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The effects of graduate-student unionization

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DEDICATION

To my parents, Tom and Julie.

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ABSTRACT

Beginning in the 1970s, graduate assistants have organized labor unions. Presently, 36 universities have a graduate–student union. However, the effect graduate–student unions have on wages, wage variance, health benefits, and organizational structure is unknown. This study uses data from the *Chronicle of Higher Education* and government data to estimate the economic effects of unionization. By using a multilevel model is used to control for intra–university correlation of wages, this study concludes graduate unions are effective at raising stipends, but ineffective at lowering fees, providing health–care coverage, and lowering intra–university wage variance.

CHAPTER 1. INTENT AND MECHANISMS OF UNIONIZATION

While union memberships are declining, graduate–student unions are have become popular. Even though faculty and staff unions have made unionism more familiar to campuses, graduate students still do not fit the demographic profile of traditional unionized labor. Graduate assistants are, for all intent and purposes, temporary employees—leaving their duties after graduation; young—typically under thirty; and have completed over 16 years of schooling.[1]

The effects of graduate–student unionization on stipend levels, stipend distributions, health benefits, and academic success are largely unknown. The paucity of research is largely due to a lack of systematic reporting of wages, hours worked, fringe benefits, number of strikes, and other labor management issues regarding graduate–student unions. Notwithstanding, a number of scholars have argued the potential beneficial and deleterious effects unionization. This paper will evaluate those arguments against the known empirical data.

One difficulty is to present a framework to view graduate–student unionization. This paper will adopt Richard Freeman and James Medoff's "two faces of unionism" to the scholarly literature on graduate–student unions (Chapter 1). This framework will augment the existing research in two ways: first, it will be easier for researchers to view the larger picture of unionization and weight the costs and benefits. Second, it will become evident that the economic effects of unionization is the largest piece of missing data.

Chapter 2 will fill in the missing gap on graduate–student union research by using a panel data set assembled from *The Chronicle of Higher Education*, the U.S. Department of Education, National Research Council, and the National Science Foundation. The union's effect on the union–nonunion wage gap, health benefits, and wage variation will be explored. Chapter 3

[1]Hirsch et al. (See 2004, Table 5.4) for a description of current unionized workers.

will use previous research on graduate–student unions, along with the research presented in Chapter 2, to weigh the costs and benefits from unionization.

Graduate assistants are known under a number of labels: teaching assistants (TAs); research assistants (RAs); and (GAs), which usually includes TAs and RAs. Thus, unions composed of graduate assistants also have a number of synonyms: graduate–*student* unions; graduate–*employee* unions; and graduate–*assistant* unions. For reasons that will become clear, union activists usually denote themselves as graduate–employee unions; however, this paper will refer to them as graduate–student unions. Unionization itself will generally refer to, unless otherwise noted, to graduate–student unionization.[2]

1.1 History of Graduate–Student Unions

The University of Wisconsin–Madison's Teaching Assistants' Association (TAA) is generally regarded as the first graduate–student labor union. Originally an informal union, in 1969 members of the TAA threatened to strike if the Wisconsin state legislature passed a bill that would revoke out-of-state tuition remission for graduate assistants. The threat worked and the bill was quickly withdrawn. Following their political success, the TAA began to seek formal recognition and a labor contract. In the same year, the University of Wisconsin voluntarily recognized the TAA as a collective bargaining agent and entered contract negotiations. However, by March 1970, after a year of negotiations, little progress was made in reaching a contract. The TAA struck and shortly thereafter, the University of Wisconsin and the TAA reached a deal and signed their first labor contract.

Although the TAA was the first union, it was not the first to receive a contract. In 1968, the City University of New York (CUNY) included graduate assistants in its union contract with the faculty—who were already unionized. Following Wisconsin and CUNY, the Michigan, Oregon, and three Florida public universities—University of Florida, South Florida University, and Florida Agriculture & Mechanical University—unionized in the 1970s.

Graduate–student unionization developed through two lineages: public universities and

[2]Although this paper discusses the court cases pertaining to the classification of graduate assistants as employees, this research does not contribute to the discussion.

private universities. A bulk of the unionized universities are public institutions. Unionization eligibility for public universities depends on state law. States with already dense union membership were often the first to grant union status.[3]. Private universities, however, were subject to federal law and the National Labor Relations Board (NLRB) had the authority to approve or deny bargaining rights.

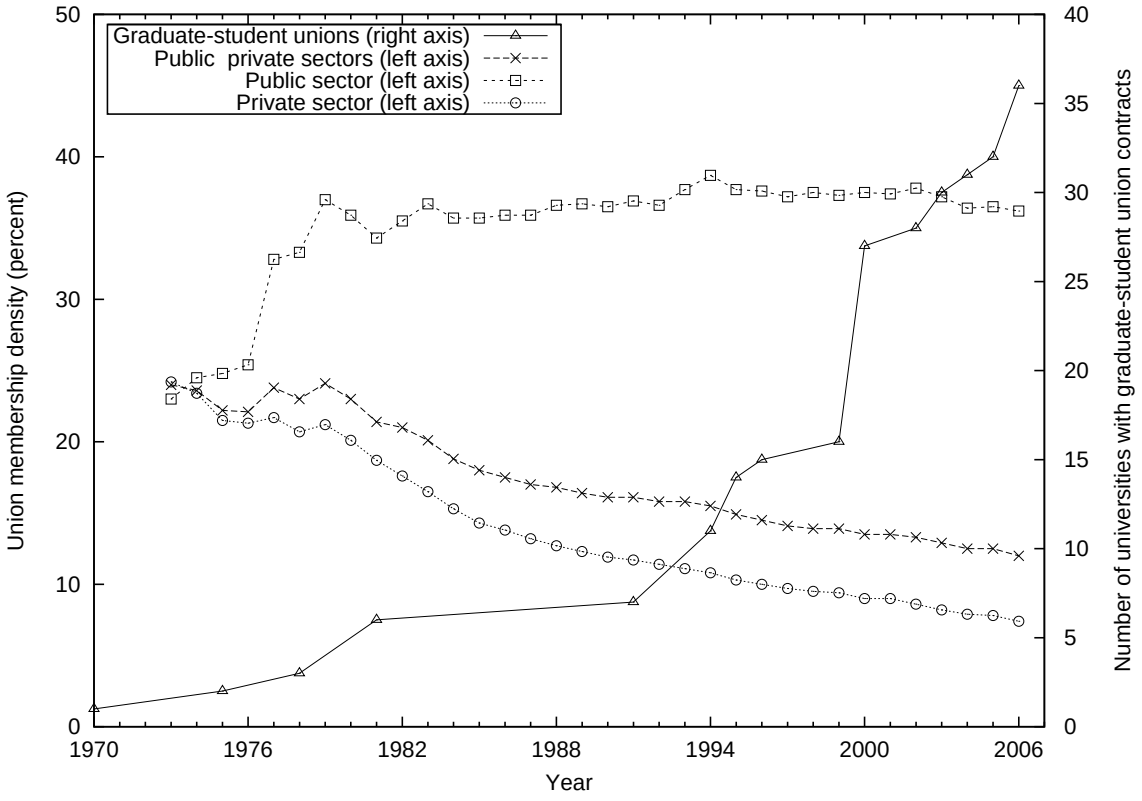
Initially, the NLRB refused to intervene in the affairs of private, nonprofit universities (*Columbia*, 97 NLRB 424), but finally asserted jurisdiction over graduate students in private universities in 1970 (*Cornell*, 183 NLRB 41, 1970). When teaching assistants at Adelphi University petitioned for union recognition, (*Adelphi*, 195 NLRB 30), the NLRB determined graduate assistants were not employees and may not unionize. In the majority opinion, two board members summarized the position that would be upheld for the next thirty years:

> The graduate assistants are graduate students working toward their own advanced academic degrees, and their employment depends entirely on their continued status as such. They do not have faculty rank, are not listed in the University's catalogs as faculty members, have no vote at faculty meetings, are not covered by the University personnel plan, have no standing before the University's grievance committee, and, except for health insurance, do not participate in any of the fringe benefits available to faculty members ... Unlike faculty members, graduate assistants are unaided, instructed, assisted, and corrected in their performance of their assistantship duties by the regular faculty members to whom they are assigned (p. 646).

Medical residents at Cedars-Sinai Medical Center also petitioned for union recognition (*Cedars–Sinai*, 223 NLRB 57, 1976). The NLRB, however, echoed the *Adelphi* decision when the Board rejected medical residents and interns from unionizing because "[t]hey participate in these programs not for the purpose of earning a living; instead, they are there to pursue the graduate medical education that is a requirement for the practice of medicine (p. 253)." Later, even faculty unions at private universities, who enjoyed earlier success, lost a Supreme Court case

[3]The first three graduate unions were in states were the density of union membership was higher than the national average (see Hirsch et al., 2001). Moreover, most of the graduate–student unions are in the Pacific, West North Central, East North Central, and Middle Atlantic regions—the regions with the most dense union membership (Hirsch et al., 2004).

Figure 1.1 Union membership density and number of graduate-student unions, 1973–2006



and were prohibited from unionizing because faculty members were considered to be managers instead of employees (*NLRB v Yeshiva University*, 444 U.S. 672, 1980). The *Cornell*, *Adelphi*, *Cedars–Sinai*, and *Yeshiva* cases had effectively halted the chance of any successful unionization attempt at a private university.

Meanwhile, graduate students in public universities, which are governed by state laws and agencies, were able to continue unionizing since they are not covered by NLRB rulings. The graduate–student union differs from the overall unionization trend in the United States. Figure 1.1 shows the proportion of U.S. workers who are members of a union has fallen nearly 20 percent since 1944 (Hirsch et al., 2001, 2006). Conversely, the number of organized campuses has doubled in the last ten years,[4] which coincides with the rise in public–sector unionism.[5]

[4]Unfortunately, there is no reliable source of union density numbers for graduate assistants.

[5]See Reder (1988) for a detailed discussion on the bifurcation between private and public section unionism

Presently, at least 36 universities are unionized.[6] A bulk of the graduate–student unionization occurred during the 1990s, where among other universities, four campuses at State University of New York (SUNY) and the ten University of California universities organized in 1992 and 1999, respectively.

Although many unions were officially recognized in the 1990s, the drives took as many as twenty years to come to fruition. To collectively bargain, the university must first recognize the union as a collective bargaining agent. For instance, the University of California's drive begun in the 1980s which eventually led to the recognition of the readers and tutors union at Berkeley in 1988. A few years later, in 1992, the graduate assistants went on in order to gain formal recognition by the University of California-Berkeley administration. Again in 1998, graduate assistants went on strike during fall semester finals to no avail. Berkeley's graduate–student union then petitioned the California Public Employee Relations Board (PERB) to be recognized as a collective bargaining agent. Later that year, PERB ruled graduate assistants were indeed "employees" and were permitted to unionize. Similarly, even the University of Wisconsin-Madison, which had initially voluntarily recognized their GA union, revoked its recognition in 1980 after the Teaching Assistants' Association struck over matters of educational policy and institutional governance (Barba, 1994). It was not until 1986 when the Wisconsin legislature, which oversees bargaining units, recognized the TAA as a formal union.

Despite the NLRB prohibition of unions at private universities, the unionization effort continued at private, normally prestigious, universities. Unions, which did not have collective bargaining status, organized at Yale and New York University (NYU). Administratively, non–contractual unions are equivalent to any other student organization. While universities were not required to bargain with these unions, the Supreme Court and NLRB decisions did not prevent universities independently recognizing GA unions. One of the strongest unionization efforts was the Yale University where the Graduate Employee and Students Organization (GESO) went on six strikes between 1990 and 2005. A bitter strike came in 1996 when graduate assistants refused to calculate and submit semester grades for classes they taught (Goldin, 1995; Glenn,

[6]California State University unionized in 2006, but of CSU's 23 campuses, it is unclear how any have unionized graduate assistants.

2005). Administrators continued to refuse to recognize the union and the strike eventually ended.[7]

The rapid push for GA unionization at the close of the decade would only get turned on its head. Relying heavily on the dissent in the aforementioned *Adelphi* case, the NLRB began to permit unionization at private institutions. *Boston Medical Center* case (330 NLRB 30, 1999)—a case involving medical residents petition to unionize—overturned the important *Cedars–Sinai* case by shifting their focus on the literal definition of "employee" in the National Labor Relations Act (NLRA) (29 U.S.C. 152, Section 2(3)). The definition is very inclusive and the Board determined that medical residents were employees and, therefore, had the right to unionize. The spirit of this decision was carried forward when the unionization effort at NYU was applied to the NLRB. Again, the NLRB reviewed union eligibility under the broad definition of "employee" and determined graduate students to be eligible for unionization (332 NLRB 111, 2000).

The *NYU* case seemingly opened the door for other private universities to pursue their own drives. However, unionization efforts at private universities suffered two setbacks. First, in 2002, a formal campus–wide vote on graduate–student unionization at Cornell was defeated—the first union drive at a private university to fail (Smallwood, 2002a). Ballots were also casted at Brown, Columbia, Pennsylvania, and Tufts University, but school administrators were able to postpone counting as administrations appealed their cases. The *NYU* ruling, which gave unionization efforts at private universities a fresh and almost tangible opportunity, was short–lived. In 2004, administrators at Brown University appealed the union drive to the NLRB, where the composition of board members significantly changed, overturned the *NYU* ruling, thus banning private universities from unionizing (342 NLRB 42, 2004). Since the *Brown* ruling, New York University has refused to renew a new unions contract with graduate assistants (Gravois, 2005).

Table 1.1 shows all of the universities where graduate assistants have unionized. The formation date indicates the year a union first formed; the recognized date is when the university

[7]Participants claimed NYU threatened them in order to end the strike, but a judge ruled the strike was unprotected under fair labor laws.

administration officially recognized the union; and first contract is when the first union contract was ratified by graduate students.[8] Since 2000, the University of California and California State University system signed contracts with their graduate assistants. The Illinois Public Employee Relations Board has also granted collective bargaining rights to universities, permitting Southern Illinois University, the University of Illinois at Urbana–Champaign, Springfield, and Chicago to unionize.[9]

1.2 Antecedents of Unionization

1.2.1 Causes

The rise of GA unions can be attributed to the sometimes bleak economic realities that face graduate students, both in school and in the job market. For one, graduate students have been taking longer to complete their degrees (Ehrenberg et al., 2004; U.S. Department of Education, 2005) and spending more time as graduate assistants (Ehrenberg and Mavros, 1995). Meanwhile, outside monies for financial assistance from the federal government has decreased (U.S. Department of Education, 2005; Ehrenberg et al., 1993). After graduation, the outlook is not any more sanguine. Graduate students, particularly in the humanities, are facing a tighter job market (Aronowitz, 1998; Barba, 1994), universities are cutting back on the number of tenured faculty positions being offered, and some real wages have fallen (U.S. Department of Education, 2005). Union gains are also attributable to changing institutional structures. Legislation permitting unionization and the spread of faculty unions have helped graduate unions succeed in gaining recognition (Julius and Gumport, 2002).

The time–to–degree—the amount of time it takes to receive a graduate degree after starting the program—has been steadily increasing since the 1970s. Table 1.2 shows the median time–to–degree between 1978 and 2003 has risen for all disciplines. However, social sciences,

[8] A number of events can be counted as a formation of the union. These dates usually signified a success "card signing" drive, an official vote of confidence for a union, or any legal action (e.g., petition) was recorded. An entire timeline with precise dates and references can be found at http://tschenk.public.iastate.edu/timeline/timeline.html .

[9] Seventeen unions have formed but not been formally recognized: Boston University; Brandeis; Brown; Columbia; Cornell; Indiana; Ohio State; Pennsylvania State; Purdue; Rensselaer; Tufts; Maryland; University of North Carolina at Chapel Hill; University of Pennsylvania; University of Southern California; University of Virginia; and Yale University.

Table 1.1 Recognized Unions and Important Dates

University	Formation	Recognized	First Contract	Membership
University of Wisconsin, Madison	1969	1969	1970	TA
University of Michigan	1975	1975	1975	TA
University of Oregon	1975	1976	1978	TA
State University of New York, Buffalo	1975	1991	1994	TA[2]
University of Florida	1976	1981	1981	TA & RA
University of South Florida	1981	1981	1981	TA & RA
Florida A & M	1981	1981	1981	TA & RA
University of California, Berkeley	1983	1988	2000	TA
State University of New York, Albany	1984	1991	1994	TA[2]
State University of New York, Binghamton	1984	1991	1994	TA
State University of New York, Stony Brook	1984	1991	1994	TA
New York University (NYU)	1991	2000	2000[1]	TA & RA
University of Iowa	1993	1996	1996	TA & RA
University of California, San Diego	1992	1999	2000	TA
University of Illinois, Urbana–Champaign	1993	2002	2004	TA & RA
University of California, Davis	1993	1999	2000	TA
University of California, Los Angeles	1994	1999	2000	TA
University of California, Santa Barbara	1994	1999	2000	TA
Wayne State University	1997	1998	1999	TA
University of California, Riverside	1997	1999	2000	TA
University of California, Irvine	1998	1999	2000	TA
Temple University	1997	2001	2002	TA & RA
Oregon State University	1999	1999	2000	TA & RA
University of Washington	2000	2003	2003	TA & RA
Michigan State University	2001	2001	2002	TA
University of Wisconsin, Milwaukee	1971	1991	1991	TA
University of Massachusetts, Lowell	1993	1993	1996	TA & RA
University of Kansas	1995	1995	1995	TA

Table 1.1 (Continued)

Recognized Unions and Important Dates

University	Formation	Recognized	First Contract	Membership
University of Massachusetts, Boston	2000	2000	2001	TA & RA
University of Rhode Island	2001	2003	2003	TA & RA
University of Illinois, Chicago	2004	2004	2006	TA
California State University System	2004	2004	2006	TA
University of California, Merced	2005	2005	2005	TA
Southern Illinois University, Carbondale	2005	2006	2006	TA
University of Illinois, Springfield	2005	2005	2006	TA
Western Michigan University	2005	2005	2006	TA

Source: Various, see http://tschenk.public.iastate.edu/timeline/timeline.html

TA denotes teaching assistants, RA denotes Research Assistants.

[1] University refused to renew contract.

[2] In 2007, the NLRB declared some research assistants were employees and potentially eligible to unionize (350 NLRB 18, 2007).

Table 1.2 Median time–to–degree, 1978-2003

	Time to degree (in years)		Percent change
	1978	2003	
All fields[1]	6.3	7.5	19.05
Physical sciences	5.9	6.8	15.25
Engineering	5.8	6.9	19.87
Life sciences	5.9	7.0	18.69
Social sciences	6.2	7.8	25.80
Humanities	7.5	9.0	20.00
Education	6.8	8.3	22.05

Source: National Science Foundation 2003, Table 15

[1] Includes disciplines not shown here.

education, and the humanities have had the largest percentage increases. This is on top of their already comparatively high time–to–degree rates from the 1970s. As a result, the student faces higher opportunity costs while in graduate school since they must forgo current job opportunities to finish their studies.

In addition to economic costs, there is also the worry of the pure accounting costs as a graduate student. The share of graduate students being supported by federal funds has declined (Ehrenberg et al., 1993); meanwhile, the share of graduate students relying on teaching or research assistantships has increased. The type of assistantships assigned depends on the student's major. For example in 2003, 56.6% of engineering students were supported by research assistantships, 16.4% by fellowships, and only 8.1% by teaching assistantships. By contrast, over 32% of the students in the humanities are teaching assistants, 34% were using their own funds, and only 1.8% held research assistantships (U.S. Department of Education, 2005, see Table 18).

Debt levels also tend to be higher for those in social sciences and humanities (see Table 1.3). The mean debt levels for graduate students in engineering, for instance, was $7,860 in 2003, while the debt burden for social sciences and humanities averaged $18,083 and $15,152, respectively. Humanities and social science graduate students are also the least likely to have no

debt (39.6% and 36.6%, respetively) and most likely to have incurred debts exceeding $35,001 (21.1% and 28.2%). Further, it appears this debt is primarily accumulated during graduate school. As undergraduates, future doctoral recpients in the social sciences and humanities have less than $5,000 in debt and are very likely to have no debt at all.

Graduate assistants are potentially being used as low–cost substitutes for full–time faculty members, especially for menial tasks avoided by tenured faculty (Julius and Gumport, 2002; Lafer, 2003). range from $55,000 to $110,000 (U.S. Department of Education, 2005), while graduate assistants earn roughly $15,000 (see Chapter 2). Table 1.4 shows roughly 14% of courses in the humanities are taught by teaching assistants. When looking at first year courses only, the proportion taught by GAs increases to 20%, indicating teaching assistants are more likely to teach introductory courses rather than upper level undergraduate courses.

Spending time away as a graduate student and working as a teaching assistant does appear to have adverse effects on time–to–degree figures. When major and other factors are controlled for, graduate students at Cornell University who served as teaching assistants took longer to graduate than those on fellowship or research assistantship (Ehrenberg and Mavros, 1995). Thus, as federal funding for graduate students has decreased, the need for assistantships has risen, which has contributed to longer and higher opportunity costs of staying in graduate school. In turn, graduate assistants are using unions as a way argue for higher stipends or limited workloads.

In addition to the plight of graduate students in school, students are also concerned about finding jobs after graduation. Graduates in the humanities and the social sciences are facing a tougher job market than their colleagues. First, universities are decreasing the proportion of members. In the past decade, the share of tenured faculty has fallen 10 percent, below 50 percent for the first time (see U.S. Department of Education, 2005, Table 242). Second, humanities doctoral graduates are less likely to participate in the labor market and are less likely to find work in their field. While unemployment is low for humanities graduates, over eleven percent are involuntarily employed outside their field—twice the overall average (Table 1.5). Moreover, 84% of humanities graduates participate in the labor market, which is 4%

Table 1.3 Debt related to the education of doctorate recipients, 2003

Debt level	Total	Physical Sciences	Engineering	Life Sciences	Social Sciences	Humanities	Education
Cumulative debt							
Mean	$12,478	$8,940	$7,860	$11,478	$18,083	$15,152	$12,834
No debt	50.0%	57.7%	65.6%	50.7%	36.6%	39.6%	51.0%
< $5,000	6.4	7.2	6.1	6.9	5.0	7.3	6.1
$5,001 - $10,000	6.0	6.7	4.5	6.8	6.1	6.7	5.2
$10,001 - $15,001	5.4	5.9	4.0	5.7	5.5	6.8	4.6
$15,001 - $20,000	5.0	5.1	3.7	5.4	5.2	5.9	6.7
$20,001 - $25,000	3.9	3.6	2.7	4.0	4.7	5.2	3.2
$30,001 - $35,000	3.1	2.2	1.9	3.2	4.3	3.8	3.3
$35,001 - $35,000	3.0	2.1	1.6	3.2	4.4	3.6	3.1
$35,001 >	17.2	9.6	9.9	14.1	28.2	21.1	18.9
Debt Share							
Graduate	69.24%	57.27%	63.96%	61.26%	74.39%	73.54%	76.30%

Source: National Science Foundation 2003, Table 19

Table 1.4 Percentage of all undergraduate courses taught in program, by type of instructional staff

Rank and course type	Median of Values[1]	Anthropology	English	History	Linguistics	Philology	Philosophy
Full–time tenure track							
All undergraduate courses	59.0%	60.4%	42.2%	59.5%	63.5%	51.4	62.8%
Introductory courses	48.1	50.7	25.4	49.0	48.1	34.6	54.7
Full–time non–tenure track							
All undergraduate courses	9.4	9.4	15.4	7.2	8.8	14.3	9.3
Introductory courses	11.2	10.0	17.6	9.0	8.5	16.3	11.2
Part–time tenure track							
All undergraduate courses	0.9	2.4	0.5	1.0	0.5	1.4	0.9
Introductory courses	0.7	0.8	0.6	1.0	0.1	1.1	0.6
Part–time non–tenure track							
All undergraduate courses	19.1	17.6	28.1	19.1	16.2	18.2	18.4
Introductory courses	26.4	22.0	36.6	23.0	13.4	26.7	26.4
Graduate Assistants							
All Undergraduate Courses	13.9	10.2	13.9	13.2	17.7	14.7	8.6
Introductory Courses	19.8	16.4	19.9	17.0	29.9	21.3	7.0

Source: American Historical Association 2007, Tables 1, 2A

[1] Includes disciplines not shown here.

Table 1.5 Employment characteristics of doctoral scientists and engineers, 2003

	All[1]	Life sciences	Physical sciences	Social sciences	Engineering sciences	Humanities
Unemployment rate	2.1%	1.8%	2.3%	1.4%	2.7%	1.7%
Out–of–field rate[2]	5.0	3.8	2.7	2.6	3.5	11.6
Labor force participation	88.5	88.7	86.2	88.1	88.8	84.3

Source: National Science Foundation 2003, Table 28

[1]Includes other disciplines not shown here.

[2]Out–of–field rate measures those involuntarily working out of their field.

lower than the overall average. Third, Table 1.6 shows faculty salaries in the humanities has also fallen since 1987. The average salary for a faculty member in the humanities, in 2004 dollars, has fallen 1.3 percent between 1987 to 2006; meanwhile, salaries for other disciplines have increased.

The statistical evidence indicates that graduates in the humanities, and to a lesser extent, social sciences, have been hit hardest by longer graduation times, lower tenure rates, and lower salaries. At the same time, there is evidence graduate students in the humanities and social sciences are the instigators of unions. In a survey of attitudes toward graduate–student unions, an administrator notes, "[t]here is no need [to unionize]. They [in the sciences] have all they want, high compensation and jobs when they graduate... (Julius and Gumport, 2002, p. 202)" It would not be surprising, then, to suspect that graduate students in the humanities fight hardest for unionization and receive the highest comparative benefit.[10]

The catalyst for unionization extends beyond self–interest. Graduate assistants have also objected to the "corporatization" of universities (Rhoads and Rhoades, 2005; Lafer, 2003). Universities are able to generate revenue by patenting research and offering distance learning. Pro-union scholars argue these revenue–generating programs are done in conjunction corporations and benefit administrators, tenured faculty, and corporations. (Lafer, 2003).

[10]This does not imply they will have higher wages compared to other departments on the same campus. Instead, humanities will probably have the largest union–nonunion wage gap when compared to other institutions. There is actually reason to believe that the intra-university standard deviation of wages will decrease with unionization.

Table 1.6 Average base salary of full–time faculty and instructional staff in degree granting institutions [in 2004–2005 dollars]

	Agriculture & home economics	Business	Education	Engineering	Health	Humanities	Natural sciences	Social sciences
1987 - 1988	$65,167	$60,851	$54,468	$70,225	$87,235	$57,053	$64,304	$62,183
2003 - 2004	66,447	76,216	58,801	78,967	92,472	56,313	72,816	66,532
Percent change	2.0%	25.3%	8.0%	12.4%	6.0%	-1.3%	13.2%	7.0%

Source: U.S. Department of Education 2005, Table 234

Another catalyst for graduate–student unionization is legislation that permits unions to bargain with universities. Faculty unions have also helped graduate assistants establish successful unions, often voicing support for graduate–student union efforts (e.g., Fogg, 2004). GA union drives that occur on campuses with full-time faculty unions have had better success at achieving recognition than union drives that "go it alone" (Julius and Gumport, 2002).

Graduate-student unions have sought a reduce workloads and improve working conditions. Namely, they seek stipend increases; fringe benefits for themselves and their families; lower workloads; additional benefits such as daycare; job security; and an improved grievance process (Rhoades and Rhoads, 2002; DeCew, 2003). These demands have had some success. The NYU graduate union, for instance, has secured annual raises of 3.5% and full health benefits (Smallwood, 2002b). The University of Michigan–Ann Arbor gave their students free daycare for children of GAs.

1.2.2 Opposition

Opponents to graduate-student unions have argued that graduate assistants are not employees, but rather, apprentices for future jobs (223 NLRB 57, 1976; 342 NLRB 42, 2004). University administrators, who often vigorously oppose unionization efforts, and faculty members fear that unions will interfere with faculty-student relationships (Boghossain and Velleman, 2007) or unions will attempt to gain control and negotiate over academic policy (Cavell, 2000). Lastly, union opponents, including graduate students, are concerned increased benefits will come at the cost of higher undergraduate tuition or smaller department sizes (DeCew, 2003; Smallwood, 2002a).

Whether graduate assistants are employees is still the key element in the legal cases presented to the NLRB and the courts. The NLRB has taken two distinct legal methods of determining union eligibility. The first focuses on the "primary intention" of graduate assistantships. The second uses a "strict" interpretation of Section 2(3) of the National Labor Relations Act. Initial cases involving student unionization (e.g., *Adelphi*, *Cedars–Sinai*, and *Cornell*), used the "primary intent" test. As noted above, the court determined graduate as-

sistants were not employees because worked on a condition of their studies and were supervised by faculty.

The court shifted their legal interpretation beginning with *Boston Medical Center* case and carried through to *NYU* case. The NLRB compared the duties of graduate assistants to the strict definition of "employee" in Section (2)3 of the NLRA. According to the Act, anyone is considered an employee with the exception of those (1) who are employed as an agricultural laborer, (2) in domestic service of any family or person, (3) any individual employed by his parents or spouse, (4) any individual employed as a supervisor, or (5) any employee of an employer subject to the Railway Labor Act (45 U.S.C 151). Since, as the Board argued, graduate assistants do not fit into any of these exceptions, they were to be considered "employees" In overturning previous cases that restricted graduate unionization, the Board argued the "primary intention" interpretation required the court to overlay a subjective interpretation of the law. A few years later, when the NLRB overturned the *NYU* ruling, the Board returned to the original "primary intention" interpretation.

Naturally, the question then becomes, which is the appropriate interpretation? Both the "primary intent" and "strict interpretation" methodology has been implicitly supported by Supreme Court rulings. In *NYU*, the decision noted the Supreme Court had previously ruled the only exceptions to the term "employee" were those enumerated in the NLRA (*NLRB v. Town & Country Electric*, 516 U.S. 85). On the other hand, the Board argued in *Brown* that the Supreme Court permitted an open interpretation of statues (*FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120), allowing courts to apply their own methodology.

Incidentally, NLRB decisions also corresponded to the political composition of the Board members. In *NYU*, the Democrat-majority Board, voting along party lines, permitted unionization; meanwhile, the Republican-majority in *Brown*, again voting along party lines, barred unionization. Thus, with political party influences and differing legal interpretations, both supported by the Supreme Court, the NLRB has not settled on a legal definition of "employee" in the graduate union context.

Second, unions may interfere with faculty-student relationships. Under a union regime,

tasks are carefully enumerated and grievance processes are outlined. Some faculty and graduate students claim the role of the mentor will decline and the individual faculty member will be looked upon as an employer, and not as someone who gives advice (Gehman, 2001; Boghossain and Velleman, 2007). However, this claim has not been supported in the literature. Case studies have revealed that faculty members do not perceive their relationship with students has been inhibited by unions (Hewitt, 2000). In fact, Julius and Gumport (2002) suggest that carefully enumerating tasks and duties may enhance the mentoring relationship because of clear expectations given to the students.

Lastly, the economic gains made by graduate-student unions will eventually have some economic impact on other areas of the university. Increasing stipends, fringe benefits, or provided other facilities such as daycare, might lead to higher tuition rates for undergraduate students. Similarly, departments may reduce the number of new students who are accepted with funding into a unionized department. First, under unionization, graduate students will be better able to secure more funding and their likelihood to graduate. Second, increased remunerations may reduce the number of incoming students, thereby potentially reducing the number of future faculty members and increasing future faculty wages.[11]

It does not seem to be the case, *prima facie*, that unionization causes catastrophic increases in tuition or reduces department size. In particular, no one to the author's knowledge has blamed unionization at the oldest GA unionized institutions—University of Wisconsin–Madison and University of Michigan–Ann Arbor—for chronic tuition increases or smaller department sizes. Of course, a number of factors possibly stronger than unionization has gone into tuition increases, which does not exclude the possibility of some relationship between unionization and costs.

[11] It is possible the labor supply would be unchanged. Departments would be more likely to decline admissions for those least likely to complete a degree, thus, having no effect on the labor market. See Ehrenberg (1992, 1991) for a further discussion on the flow of new academic labor supply.

1.3 What Do Unions Do?

Scholars have made a number of points on the implications of graduate–student unions, none too unfamiliar to other unionization movements. Ultimately, it is desirable to know what graduate student have done and the net benefit (cost) from unionization. However, the previous literature spends little or no time discussing the feasibility of unions resolving the major grievances that led to unionization in the first place.

The recommended goals of graduate–student unionization has been summarized by the American Federation of Teachers (AFT), who is often affiliated with local graduate union chapters (Fogg, 2004):

- Graduate assistants should receive a fair salary,
- receive full–tuition waivers,
- and receive health–care and retirement benefits.
- Universities should set clear work expectations,
- provide a fair job evaluation,
- should not reclassify GAs as adjunct professors,
- should provide paid orientations,
- provide academic freedom to graduate assistants,
- permit graduate assistants to serve on departmental committees.

The goals for graduate–student unions are not dissimilar to those made in other industries. It is reasonable to suspect

Richard Freeman and James Medoff's *What Do Unions Do?* (1985) presents an empirically–based framework to view the effects of unionization. Freeman and Medoff introduced the "two faces of unionization." The "monopoly face" of unions uses their collective bargaining power to raise wages. Obviously, higher wages—which would benefit some employees—would raise costs

for the firm and may reduce overall employment—thereby hurting other employees. On the other hand, unions also have a "collective voice face". Unions provide a way to voice employee concerns to the employer. Collective voice, the authors argue, provide a mechanism to improve economic efficiency by reducing quit rates and improve productivity. Consequently, the increased economic efficiency can overcome the negative effects for the firm caused by higher wages (e.g. monopoly face).

Economic efficiency, of course, is not the only concern. The monopoly and collective voice face have deleterious and beneficial effects of the distribution of income and the social nature of the organization. Generally, labor unions lower intra-firm variance of wages (Freeman and Medoff, 1985; Freeman, 1980, Chp. 5), while increasing the wage inequality between union and nonunion workers. Unions also enhance the social organization of the firm by introducing democratic procedures to the governance of the firm. These processes, which enhance union voice, often lowers quit rates among workers (Addison and Belfield, 2004).

Graduate–student unionization is malleable to the framework used by Freeman and Medoff. Table 1.7 adapts Freeman and Medoff's orginal figure (1985, Table 1–1) to the issues in graduate unions which were raised in the preceding section. Graduate unions have already tried to use their monopoly power to negotiate for better stipends and benefits. The use of collective voice has also been highlight, and to some extent, studied by scholars. The next three sections will briefly discuss how the two faces of unionization relates to economic efficiency, distribution of income, and the social organization on campus.

1.3.1 Economic Efficiency

It is likely unionization has secured some stipend increases, contributing to their popularity. The monopoly face of unionism is primarily responsible for guaranteeing better stipends and even union recognition itself. Unionizers have not been afraid to strike, withhold grades, and occupy buildings. Withholding labor persuaded, if not forces, administrators to bargain. The positive benefit for graduate students is higher stipends and better benefits. The cost, however, is likely to be carried over to other students or reduce the number of new acceptances.

Table 1.7 Monopoly and Collective Voice Faces in Graduate–Student Unionization

	Economic Efficiency	*Distribution of Income*	*Social Nature*
Monopoly Face	Unions will increase stipends and fringe benefits.	Unions will only increase stipends for specific students.	Unions interfere with faculty–student relationships.
Collective Voice Face	Unions will increase efficiency by enumerating tasks.	Unions will lower intra-University stipend variation.	Unions will eliminate exploitation of GAs.

The collective voice face does have a chance to improve economic efficiency. Unions negotiate for better grievance procedures and better work environments which, hypothetically, can improve work efficiency (Julius and Gumport, 2002). Leaving (quitting) is an important component to displaying dissatisfaction for a job (Hirschman, 1970) and is particularly important since graduate students are tied to the university for more than just employment. Improving job quality through better procedures can increase productivity and reduce costs for the university by ensuring a working TA staff.

1.3.2 Distribution of Income

Unions, through the monopoly power, will be in the position to raise stipends and benefits relative to nonunionized universities. While inequality between union and nonunion universities will likely rise, the intra–University wage gap will shrink. The collective voice face of unionism has negotiated for new wage schemes that lowered the variation of wage within the firm. Similarly, graduate–student unions may also bargain for schemes with the same effect. Namely, unions may be effective at lowering the variation of wages between the natural sciences and the social sciences and humanities.

1.3.3 Social Organization

The social nature of union organization is heavily relied upon in the current graduate–student union literature. The democratic institution within graduate–student unions is often the pride of union organizers (see Herman and Schmid, 2003). Unions begin with a campus–wide vote to determine the bargaining union and its officers. Tentative contracts are also vote upon before being formally accepted. Both officers and contracts are regularly brought to a vote.

However, unions may be initially ran and organized by non-elected or even non-local members. National unions, which have been assisting GA unions, often send their employees to head campaigns (Breitzer, 2003). Moreover, the classic majority–rule problem may permit unions to organize, but only because of high turnouts from particular departments. That is,

some departments may be uninterested in unions and effectively not represented.

1.4 Can Unions Succeed?

The previous section outlined the five main causes of unionization: (1) increased time–to–degree; (2) high costs; (3) more debt; (4) more but less desirable work and; (5) a tougher job market. The obvious question is whether can ameliorate the issues that led to unionization. Undoubtedly, traditional labor unions are effective at increasing wages. Faculty unions have already been successful at increasing wages in a campus setting (Freeman, 1978; Guthrie-Morse et al., 1981; Barbezat, 1989). Graduate students, however, are inherently ephemeral, leaving the union after graduation. The entire union membership often has a 100% turnover at least once a decade.

The previous section detailed the mechanism, monopoly power and collective voice, that would be used by the unions to redress their concerns. The monopoly voice will be able to reduce costs for graduate assistants by bargaining for tuition remission and lowering debt by increasing salaries. The eventual higher cost of graduate assistants may encourage departments to enroll fewer graduate students, thereby lowering the future labor supply of faculty and resolving job market woes. The collective voice face would be able to bargain for more desirable work and an effective grievance procedure for students being forced to work too much.

However, unionization will unlikely be able to decrease . Unions, if effective, will create incentives that do not encourage quicker completion. Higher stipends, better health benefits, and lower debt decreases the opportunity cost of staying in graduate school.

Overall, unionization has the ability to address the complaints given by graduate students. The monopoly and collective voice faces have the right tools to accomplish their goals. However, it is not known whether it is actually being achieved by unions. While there are reasons to suspect unionization can achieve their goals, there are reasons why it may not, such as a high annual attrition rate.

Studies on the effects of unionization will either implicitly or explicitly address the impact on economic efficiency, distribution of income, and social organization. Qualitative analysis of

the effects on social organization has already started (e.g., Hewitt, 2000; Julius and Gumport, 2002), but the quantitative impact on the economic variables is still unclear. In the next chapter, a study of the economic effects will be undertaken. In particular, the effectiveness of the monopoly face of unionism in the areas of economic efficiency and distribution of income (e.g., higher wages, inter-University wage variance, and intra-University wage variance) will be studied. Later in chapter 3, these findings will be combined with other research to evaluate the effectiveness of unions.

CHAPTER 2. ECONOMIC EFFECTS

One previous study was able to analyze the economic effects from graduate–student unions. Graduate stipends are not published regularly to let researchers analyze how unions affect stipends. This chapter relies on a survey conducted by *The Chronicle of Higher Education* of stipends in 2001, 2002, and 2004 makes it possible to begin some analysis.

A study by Ehrenberg et al. (2004)—the only study of graduate-student stipends—showed graduate–student unions were ineffective at increasing stipends. In a five-year period from 1996 to 2001, stipends at nonunionized universities rose 13.9%, while stipends at unionized institutions rose 10.7%. However, unionized schools were better able to reduce the amount of required fees. Total compensation (stipends minues required fees) at unionized schools increased 18.47% compared to 14.5% for nonunionized institutions, implying graduate unions were better able to reduce required fees.

Unfortunately, the authors of the study were bounded by strict confidentiality agreements and were only able to compare averages instead of using traditional econometric analysis. Thus, it is unclear whether differences between unionized and nonunionized institutions or other differences between institutions. Moreover, their study was not able to directly compare health benefits for universities.

Notwithstanding the paucity of research on graduate-assistant stipends, a number of studies have investigated the economic effects of faculty unionization. The evidence from faculty unions studies were mixed. A number of studies found faculty with unions had higher salary and compensation levels relative to nonunionized universities (Freeman, 1978; Birnbaum, 1974, 1976; Barbezat, 1989; Monks, 2000). A handful of other studies found faculty wages had little or negative effects (Morgan and Kearney, 1977; Marshall, 1979; Guthrie-Morse et al., 1981;

Rees, 1993; Hosios and Siow, 2004).

Results from the faculty unionization movement provides some indication about graduate–student unions. Both groups are well–education and work on university campuses with a department–university organization structure. The main services provided by both are teaching and research. However, graduate assistants (GAs) also differ in important ways; namely, GA's do not have a tenure system. Also, graduate assistantships are short–term employment, terminated when the student graduates. Because of this, unions face high turn over rates that may hamper their ability to effectively bargain.

The rest of this chapter will study the economic and income distribution effects of unionization outlined in Table 1.7. The central hypotheses tested here, and presumed in the literature, are that unions increase stipends and health care benefits while lowering the variance of income within a university.

2.1 Data Set

The data used in this study is collected from a number of sources. Stipend data was collected by *The Chronicle of Higher Education* for the 2000-01, 2001-02, and 2003-04 academic years (Smallwood, 2001, 2004). The *Chronicle* collected the average stipends at the department level for teaching assistants (TAs) and research assistants (RAs) in biology, economics, English, mechanical engineering, and sociology. Additionally, the surveys provided some simple data on health-care benefits. Universities indicated whether the university paid for health benefits for graduate assistants and dependents.

Forty-five universities from the Association of American Universities—an accreditation agency—were observed in the surveys for the 2000-01 and 2001-02 academic years. For the 2003-04 survey, eighty-three "leading universities" were sampled. In total, 101 unique universities were sampled. Twenty-five universities were included in the 2000-01, 2001-02, and 2003-04 surveys.

Stipend data was then paired to institutional and departmental characteristics for that given year. The Integrated Postsecondary Education Data System (IPEDS) was used to find

the type of institution (public or private); the cost–of–living for students attending the university; tuition costs; endowment size of the university; and total enrollment. Ranks for academic departments was obtained from the National Research Council 1995.

Union data was obtained from the Coalition of Graduate Employee Unions (CGEU), newspapers, and other writings. Union status has been divided into three categories: *Contract union*, *Noncontract Unions*, and *No Union*. A *contract union* is a union that has secured a labor contract. A *noncontract union*, on the other hand, is one where there is an active union presence, but they have not secured a contract. Some of the noncontract unions are simply not permitted to unionize (e.g., NYU), while others have yet to receive recognition. As a result, these unions have no formal bargaining power. Finally, *no union* is simply a university without a labor union.

When there is a contractual union, teaching assistants are always included. However, some research assistants are not part of a contractual union. Thus, contractual unions have also been decomposed into two groups, *TA union* and *TA+RA union*. *TA union* only includes teaching assistants, while *TA+RA union* included both teaching and research assistant.

Noncontractual unions may strike and protest, but they lack the ability to formally bargain and sign contracts. Since contractual unions *are* able to sign legally binding contracts and can appeal to state labor boards concerning unfair labor practices, they will likely have the strongest impact on stipends, health benefits, and wage variation. The main negotiating tool for noncontract unions, however, are strikes since they have no negotiating power, thus, noncontract unions are likely to have little or no impact on stipends.

A summary of the data is listed in Table 2.1. Roughly 22 percent of departments who reported TA wages in this sample belong to a union and 29 percent of departments who reported RA wages are unionized. Ten percent of the sampled universities are noncontract unions. The mean stipends for nonunion teaching assistants are similar to unionized assistants. Research assistants at nonunionized universities earn more.

Years organized is the length of time since the date of the first union contract and subtracting it from the observed year. For instance, in the 2001, the years organized for the

Table 2.1 List of Variables and Descriptive Statistics

Variable	Averages	
	TA's	RA's
STIPENDS		
Stipend (All)	$12,881	$13,725
Stipend (Non-union)	$12,837	$14,140
Stipend (Covered Unions)	$12,858	$12,831
Stipend (Non-covered Unions)	$13,178	$14,165
Stipend (TA union)	$12,814	$12,831
Stipend (RA union)	$13,148	$13,029
YEAR		
2000-01	0.30	0.27
2001-02	0.25	0.21
2003-04	0.44	0.52
MAJOR		
Biology	0.19	0.21
Economics	0.18	0.17
English	0.16	0.13
History	0.16	0.12
Mechanical Engineering	0.15	0.22
UNION STATUS		
Contract Union	0.22	0.29
Non-contractual Union	0.10	0.09
TA Union	0.27	0.27
TA + RA Union	0.23	0.21
Years Organized[1]	7.6	7.8
INSTITUTIONAL DATA		
Rank	44.78	38.44
Private	0.26	0.24
Cost–of–Living	$9,115	$9,270
Tuition Cost	$10,368	$10,114
Wealth	$1,924,673,422	$1,926,659,179
Total Enrollment	21,832	22,247

Numbers represent department–level averages and proportions for TAs and RAs.

[1] For unionized universities.

University of Michigan, which unionized in 2001, is zero. University of Wisconsin, the first campus to organize, has a value of thirty. The literature suggests one of two effects may be evident. Unions may garner higher wages as they become older. Unions may witness increasing returns over time because they become more experienced and effective (e.g. Barbezat, 1989; Freeman, 1978). Alternatively, unions may initially bargain for union security provisions and only initially produce small wage gains (Freeman and Kleiner, 1990). Otherwise, unions may experience decreasing returns over time. Douglas (1930) argued unions initially establish large wage gains as a show of effectiveness to union members, but focus on other areas in later contracts.

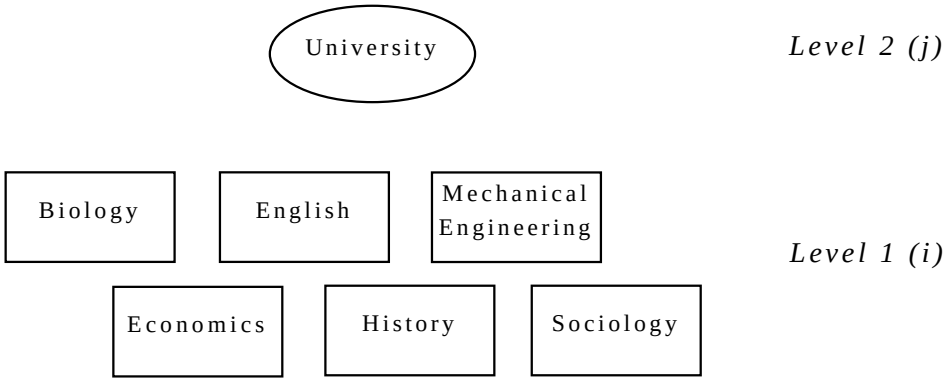
Key departmental and university characteristics are also likely to affect stipends. First, universities in high cost–of–living areas will be associated with higher wages. Cost–of–living is estimated by summing the estimated housing cost and other expenses for off–campus students (National Science Foundation, 2003). Paradoxically, highly ranked departments pay noticeably more than lower ranked departments (Smallwood, 2001).[1] The rank for each department is included from the somewhat dated ranking from the National Research Council 1995.[2] Finally, wealthier universities will probably pay more. A wealth-per-student ratio was constructed by dividing endowment size by total enrollment.

Finally, some graduate assistants may be more productive. Directly measuring productivity for teaching and research assistants is difficult. Universities typically report graduate assistants work 20 hours a week, but the figures are usually recommended times and not true averages. Some GA's may work more, while others much less. To circumvent this issue, assume universities are perfectly competitive firms and graduate assistants are in a perfectly competitive labor market. Under these labor market conditions, the price of labor will equal the marginal product of labor. In a university, the price of labor can be measured by the tuition

[1]Graduate school can be viewed as a trade off for present earnings with higher future salaries. Presumably, graduates from highly ranked departments are more likely to be tenured and earn higher salaries. Thus, one would expect graduate students at the best departments to be paid the least; however, going to a top–ranked school is a positive sum move. Higher salaries can be explained by department wealth, where rank and wealth is positively correlated. Additionally, the expected trade-off in temporal earnings implies equivalent lifetime earnings.

[2]At the time of publication the National Research Council planned to release updated ranking on February 15, 2008 (Glenn, 2007).

Figure 2.1 University-Department Hierarchy



paid by undergraduate students for classes they take. Therefore, undergraduate tuition can be used to measure the marginal productivity of a graduate assistant.

2.2 Econometric Model

Even though each department independently reports stipend levels, departments within the same university cannot be assumed to be independent of each other. University policies, economic characteristics, organizational structure, and informal attitudes universally affect all departments. Figure 2.1 shows the relationship between departments and university. Departments, while unique, are nested within universities. As a result, stipends within a university are likely to be correlated. The relationship can be dichotomized into two levels: level 1 are individual departments in a university. Departments are nested within universities (level 2). Departmental stipends are likely to be correlated within each university, even though inter-university stipends can be distinct. For instance, Emory University reported stipends of $12,235 for economics, English, history, and sociology, while biology received $19,000. While there is some distinct characteristics between social science and humanities departments, the rigid correlation between those departments is likely caused by a university–level policy.

The amount of wage correlation within a university can be measured by the intraclass correlations coefficient (ICC). A straightforward way of obtaining an is through an F-statistic

Table 2.2 Analysis of Variance for Stipends

Variation	SS	DoF	MS	F
Within Universities	2.5 e+12	97	25,737,783.1	5.28
Between Universities	9.6 e+12	696	4,874,079.40	
Total	5.9 e+12	1371	7426133.96	

obtained from an Analysis of Variance (ANOVA) table:

$$\rho_{icc} = \frac{F-1}{F+\tilde{n}-1},$$

where F is the F-statistic obtained from an ANOVA table, $\tilde{n}$ is the weighted number of observations within each university, and $p \in [-1, 1]$.

Table 2.2 shows an ANOVA table between clusters of universities and stipends. Within group mean squared error is lower than between group mean squared error, indicating the distribution of stipends within universities are narrower than the distribution between universities. The weighted average number of observations for each university ($\tilde{n}$) is 13.72 so the intraclass correlation of stipends within universities is 22.7 percent.[3]

Traditional ordinary least–squares (OLS) techniques cannot be used on data sets with an intraclass correlation. Specifically, OLS regressions will increase the probability of committing Type I errors (Kreft and de Leeuw, 1998; Barcikowski, 1981) for two reasons. First, the degrees of freedom in the sample will be inflated. In this chapter, there are 1,372 observed stipend levels over three years; however, there are only 101 universities in the sample. While it appears there are $N = 1,372$ independent observations, the error terms between departments in the same university are correlated, violating the OLS assumption that error terms are independent.[4] Second, OLS will also underestimate standard errors of the coefficients (Goldstein, 2002, p. 23). Models with inflated degrees of freedom will have a higher critical value, while the lower standard errors will artificially increase the chance of accepting a coefficient as significant.

[3]Even though there are only six departments observed, $\tilde{n}$ exceeds six because departments were observed over three years. This implies each university reported stipends in each department at least twice on average.

[4]Obviously, correlation is also important for the success of OLS regressions. One solution is to assign a dummy variable for each university, but using dummy variables will fail to account for "casual heterogeneity." See Steenbergen and Jones (2002) for a further discussion on this issue.

Referring to Figure 2.1, it is clear there are two levels to this data: a lower level consisting of individual departments and an upper level of universities.[5] A two-level random-intercept multilevel regression model will produce unbiased and consistent estimates with a nested data set. To build the model, first consider a standard OLS model:

$$y_{ij} = \alpha + \sum_{k=1}^{m} \beta_k x_k + \epsilon_{ij} \tag{2.1}$$

where x is the k^{th} random variable for the i^{th} department and j^{th} university, β_k is the k^{th} regression coefficient, and e_{ij} is the error term. The intercept in equation 2.1 is always fixed. However, the intercepts for individual universities may differ since unobserved university characteristics can change the overall baseline stipend levels. By adding a random variable, u_j, for each university j to allow for a unique intercept, the multilevel model can be written as:

$$y_{ij} = (\alpha_i + u_i) + \sum_{k=1}^{m} \beta_k x_k + \epsilon_{ij}. \tag{2.2}$$

The error terms, ϵ_{ij} and u_j have the following properties:

$$u_i \sim \mathrm{N}\left(0, \sigma_{\mathrm{u}}\right)$$

$$\epsilon_{ij} \sim \mathrm{N}\left(0, \sigma_{\epsilon}\right)$$

Given these properties and equation (2.2), the following can be derived:

$$\mathrm{E}\left(y_{ij}\right) = \alpha + \sum_{k=1}^{m} \beta_k x_k$$

$$\mathrm{Var}\left(y_{ij}\right) = \sigma_u^2 + \sigma_{\epsilon}$$

Equation (2.2) is used for the remainder of the chapter to estimate the effect unionization has on stipend levels and health care coverage.[6] Dummy variables representing *Contract* and *Noncontract* unions will be used to measure the union–nonunion gap. The dummy variables *TA Union* and *TA+RA Union* will also be used in the multilevel regression regression. A third model that analyzes the effects of unionization on intra–university wage variances will use traditional OLS regression. For the regressions in this chapter, the omitted binary variables are the 2000-01 academic year, biology major, nonunionized and public universities.

[5] The university system—a university with multiple campuses (e.g., University of California California, SUNY) could be treated as a level as well; however, of 87 university systems, only five had more than one campus, an insufficient number for a three-level regression. See 3.2

[6] See Goldstein (2002) for a more intensive discussion on multilevel models

2.3 Results

2.3.1 Stipends

The first question to be addressed is whether unions are effective at raising stipends. The dependent variable for the regression, which is based on equation (2.2), is the log of stipends. Year, major, union status, department rank, private university, cost-of-living, log of tuition cost, and the ratio of endowment wealth to total enrollment are included as control variables.

Table 2.3 and 2.4 shows the results using two different union controls for teaching and research assistants, respectively. One regression uses contract union and nonunion contract as the union control. The other uses TA union, TA+RA union, and contract union. Furthermore, since years organized is correlated with union status, each regression is ran with and without the Years Organized variable.

The union wage gap for contractual unions varies between 8 and 24 percent, depending on the inclusion of the Years Organized and Years Organized Squared variables. The results imply returns to unionization are initially around 20 percent, but the gap decreases for the first 19 years. The returns to unionization disappear when unions are about 8.5 years old, bottom out at 19 years, and positive returns resurface at 30.5 years.

When Years Organized is omitted, the union coefficient drops to around 8 percent. One possible explanation is the average returns for the nonlinear models (2 and 4) are roughly 8 percent. To test this idea, the Mean Value Theorem for Integrals (Larson et al., 2002, pp. 278-9) can be applied. Model 2 from Table 2.3 indicate the union–nonunion wage gape is $0.23 - 0.038t + 0.001t^2$, where t is years organized, can be evaluated over the Years Organized values observed in this study (between 0 and 34 years):

$$\frac{1}{34-0}\int_0^{34}\left(0.23 - .038x + .001x^2\right) = -.0307$$

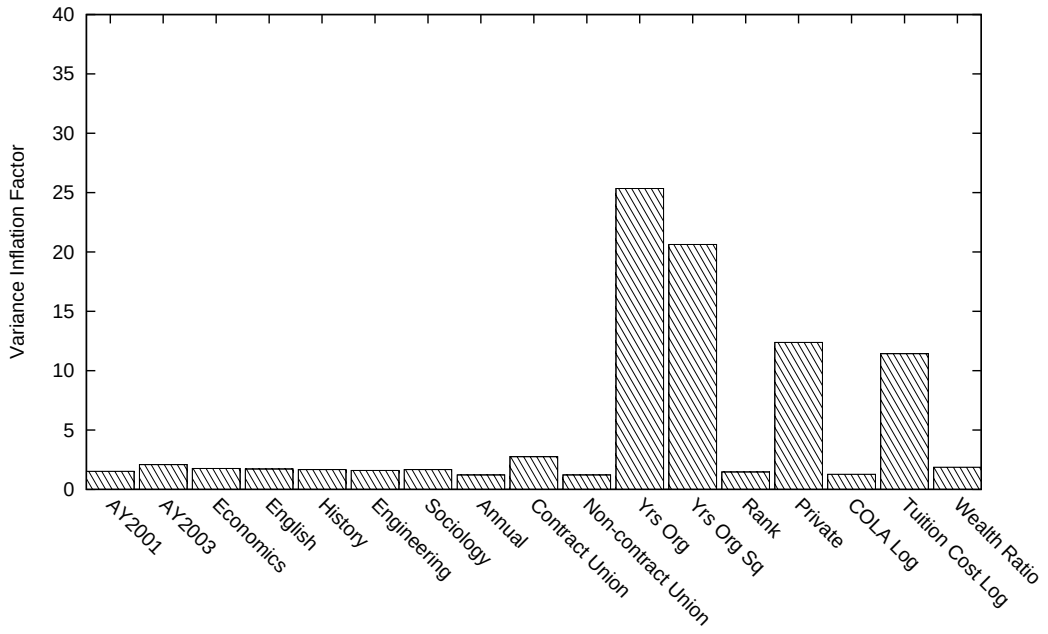
which implies the average returns to unionization is at a negative 3 percent. The major caveat with this, however, is most unions have formed during the 1990s. Only a handful of universities unionized before 1990, (see Table 1.1) thus according to these results, most of them are still earning more compared to nonunion universities.

Table 2.3 Two-Level Random-Intercept Multilevel Regression on Log of Stipends for Teaching Assistants

Variable	*Contract Union*				*TA and TA+RA Union*			
	Model 1		Model 2		Model 1		Model 2	
Fixed								
2001	0.033†	(0.019)	0.037†	(0.019)	0.046**	(0.022)	0.044**	(0.022)
2003	0.083*	(0.028)	0.101*	(0.027)	0.094*	(0.030)	0.106*	(0.029)
Economics	-0.034	(0.024)	-0.031	(0.024)	-0.033	(0.024)	-0.031	(0.024)
English	-0.046†	(0.025)	-0.044†	(0.024)	-0.045†	(0.025)	-0.044†	(0.024)
History	-0.069*	(0.025)	-0.069*	(0.025)	-0.070*	(0.025)	-0.069*	(0.025)
Engineering	-0.013	(0.024)	-0.012	(0.024)	-0.013	(0.024)	-0.011	(0.024)
Sociology	-0.054**	(0.026)	-0.053**	(0.025)	-0.053**	(0.025)	-0.052**	(0.025)
Annual Pay	0.338*	(0.031)	0.335*	(0.030)	0.338*	(0.031)	0.335*	(0.030)
Contract Union	0.086**	(0.037)	0.230*	(0.049)				
TA Union					0.122**	(0.048)	0.247*	(0.055)
TA+RA Union					0.080**	(0.037)	0.224*	(0.049)
Noncontract Union	0.061	(0.051)	0.070	(0.046)	0.063	(0.050)	0.071	(0.046)
Years Org.			-0.038*	(0.010)			-0.037*	(0.010)
Years Org. Sq.			0.001*	(3.3e-04)			0.001*	(3.4e-04)
Rank	2.8e-05	(3.7e-04)	9.4e-05	(3.6e-04)	3.8e-05	(3.8e-04)	9.2e-05	(3.7e-04)
Private	0.110	(0.110)	0.100	(0.103)	0.105	(0.110)	0.098	(0.103)
COLA-Log	0.094	(0.078)	0.098	(0.074)	0.096	(0.078)	0.098	(0.074)
Tuition-Log	0.005	(0.058)	0.002	(0.054)	0.008	(0.058)	0.004	(0.054)
Wealth Ratio	-1.7e-09	(5.8e-08)	1.6e-08	(5.4e-08)	5.4e-10	(5.76e-08)	1.6e-08	(5.4e-08)
Intercept	8.421*	(0.881)	8.394*	(0.837)	8.367*	(0.885)	8.375*	(0.838)
Random								
σ_u (Intercept)	0.106*	(0.013)	0.096*	(0.012)	0.107*	(0.014)	0.096*	(0.0124)
σ_ϵ (Model)	0.159*	(0.005)	0.158*	(0.005)	0.159*	(0.005)	0.158*	(0.0051)
Observations	558		558		558		558	
University Clusters	82		82		82		82	

Standard Errors in parenthesis; Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.:∗∗ ; Models 1 and 3 does not include Years Organized, while it is included in Models 2 and 4. Omitted variables: 2000, Biology, 9-month pay, nonunion, and public university.

Figure 2.2 Variation Inflation Factors (VIFs) for Teaching Assistants



The seemingly apocryphal returns for contractual unions when years organized is included can be attributed to a large union cohort and econometric problems. All of the universities in this study were either organized in the 1990s or before 1981. Thus, Years Organized does not have values between 11 and 19 years and intermittent values between 20 and 34 years.[7]

Furthermore, Years Organized and union status is correlated since only unionized schools can have a positive Years Organized value. While this is true for all studies including Years Organized, past studies worked with much larger data sets. It appears this study, with 558 observations for TAs and 410 for RAs, is inhibited by the correlation. Figure 2.3.1 shows the variance inflation factors (VIFs) after estimating Model 2 in Table 2.3, and, as expected, the values for Years Organized and Years Organized Squared are above the threshold. Due to the interpolation and econometric issues, union estimates with Years Organized are not reliable. The subsequent discussion and statistical analysis will exclude Years Organized.

[7]Recall the Years Organized values were calculated over the 2000, 2001, and 2003 academic years.

Interestingly, returns for unionization are higher for teaching assistants when only teaching assistants are included in the union. Teaching assistant–only unions earn approximately 2% more compared to when research assistants are included. Noncontract unions, those which do not have collective bargaining agreements with the university, do not earn a statistically significant higher wage than nonunionized universities.

Table 2.4 shows the regression on the Log of Stipends for research assistants. Contrary to the findings for teaching assistants, contract unions do not help research assistants. Even when unions are explicitly included in unions (Models 3 and 4) they do not see wage gains. Unsurprisingly, noncontract unions also do not increase RA stipends. This finding is in line with the hypothesis that research assistants are not active participants in graduate–student unions.

The Annual variable indicates wages were received over a 12-month period instead of an academic year (9-months). If wages were strictly proportional to time worked, stipends for an Annual worker would be 33% more than over an academic year. For a teaching assistant, the coefficient is almost exactly 33 percent. For research assistants, the coefficient indicates stipends are 25% higher; however, the 95% confidence interval includes 33 percent.

The regression outputs also reports estimates of the variation for the random intercept, σ_u, and the model's error term, σ_ϵ, from equation (2.2). The standard deviation of the intercept indicates the variation in the intercept attributable to unobserved university factors. For TA's and RA's, the random intercept terms are statistically significant. The random intercept variation is higher for research than teaching assistants, which implies there is more variation attributable to unobserved university effects for research assistants. One example is certain universities are better–able to obtain the requisite funding for RAs.

The random intercept variation and model error estimates can also be used to obtain the intraclass correlation of stipends while holding other factors constant (Rabe-Hesketh and Skrondal, 2005, p. 37):

$$\frac{\sigma_{\mathrm{u}}^2}{\sigma_{\mathrm{u}}^2 + \sigma_\epsilon^2} \tag{2.3}$$

When equation (2.3) is applied to Model 1 for teaching and research assistants, the intraclass

Table 2.4 Two-Level Random-Intercept Multilevel Regression on Log of Stipends for Research Assistants

Variable	*Contract Union*				*TA and TA+RA Union*			
	Model 1		Model 2		Model 3		Model 4	
Fixed								
2001	0.023	(0.032)	0.032	(0.032)	0.034	(0.035)	0.033	(0.035)
2003	0.093**	(0.046)	0.127*	(0.049)	0.101*	(0.048)	0.128*	(0.049)
Economics	-0.168*	(0.040)	-0.164*	(0.040)	-0.168**	(0.040)	-0.164*	(0.040)
English	-0.291*	(0.043)	-0.286*	(0.043)	-0.292**	(0.043)	-0.286*	(0.043)
History	-0.330*	(0.043)	-0.328*	(0.043)	-0.331**	(0.043)	-0.328*	(0.043)
Engineering	-0.156*	(0.036)	-0.152*	(0.036)	-0.156**	(0.036)	-0.152*	(0.036)
Sociology	-0.188*	(0.040)	-0.185*	(0.040)	-0.188**	(0.040)	-0.185*	(0.040)
Annual	0.258*	(0.037)	0.260*	(0.038)	0.257**	(0.038)	0.260*	(0.038)
Contract Union	-0.028	(0.058)	0.117	(0.085)				
TA Union					0.013	(0.080)	0.121	(0.094)
TA+RA Union					-0.047	(0.065)	0.115	(0.090)
Noncontract Union	0.032	(0.076)	0.049	(0.078)	0.033	(0.077)	0.049	(0.078)
Years Org.			-0.035**	(0.016)			-0.035**	(0.017)
Years Org. Sq.			0.001†	(0.001)			0.001	(0.006)
Rank	-2.2e-04	(0.001)	-1.4e-04	(0.001)	-2.1e-04	(0.001)	-1.4e-04	(0.001)
Private	0.236	(0.175)	0.292	(0.179)	0.219	(0.177)	0.289	(0.182)
COLA-Log	-0.073	(0.132)	-0.113	(0.134)	-0.065	(0.132)	-0.112	(0.135)
Tuition Cost-Log	-0.042	(0.089)	-0.069	(0.091)	-0.033	(0.090)	-0.068	(0.092)
Wealth Ratio	-1.7e-07**	(8.79e-08)	-1.7e-07†	(8.9e-08)	-1.7e-07*	(8.8e-08)	-1.7e-07†	(8.87e-08)
Intercept	10.540*	(1.457)	11.100*	(1.501)	10.38*	(1.505)	11.07*	(1.524)
Random								
σ_u (Intercept)	0.154*	(0.021)	0.157*	(0.021)	0.156*	(0.0207)	0.157*	(0.0206)
σ_ϵ (Model)	0.217*	(0.009)	0.215*	(0.008)	0.216*	(0.0084)	0.215*	(0.0084)
Observations	410		410		410		410	
University Clusters	76		76		76		76	

Standard Errors in parenthesis; Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.:∗∗ ; Models 1 and 3 does not include Years Organized, while it is included in Models 2 and 4. Omitted variables: 2000, Biology, 9-month pay, nonunion, and public university.

correlation is 30.77 and 33.5 percent, respectively. These correlations are higher than the 22% correlation reported earlier (see page 31).

The results from the regression support the earlier asserted notion that science students fare better than the social sciences and humanities. Teaching assistants in biology and mechanical engineering earn approximately 5 percent more than TA's in the humanities and social sciences. Research assistants in biology earn 15 percent more than engineers, roughly 17 percent more than social sciences, and 31 percent more than students in the humanities. These results are consistent with the descriptive analysis presented in Chapter 1. Higher wages may discourage union popularity among science students.

Finally, stipends are only a portion of remunerations. Unions often bargain for tuition waivers and reduction of fees. Fortunately, the *Chronicle* survey for the 2003-04 academic year provided information on tuition waivers and required fees. The sum of stipends and tuition wavers equals the student's total compensation. Subtracting health–care premiums and required fees from total compensation will equal the net compensation. Unfortunately, the survey for the 2000-01 and 2001-02 academic year did not include this information, therefore, the following regression is only a cross-section regression for the 2003–04 academic year.

Table 2.5 shows the output from the two–level, cross–section, random–intercept multilevel model for total and net compensation. Union status is controlled by Contract and Noncontract Union status.[8] Unlike the previous results, the union–nonunion wage gap disappears for total compensation for teaching assistants. Similarly, unions are not particularly effective at increasing net compensation compared to nonunion counterparts. Both of these results imply unions are not comparatively effective at raising fringe benefits, such as tuition remission, or lowering required fees.

2.3.2 Health Benefits

The data set also contains information related to health benefits for students, spouses, and their children. By using a binary variable to denote health care coverage, the effectiveness of

[8]The TA and TA+RA variables were perfectly collinear, thus, were excluded from analysis.

Table 2.5 Two-Level Multilevel Regression Log of Total and Net Compensation

Variable	*Total Compensation*				*Net Compensation*			
	(TA)		(RA)		(TA)		(RA)	
Fixed								
Economics	-0.110**	(0.033)	-0.215**	(0.050)	-0.106**	(0.034)	-0.219**	(0.051)
English	-0.110**	(0.034)	-0.245**	(0.056)	-0.117**	(0.035)	-0.247**	(0.056)
History	-0.164**	(0.034)	-0.306**	(0.057)	-0.164**	(0.036)	-0.307**	(0.057)
Engineering	-0.127**	(0.034)	-0.203**	(0.047)	-0.125**	(0.036)	-0.205**	(0.048)
Sociology	-0.147**	(0.036)	-0.266**	(0.052)	-0.145**	(0.037)	-0.269**	(0.053)
Annual	0.134**	(0.046)	0.121*	(0.050)	0.139**	(0.048)	0.122*	(0.051)
Contract Union	0.011	(0.102)	-0.037	(0.105)	0.074	(0.133)	-0.028	(0.109)
Noncontract Union	0.324	(0.285)	0.331	(0.295)	0.339	(0.377)	0.335	(0.305)
Rank	-0.001†	(0.001)	-0.002**	(0.001)	0.001	(0.001)	-0.002**	(0.001)
Private	0.292	(0.253)	0.379	(0.275)	0.585†	(0.332)	0.441	(0.284)
COLA-Log	-0.491*	(0.221)	-0.586**	(0.226)	-0.495†	(0.289)	-0.590*	(0.234)
Tuition Cost-Log	0.253†	(0.132)	0.199	(0.141)	0.122	(0.173)	0.177	(0.146)
Wealth Ratio	1.5e-07	(1.4e-07)	-1.1e-07	(1.5e-07)	1.7e-07	(1.9e-07)	-1.1e-07	(1.5e-07)
Intercept	12.052**	(2.387)	13.617**	(2.473)	13.113**	(3.118)	13.807**	(2.557)
Random								
σ_u (Intercept)	0.267**	(0.027)	0.252**	(0.029)	0.356**	(0.036)	0.262**	(0.030)
σ_ϵ (Model)	0.131**	(0.007)	0.177**	(0.011)	0.136**	(0.007)	0.179**	(0.011)
Observations	231		183		231		183	
University Clusters	61		55		61		55	

Standard Errors in parenthesis. Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.: ∗∗ ; Omitted variables: 2000, Biology, 9-month pay, nonunion, and public university.

unions bargaining for health benefits can be estimated with a logit regression.

Equation (2.4) can be adapted to a binary dependent variable:

$$y_{ij} = \Lambda\left(\alpha_j + \sum_{k=1}^{m} \beta_{kij} x_{kij} + u_j + \epsilon_{ij}\right) \tag{2.4}$$

where y is a binary variable denoting health–benefits (1 = some health benefits) in department i at university j and Λ is the logit function:[9]

$$\Lambda\left(\mathbf{x}^{\mathrm{T}}\vec{\beta}\right) \equiv \frac{e^{\mathbf{x}^{\mathrm{T}}\vec{\beta}}}{1 + e^{\mathbf{x}^{\mathrm{T}}\vec{\beta}}}$$

The same variables, x_k's, from the previous section are used in this regression.

Health benefits for the student and dependents were measured. Since benefits were observed at the department level, y=1 indicates health benefits are an option, even though students may or may not join the plan. Union is controlled by contract union and noncontract unions has been dropped because it is perfectly correlated with student health. Notwithstanding, the hypothesis is unionized schools will be more likely to give health benefits to students and spouses.

Table 2.6 shows the output from the logit regression with student and spouse benefits as dependent variables. Neither contractual nor noncontractual unions appear to increase the probability of receiving health–care coverage for students. Similarly, unionized schools are not associated with a higher probability of receiving benefits for the dependents. High ranked departments are more likely to offer health insurance for the student, and teaching assistants, humanities students are slightly less likely to receive health benefits, but neither department rank nor discipline contributes to dependent health–care coverage.

2.3.3 Wage Variance

The hypothesis in this section is unions, particularly contract unions, lower the distribution of income between departments. Lowering the variation of stipends within the university has not been an explicit goal of graduate unions. However, since lower wage variance within a firm has been observed in other industries (Freeman, 1982; Card et al., 2004) and social science

[9] See Greene (2007) for the properties of the logit density function.

Table 2.6 Two-Level Multilevel Logit Regression on Student and Spouse Health Benefits

Variable	*Student Health*				*Dependent Health*			
	(TA)		(RA)		(TA)		(RA)	
2001	-0.101	(0.150)	-0.083	(0.212)	-0.093	(0.115)	-0.055	(0.108)
2003	-0.884	(0.809)	-1.083	(0.871)	-0.729	(0.593)	-0.135	(0.598)
Economics	-0.632	(0.485)	0.115	(0.513)	0.065	(0.192)	0.860*	(0.358)
English	-1.349**	(0.452)	-1.245**	(0.430)	-0.061	(0.178)	0.805*	(0.363)
History	-0.782†	(0.463)	-0.909†	(0.513)	0.129	(0.179)	0.623†	(0.352)
Engineering	-0.611	(0.453)	-0.350	(0.378)	-0.248	(0.229)	0.224	(0.290)
Sociology	-0.536	(0.511)	-0.017	(0.494)	0.054	(0.235)	0.693*	(0.324)
Annual	-0.714	(0.736)	-0.360	(0.552)	-0.226	(0.482)	0.856	(0.523)
Contract Union	0.562	(1.169)	0.201	(1.297)	0.348	(0.684)	-0.263	(0.736)
Rank	-0.037**	(0.011)	-0.032**	(0.009)	-0.010	(0.008)	-0.012	(0.009)
Private	-3.390	(3.877)	-3.669	(5.001)	-0.368	(1.815)	0.258	(1.801)
COLA-Log	1.298	(1.351)	1.676	(1.867)	1.165	(1.865)	0.769	(1.830)
Tuition Cost-Log	0.927	(2.090)	1.165	(2.483)	-0.508	(0.899)	-0.706	(0.834)
Wealth Ratio	-9.9e-08	(1.3e-07)	-1.4e-07†	(1.0e-07)	2.4e-08	(1.2e-07)	-8.9e-08	(1.4e-07)
Intercept	-13.430	(21.748)	-7.615	(29.458)	-5.958	(19.189)	-1.545	(19.209)
Observations	559		413		523		387	

Standard Errors in parenthesis; Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.:∗∗ ; Omitted variables: 2000, Biology, 9-month pay, nonunion, and public university.

Table 2.7 Union and Major Interaction Terms for Log of Stipends

Variable	(TA)		(RA)	
Contract*Economics	-0.034	(0.050)	0.062	(0.084)
Contract*English	-0.026	(0.050)	-0.062	(0.085)
Contract*History	-0.009	(0.051)	-0.064	(0.087)
Contract*Engineering	-0.049	(0.054)	-0.046	(0.080)
Contract*Sociology	-0.020	(0.053)	-0.042	(0.083)
Noncontract*Economics	-0.220**	(0.076)	-0.232*	(0.118)
Noncontract*English	-0.094	(0.080)	0.015	(0.143)
Noncontract*History	-0.082	(0.081)	0.059	(0.144)
Noncontract*Engineering	-0.017	(0.077)	-0.024	(0.119)
Noncontract*Sociology	-0.162*	(0.075)	-0.086	(0.111)

Standard Errors in parenthesis.

Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.:∗∗

Coefficients shown holding year, years organized, department, and university characters held constant in a two–level random intercept multilevel model.

For full regression results, see page 59.

and humanities studies would benefit from a lower wage variance, the rest of this section will explore the possibility.

A reduction in overall wage variance would likely be accomplished by lowering the social science/humanities–to–natural sciences stipend gap. To close the stipend gap, unionization would have to increase stipends more for social science and humanities departments than engineering or biology. Table 2.7 contains the interaction terms of major and union variables, holding everything else constant. If the intra–university wage variance shrunk, the interaction terms for some majors will be positive and significant. However, the results provide no statistical evidence that individual majors earn atypical higher returns from unionization. The fixed intercept union terms remain significant and relatively close to previous estimate; however, the interaction terms are not statistically significant.

The distribution of income within universities can be explored through other methods. An ANOVA table for the log of stipends is presented in Table 2.8. Mean–squared variances are presented for contractual, noncontractual, and nonunion universities. The mean–squared variance is a weighted measure of variance within each university. Since the total mean–squared

Table 2.8 Analysis of Variance on Log of Stipends

	Contract Union		*Noncontract Union*		*Nonunion*	
	Mean–squared	Share	Mean-squared	Share	Mean-squared	Share
Between Universities	.323	.23	.368	.28	.217	.09
Within Universities	.057	.15	.065	.15	.049	.18
Total	.073	.38	.078	.43	.062	.27

Total Mean–squared is the sum of between and within university mean–squared error. The share of variance is equal to the mean–squared error divided total mean–squared.

variance is different for each group, the share of Within University mean–squared variation indicates the relative variation within each university.

Indeed, the share of within university variation is lowest for contract and non-contract unions with 15% of the total variation coming from within university variation. Wage variation for nonunion universities, on the other hand, is larger with 18% of the varation from within universities. This suggests unions—even those without bargaining power—lower the distribution of income within universities. Of course, outside factors may be influencing these results, which are not apparent in the ANOVA table.

To control for other factors, an OLS regression can be used to estimate the marginal effects on stipend variation. A multilevel model will not be necessary in this regression since stipend variation will be measured at the university level. Consider,

$$\ln y_j = \alpha_j + \sum_{k=1}^{m} \beta_{kj} x_{kj} + \epsilon_j \tag{2.5}$$

where $\sigma(\ln y_j)$ is a measure for the dispersion of stipends for the j^{th} university. The subscript i has been dropped since the university is the sole unit of observation.

The wage variation is measured by three different coefficients: the standard deviation of stipends, the coefficient of variation, and the ratio of the lowest wage to highest wage. Freeman (1982) used the standard deviation of wages to measure wage variance and found the dispersion generally decreased in unionized companies. Similarly, Hosios and Siow (2004) used the difference of the log of earnings for faculty professors to measure unions impact on

wage distribution. This study will also measure wage variation with the standard deviation of stipends within a university. A large standard deviation indicates the spread of wages is *wide*. An alternative measure is the ratio of the lowest average stipend in a university to the highest stipend. The ratio is strictly between 0 and 1 and can be literally interpreted as the percentage the lowest paid department makes relative to the highest paid university. Values close to 1 indicate the dispersion of wages is *low*. Finally, wage variation is also measured by the coefficient of variation, which is the mean of stipends divided by the standard deviation. Larger coefficients imply the dispersion is *low*.

Table 2.9 shows the results for wage variation. The control variables used in this regression have differed from previous regressions. The Rank Mean is the mean rank for all departments within the university as a measure for university quality. The Rank St. Dev. is a measure of the dispersion of quality within the university since wage variance may be attributable to the dispersion of human capital. Finally, All Major denotes when all majors within the university report stipends.

Contract unions, while effective at increasing wages, do not appear to be effective at lowering the variation of wages. In all three models, the coefficients for contractual unions are statistically insignificant. The results for noncontract union are mixed. For the regression on the standard deviation of wages, the coefficient is positive, indicating wage variance grows. However, when the coefficient of variation is used, the coefficient is also positive, indicating the variation is lower. Finally, the coefficent for the Low–to–High ratio is statistically insignificant.

2.4 Summary

Four hypothesis are tested in this chapter: the union-nonunion stipend gap is positive; union–nonunion gaps for total and net compensation are positive; unions increase the likelihood of graduate assistants and dependents receiving health care benefits; and unions lower the intra–university variation of wages.

The results indicate contractual unions are especially effective at inducing higher remunerations and fringe benefits for graduate assistants. Both of these findings contradicts Ehrenberg

Table 2.9 OLS Regression on Standard Deviation of Stipends, Coefficient of Variation, and Low–to–High Ratio

	Std. Dev.		Coeff. of Var.		Low–High Ratio	
2001	-2.268	(356.356)	-0.008	(0.028)	0.018	(0.051)
2003	536.557	(335.521)	0.023	(0.026)	-0.056	(0.048)
Rank Mean	-5.627	(6.358)	0.001	(0.001)	0.001	(0.001)
Rank Std. Dev.	-19.810	(14.306)	-0.002	(0.001)	0.003	(0.002)
Contract Union	212.795	(325.993)	0.018	(0.025)	-0.021	(0.047)
Noncontract Union	1147.251*	(479.766)	0.080*	(0.037)	-0.087	(0.069)
Private	434.274	(335.664)	0.009	(0.026)	0.030	(0.048)
COLA-Log	66.343	(622.100)	0.013	(0.049)	-0.074	(0.089)
Wealth Ratio	0.001*	(0.001)	4.3e-08†	(2.4e-08)	-7.8e-08†	(4.39e-08)
All Major	-816.166**	(275.966)	-0.058**	(0.022)	0.096*	(0.040)
Intercept	2192.297	(5627.607)	0.097	(0.440)	1.212	(0.809)
Observations	128		128		128	
Adjusted R^2	.178		.097		.088	

Standard Errors in parentheses. Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.: ∗∗

et al. (2004). Their ability to collectively bargain, file unfair labor practices, and are usually supported by national organizations, which is ultimately reflected in larger stipends.

Contractual unions received 8% higher stipends for teaching assistants compared to nonunionized schools. Specifically, unions which only included teaching assistants were the most effective at raising TA wages. However, unions do not increase the total compensation (stipends + tuition remission) for teaching or research assistants. Similarly, unions do not increase net compensation. Thus, The biggest union–nonunion gap was net compensation for teaching assistants. Unionized TA's received a 33% higher net compensation package (total compensation − required fees) compared to nonunion schools. The results indicate unions are more effective at lowering required fees for teaching assistants—a salient item in many union negotiations. The reduction of university fees, on the other hand, could be countered by mandatory unions dues, which are not accounted for in this study.

A corollary result from the regressions supported an argument made in chapter 1. Natural science departments pay more than social science and humanities departments. For teaching

assistants, biology and engineering students earned 5% more than English, history, and sociology majors. The difference was even more stark for research assistants where biologists made roughly 16% more than engineering, economics, and sociology and roughly 32% more than English and history.

Contractual unions were not effective at bargaining for student health benefits for both teaching and research assistants. The probability of receiving student health–care benefits and dependent benefits was not higher for unionized universities.

Finally, a union's ability to reduce variation of wages not supported in the data analysis. Social science and humanities students typically earn less than natural science students; however, the returns to unionization are the same, implying the wage gap remains. An ANOVA table revealed the within university variation of wages is lower for unionized schools. When a formal regression was conducted, unionized schools did not lower the ratio of bottom–to–top salaries.

CHAPTER 3. TALLYING THE EFFECTS

The first chapter adapted Freeman and Medoff's faces of unionism to graduate–student unions. Unions are able to effect the university in three areas: economic, distribution of income, and social organization. Unions influence these areas through two mechanisms: the monopoly face and collective voice face. The monopoly face of unionism withholds the supply of labor

Little is known about the effectiveness of graduate–student unions. The unions impact in the aforementioned areas had not been extensively explored, largely due to a lack of data. In Chapter 2, the unions' effect on remunerations and distribution of income was explored using data from *The Chronicle of Higher Education* and various other sources. Below is a list of findings from the last chapter:

- Contractual unions increase stipends, but have minimal impact on total and net compensation.
- Unions, if anything, tends to increase the intra–university wage variation.
- Unions do not increase the relative chance of being covered by health benefits for students or dependents.

In summary, unions are effective at increasing stipend levels compared to nonunionized universities. In particular, unions with contracts are effective, while noncontractual unions—who do not have any significant formal bargaining power—do not. While the empirical evidence here suggests unions help in the economic areas of unionization, the empirical evidence does not paint a complete picture. The aim of this chapter is to review the empirical literature through the Freeman–Medoff framework.

Table 3.1 recasts Freemand and Medoff's framework presented in chapter 1 with the known empirical literature. The items included under economic effects and distribution of income were discussed in the previous chapter. The monopoly voice of graduate–student unions is able to garner higher wages, lower fees, and health benefits. The union's monopoly voice is effective because unions threaten to withhold the supply of labor through labor strikes and "work–ins." This result is a correlary from estimates of union wage gains. Moreover, the collective voice of unionization fails to lower the variance of wages between departments within the same university, contrary to the hypothesis from the framework and previous literature (Julius and Gumport, 2002).

A central concern for faculty members is graduate unionization will interfere with faculty–student relationships. However, a study by Hewitt (2000) concludes faculty members do not feel unionization inhibits the instruction of graduate students. This is noted under the collective voice face of unionism, even though unions are only maintaining the status quo. The interesting hypothesis put forth by Julius and Gumport (2002)—unions will increase productivity because unions will enumerate responsibilities clearly—has not been tested.

Clearly, the empirical evidence is still limited, although a number of hypotheses were tested in this paper. Little is known about the collective voice of graduate–student unionization. Namely, whether unionization is able to improve productivity or improve the social nature is unknown. Julius and Gumport (2002) suggests unions will be able to boost productivity by carefully enumerating tasks and expectations.

Unionization is likely to come at a cost, but to whom and the net benefit (cost) is beyond this study. The high returns to unionization suggests the greater need to look at the cost of unionization to the universities.

3.1 Resolving Conflicts

Unions certainly effect graduate students, but that does not imply the impact is an improvement. One way to measure the quality of the unions effect is to see how unions may be able to redress the initial causes that led to unionization. Chapter 1 listed the main causes of

Table 3.1 Empirical Evaluation of Monopoly and Collective Voice in Graduate–student Unionization

	Economic Efficiency	*Distribution of Income*	*Social Nature*
Monopoly Face	Unions increase stipends roughly 8%.	Unions increase the union–nonunion wage gap.	Faculty members do not perceive any difficulties.
Collective Voice Face		Unions have little effect on intra–university stipend variation.	

unionization:

1. longer time–to–degree,
2. high costs of schooling,
3. more debt,
4. more but less desirable work,
5. lower tenure rates

The empirical evidence in the previous chapter indicated unions will be likely be able to reduce debt by increasing salaries.

Basic economic theory suggests unionization may also be able to increase tenure rates. When the cost to fund graduate assistants rise, universities will be compelled to lower the number of new graduate assistants, thereby lowering the future supply of faculty members. When the current cohort of faculty members leave the labor market, the ratio of available tenure positions to the supply of faculty will rise.[1] However, unionization does not create the incentive to lower time–to–degree. As graduate assistant stipends increase, the opportunity cost of staying in graduate school decreases.

Thus, unions will be able to redress most of the initial causes of unionization, which suggests the *quality* of unions effects is high for graduate assistants.

3.2 Future Direction

This study is explicitly based on the industrial model of unionism. However, fitting an industrial model the universities may be invalid. While the goals may be the same (e.g., better wages and training), Tullock (1994) suggests economic rents for universities may be much smaller than an industrial setting. Union advocates suggest universities are able to retain economic rents by using cheaper graduate assistants instead of faculty members. Thus, wage

[1] Obviously, this analysis strongly depends upon the *ceteris paribus* assumption.

gains made by unions will only shrink rents kept by the university. Other scholars, meanwhile, deny wage surpluses exist and any wage gains will effect of costs for other students.

It is possible, to a greater extent than faculty members, universities enjoy some level of monoposony. The sunk cost for graduate study is considerable. Graduate assistants generally do not have the ability to move transfer between programs universities since transferring would require the graduate student to restart the academic program. The lack of labor mobility may permit universities to lower wages below marginal productivity. The actual versus optimal wage difference, contrary to assertions by union leaders, may be incidental and lack true economic significance. Future studies should attempt to estimate the level, if any, of monoposony power.

An important area to be researched further is the impact collective voice face of unionism has on productivity. The first crucial step will be to obtain productivity measures for graduate assistants. If unionism is able to increase productivity, possibly through better procedures, graduate–student unionization may improve departments. Second, unionization may increase the academic success of the graduate student by lower the time–to–degree and, by implication, the opportunity cost of a Ph.D.

The measure for stipends can be improved. First, a proper effective hourly wage would give a better idea on the compensation received. Regressions that included hourly wage would be able to account for unions impact on actual hours work, which is likely accounted in contracts. The union–nonunion wage gap may be negatively biased. Unions typically stipulate the maximum number of workable hours. Thus, the hourly wage for unionized workers may be higher than nonunion workers.

Second, instead of using average department stipends, individual stipends would be more informative. This study was only able to analyze interdepartmental wage variance. While interdepartmental wages seemed to grow with noncontractual unions, intra–department wage variance may have shrunk. Unfortunately, the data set used in this study is unable to investigate these factors. Future data sets should attempt to use individual–level stipends.

The analysis of total and net compensation levels was only for the 2003-04 academic year. Other regressions in this study consisted of panel analysis. Unions cannot be said to "cause"

higher compensation levels without a panel study which compares nonunion and unions wages at the same university. Outside of experimentation, philosophers and statisticians have recognized the necessity of the passage of time to link cause and effect (Hume, 1740, 1748; Granger, 1980).

APPENDIX

Statistical Models

The goal of this section is to explore the econometric issues more deeply than the main body of this research.

Choosing the Correct Model

Ordinary Least–Squares

Chapter 2 of this study argued the (OLS) approach in this data set is inappropriate, but did not explore the issue more deeply. The issue can be highlighted by an example of two departments within each $i$thuniversity (see Wooldridge, 2001, p. 329). For departments 1 and 2, the OLS regressor can be written:

$$y_{i1} = \mathbf{x}_{1j}\beta + U_j + e_{1j}$$

$$y_{i2} = \mathbf{x}_{2j}\beta + U_j + e_{2j}$$

where U_j is the unobserved university effect, $\mathbf{x}$ is the $k \times n$ matrix of variables and β is a matrix of coefficients. The exogeneity assumption requires e_{1j} and e_{2j} are uncorrelated with the explanatory variables in *both* equations. This is unlikely since unobserved effects are likely to effect both departments.

Using OLS will induce Type I errors for two reasons. First, the degree–of–freedom in the study will be artificially inflated. Observations at departments within each university, although appear to be independent, are correlated and should not be considered an "independent" observation. Since the number of observations would be higher, the critical value for a Z and t-test, which is a function of the rejection region and number of observations, will also be

higher. Second, the standard errors will also be inflated (Goldstein, 2002, p. 23). The problem of inflated degrees–of–freedom and larger standard errors is illustrated below. Equation (A.1) assumes the test statistic obtained from β_i and the standard error (SE) from an OLS regression is equal to the critical value for t-statistic at α rejection region and n number of observations.

$$\frac{\beta_i}{\mathrm{SE}_i} = t^*_{\alpha,n} \tag{A.1}$$

When the standard error spuriously rises, the new test statistic will be less than the "real" test statistic, such that $\hat{\mathrm{SE}}_i > \mathrm{SE}_i$. Similarly, the new critical value obtained will be larger, such that $t^*_{\alpha,n} < \hat{t^*}_{\alpha,n}$. Combining these effects with equation (A.1) gives,

$$\frac{\beta_i}{\hat{\mathrm{SE}}_i} < \frac{\beta_i}{\mathrm{SE}_i} = t^*_{\alpha,n} < \hat{t^*}_{\alpha,n} \tag{A.2}$$

By the transitivity principle, equation (A.2) can be reduced to the unambiguous result that:

$$\frac{\beta_i}{\hat{\mathrm{SE}}_i} < \hat{t^*}_{\alpha,n} \tag{A.3}$$

The conclusion is OLS will cause the coefficient to be rejected when it should be accepted. While the increase in Type I errors for OLS regressions in nested data sets is more present for all regressions, it is more pervasive for smaller data sets. In large data sets, $\hat{t^*}_{\alpha,n}$ is computationally equivalent to $t^*_{\alpha,n}$. Nevertheless, only one of the conditions needs to hold to for (A.3) to hold.

Clustered Robust Errors

An alternative to standard OLS estimates is to use a variant of White's (1980) robust errors with an OLS regression. Clustered Robust Errors can control for intraclass correlation (see page 31). As pointed out above, each individual observation (departments) cannot be treated as independent. However, each university *can* be treated as an independent observation.[2] Froot (1989) developed a variant of White's robust errors to account for intraclass correlation. The robust standard errors will be slightly larger when the intraclass correlation is positive and smaller when the intraclass correlation is negative.

[2]Stipends between universities may be correlated if the universities belong to a larger system (e.g., University of California, State University of New York (SUNY)), but the correlation is likely to be weaker.

As it turns out, the results for clustered robust errors and the multilevel models is similar. Tables A.2 and A.3 shows the results for ordinary least–squares, OLS with Clustered Robust Errors, and a two–level random intercept multilevel regressions for teaching and research assistants.[3] The coefficients for OLS and OLS with robust errors are the same, as they should be, but standard errors are different. The estimates and standard errors are both numerically very different from the previous two regressions, but their statistical interpretations are largely the same. Additionally, multilevel regressions provide an estimate of the variation in the intercept. The distribution of the intercept is able to indicate the variation of stipends due to unobserved university effects.

Three–level Model

A footnote on page 32 briefly considered and dismissed the possibility of a three-level multilevel regression. Universities may be nested with larger university systems. For instance in this data set, University of California at Berkeley, Davis, Irvine, Los Angeles, San Diego, and Santa Barbara are all within the University of California system. The State University of New York (SUNY), University of Illinois, University of Alabama, and the University of Wisconsin have multiple schools within the data set.

However, five clusters is unlikely to be sufficient for a third level. As an example, Table A.4 shows the output of a 3–level regression for teaching assistants. The coefficients are roughly similar to earlier results, but different nonetheless. A new random variable measures, σ_s estimates the variation for unobserved intra–system effects. The intraclass correlation of stipends for the same university system s and different universities j can be calculated as:[4]

$$\frac{\sigma_s^2}{\sigma_s^2 + \sigma_u^2 + \sigma_\epsilon^2}$$

When the calculation is applied to Table A.4, the intraclass correlation is 63.7 percent, which is larger than the within–university intraclass correlation, 26.9 percent. The issue is many university "systems" only contain one university, which estimates the within–system correlation

[3] See Tables 2.3 and 2.4 for the original estimates

[4] This is a variant of the earlier two–level intraclass correlation given in equation (2.3) on page 36, Rabe-Hesketh and Skrondal (see 2005, pp. 224–225)

Table A.2 Comparison of OLS, Robust Errors, and Multilevel Regressions for Teaching Assistants

	Ordinary Least–Squares		OLS with Robust Errors		Multilevel Model	
Fixed						
2001	0.030	(0.022)	0.030**	(0.008)	0.032†	(0.019)
2003	0.091**	(0.023)	0.091**	(0.030)	0.079**	(0.028)
Economics	-0.048†	(0.028)	-0.048	(0.045)	-0.034	(0.024)
English	-0.064*	(0.028)	-0.064	(0.043)	-0.045†	(0.025)
History	-0.085**	(0.029)	-0.085†	(0.043)	-0.070**	(0.025)
Engineering	-0.031	(0.028)	-0.031	(0.048)	-0.014	(0.024)
Sociology	-0.064*	(0.029)	-0.064	(0.041)	-0.053*	(0.025)
Annual	0.292**	(0.032)	0.292**	(0.047)	0.339**	(0.031)
Contract Union	0.063**	(0.020)	0.063†	(0.035)	0.078*	(0.036)
Noncontract Union	0.038	(0.029)	0.038	(0.051)	0.049	(0.078)
Rank	-0.001*	(0.001)	-0.001	(0.001)	2.8e-05	(3.7e-04)
Private	0.024	(0.064)	0.024	(0.082)	0.088	(0.109)
COLA-Log	0.114*	(0.050)	0.114	(0.088)	0.092	(0.078)
Tuition Cost-Log	0.066†	(0.034)	0.066	(0.042)	0.016	(0.057)
Wealth Ratio	-5.2e-08**	(3.9e-08)	-5.2e-08	(7.82e-08)	-1.7e-09	(5.8e-08)
Intercept	7.799**	(0.575)	7.799*	(0.911)	8.352**	(0.883)
Random						
σ_u (Intercept)					0.107**	(0.013)
σ_ϵ (Model)					0.159**	(0.005)

Standard Errors in parentheses. Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.:∗∗ ; Omitted variables: 2000, Biology, 9-month pay, nonunion, and public university.

Table A.3 Comparison of OLS, Robust Errors, and Multilevel Regressions for Research Assistants

	Ordinary Least–Squares		OLS with Robust Errors		Multilevel Model	
Fixed						
2001	0.019	(0.037)	0.019	(0.015)	0.023	(0.032)
2003	0.058	(0.038)	0.058	(0.043)	0.087†	(0.046)
Economics	-0.167**	(0.045)	-0.167**	(0.040)	-0.168**	(0.040)
English	-0.313**	(0.048)	-0.313**	(0.063)	-0.292**	(0.043)
History	-0.330**	(0.050)	-0.330**	(0.071)	-0.331**	(0.043)
Engineering	-0.166**	(0.041)	-0.166**	(0.028)	-0.157**	(0.036)
Sociology	-0.195**	(0.046)	-0.195**	(0.034)	-0.188**	(0.040)
Annual	0.243**	(0.035)	0.243**	(0.034)	0.257**	(0.037)
Contract Union	-0.022	(0.033)	-0.022	(0.046)	-0.035	(0.058)
Noncontract Union	-0.011	(0.047)	-0.011	(0.063)	-0.003	(0.085)
Rank	-0.001	(0.001)	-0.001	(0.001)	0.001	(0.001)
Private	0.136	(0.110)	0.136	(0.148)	0.216	(0.172)
COLA-Log	-0.020	(0.091)	-0.020	(0.108)	-0.075	(0.132)
Tuition Cost-Log	0.009	(0.057)	0.009	(0.073)	-0.032	(0.087)
Wealth Ratio	-1.6e-07**	(6.2e-08)	-1.6e-07	(1.3e-07)	-1.8e-07	(8.8e-08)
Intercept	9.698**	(1.025)	9.698**	(1.312)	10.485**	(1.454)
Random						
σ_u (Intercept)					0.154**	(0.021)
σ_ϵ (Model)					0.217**	(0.009)

Standard Errors in parentheses. Significance levels: 10% Sig.:†, 5% Sig.:$*$, 1% Sig.:$**$; Omitted variables: 2000, Biology, 9-month pay, nonunion, and public university.

Table A.4 Three-level Random-intercept Multilevel Regression

	Coefficient	(Std. Error)
2001	0.0326	(0.0319)
2003	0.130*	(0.0485)
Economics	-0.164*	(0.0399)
English	-0.286*	(0.0425)
History	-0.328*	(0.0431)
Engineering	-0.152*	(0.0355)
Sociology	-0.185*	(0.0400)
Annual	0.260*	(0.0376)
Contract Union	0.126	(0.0841)
Noncontract Union	0.051	(0.0778)
Years Org.	-0.0393**	(0.0165)
Years Org. Sq.	0.00112†	(0.000578)
Rank	-0.000154	(0.000599)
Private	0.293	(0.180)
COLA-Log	-0.107	(0.134)
Tuition Cost-Log	-0.0703	(0.0916)
Wealth Ratio	-1.7e-07†	(8.9e-08)
Intercept	11.05*	(1.500)
σ_s (System)	-2.606**	(1.16)
σ_u (University Intercept)	-1.969*	(0.334)
σ_ϵ (Model)	-1.540*	(0.0391)

Standard Errors in parentheses. Significance levels: 10% Sig.:†, 5% Sig.:∗, 1% Sig.:∗∗ ; Omitted variables: 2000, Biology, 9-month pay, nonunion, and public university.

as unity. Obviously, the intraclass correlation is misleading and overstates the amount of correlation. Thus, the three-level multilevel regression is inappropriate for this data set.

Omitted Models

In chapter 2, Table 2.7 showed the coefficients of a regression with interaction terms. The full model was not shown to limit the focus on the interaction terms. Table A.5 shows the complete output from the regression.

Table A.5 Union and Major Interaction Terms for Log of Stipends

Variable	(TA)		(RA)	
Fixed				
2001	0.033†	(0.019)	0.022	(0.032)
2003	0.079**	(0.028)	0.084†	(0.046)
Economics	-0.007	(0.029)	-0.165**	(0.047)
English	-0.034	(0.031)	-0.277**	(0.054)
History	-0.065*	(0.032)	-0.319**	(0.055)
Engineering	0.001	(0.030)	-0.147**	(0.043)
Sociology	-0.033	(0.033)	-0.173**	(0.052)
Annual	0.314**	(0.032)	0.241**	(0.039)
Contract Union	0.099*	(0.048)	-0.014	(0.077)
Noncontract Union	0.127†	(0.072)	0.055	(0.107)
Contract*Economics	-0.034	(0.050)	0.062	(0.084)
Contract*English	-0.026	(0.050)	-0.062	(0.085)
Contract*History	-0.009	(0.051)	-0.064	(0.087)
Contract*Engineering	-0.049	(0.054)	-0.046	(0.080)
Contract*Sociology	-0.020	(0.053)	-0.042	(0.083)
Noncontract*Economics	-0.220**	(0.076)	-0.232*	(0.118)
Noncontract*English	-0.094	(0.080)	0.015	(0.143)
Noncontract*History	-0.082	(0.081)	0.059	(0.144)
Noncontract*Engineering	-0.017	(0.077)	-0.024	(0.119)
Noncontract*Sociology	-0.162*	(0.075)	-0.086	(0.111)
Rank	-2.8e-05	(3.7e-04)	-3.2e-04	(5.9e-04)
Private	0.098	(0.108)	0.221	(0.171)
COLA-Log	0.093	(0.077)	-0.080	(0.131)
Tuition Cost-Log	0.013	(0.057)	-0.036	(0.086)
Wealth Ratio	-3.0e-09	(5.7e-08)	-1.8e-07*	(8.7e-08)
Intercept	8.368**	(0.874)	10.566**	(1.441)
Random				
σ_u (Intercept)	0.106**	(0.013)	0.153**	(0.021)
σ_ϵ (Model)	0.157**	(0.005)	0.214**	(0.008)
Observations	558		410	
University Clusters	82		76	

Standard Errors in parenthesis; Significance levels: 10% Sig.:†, 5% Sig.:$*$, 1% Sig.:$**$
Omitted variables: 2000, Biology, Biology*Noncontract, Biology*Contract, 9-month pay, nonunion, and public university.

BIBLIOGRAPHY

Addison, J. T. and Belfield, C. R. (2004). Union voice. *Journal of Labor Research*, 25:563–596.

Adelphi (1972). Adelphi university. *NLRB*, 195:30.

American Historical Association (2007). Who is teaching in U.S. college classrooms? A collaborative study of undergraduate faculty, fall 1999.

Aronowitz, S. (1998). Are unions good for professors? *Academe*, pages 12–17.

Barba, W. C. (1994). The unionization movement: An analysis of graduate student employee union contracts. *Business Officer*, 27:35–43.

Barbezat, D. A. (1989). The effect of collective bargaining on salaries in higher education. *Industrial and Labor Relations Review*, 42:443–455.

Barcikowski, R. S. (1981). Statistical power with group mean as the unit of analysis. *Journal of Educational Statistics*, 6:267–285.

Birnbaum, R. (1974). Unionization and faculty compensation. *Educational Record*, 55:29–33.

Birnbaum, R. (1976). Unionization and faculty compensation: Part II. *Educational Record*, 57:116–118.

Boghossain, P. and Velleman, J. D. (2007). Should graduate assistants be represented by labor unions?

Boston Medical Center (1999). Boston Medical Center Corporation. *NLRB*, 330:30.

Breitzer, S. R. (2003). More than academic: Labor conscousness and the rise of UE Local 896-COGS. In Herman, D. M. and Schmid, J. M., editors, *Cogs in the Classroom Factory: The Changing Identity of Academic Labor*, pages 71–90. Praeger, Westport, CT.

Brown (2004). Brown university. *NLRB*, 342:42.

Card, D., Lemieux, T., and Riddell, W. C. (2004). Unions and wage inequality. *Journal of Labor Research*, 25:519–562.

Cavell, L. J. (2000). Graduate student unionization in higher education. http://www.ericdigests.org/2001-3/graduate.htm.

Cedars-Sinai (1976). Cedars-Sinai Medical Center. *NLRB*, 223:57.

Cornell (1970). Cornell University. *NLRB*, 183:672.

DeCew, J. W. (2003). *Unionization in the Academy: Visions and Realities*. Rowman & Littlefield Publishers, Inc.

Douglas, P. H. (1930). *Real Wages in the United States, 1890-1926*. Riverside Press, Cambridge, MA.

Ehrenberg, R. G. (1991). A stock flow model of academic labor supply. In Clotfelter, C. T., Ehrenberg, R. G., Getz, M., and Siegfried, J. J., editors, *Economic Challenges in Higher Education*, page 432. University Of Chicago Press.

Ehrenberg, R. G. (1992). The flow of new doctorates. *Journal of Economic Literature*, 30:830–875.

Ehrenberg, R. G., Klaff, D. B., Kezsbom, A. T., and Nagowski, M. P. (2004). Collective bargaining in american higher education. In Ehrenberg, R. G., editor, *Cornell University Press*, pages 153–173.

Ehrenberg, R. G. and Mavros, P. G. (1995). Do doctoral students' financial support patterns affect their times-to-degree and completion probabilities? *The Journal of Human Resources*, 30:581–609.

Ehrenberg, R. G., Rees, D. I., and Brewer, D. J. (1993). How would universities respond to increased federal support for graduate students? In Clotfelter, C. T. and Rothschild, M., editors, *Studies of Supply and Demand in Higher Education*, pages 183–206. University of Chicago.

FDA v. Brown & Williamson Tobacco (1995). FDA v. Brown & Williamson Corp. *U.S.*, 516:85.

Fogg, P. (2004). Faculty union calls for better treatment of graduate assistants. *The Chronicle of Higher Education*, 51.

Freeman, R. (1978). Should we organize? Effects of faculty unionism on academic compensation. *NBER*.

Freeman, R. B. (1980). Unionism and the dispersion of wages. *Industrial and Labor Relations Review*, 34:3–23.

Freeman, R. B. (1982). Union wage practices and wage dispersion within establishments. *Industrial and Labor Relations Review*, 36:3–21.

Freeman, R. B. and Kleiner, M. M. (1990). The impact of new unionization on wages and working conditions. *Journal of Labor Economics*, 8:S8–S25.

Freeman, R. B. and Medoff, J. (1985). *What Do Unions Do*. Basic Books.

Froot, K. A. (1989). Consistent covariance matrix estimation with cross-sectional dependence and heteroskedasticity in financial data. *The Journal of Financial and Quantitative Analysis*, 24:333–355.

Gehman, J. (2001). Graduate students unite? *Regulation*, 25:10–11.

Glenn, D. (2005). Look for the union label. *The Chronicle of Higher Education*, 51:A14.

Glenn, D. (2007). Long-awaited national research council rankings to be released in February. *The Chronicle of Higher Education*.

Goldberger, M. L., Mahar, B. A., and Flattau, P. E., editors (1995). *Research Doctorate Programs in the United States: Continuity and Change*. National Academy Press.

Goldin, D. (1995). Yale teaching assistants vote for a grade strike. *New York Times*.

Goldstein, H. (2002). *Multilevel Statistical Models*, volume 3 of *Kendall's Library of Statistics*. Hodder Arnold, New York, NY.

Granger, C. W. J. (1980). Testing for causality : A personal viewpoint. *Journal of Economic Dynamics and Control*, 2:329–352.

Gravois, J. (2005). A union symbol, headed for deletion. *The Chronicle of Higher Education*, 51:A8.

Greene, W. H. (2007). *Econometric Analysis*. Prentice Hall, 6th edition.

Guthrie-Morse, B., Leslie, L. L., and Hu, T.-W. (1981). Assessing the impact of faculty unions: The financial implications of collective bargaining. *The Journal of Higher Education*, 52:237–255.

Herman, D. M. and Schmid, J. M. (2003). *Cogs in the Classroom Factory*. Praeger, Westport, CT.

Hewitt, G. J. (2000). Graduate student employee collective bargaining and the educational relationship between faculty and graduate students. *Journal of Collective Negotiations*, 29:153–166.

Hirsch, B. T., Macpherson, D. A., and Schumacher, E. J. (2004). Measuring union and nonunion wage growth. In Wunnava, P. V., editor, *The Changing Role of Unions*, pages 115–147. M.E. Sharpe, Armonk, NY.

Hirsch, B. T., Macpherson, D. A., and Vroman, W. G. (2001). Estimates of union density by state. *Monthly Labor Review*, 124:51–55.

Hirsch, B. T., Macpherson, D. A., and Vroman, W. G. (2006). Union density estimates by state, 1964-2005. http://www.trinity.edu/bhirsch/MonthlyLaborReviewArticle.htm.

Hirschman, A. O. (1970). *Exit, Voice, and Loyalty: Responses to Decline in Firms, Organizations, and States*. Harvard University Press.

Hosios, A. J. and Siow, A. (2004). Unions without rents: the curious economics of faculty unions. *Canadian Journal of Economics*, 37:28–52.

Hume, D. (1740). *A Treatise of Human Nature*.

Hume, D. (1748). *An Enquiry into Human Understanding*.

Julius, D. J. and Gumport, P. J. (2002). Graduate student unionization: Catalysts and consequences. *The Review of Higher Education*, 26:187–216.

Kreft, I. and de Leeuw, J. (1998). *Introducing Multilevel Modeling*. Sage Publications Inc.

Lafer, G. (2003). Graduate student unions: Organizing in a changed economy. *Labor Studies Journal*, 28:25–43.

Larson, R., Hostetler, R. P., and Edwards, B. H. (2002). *Calculus with Analytic Geometry*. Mcdougal Littell/Houghton Mifflin, 7th edition.

Marshall, J. L. (1979). The effects of collective bargaining on faculty salaries in higher education. *The Journal of Higher Education*, 50:310–322.

Monks, J. (2000). Unionization and faculty salaries: New evidence from the 1990s. *Journal of Labor Research*, 21:305–314.

Morgan, D. R. and Kearney, R. C. (1977). Collective bargaining and faculty compensation: A comparative analysis. *Sociology of Education*, 50:28–39.

National Labor Relations Act (2006). National labor relations act. *U.S. Code*.

National Science Foundation (2003). Doctorate recipients from united states universities: Summary report 2003.

NLRB v. Town & Country (1995). NLRB v. Town & Country Electric. *U.S.*, 516:85.

NLRB v. Yeshiva (1980). NLRB v. Yeshiva University. *U.S.*, 444:672.

NYU (2000). New York University. *NLRB*, 332:111.

Rabe-Hesketh, S. and Skrondal, A. (2005). *Multilevel and Longitudinal Modeling Using Stata*. Stata Press.

Reder, M. W. (1988). The rise and fall of unions: The public sector and the private. *The Journal of Economic Perspectives*, 2:89–110.

Rees, D. I. (1993). The effect of unionization on faculty salaries and compensation: Estimates from the 1980s. *Journal of Labor Research*, 14:399–422.

Rhoades, G. and Rhoads, R. A. (2002). The public discourse of U.S. graduate employee unions: Social movement identities, ideologies, and strategies. *The Review of Higher Education*, 26:163–186. Volume 26, Number 2, Winter 2003.

Rhoads, R. A. and Rhoades, G. (2005). Graduate employee unionization as symbol of and challenge to the corporatization of u.s. research universities. *Journal of Higher Education*, 76:243–275.

Smallwood, S. (2001). Stipends are key in competition to land top graduate students. *The Chronicle of Higher Education*, 48.

Smallwood, S. (2002a). Cornell's teaching assistants reject unionization. *The Chronicle of Higher Education*, 49.

Smallwood, S. (2002b). NYU agrees to contract with TA's, setting minimum stipend and health benefits. *The Chronicle of Higher Education*.

Smallwood, S. (2004). The stipend gap. *The Chronicle of Higher Education*, 51.

Steenbergen, M. R. and Jones, B. S. (2002). Modeling multilevel data structures. *American Journal of Political Science*, 46:218–237.

SUNY (2007). Research Foundation of the State University of New York. *NLRB*, 350. http://www.nlrb.gov/shared_files/Board Decisions/350/v35018.htm.

Tullock, G. (1994). The effect of unionization on faculty salaries and compensation. *Journal of Labor Research*, 15:199–200.

U.S. Department of Education (2005). Digest of education statistics.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica*, 48:817–838.

Wooldridge, J. M. (2001). *Econometric Analysis of Cross Section and Panel Data*. The MIT Press.