Schl
Average Teacher Satisfaction	3.3580***	3.6710***
	(1.0602)	(1.1596)
Pct Seniors Graduated	0.1986***	0.1922***
	(0.0309)	(0.0340)
Pct Students on School Lunch	-0.1217***	-0.1229***
	(0.0211)	(0.0229)
Charter School (=1)	6.3095*	6.4893*
	(3.2301)	(3.5444)
Student Teacher Ratio	-0.2214**	-0.2506**
	(0.1053)	(0.1123)
Average Daily Attendance Rate	0.0476	0.0338
	(0.0388)	(0.0430)
Other teacher controls?	Yes	Yes
Other student controls?	Yes	Yes
Other school controls?	Yes	Yes
Constant	6.6838	-35.2493
	(63.0631)	(72.1402)
Observations	2890	2680
Adjusted R-squared	0.324	0.306

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other teacher controls include: percent of teachers with BA in Education, percent of teachers with a Master's, average competitiveness of teachers' undergraduate institutions; years of experience and its square; percent of teachers who are Black, Hispanic, or other minority, female, unionized, holding state or other teaching certificates, part time; age and age squared; log earnings. Other student controls include: percent of students who Hispanic, Black, or other ethnicity, limited English proficient, on an individualized education plan, male, and migrant. Other school controls include the length of the school day and year and their squares, enrollment and its square; interactions of student and teacher ethnicities; if the school is a specialized instruction (Montessori), special education, vocational, or an alternative school, and controls for urbanicity (city, suburb, or rural). SOURCE: U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Teacher Questionnaire"2007-08; and U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Questionnaire"2007-08.

The OLS estimates suggest that a one standard deviation increase in teacher job satisfaction increases the college enrollment rate by roughly 1.3 percentage points for both samples. Thus, the OLS estimates imply teacher job satisfaction may have a lasting effect on student outcomes beyond high school.

While OLS suggests a positive and significant effect of teacher job satisfaction on high school graduates' decision to attend college, one may worry that satisfaction may be endogenous, implying that the OLS estimates of equation (1) may be biased and inconsistent. Thus, this study also implements an IV strategy, the results of which are presented in Table V. Comparing the OLS and IV results, the estimates on the controls are similar in sign and magnitude between the two

models, and the estimates are all of the predicted sign, confirming the plausibility of the model.

Table V. IV estimates of teacher satisfaction on student outcomes

	College Enrollment	
	All Schools	3+ Obs/Schl
Average Teacher Satisfaction	6.4432**	6.8805**
	(3.0656)	(3.2200)
Pct Seniors Graduated	0.1988***	0.1944***
	(0.0303)	(0.0335)
Pct Students on School Lunch	-0.1183***	-0.1208***
	(0.0209)	(0.0226)
Charter School (=1)	7.0495**	7.1825**
	(3.1635)	(3.4598)
Student Teacher Ratio	-0.2242**	-0.2361**
	(0.1038)	(0.1103)
Average Daily Attendance Rate	0.0425	0.0236
	(0.0380)	(0.0419)
Other teacher controls?	Yes	Yes
Other student controls?	Yes	Yes
Other school controls?	Yes	Yes
Observations	2890	2680
Adjusted R-squared	0.322	0.304

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other teacher controls include: average percent of teachers with BA in Education, percent of teachers with a Master's, competitiveness of teachers' undergraduate institutions; years of experience and its square; percent of teachers who are Black, Hispanic, or other minority, female, unionized, holding state or other teaching certificates, part time; age and age squared; log earnings. Other student controls include: percent of students who Hispanic, Black, or other ethnicity, limited English proficient, on an individualized education plan, male, and migrant. Other school controls include the length of the school day and year and their squares, enrollment and its square; interactions of student and teacher ethnicities; if the school is a specialized instruction (Montessori), special education, vocational, or an alternative school, and controls for urbanicity (city, suburb, or rural). SOURCE: U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Teacher Questionnaire"2007-08; and U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Questionnaire"2007-08.

The results in Table V confirm the positive relationship found in the OLS analysis between job satisfaction and the college enrollment rate; however, the results indicate that the OLS analysis underestimates the effect of job satisfaction on the college enrollment rate. Specifically, a one standard deviation increase job satisfaction is associated with an increase in the enrollment rate of 2.4-2.5 percentage points. Thus, both models indicate teacher job satisfaction has a lasting and long-term effect on student outcomes. Increasing average levels of satisfaction may therefore improve the four-year college enrollment rate.

As a robustness check, this study also analyzed a subsample of the schools for which the teachers' happiness (and instrument responses) were reported only by those teaching in grades 11-12, as it is possible their most recent teachers have a greater influence on students. The OLS and

IV results are presented in Table VI[9]. For both models, the results are similar to those of the main analysis, and the impact of satisfaction appears to be slightly larger in magnitude. Thus, the main analysis can be considered a lower bound on the impact of job satisfaction on student outcomes.

Table VI. Robustness check OLS & IV estimates of teacher satisfaction on college enrollment

	OLS		IV	
	All Schools	3+ Obs/Schl	All Schools	3+ Obs/Schl
Average Teacher Satisfaction	2.5518**	3.1847***	7.5614**	8.7251***
	(1.0399)	(1.1674)	(3.0593)	(3.1435)
Pct Seniors Graduated	0.2103***	0.1720***	0.2029***	0.1589***
	(0.0318)	(0.0369)	(0.0312)	(0.0359)
Pct Students on School Lunch	-0.1227***	-0.1345***	-0.1169***	-0.1279***
	(0.0221)	(0.0246)	(0.0220)	(0.0243)
Charter School (=1)	6.4098*	3.8876	7.4241**	4.1622
	(3.3646)	(3.4577)	(3.3084)	(3.3778)
Student Teacher Ratio	-0.2433**	-0.2588**	-0.2428**	-0.2525**
	(0.1074)	(0.1154)	(0.1067)	(0.1145)
Average Daily Attendance Rate	0.0430	0.0200	0.0399	0.0139
	(0.0406)	(0.0470)	(0.0399)	(0.0460)
Other teacher controls?	Yes	Yes	Yes	Yes
Other student controls?	Yes	Yes	Yes	Yes
Other school controls?	Yes	Yes	Yes	Yes
Constant	16.0642	-60.7566	6.9995	-61.2894
	(68.2715)	(76.4353)	(66.5997)	(74.2345)
Observations	2710	2310	2710	2310
Adjusted R-squared	0.324	0.308	0.318	0.300

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Other teacher controls include: percent of teachers with BA in Education, percent of teachers with a Master's, average competitiveness of teachers' undergraduate institutions; years of experience and its square; percent of teachers who are Black, Hispanic, or other minority, female, unionized, holding state or other teaching certificates, part time; age and age squared; log earnings. Other student controls include: percent of students who Hispanic, Black, or other ethnicity, limited English proficient, on an individualized education plan, male, and migrant. Other school controls include the length of the school day and year and their squares, enrollment and its square; interactions of student and teacher ethnicities; if the school is a specialized instruction (Montessori), special education, vocational, or an alternative school, and controls for urbanicity (city, suburb, or rural). SOURCE: U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Teacher Questionnaire"2007-08; and U.S. Department of Education National Center for Education Statistics, Schools and Staffing Survey (SASS), "Public School Questionnaire"2007-08.

5. Conclusions

Improving student outcomes and college enrollment remains a major policy focus of the

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[9] A full set of results, including the first stage estimates, is available upon request for the robustness check. All results are similar to and support those in the main text.

nation. For decades, researchers have attempted to determine which school inputs affect student outcomes. While much attention has been given to addressing teacher qualifications and teacher effectiveness, little research has focused on teacher attitudes. This paper sheds light on how teacher attitudes may affect student outcomes. It contributes to the literature by investigating the effect of teacher job satisfaction on productivity, as measured by the four-year college enrollment rate of graduates.

Multiple estimation methods indicate a positive relationship between the average level of teacher job satisfaction within a school and student outcomes. It further documents that differences in teachers' opinions regarding various job characteristics influence overall satisfaction. Future research should investigate further nonpecuniary aspects of job satisfaction and community culture within a school. This study finds suggestive evidence that by improving the community culture of the school, and by providing support and autonomy to teachers, policy makers may be able to improve student outcomes at low monetary cost.

This study is the first of which the author is aware to find a positive and lasting impact of teacher job satisfaction on student outcomes related to economic gains in later life. Future research should update the findings with more recent data which may reflect post-recession (and post-COVID-19) college enrollment decisions. Another avenue of research could investigate if higher quality teachers are drawn to schools with happier teachers, which may further improve student outcomes.

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