Relative Earnings in the Teaching Profession: A State-by-State Analysis

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FOREWORD

The inspiration for this thesis came from my mother. She is not only my role model, a brilliant cook and devoted mother, but also a passionate middle-school teacher. She was formerly a professor in an engineering college in India and absolutely loves mathematics. She has continued to pursue her passion for the subject and now teaches math at a public middle school. Also, a warm thank you to my father, who is my eternal cheerleader and my biggest encouragement in taking on challenges. I wouldn't know what to do without their constant support.

ACKNOWLEDGEMENTS

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A special thanks to Professor Deena Engel and Professor Vishal Sing for helping me organize, sort and make sense of the massive amount of data. Thank you to my friend Huo-Huo Liu for your meticulous edits and to Harneet Kaur and Tyler Senackerib for your help and support throughout the year.

ABSTRACT

This thesis seeks to explore the trends in teachers' earnings over the last fifteen years on a national and state-level basis. It also utilizes the earnings data to examine whether there is a relationship between relative teachers' pay and student performance. On a national level, analyzing the mean annual wages for teachers and a set of comparable occupations shows that teachers earn significantly less than comparable workers, and that this pay differential has continued to increase since 1997 (my results are limited to data from 1997-2012). Exploring the percentile wage data also highlights the increasing pay differential for teachers in the highest wage brackets. The analysis on the state level reveals that only seven states had higher relative teacher compensation in 2012 than in 1998. Correlating test scores against relative teacher compensation reveals statistically significant positive relationships for six out of the twenty different sets of data points tested. Implications of implementing higher teacher compensation are outlined in the last section of this thesis, along with opportunities for further research.

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INTRODUCTION

In the most recent international test that measures students' proficiency in reading, math and science, the United States ranking reflected what American Education Secretary Arne Duncan called "picture of educational stagnation[1]." In 2012, a total of 65 countries and educational systems participated in the Program for International Student Assessment, more commonly known as "PISA". The test is administered to 15-year-olds worldwide and is conducted every three years. The U.S. slipped in rankings in *each* subject, placing below average in math:

Math – the U.S. was outscored by 29 of the participating countries in the 2012 test. This ranking was a decline from the 2009 test, where 23 countries performed better. Countries like Poland, the Czech Republic, Latvia and Ireland outperformed the U.S.

Science – the U.S. was outscored by 22 of the participating countries in 2012. This represents another decline from the 2009 test where only 18 countries scored higher. Countries that placed higher than the U.S. included the Czech Republic, Estonia, Vietnam and Slovenia.

Reading – although this is the strongest subject for the U.S., 19 participating countries outranked the U.S. in 2012. Again, this is worse than the U.S. ranking in 2009[2] where there were only 9 higher scoring participants.

These results reveal stagnation in the U.S. education system at the international level despite new initiatives, funding, and adoption of programs such as Race to the Top. Meanwhile, according to the 2012 PISA results, many other nations have made progress in rankings and have outperformed their previous scores over the last couple of years. Examining the policies of countries like China and Singapore provide insight into building

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[1] "The Threat of Educational Stagnation and Complacency." *U.S. Department of Education*.
[2] Chappell, Bill. "U.S. Students Slide In Global Ranking On Math, Reading, Science." *NPR*.

successful educational systems. There are, of course, numerous issues that come into play when comparing educational system including a myriad of socioeconomic, cultural and political factors. However, one common factor found across the highest scoring nations is the emphasis placed on teachers. These countries allocate a lot of resources towards teachers, offering extensive training, opportunities to study abroad, programs structured to improve their teaching techniques, opportunities for career advancement[3] etc. Most importantly, these countries pay the teachers high salaries so they can attract top talent with other career options. The high compensation and prestige in teaching has made the profession one of the most desirable jobs in countries like China, Singapore and Finland (all top scoring nations)[4].

In McKinsey's 2010 report about educational reform, "Closing the Talent Gap", Sing Kong Lee, Director of Singapore's National Institute of Education, stated, "It is a no-brainer that a nation would want to have a top-quality teaching force". Singapore's education system is one of the most renowned in the world[5] along with those of Shanghai, Hong Kong, Taiwan, and South Korea. The nation's Director of Personnel in the Ministry of Education, Lu Yang, remarked that in teaching, "Compensation matters when you want to get those people who are high quality and have some interest in teaching but also many other career choices." She elaborated on the need for high compensation for teachers:

> "You want them to say, 'Okay, the pay is not too bad so I will try; I'll give myself a
> chance.' And hopefully within the first five years you help them to discover the
> passion for teaching and they realize that this is really something that is very

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[3] Schleicher, Andreas. "Opinion: What Asian Schools Can Teach the Rest of the World." *CNN*. Cable News Network, 03 February 2014.

[4] "Varkey GEMS Foundation." *Global Teacher Status Index*. October 2013.

[5] Singapore ranked in the top 3 on math and science on the quadrennial Trends in International Mathematics and Science Studies assessments in 2007, after having come in first place in 1995, 1999 and 2003 – *McKinsey on Society* (September 2010).

meaningful they can do…You really want to make the difference for those who are good and who have different choices, an accountant, an engineer, maybe even a doctor or a lawyer.[6]"

Although the appeal of the teaching profession can be traced to numerous factors like the importance attributed to education in various cultures, the professional peer group, passion for teaching, professional opportunities and more, an extremely important factor on how an occupation is perceived is compensation. McKinsey's market research with 900 college students that were in the top-third of their class and 525 teachers with similar backgrounds found that most students find teaching unappealing because of the poor quality of the peer group, the lack of professional growth opportunities and low compensation. Furthermore, for 91% of college students that were not pursuing teaching as a profession, it was revealed that the attribute with the biggest difference relative to their chosen profession was, in fact, compensation. McKinsey's report suggested that, "Improving compensation and other features of teaching careers could dramatically increase the portion of top-third new hires in high-needs schools and school districts". An improvement in compensation would not only help attract talented students considering alternative career opportunities, it would also lead to a renewed perception of the teaching profession in the U.S.

The concern over the lack of progress in U.S. education and its declining rank in international assessments has reintroduced efforts to improve the quality of American public schools. Past research has found that it has become increasingly challenging to attract good candidates into the teaching profession, especially in light of improved job opportunities

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[6] "Closing the Talent Gap: Attracting and Retaining Top Third Graduates to a Career in Teaching."
McKinsey on Society. September 2010.

outside of teaching[7]. Although many school districts and educational initiatives have taken steps to evaluate and improve effectiveness in teaching, more emphasis needs to be placed on the measures that attract talented individuals to the profession. When it comes to its students, the U.S. spends more than most developed nations (through after-school programs, vocational training etc.)[8]. However, the U.S. has essentially been doing the opposite in regards to teachers – while other nations have offered increasingly competitive salaries for teachers, teacher compensation in the U.S. has been *declining* for years. Ultimately, teacher compensation is only one dimension of professional work, but it is arguably one of the most important when trying to attract talented individuals to the profession.

My thesis examines relative teachers' compensation by using a dataset of mean annual wages provided by the Bureau of Labor Statistics (BLS) augmented by an analysis of state level by occupation and state on achievement data. First, I outline previous literature on relative teacher compensation followed by the methodology for data collection, calculation and analysis. Next, I present my analysis of the data on a national level, comparing the mean annual wage of teachers with those of comparable occupations and per capita GDP. In the following section, I use the state-level data to rank states on relative teacher compensation, to compare teacher earnings with those of attractive alternate professions, and to examine the relationship between teacher compensation and National Assessment of Educational Progress (NAEP) test scores in particular states. Correlating the test scores with relative teacher pay reveals statistically significant results for six different sets of test scores, thus reinforcing the importance of relative pay for teachers.

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[7] Corcoran, Evans, and Schwab (2004), "Women, the Labor Market, and the Declining Relative Quality of Teachers," *Journal of Policy Analysis and Management*

[8] The United States spent $15,171 on each student in the system, while the average spent by other nations was $9,313 per young person –"U.S. Education Spending Tops Global List, Study Shows." *CBSNews*. June 2013.

LITERATURE ON RELATIVE TEACHER PAY

While there is a great deal of research on teacher compensation and its impact on teacher quality, there are many methodological issues that come into play when conducting relative compensation analysis. Points of contention include the set of occupations comparable to teaching, source of the data (whether the data was derived from employer or employee surveys), the reference group (whether it should be college students, high-school students etc.), appropriate pay interval (annual, weekly or hourly), appropriate measure of teacher quality (test scores, college selectivity), definition of compensation (whether or not it should include benefits), the scope of the occupation (how narrowly or widely defined it is) and the like. Thus, research conducted on these issues will differ widely along many of these factors, and conclusions on relative teacher compensation are bound to vary.

In "How does Teacher Pay Compare (2004)," Allegretto, Corcoran and Mishel note that research conducted over a short-term period found no relationship between teacher quality and pay. For example, Ballou and Podgursky (1997) examined increases in relative teacher salaries across states in 1979 and 1989, and found that it did not have any effect on increasing teacher quality. Figlio (2002) analyzed increases in district-level salaries in unionized schools and found no statistically significant relationship with the quality of newly hired teachers. Other studies pointed out that there are other factors that have a greater impact on teacher quality than compensation. In the paper "Why Bright College Students Won't Teach[9]", Barnett Berry found that the brightest students in the study did not want to pursue teaching because of frustrating working conditions, few opportunities for career and intellectual growth, lack of professionalism, and the perception of teaching as "too boring".

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[9] Berry, Barnett "Why Bright College Students Won't Teach (1986)"

Another argument against the significance of salary is that the nature of teaching allows for good hours, vacations, and "intrinsic rewards from teaching", which makes the occupation difficult to substitute with others. This, in turn, makes the decision to enter or leave teaching less sensitive to salary change (E.A. Hanushek and S.G. Rivkin 2006).

On the other side of the coin, there are several studies supporting the claim that compensation is an important factor affecting teaching quality in the long run. Bacolod (2003) found that the relative decline in the quality of graduates pursuing a teaching career was strongly associated with the decline in relative compensation for the profession. Another study by Lakdawalla (2001, 2003) found that higher wages for professions outside of teaching led schools to substitute highly paid *quality* teachers with greater *quantity* of teachers (that is, smaller class size). Furthermore, studies conducted by Loeb and Page (2000), and Stoddard (2003) found that after controlling for local wage opportunities and job characteristics, relative teacher pay is strongly correlated with student outcomes, measured in high-school dropout rates.

Previous studies have also examined teacher salaries relative to broad occupation segments and specific professions. The American Federation of Teachers (AFT) conducts surveys of teacher salaries, and then examines relative mean annual salaries of teachers. The AFT found that salaries for alternative occupations have remained consistently above those of teachers since the early 1960s. AFT also stated that during 2006-2007, teachers earned about 70 cents on the dollar of similar professions and recognized that "individuals considering a teaching career and reviewing the average salaries of educators versus those of similar professionals would learn that this penalty was almost $22,000 per year, or about 30%

of the average professional salary[10]." Although these findings depend on the set of comparable occupations chosen, they still make a strong statement about the growing wage penalty associated with teaching.

In their papers, "How does Teacher Pay Compare (2004)" and "The Teaching Penalty (2008)", Allegretto, Corcoran and Mishel use weekly data on teachers pay to examine relative teacher compensation on a national level. While they state that there are good reasons to use either annual or weekly wages, they choose the weekly approach to reconcile any differences in the amount of weeks worked by comparable professions. They choose their comparable occupations based on skill level required for the job defined by attributes such as knowledge, complexity, supervision received etc. (method is detailed in section 2). Their findings reveal that teachers earn significantly less than comparable workers. The research emphasizes the importance of raising teacher compensation in order to recruit and retain a higher quality teacher workforce, and to improve the quality of the [median] teacher. My thesis supports the conclusions made by Allegretto, Corcoran and Mishel, using a different approach. I use a different dataset to examine relative teacher compensation. Described in more detail in the next section, the data is the mean *annual* wages of teachers and comparable occupations provided by the Bureau of Labor Statistics (BLS). I chose to use this dataset because it provides a more comprehensive breakdown of wages – it includes elementary, middle, secondary, special education, and vocational school teachers etc., and the 10th, 25th, 50th, 75th and 90th percentile of wages for each occupation for a span of fifteen years (1997-2012). Wages in the teaching profession increase based on years of experience or "seniority" level. Therefore, analyzing the data for various percentiles wages provided by the

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[10] "Survey and Analysis of Teacher Salary Trends (2007)." AFT. *American Federation of Teachers.*

BLS survey allows me to closely examine the opportunity for salary growth and conduct a more comprehensive comparison of wages across different professions. Furthermore, previous research has justified the use of annual wage data because teachers often have to participate in professional training over the summer or prepare classroom materials and lessons for the upcoming year. Additionally, a number of inconsistencies when using weekly data,[11] such as the lack of incorporating leave entitlements, have prompted researchers to fall back on annual wage data for comparison purposes[12] (M. Podgursky and R. Tongrut 2006). However, the results from analyzing the BLS annual wage are consistent with those of Allegretto, Corcoran and Mishel. Some of Allegretto, Corcoran and Mishel's key findings include:

❖ Several types of analyses show that teachers earn significantly less than comparable workers and this wage disadvantage has grown considerably since 1996;

❖ Recent trends represent only a small part of a long-run decline in the relative pay of teachers. Among all public school teachers the relative wage disadvantage grew almost 20 percentage points over the 1960-2000 period;

❖ A continuing issue is whether teacher pay is sufficient to attract and retain quality teachers: trends in relative teacher pay seem to coincide with trends in teacher quality over the long run.

Allegretto, Corcoran and Mishel (2008) conclude that, "any effort to alter the quality of the teacher workforce by changing recruitment and retention must address the teacher pay disadvantage if there are expectations of changing the profile of the typical teacher, which is required to have a substantial impact on educational outcomes." The key findings in

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[11] Allegretto, Corcoran, and Mishel "How does Teacher Pay Compare (2004)"
[12] BLS chief of Division of Compensation Data Estimation National Compensation Survey reinforced the use of annual data when comparing occupations

my thesis support these claims. Analyzing the mean annual wages for teachers and a set of comparable occupations shows that teachers earn significantly less than comparable workers, and that this pay differential has continued to increase since 1997 (my results are limited to data from 1997-2012). My analyses of mean annual wage data from different states revealed a statistically significant relationship between relative teacher pay and the 2011 NAEP reading test scores of 4th and 8th graders, the 2007 reading test results for 4th graders, and the 2005 reading and math test results for 4th and 8th graders (more in section 3).

My thesis makes a case for addressing the critical issue of teacher compensation. If ignored, this issue is likely to fuel a cycle of low public regard for the profession, lack of professional interest amongst talented individuals, a continuous decline in teacher quality, and ultimately poor student outcomes. A study called 'Global Teacher Status Index' conducted by the Varkey GEMS Foundation[13] collects data from countries all over the world to assess teachers' status in those countries. The report noted the importance of the link between status and compensation, observing, "status in a culture often depends on how much the compensation is in absolute or relative terms". When evaluating the perception of the teaching profession, the report revealed that in China, teachers are considered most like doctors. In France and Turkey, they are considered to be most like nurses. In the U.S., however, teachers are seen to be most like librarians. The diminishing pool of top students interested in pursuing teaching appropriately reflects the profession's deteriorating public perception. Corcoran, Evans and Schwab (2004) briefly discussed the impact of improved job opportunities for women during the mid-20th century on the teaching profession. The teaching profession had a captive labor pool in academically skilled women who did not

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[13] Varkey GEMS Foundation is a not-for-profit organization established to improve the standards of education for underprivileged children through projects encouraging enrolment in schools, worldwide teacher training programs and advocacy campaigns.

have many job opportunities outside of teaching, nursing, and social work. However, as labor market opportunities for women improved, college-educated women were much more likely to pursue medicine, law, science and management (Black and Juhn 2000; Goldin 2006). These alternative opportunities have continued to diminish the pool of individuals interested in the teaching profession, especially when it comes to high-achieving students. According to a study by McKinsey in 2010, the top scoring nations like Singapore, Finland and South Korea focus on recruiting and retaining top students as a principal strategy. They recruit 100% of their teachers from the top third students in the class. In the U.S., however, only 23% of new teachers come from the top third of the class (this is just 14% in high poverty schools). Sandra Feldman, former president of the American Federation of Teachers, discussed the impact of not being able to attract talent into teaching: "You have in the schools right now, among the teachers who are going to be retiring, very smart people…we're not getting in now the same kinds of people. It's disastrous.[14]" It is clear that the increasing number of high-paying career choices outside of teaching will continue to pummel this percentage even further down unless steps are taken to remedy the situation. Although relative teacher compensation is only one feature in a complex dynamic of an educational system, many previous studies and my thesis affirm that it is one of the most critical issues in the struggle to improve education in the U.S.

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[14] "Closing the Talent Gap: Attracting and Retaining Top Third Graduates to a Career in Teaching." *McKinsey on Society*. September 2010.

I. METHODOLOGY

– DATA SOURCES –

Data for Annual Wages:

The Bureau of Labor Statistics (BLS) conducts the "Occupational Employment Statistics" (OES) survey every year and publishes its results online. The survey is a semi-annual mail survey of non-farm establishments and contains data from 1997 to 2012[15]. BLS states that establishments to be surveyed are selected so that the data captures every metropolitan and nonmetropolitan area in every state across industries and establishments size. The collected data is used to produce occupational estimates at the national, state, and sub-state levels. Although the integrity of the data is impacted by selection and response bias, it is an extensive survey and a good proxy of how occupational wages have fared for the past fifteen years. For the purposes of the OES survey, "employees" are defined as all part-time and full-time workers who are paid a wage or salary. The survey does not cover the self-employed, owners and partners in unincorporated firms, household workers, or unpaid family workers. Wages considered in the survey represent gross pay, exclusive of any premiums.

Another source for annual wage data is the National Compensation Survey (NCS), also conducted by the BLS. Both OES and NCS provide information on wages and salaries by occupation, but have different strengths. BLS states that OES data has an advantage over NSC data because it has information for detailed occupations and a greater range of occupations. The OES data also provides information on average wages of all workers for occupations, and wage information for occupations at specific levels of work. However,

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[15] The BLS recently published the data for the year 2013 in April, 2014. This data is not included in my analysis.

NCS data collects more information on duties and responsibilities of the job, obtains work schedules from the surveyed establishment and shares other strengths with OES data[16]. A noteworthy disadvantage in both data sources is that they only reflect those currently employed, and do not adjust for differences in experience. For the purposes of my study, I have chosen OES data because it allows me to analyze the wages of average workers for various occupations and also provides detailed data by breaking down occupations to specific job titles, as well as wages into specific percentiles.

Gathering and Standardizing Annual Wage data:

The BLS has provided the results of their annual surveys from 1997 to 2013 on their official website[17]. The data is structured using occupation codes and job descriptions for which they provide the mean annual wage, the hourly wage (for some occupations), total employment, and the 10th, 25th, 50th, 75th, and 90th percentile annual and hourly wage. The data is broken down by the different states and U.S. territories, and by the years 1997 to 2013. I consolidated all the data for the particular occupations I needed in my analysis (listed in "occupational group" section). The BLS website points out the changes in occupational codes and the limitations they pose in comparing the data over different time periods. I addressed this discrepancy by comparing "job descriptions" from year to year and assigning new codes accordingly. For example, the occupation "Personnel - training and labor relations specialists" is labeled as "Public relations specialist" after 1999. Other occupations such as "Computer Programmers" continued to have the same description from 1997 to 2012 but changed occupational codes in 1999 and 2010. I used a MySQL database to

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[16] "Overview of BLS Wage Data by Area and Occupation." *U.S. Bureau of Labor Statistics*.
[17] Website link – http://www.bls.gov/bls/blswage.htm

compile all the data and assign new standardized codes by occupation for each year. This allowed me to easily compare data for wages across years for the selected occupations.

Data for Per Capita GDP and Test Scores:

Other data such as per capita GDP is derived from the U.S. Department of Commerce's Bureau of Economic Analysis (BEA). The per capita GDP numbers are chained to 2005 dollars, so any comparisons to this data have been adjusted to 2005. I used the data as a benchmark to analyze how teacher earnings fare against per capita GDP. Note that per capita GDP is driven down due to the nature of its calculation. The GDP of the state is divided by the total number of people in the state, which includes the young, elderly and unemployed population. That inflated denominator in the calculation drives down the per capita GDP in states with a large population, given everything else is equal.

I also use test scores to explore whether there is a relationship between relative teacher compensation and student test results. The test scores for this analysis were provided by the National Center for Educational Statistics website[18] and are referred to as National Assessment of Educational Progress scores, or NAEP test scores. The NAEP test is the largest nationally representative and continuing assessment of America's students in mathematics, reading, science, writing, the arts, civics, economics, geography, U.S. history, and in technology and engineering literacy[19]. My thesis uses test score data by state for mathematics and reading for the following years: 2000, 2003, 2005, 2007, 2009 and 2011.

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[18] "NAEP Data Explorer (NDE)." *National Assessment of Educational Progress.*
[19] The "technology and engineering literacy" test was introduced in 2013.

– OCCUPATIONAL GROUPS –

The OES survey provides data for hundreds of occupations. However, for the purpose of my thesis, I selected and grouped particular occupations together in order to compare the average compensation to that of teachers'. These groups include: "Teachers", "Teachers, (broad)", and "Comparable Occupations." A number of occupations fall into each group and are listed in the table below. For each group, the mean annual wage is calculated using an average of the wages for each job included in the group, weighted by number of employed in each occupation. The mean annual wages for the different percentiles (10th, 25th, 50th, 75th, and 90th) are also calculated using weighted averages.

"Teachers"

The group "Teachers" includes only the main categories of teachers (kindergarten, elementary, middle and secondary school), and excludes preschool, special education and vocational teaching occupations (exact job descriptions listed in Occupational Group Table below). Analyzing the wages for this group provides a more specific estimate of how traditional teacher wages have fared in the last fifteen years. These select categories represent wages in traditional teaching more accurately because elementary and secondary school teachers are the largest teacher categories in the survey, while special education and vocational teachers are much smaller groups with generally lower pay. Note that preschool teachers are excluded from this group because schooling at that stage is less teaching intensive and involves more caring/watching over the children. Including preschool teachers in the calculation drives down the average teacher salary by around 5% each year and shows a considerably higher pay gap when comparing teacher salaries to that of other occupations. Various percentiles of mean annual wages (10th, 25th, 50th, 75th, and 90th) are also calculated for the group "Teachers".

"Teachers (broad)"

The group "Teachers, (broad)" includes a wider range of teachers. In addition to the traditional teacher categories from the first group, it includes preschool, vocational and career/technical education teachers, special education teachers, guidance counselors, and vocational counselors. These jobs usually compensate less than traditional teaching and tend to be smaller categories. Nevertheless, this allows us to get a much broader understanding of wages in the overall teaching career paths.

"Comparable Professions"

The group of "Comparable Professions" consists of a number of professions including registered nurses, accountants and auditors, computer programmers, etc. (listed in the "Occupational Group" tables). Researchers have not yet agreed on a single method to identify professions that represent proper comparison groups to the teaching profession. In their study, "How Does Teacher Pay Compare? (2004)", Corcoran, Allegretto and Mishel use data from the Bureau of Labor Statistics' NCS to identify professions that are similar to teaching, based on specific skills used on the job. Each occupation is rated for the level of skill required along 10 different dimensions including knowledge, supervision received, guidelines, complexity, scope and effect, personal contacts, purpose of contacts, physical demands, work environment and supervisory duties. They identify professions that are comparable to teaching based both on their raw skill requirements and upon the market valuation of these skills. A study conducted by Pierce (1999) showed that the skill rating tool developed by The Bureau of Labor Statistics does in fact reflect skills that are valued in the

marketplace. My thesis uses the occupations identified by Corcoran, Allegretto and Mishel, as "Comparable Professions".

As mentioned earlier, an important consideration in using the data for these comparable professions is addressing the changes in job descriptions and occupational code in the OES surveys over time. The BLS states that comparisons over periods of time using the data can be challenging because of changes in these occupational classification systems and other factors. For example, "Technical Writer and Editors" was considered one profession in 1997 and 1998 but was split into two separate occupations starting in 1999. The same split is seen in "Special Education Teachers", which was considered a single title in 1997 and 1998, but split into "Special Education – Preschool, kindergarten, and elementary" and "Special-Education – middle school" in 1999 and then split even further after 2010. In order to make the data comparable in these cases, I consolidated the data for occupations that were split after 1997 back into a single occupation. For example, the mean annual wages of "technical writers" and "editors" were combined by taking the average of the annual wages and weighting them by the number employed as editors and technical writers. For the purposes of this study, these occupations are consolidated into one big group of "Comparable Professions" and thus, individual occupation definitions are less important. In addition, the BLS states that there might have been some changes in occupation and industry classifications over time, but these changes are difficult to discern and control. Nevertheless the comparable group gives us a good understanding of the alternative job opportunities available for individuals considering teaching.

– OCCUPATIONAL GROUPS –

Group 1 - Teachers
Teachers, Kindergarten
Teachers, Elementary School
Teachers, Middle School
Teachers, Secondary School

Group 2 – Teachers (broad)
Teachers, Preschool
Teachers, Kindergarten
Teachers, Elementary School
Teachers, Middle School
Teachers, Secondary School
Teachers and Instructors, Vocational Education and Training
Career/Technical Education Teachers: Middle School
Career/Technical Education Teachers: Postsecondary
Career/Technical Education Teachers: Secondary School
Educational, Guidance, School, and Vocational Counselors
Teachers, Special Education
Special Education Teachers: Pre-K, Kindergarten, and Elementary School
Special Education Teachers: Preschool
Special Education Teachers: Kindergarten and Elementary School
Special Education Teachers: Middle School
Special Education Teachers: Secondary School
Special Education Teachers: All Other

Group 3 - Comparable Professions
Accountants and Auditors
Insurance Underwriters
Public Relations Specialists
Computer Programmers
Registered Nurses
News Analysts, Reporters and Correspondents
Occupational Therapists
Physical Therapists
Compliance Officers and Enforcement Inspectors, Except Construction
Architects, Except Landscape and Marine
Conservation Scientists
Curators, Archivists, Museum Technicians, and Conservators
Archivists
Curators
Clergy
Technical Writers and Editors
Technical Writers
Editors

II. RELATIVE TEACHER COMPENSATION IN THE U.S.

Using data from the BLS described above, I found that teachers in the U.S. earn considerably less than comparable occupations (as defined in the previous chapter), and that this gap has been widening in the past years. Figure 1 compares mean annual wages for "teachers", "teachers (broad)", "comparable occupations" and per capita GDP. All the data for Figure 1 is in terms of 2005 dollars to make it comparable to the data for per capita GDP, which is chained to 2005 dollars[20]. Note that data for "teachers" and "teachers (broad)" for the years 2004-2006 is omitted from Figure 1. This is because OES's data for the wages of teachers in the state of New York was removed due to reporting errors. Although the wages represent a national average, New York state teachers are among the highest paid and represent a large number of the nation's teachers, without which the overall trend would show a misleading decline.

Figure 1: Mean Annual Wages of Teachers, Teachers (broad), Comparable Professions and Per Capita GDP (in $2005)

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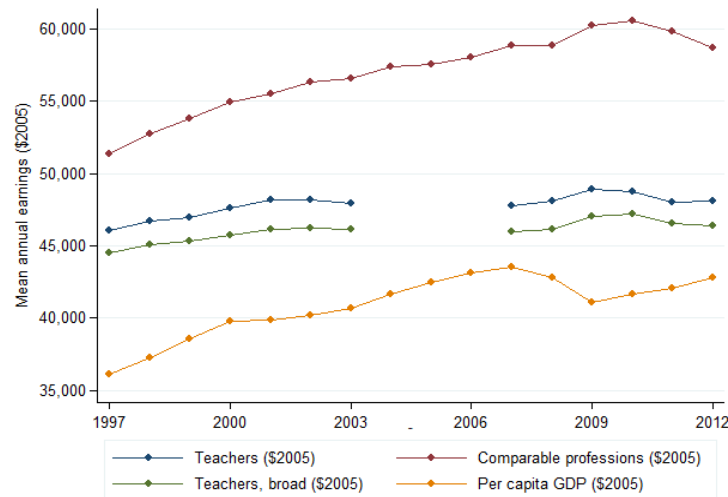
[20] "Regional Economic Accounts." *U.S. Bureau of Economic Analysis*.

Corcoran, Allegretto and Mishel (2004) discuss the evolution of relative teacher pay prior to 1997. They noted that in the early 1950's, female teachers actually earned more on average than other female college graduates. However, in the early 1970's, relative teachers pay started declining. Although the wages recovered slightly in the early 1980's, they began a decline again in late 1980's and have been declining ever since. My data reinforces their findings and Figure 1 shows that although teachers make well above per capita GDP in the U.S., the gap between "comparable professions" and the "teacher" groups has been increasing since 1997. Figure 1 also shows that wages for comparable professions are not only higher than those of teachers, but also increased faster than the mean annual wages for teachers. Notably, the mean annual wages of teachers in the U.S increased during the financial crisis of 2008. Although the crisis led to massive layoffs of teachers across the nation, one reasonable explanation for the increase in wages is the layoff of newer teachers. Layoffs are usually executed systematically, where teachers which the least seniority (newest teachers) are the first to go[21]. The newest teachers are also the lowest paid teachers, so when they are fired, the more senior, high-earning teachers are left in the pool. This causes an increase in the overall mean annual wage for the group during those years.

Table 1 on the next page shows the difference between mean annual wages of the 'comparable professions' group, the traditional 'teachers' group and a separate traditional 'teachers' group, which included preschool teachers (to illustrate the resulting increase in the pay gap) from 1997-2012. The "Diff %" represents how much higher the comparable group earns, on average, as a percentage of teachers' wages at that time. For example, in 1997, the occupations in the comparable group overall earned 11.5% more than the teachers group

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[21] "Teacher Seniority Rules Challenged." *The Wall Street Journal.* February 2010.

and 16.6% if teachers category *included* preschool teachers. Note that data for the state of New York is missing for 2004-2006[22], which might lead to higher differences during those years. However, the gap after 2007 does include all the data and continues to show a high pay differential. In fact, the "gap" could actually be *understated* in the years during the financial crisis (2008-2011), since the mean annual wage is inflated due to the layoffs of newer teachers. Since 1997, the gap has almost doubled by 2012 raising legitimate concern over this incessant downward trend in relative teacher salaries.

Table 1 shows that in 2012, individuals would be forgoing over $12,000 - $15,000 a year by choosing teaching over other comparable professions. Another way to compare opportunities in different occupations is to analyze the range of salaries and the

TABLE 1 – Teachers' and Comparable Professions' mean annual wages *(in real dollars)*					
Year	Comparable Group	Teachers Group	*Diff.*	Teachers, including Pre-K	*Diff.*
1997	$42,225	$37,854	*11.5%*	$36,210	*16.6%*
1998	$44,015	$38,971	*12.9%*	$37,288	*18.0%*
1999	$45,903	$40,051	*14.6%*	$38,263	*20.0%*
2000	$48,449	$41,995	*15.4%*	$39,703	*22.0%*
2001	$50,314	$43,669	*15.2%*	$41,231	*22.0%*
2002	$51,884	$44,401	*16.9%*	$42,006	*23.5%*
2003	$53,282	$45,137	*18.0%*	$42,828	*24.4%*
2004	$55,466	$44,993	*23.3%*	$42,857	*29.4%*
2005	$57,546	$45,880	*25.4%*	$43,764	*31.5%*
2006	$59,863	$47,849	*25.1%*	$45,567	*31.4%*
2007	$62,467	$50,742	*23.1%*	$48,219	*29.5%*
2008	$64,830	$53,025	*22.3%*	$50,255	*29.0%*
2009	$66,170	$53,696	*23.2%*	$51,037	*29.7%*
2010	$67,607	$54,463	*24.1%*	$51,985	*30.1%*
2011	$68,927	$55,326	*24.6%*	$52,872	*30.4%*
2012	$68,956	$56,494	*22.1%*	$53,914	*27.9%*

growth in wages for the given profession. Salary levels of teachers depend on seniority and increase over years of teaching. When comparing the top and bottom percentiles of annual wages for comparable professions and teaching, comparable professions fare much better in the top percentiles. Figure 2 compares the different percentiles of wages in the comparable group with those in the teachers group. The graph reveals that the 90th percentile of wages for the comparable group is much higher than that of the teachers group. In fact, the

[22] Data is omitted due to errors in OES data for NY State for the years 2004-2006

Figure 2: Comparing the 90th and 10th Percentile Wages for Comparable Occupations and Teachers
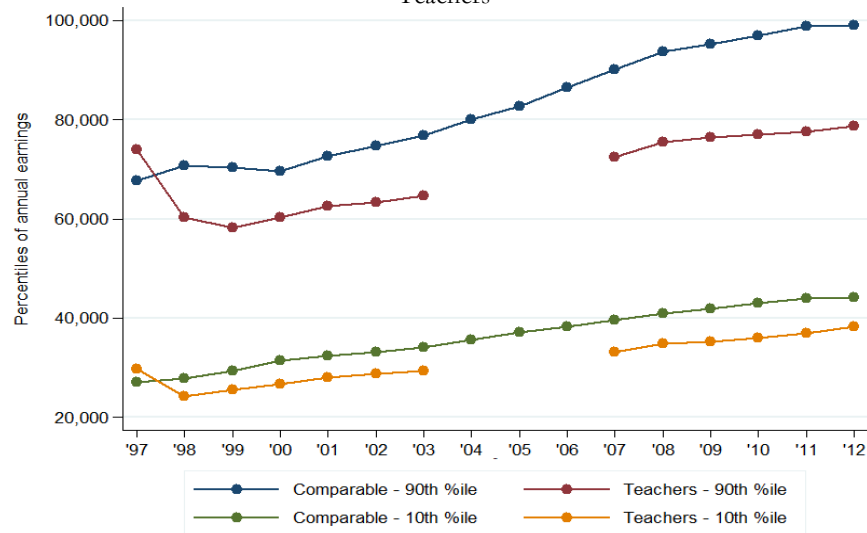
difference between the 90th percentiles of wages for the two groups is much greater than the difference between the 10th percentiles of wages. Starting in 2007, the gap between the 90th percentile wages for the two groups shows further increase, which reflects the decrease in relative earnings for the highest-paid teachers. As mentioned earlier, this gap may actually be understated because the data reflects the inflated teachers' salaries during the financial crisis.

From the list of comparable occupations, some of the most attractive alternatives to teaching include nursing, computer programming, and accountanting. Figure 3 compares the mean annual wage for teachers to the mean annual wage of computer programmers, registered nurses and accountants. As you can see, all of these professions earn more than teachers in each year from 1997-2012. Again, the pay differential increases after 2007, making teachers' wages relatively worse over time[23]. As shown in Table 2, teachers earned approximately $3,500 less than accountants, $5,000 less than registered nurses and $18,000 less than computer programmers in 1998. However, by 2012, this increased to approximately $14,000, $11,000, and $21,000 less in mean annual wages than accountants, registered nurses

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[23] The data for this analysis is adjusted for inflation (in $2012)

and programmers, respectively. In fact, when examining the overall change in mean annual wages from 1998 to 2012 for the different occupations, Table 2 shows an increase of 11% in the earnings of the comparable group – a 20% increase for accountants, a 12% increase for registered nurses and a 4% increase for computer programmers (who already have the highest salary). For teachers, however, the increase in mean annual wages from 1998 to 2012 is a mere 3%.

Figure 3: Comparing mean annual wages for teachers, registered nurses, computer programmers and accountants
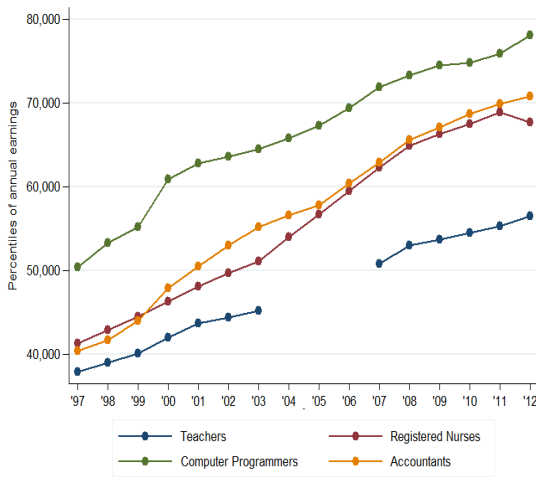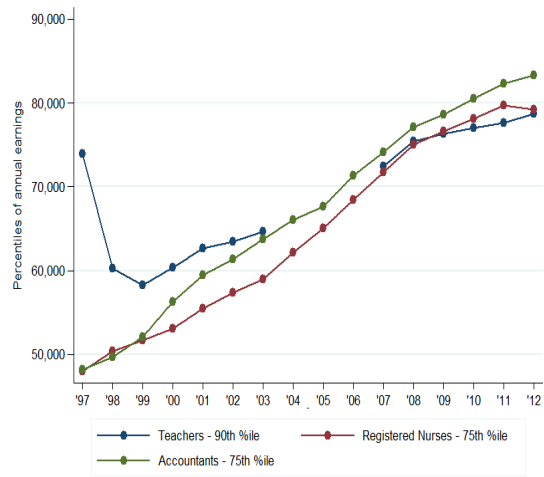
Figure 4: Comparing 90th percentile of wages for teachers to 75th percentile of wages for nurses and accountants

Looking at the data in a different way, Figure 4 shows the percentile breakdown of wages for the different occupations and reveals that the 75th percentile of annual wages for accountants and registered nurses surpassed the 90th percentile of wages for teachers in the last five years. In 2009, the 75th percentile wages for registered nurses of $82,040 (in 2012 dollars) surpassed the 90th percentile of wages for teachers of $81,715 (in 2012 dollars). The 75th percentile of wages for accountants had surpassed the 90th percentile of wages for

teachers in 2007[24] when accountants earned \$82,119 (in 2012 dollars) and teachers in the highest pay bracket earned \$80,184 (in 2012 dollars).

		Table 2: Mean Annual Wages (in \$2012)				
Year	**Comparable**	**Teachers (broad)**	**Teachers**	**Accountants**	**Registered Nurses**	**Computer Programmers**
1997	\$60,403	\$52,351	\$54,150	\$57,715	\$58,991	\$72,106
1998	\$61,998	\$53,007	\$54,892	\$58,714	\$60,411	\$75,085
1999	\$63,260	\$53,260	\$55,195	\$60,561	\$61,329	\$76,046
2000	\$64,597	\$53,787	\$55,991	\$63,816	\$61,669	\$81,166
2001	\$65,227	\$54,264	\$56,613	\$65,388	\$62,328	\$81,402
2002	\$66,216	\$54,286	\$56,665	\$67,558	\$63,389	\$81,176
2003	\$66,485	\$54,208	\$56,322	\$68,796	\$63,701	\$80,436
2004	\$67,415	\$52,939	\$54,686	\$68,797	\$65,643	\$79,953
2005	\$67,651	\$52,325	\$53,936	\$67,873	\$66,625	\$79,057
2006	\$68,176	\$52,663	\$54,493	\$68,795	\$67,764	\$78,988
2007	\$69,170	\$54,085	\$56,188	\$69,661	\$68,916	\$79,557
2008	\$69,133	\$54,221	\$56,545	\$69,898	\$69,190	\$78,170
2009	\$70,814	\$55,334	\$57,465	\$71,829	\$70,927	\$79,763
2010	\$71,184	\$55,468	\$57,344	\$72,291	\$71,053	\$78,691
2011	\$70,354	\$54,713	\$56,471	\$71,277	\$70,288	\$77,445
2012	\$68,956	\$54,474	\$56,494	\$70,741	\$67,692	\$78,121
Change from 1998-2012[25]	**11%**	**3%**	**3%**	**20%**	**12%**	**4%**

Table 2 shows that comparable occupations saw the biggest increase in salary in the year 1999, when mean annual wage increased by 2.64%. For teachers, however, the highest increase in wages was in the year 2007, when mean annual wage increased by 2.70%. It was also the first time that (in real dollars) the mean annual wages for teachers broke the \$50,000 threshold, reaching \$50,742. However, as mentioned earlier, the pay gap also started increasing in 2007. Ignoring the figures for 2004-2006 due to errors in NY state data, the pay differential increased from 11.55% in 1997 (when compared to comparable professions) to 23.1% in 2007 (also shown in Table 1). In 2010, accountants' mean annual wage saw the

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[24] Note that this could have happened earlier but cannot be verified since data for 2004-2006 is omitted. The accountant's 75th percentile wage of \$81,229 in 2006 is already higher than 90th percentile of teachers' wages of \$80,184 in 2007.

[25] I did not take 1997 into consideration due to possible errors in the 1997 percentile wage data.

greatest increase compared to that of teachers – accountants earned 26.07% more as a percentage of teachers' wages. In 1998, this difference was only 6.96%, which shows a decline of relative teachers' earnings of almost 20% in the last 13 years. In 2011, registered nurses' salaries saw the greatest increase in wages compared to that of teachers – registered nurses earned 24.47% more as a percentage of teachers' wages. Again, in 1998 this difference was 10%, showing a deterioration of relative teacher earnings of around 15% in the last 13 years.

TABLE 3: Percentile Wages of Teachers, Registered Nurses and Accountants

Mean annual wages in $2012	1998	2012	Change %
Teachers 10th percentile	$34,058	$38,192	12%
Teachers 25th percentile	$41,877	$45,294	8%
Teachers 50th percentile	$53,261	$55,173	4%
Teachers 75th percentile	$67,977	$67,117	-1%
Teachers 90th percentile	$84,852	$78,721	-7%
Nurses 10th percentile	$42,650	$47,811	12%
Nurses 25th percentile	$49,419	$55,781	13%
Nurses 50th percentile	$58,015	$66,522	15%
Nurses 75th percentile	$71,040	$79,213	12%
Nurses 90th percentile	$87,262	$91,422	5%
Accountants 10th percentile	$33,967	$40,327	19%
Accountants 25th percentile	$42,116	$49,827	18%
Accountants 50th percentile	$53,161	$63,701	20%
Accountants 75th percentile	$70,061	$83,298	19%
Accountants 90th percentile	$103,979	$109,015	5%

Table 3 shows the change in percentile of wages for teachers, registered nurses and accountants from 1998 to 2012. The table shows that the 10th percentile of earnings (used as an approximation for starting salaries) for the different professions experienced similar growth ranging from 12% to 19%. However, as the percentiles increase, the growth in teachers' wages becomes relatively worse. The growth in 50th percentile of wages is 15% for registered nurses, and 20% for accountants, but a mere 4% for teachers. The growth in the

75th percentile of wages is actually *negative* 1% for teachers while nurses and accountants enjoy an increase of 12% and 19%, respectively. The highest paid bracket (90th percentile) of teacher wages experience a *decrease* of 7% from 1998, while registered nurses and accountants see an increase of 5%. These figures reveal the lack of growth in earnings for the highest paid teachers, which makes the profession even more unappealing from a long-term perspective.

The data clearly shows that teacher compensation continues to look dismal when compared to that of other occupations, and that the opportunity of growth in wages is equally bleak. The long-term trend of decreasing relative earnings for teachers is more than likely to persist unless steps are taken to stabilize or increase teachers' pay.

III. RELATIVE TEACHER COMPENSATION: STATE-BY-STATE

Analyzing state-by-state data for mean annual wages allows us to hone in on the opportunties available in individual states and evaluate the changes in teacher wages and relative compensation across all states over the span of fifteen years (1997-2012). Analyzing different percentiles of wages also reveal the opportunity for salary growth across states.

Table 4 shows the relative earnings of teachers across different states and the state rank from #1 to #51 for 2012 (representing highest to lowest relative teacher earnings). Note that for 1998, data for Delaware and Washington DC is missing, so the rankings range from #1 to #49. In 2012, teachers in Wyoming had the highest relative wages – teachers' wages were 99.6% of comparable occupations' wages. Arizona showed the lowest relative pay for teachers – the mean annual wage for teachers in 2012 was only 62.7% of comparable professions' earnings in Arizona. In 1998, the mean annual wage for teachers in Pennsylvania was actually *higher* than the mean wage for comparable professions – teachers earned 110.4% of comparable professions' wages. The state with the worst relative teachers' pay in 1998 was Mississippi, where teacher earnings were 72% of comparable professions' earnings. Notably, the relative teacher earnings for Mississippi in 1998 was approximately 10% better off than the relative teacher earnings in Arizona for 2012.

It is important to note that when comparing relative teacher earnings in different states, many variables come into play. These include the changes in economic landscapes, the number of teacher positions available, the amount of comparable occupations in the state, and the strength of the teacher union in the state. For example, there are many differing components in the economic landscape of particular states – major income sources for a

state like Wyoming (WY) include mineral extraction, travel, and tourism. Occupations that constitute our "comparable professions" like accountants, registered nurses and computer programmers are not prominent in the state. Therefore, relative teacher salaries seem much better off than in other states where comparable professions are in higher demand or dominate the market. Figure 5 illustrates a steep increase in teacher salaries in WY after 2006. The increase in salaries may have been triggered due to a major school finance lawsuit judgment in 2001 called *Campbell v. State of Wyoming*[26]. The lawsuit ordered a large increase in school funding, a lot of which went to teacher salaries[27]. Note that from 2008-2009 the salaries might have been inflated because newer teachers were let go during the crisis, but WY continues to show high relative teacher salary even after 2011. The declining salaries of comparable occupations in WY also help close the gap in 2012.

In Arizona (AZ), the healthcare and transportation industries, along with the government sector, are huge sources of employment. Some of the top employers in the state of Arizona include Banner Health, Wells Fargo, Intel Corporation and Bank of America[28]. Individuals are likely to consider these companies/jobs when evaluating careers, and relative teacher compensation is more likely to factor into the decision. Figure 6 shows that relative earnings in AZ have been declining since 2004 (the slight increase in 2008 is probably due to the financial crisis). The gap continues to rise in 2010, revealing the ongoing decline in relative teachers' wages. Note that another factor impacting teacher compensation in particular states is the action of teachers unions. My analysis shows that the strength of teacher unions in different states, as reported by Winkler, Scull, and Zeehandelaar (2012),

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[26] "School Funding Cases in Wyoming." *National Education Access Network RSS*. April. 2012.
[27] A review of funding took place in 2005-2006 and recommended increases in teacher salaries.
[28] "Arizona's Largest 100 Companies - Azcentral.com." *The 2013 Arizona Republic 100.*

has a statistically significant correlation with relative teachers' pay (Figure 8). Note that in Figure 8, the stronger unions have higher ranks (e.g. #1 is the strongest), which result in a negative correlation. The teacher union in state of the Arizona is considered to be one of the weakest, which might be a factor in the continuous decline in relative teacher earnings. The state of NY continues to be a strong state for relative teacher earnings. Although New York City dominates the economy of the state, individuals have a larger range of job opportunities to choose from than in most states. In 2012, NY ranked 3rd in relative teacher compensation, as teachers earned up to 95.2% of the mean annual wages of comparable professions. In 1998, NY state teachers also fared well, earning 93% of the mean annual wages of comparable professions. The state of New York has one of the strongest teacher unions, which might have led to the relatively high teacher compensation. Note that there might be some errors in the data for NY wages from the year 2000 to 2003, leading to the steep increase in earnings in 2000. Figure 7 also shows the relative teachers' pay in the state of North Dakota (ND). ND was the state with the biggest positive change in teachers' salary – the mean annual wages of teachers grew 5.4% from 1998 to 2012. This is higher than the national increase in teachers' wages of 3%, mentioned earlier. Figure 7 shows that the increase in relative compensation is, in part, due to the decreasing pay for comparable occupations in 2011.

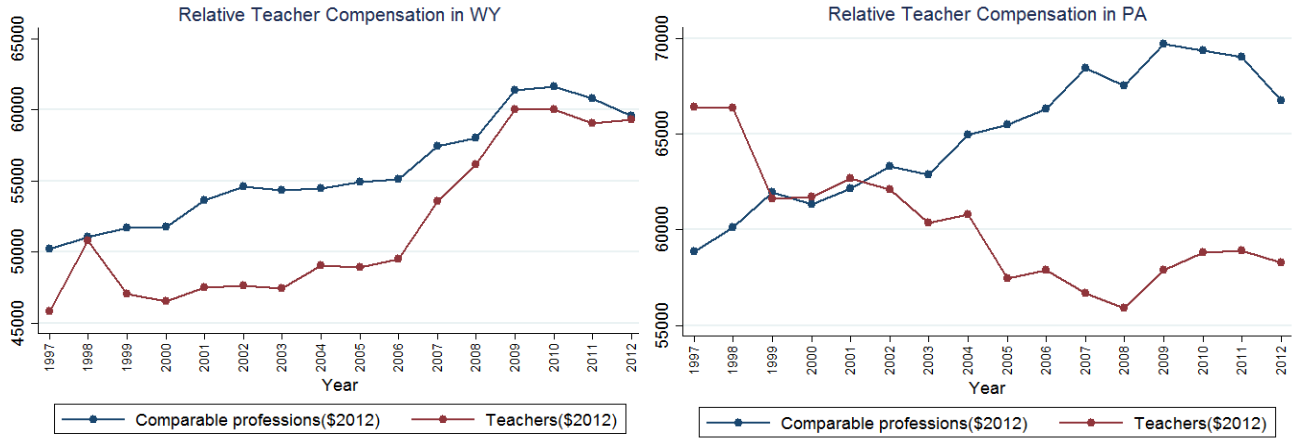**Figure 5:** Wyoming (WY) ranked #1 in 2012, Pennsylvania (PA) ranked #1 in 1998

Figure 6: Arizona (AZ) and Mississippi (MS) ranked the lowest in relative teachers pay in 2012 and 1998,
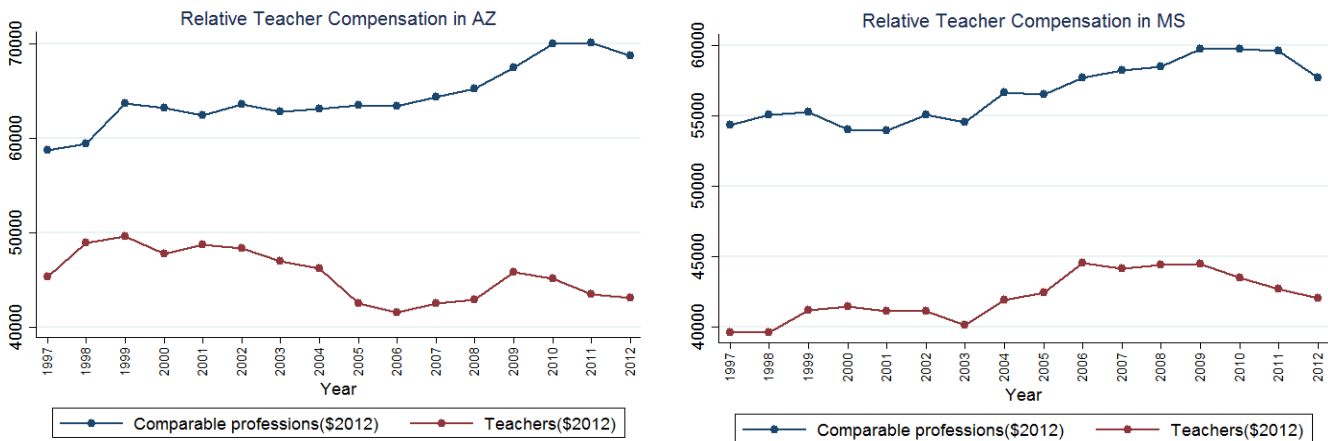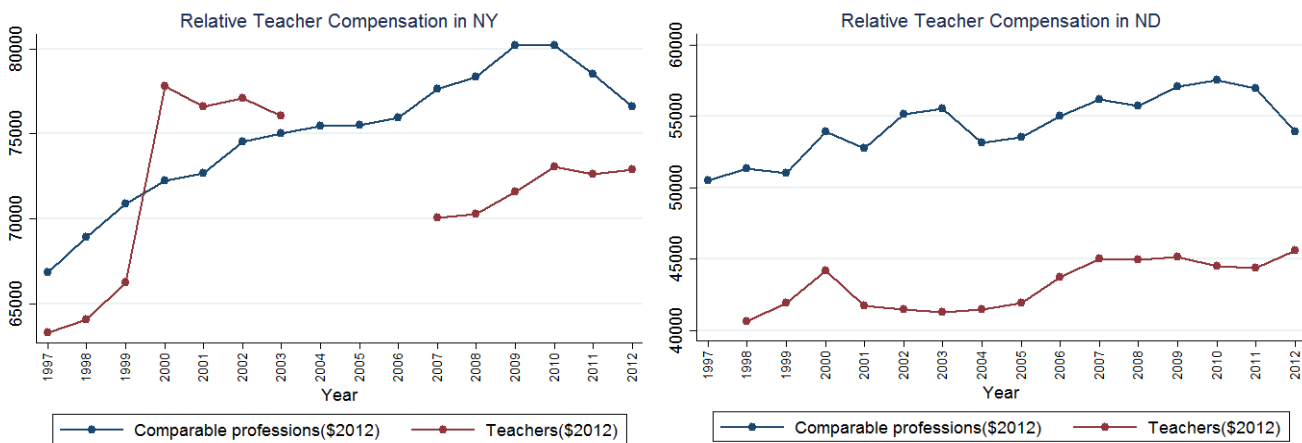

Figure 7: Relative Teacher Compensation in New York (NY) and North Dakota (ND)

**Note that there might be errors in the data from 2000 to 2003 in the state of NY

TABLE 4	2012 Teacher Earnings		1998 Teacher Earnings	
STATE	Comparable Earnings	Rank	Comparable Earnings	Rank
WY*	99.6%	1	99.5%	6
RI*	98.9%	2	97.5%	9
NY*	95.2%	3	93.0%	13
OH	93.5%	4	98.3%	8
MI	92.3%	5	97.0%	10
IL	89.2%	6	90.3%	17
CT	88.8%	7	99.6%	5
WI	87.6%	8	99.2%	7
PA	87.3%	9	110.4%	1
AK	87.2%	10	104.4%	2
MN	87.0%	11	88.1%	22
NJ	86.0%	12	97.0%	11
IN	86.0%	13	102.0%	3
KY	85.4%	14	89.5%	19
VA	85.4%	15	85.8%	26
MD	84.7%	16	85.8%	25
ND*	84.6%	17	79.2%	45
SC	83.9%	18	85.5%	27
IA	83.9%	19	91.0%	16
VT	83.5%	20	96.7%	12
MA*	83.1%	21	82.9%	37
AL	82.5%	22	86.6%	24
CA	81.2%	23	89.8%	18
NH	80.9%	24	92.2%	15
NE	80.5%	25	84.1%	34
GA	79.8%	26	89.1%	21
TN	79.7%	27	82.0%	40
WA	79.7%	28	83.5%	35
AR	79.7%	29	84.6%	33
MO*	79.4%	30	76.6%	47
ID	79.0%	31	101.8%	4
LA	78.8%	32	86.9%	23
DE	78.8%	33	.	.
MT	78.5%	34	85.0%	30
ME	78.4%	35	85.3%	28
NM	78.1%	36	84.9%	31
UT	78.1%	37	79.2%	44
WV	78.0%	38	92.8%	14
OR	77.9%	39	89.3%	20
KS	77.3%	40	82.8%	38
FL	77.0%	41	85.3%	29
OK	75.4%	42	77.1%	46
SD	74.6%	43	83.2%	36
TX	73.8%	44	81.4%	41
HI	73.2%	45	84.6%	32
MS*	72.9%	46	72.0%	49
NV	72.0%	47	79.8%	43
DC	71.8%	48	.	.
CO	71.5%	49	80.2%	42
NC	68.8%	50	74.4%	48
AZ	62.7%	51	82.4%	39

*States with higher relative teachers earnings in 2012, compared to 1998

According to Table 4, only seven states in 2012 had higher relative teacher earnings when compared to 1998. These states include Wyoming, Rhode Island, New York, Massachusetts, Missouri, Mississippi, with the highest positive change seen in the state of North Dakota (an increase of 5.4%). The rest of the states (and Washington DC) showed declines in relative teacher earnings. The states with the highest declines in relative teacher earnings were Pennsylvania and Idaho, where relative teacher earnings in 2012 decreased by 23.1% and 22.8% respectively, compared to 1998. Figure 5 shows the trend in teachers' salary in Pennsylvania (PA), which used to have the highest relative earnings in 1998 and still ranks #9 in relative teacher compensation in 2012. PA also has a very strong teacher union presence (Amber Winkler, Janie Scull, & Dara Zeehandelaar, 2012). Idaho, on the other hand, used to be one of the best states for relative teachers pay in 1998, ranking #4, but declined to #31 in 2012. This could be due to a mix of factors including weak teacher union and the shift of the state's economy from an agricultural-based to a science and technology-based, which could have increased earnings of comparable occupations over time.

As mentioned previously, WY has the highest relative teacher earnings in 2012. Table 5 shows how the mean annual wages of teachers compare to that of registered nurses, accountants and comparable occupations for particular states. The percentage values represent teacher wages as a percentage of the respective occupation's wages. The wages listed in Table 2 showed that *nationally,* the mean annual salary of a teacher in 1998 was 88% of comparable occupations' wage, 93% of an accountant's wage, and 90% of a nurse's wage. In 2012, it declined to 81% of comparable occupations' wage, 79% of an accountant's wage and 83% of a nurse's wage. However, the 1998 mean annual wage for teachers in WY was on par with that of comparable occupations, and *higher* than the wages for registered nurses

and accountants. In 2012, teachers in WY were paid (on average) the same as accountants in WY and 2% less than registered nurses, which is far better than the national relative pay for teachers.

In 2012 dollars ($)			**TABLE 5**					
ST	**Year**	**Teachers**	**Comparable**		**Registered Nurses**		**Accountants**	
WY	1998	$50,802	$51,055	*100%*	$49,046	*104%*	$50,440	*101%*
	2012	$59,330	$59,571	*100%*	$60,690	*98%*	$59,360	*100%*
Change 98-12		17%	17%		24%		18%	
AZ	1998	$48,927	$59,351	*82%*	$58,131	*84%*	$58,525	*84%*
	2012	$43,063	$68,652	*63%*	$71,390	*60%*	$62,070	*69%*
Change 98-12		-12%	16%		23%		6%	
NY	1998	$64,056	$68,906	*93%*	$69,949	*92%*	$64,639	*99%*
	2012	$72,910	$76,624	*95%*	$74,100	*98%*	$85,140	*86%*
Change 98-12		14%	11%		6%		32%	
ND	1998	$40,651	$51,327	*79%*	$52,680	*77%*	$46,285	*88%*
	2012	$45,598	$53,891	*85%*	$53,520	*85%*	$54,620	*83%*
Change 98-12		12%	5%		2%		18%	
PA	1998	$66,367	$60,141	*110%*	$59,399	*112%*	$55,398	*120%*
	2012	$58,278	$66,761	*87%*	$65,000	*90%*	$70,420	*83%*
Change 98-12		-12%	11%		9%		27%	
MS	1998	$39,617	$55,023	*72%*	$55,441	*71%*	$52,849	*75%*
	2012	$42,046	$57,694	*73%*	$57,740	*73%*	$59,480	*71%*
Change 98-12		6%	5%		4%		13%	
Note: The % values to the right of mean annual wages represent teacher wages/respective occupation wage for that year								

Furthermore, while the national mean annual wage for teachers increased only 3% from 1998 to 2012, the increase in Wyoming was 17%. In New York, teacher wages actually improved as a percentage of comparable occupation wages overall (a 2% increase) and as a percentage of nurses' wages (a 6% increase). However, teachers' salaries dropped as a percentage of accountants' wages, perhaps due to the opportunities in New York City's financial sector. Although the state of North Dakota still holds one of the lowest rankings for relative teachers pay (mean annual wages have not breached $50,000), relative teacher earnings have improved over the years.

Another interesting facet to analyze on a state level is the opportunity for growth in teacher wages. Table 6 on the next page shows the 10th and 90th percentile wages of teachers, comparable occupations, nurses and accountants in 1998 and 2012. In Wyoming, when compared to the 10th percentile of wages of comparable occupations, nurses, and accountants, teacher wages showed the highest increase of 38.3% from 1998 to 2012. However, the 90th percentile wages for teachers saw a decline of 1.8%, while nurses experienced the highest increase of 21.7%. Even Mississippi, which remains one of the states with the lowest relative teacher compensation, saw the highest increase in the 10th percentile of wages for teachers – an increase of 16.9% (10th percentile of comparable occupations saw an increase of 2.4%). The state of New York also had the highest increase in 10th percentile wages for teachers – an increase of 39.3%, which is over 20% higher than the increase in 10th percentile salaries for comparable occupations. In fact, the seven states that had higher relative teacher earnings in 2012 when compared to 1998, (Wyoming, Rhode Island, New York, Massachusetts, Missouri, Mississippi, North Dakota), have *all* experienced either the highest or 2nd highest growth in 10th percentile wages for teachers (compared to the 10th percentile wages for nurses, accountants and comparable occupations). This trend and the data from Table 3 suggest that increases in the lower percentile wages are a big driver in the overall increase in teacher wages from 1998 to 2012. However, salaries at the higher pay brackets continue to decline or remain stagnant, which limits wage growth opportunities even in states with the highest relative teacher compensation.

TABLE 6: Comparing 10th and 90th Percentile Wages from 1998 to 2012

In 2012 dollars ($)

ST	YEAR	10th Percentile Wages				90th Percentile Wages			
		Teacher	Comparable	Nurses	Accountants	Teacher	Comparable	Nurses	Accountants
WY*	1998	$32,201	$34,771	$35,383	$28,636	$76,271	$75,646	$64,174	$93,993
	2012	$44,535	$41,428	$45,040	$38,320	$74,886	$80,980	$78,080	$86,950
Change 98-12		**38.3%**	19.1%	27.3%	33.8%	**-1.8%**	7.1%	21.7%	-7.5%
MS*	1998	$27,307	$37,233	$39,961	$31,763	$52,910	$79,797	$73,329	$86,232
	2012	$31,925	$38,136	$40,050	$33,120	$56,544	$82,646	$80,860	$91,820
Change 98-12		**16.9%**	2.4%	0.2%	4.3%	**6.9%**	3.6%	10.3%	6.5%
AZ	1998	$32,776	$36,378	$42,919	$33,904	$70,570	$92,912	$73,766	$107,289
	2012	$32,002	$46,259	$51,980	$38,860	$58,756	$95,204	$92,760	$91,550
Change 98-12		**-2.4%**	27.2%	21.1%	14.6%	**-16.7%**	2.5%	25.7%	-14.7%
NY*	1998	$31,055	$38,519	$42,496	$34,087	$116,804	$120,703	$118,600	$119,037
	2012	$43,266	$45,515	$49,860	$45,740	$111,092	$116,149	$103,130	$138,110
Change 98-12		**39.3%**	18.2%	17.3%	34.2%	**-4.9%**	-3.8%	-13.0%	16.0%
ND*	1998	$28,307	$35,299	$40,341	$24,861	$54,739	$72,762	$68,442	$73,498
	2012	$32,284	$37,241	$40,760	$33,410	$61,851	$73,671	$69,970	$80,880
Change 98-12		**14.1%**	5.5%	1.0%	34.4%	**13.0%**	1.2%	2.2%	10.0%
PA	1998	$37,360	$37,900	$42,426	$31,129	$115,593	$95,088	$84,133	$100,021
	2012	$38,201	$42,542	$45,480	$39,370	$83,487	$97,305	$88,880	$111,850
Change 98-12		**2.3%**	12.2%	7.2%	26.5%	**-27.8%**	2.3%	5.6%	11.8%

*States where teachers' 10th percentile wages experienced either the highest or 2nd highest growth. This includes RI, MO, and MA (not shown in the table).

Figure 8: Correlation of Relative Teacher Pay and Union Strength in 2012. Note that higher ranking reflects stronger teachers union.

P-value: 0.001
T-statistic: -3.68
Coefficient: -.002
R-squared: 0.22
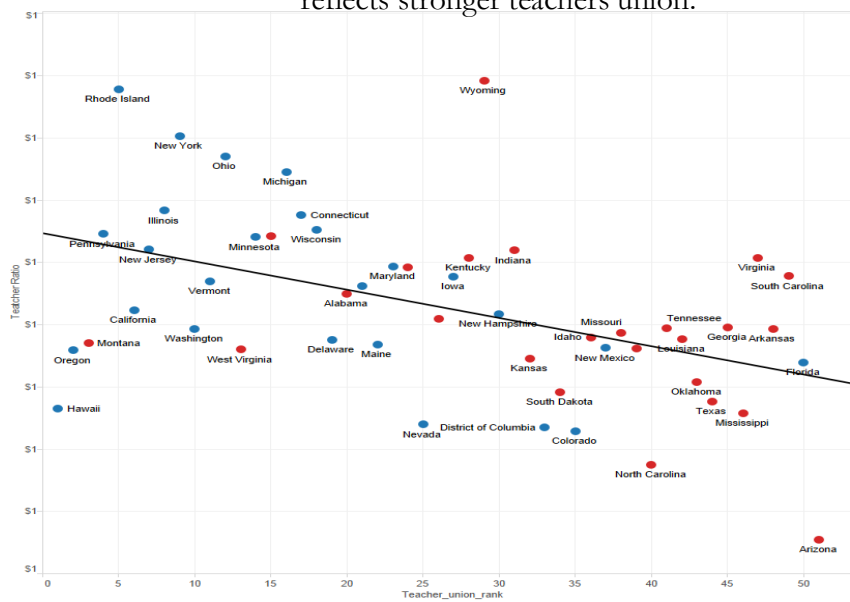
IV. RELATIVE COMPENSATION AND TEST SCORES

With all the analysis on relative teacher pay, it is reasonable to ask whether or not higher relative compensation impacts educational outcomes for students. In order to test the relationship between relative teacher compensation and student outcomes, I calculated a ratio of teacher earnings to comparable professions' earnings for each year, across all the states. As mentioned before, I combined this information with scores from the National Assessment of Educational Progress, or NAEP, test, by state for mathematics and reading for the years 2000, 2003, 2005, 2007, 2009, and 2011. Subsequently, I ran a regression to test for a linear relationship between relative teacher compensation and test scores. I tested twenty different sets of test scores and found a statistically significant positive correlation between relative teacher compensation and test scores for six of the tests.

Figure 9 shows the linear regression for the 8th and 4th grade 2011 reading tests. The regression has a t-statistic of 2.27 and p-value of 0.028 for the 8th grade reading test and a t-statistic of 2.27 and p-value of 0.027 for 4th grade reading test. The p-values of less than 0.05 show that this positive correlation is statistically significant in both cases. Figure 10 shows more detail into the relationship between the relative teacher earnings and test scores in WY and AZ. It is important to note that there may be many confounding variables impacting the scores and contributing to the positive correlation. While the pattern seems very strong in the state of WY, the data points for the state of AZ do not clearly show a pattern. I regressed twenty different sets of scores for 8th and 4th grade reading and math tests with relative teacher compensation. Table 7 shows that out of the twenty tests, six showed statistically significant positive correlation. The t-statistics show that the correlations for all tests are positive, although not always statistically significant. The results are worthy of

consideration, especially given that three out of the five years tested exhibited a positive correlation in at least one of the tests.

Note that the NAEP tests for various other subjects such as science, writing, arts, civics, economics, geography, U.S. history, and technology and engineering literacy. Further tests and research into the data could easily reveal more about the relationship between the relative teacher compensation and student outcomes.

Figure 9: Linear Regressions for Relative Teacher Compensation and 8th Grade Reading Scores (2011), and Relative Teacher Compensation and 4th Grade Reading Scores (2011)
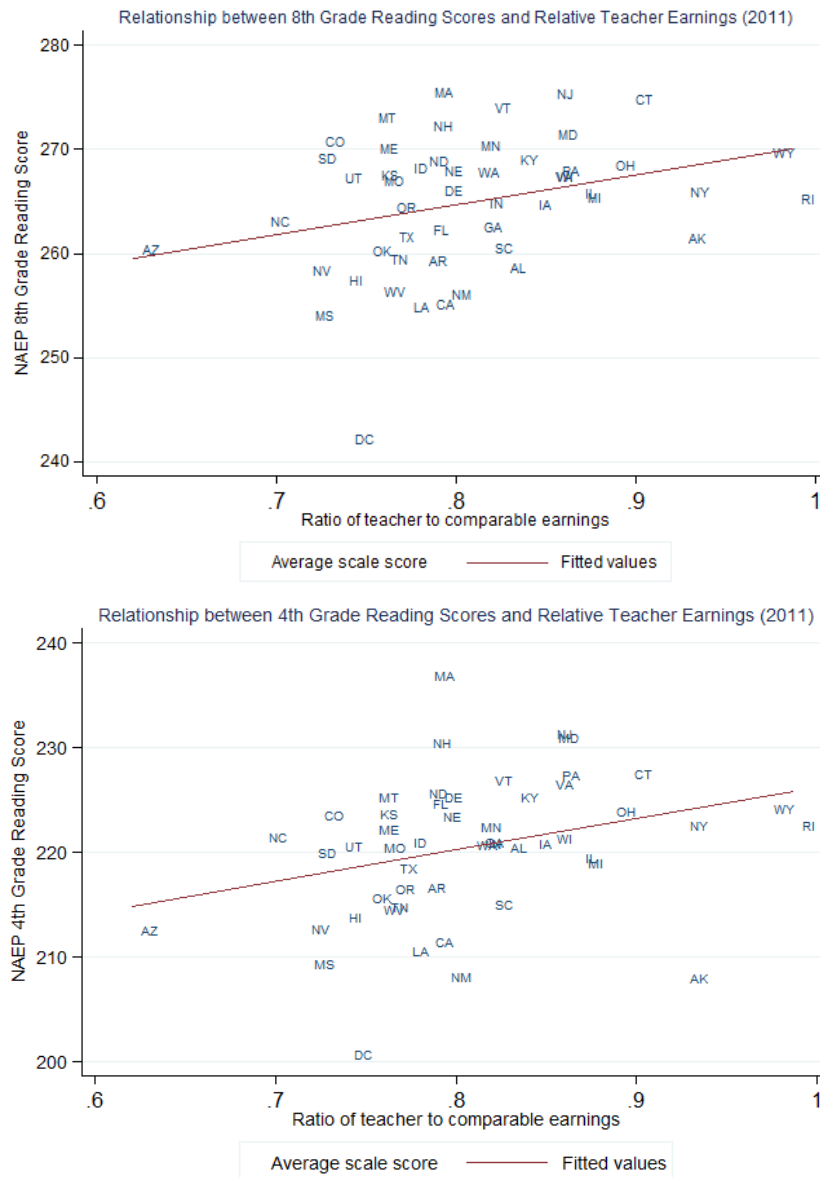
Table 7: Results of Linear Regressions

Year	Subject	Grade	P > |t|	T-Statistic	Statistically Significant?
2011	**Reading**	**8th**	**0.028**	**2.27**	**YES**
	Reading	**4th**	**0.027**	**2.27**	**YES**
	Math	8th	0.203	1.29	NO
	Math	4th	0.147	1.47	NO
2009	Reading	8th	0.148	1.47	NO
	Reading	4th	0.094	1.71	NO
	Math	8th	0.453	0.76	NO
	Math	4th	0.344	0.95	NO
2007	Reading	8th	0.103	1.66	NO
	Reading	**4th**	**0.016**	**2.51**	**YES**
	Math	8th	0.253	1.16	NO
	Math	4th	0.070	1.85	NO
2005	**Reading**	**8th**	**0.023**	**2.35**	**YES**
	Reading	**4th**	**0.010**	**2.67**	**YES**
	Math	8th	0.090	1.73	NO
	Math	**4th**	**0.033**	**2.2**	**YES**
2003	Reading	8th	0.172	1.39	NO
	Reading	4th	0.068	1.87	NO
	Math	8th	0.390	0.87	NO
	Math	4th	0.230	1.22	NO

Figure 10: Relative Teacher Compensation and 4th Grade Reading Scores in WY and AZ
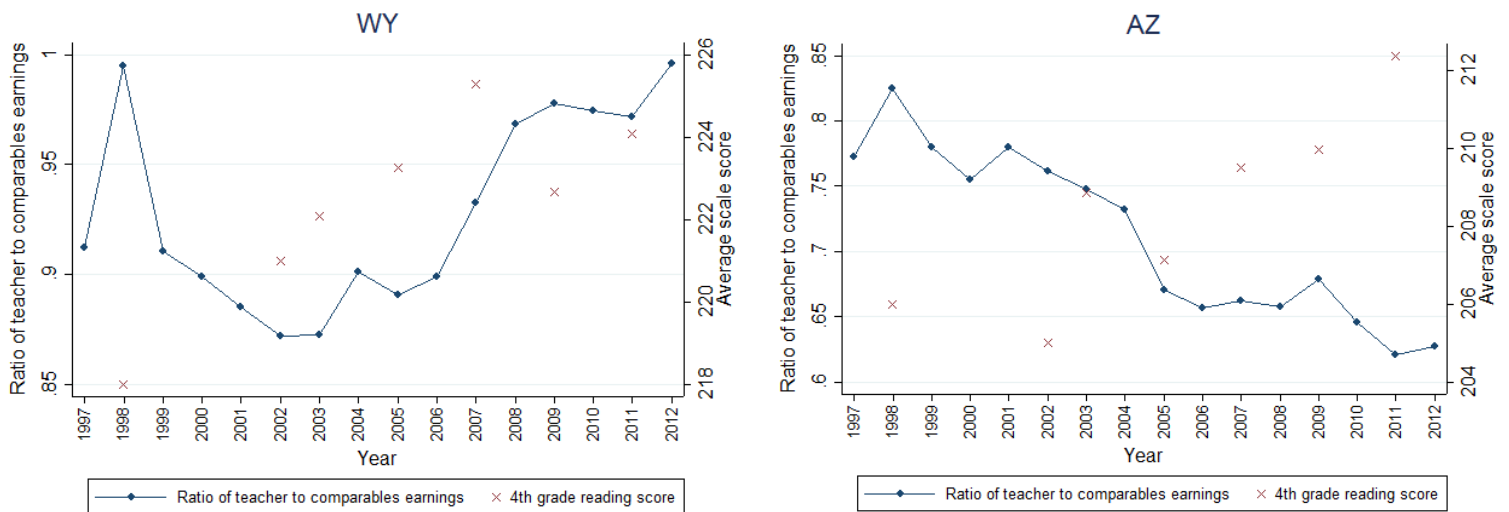
V. CONCLUDING THOUGHTS

"In many countries teachers no longer retain the elevated status that they used to enjoy. Over time, this declining respect for teachers will weaken teaching, weaken learning, damage the learning opportunities for millions and ultimately weaken societies around the world"   - The Varkey GEMS Foundation

The analysis in my thesis clearly shows the widening gap between teacher and comparable professions' wages. It also provides advances over prior literature by exploring percentile wage data and highlighting the increasing differential for teachers in the higher wage brackets. The increase in earnings experienced by particular occupations such as nursing, accounting and computer programming further emphasize the relative stagnation of teaching compensation. The analysis on the state level revealed that only seven states had higher relative teacher earnings in 2012 than in 1998. Furthermore, examining the correlation between test scores and relative teacher compensation provides insight into a positive relationship between the two and instills a strong cause for further research.

Compensation is an important factor of how an occupation is perceived, and status is inextricably linked to relative pay. The study 'Global Teacher Status Index' also evaluated countries' perceptions of wages for teachers. It reported that the perception of what teachers earn is close to reality for most of the countries surveyed. In the U.S., however, the report revealed that people estimated *lower* earnings for teachers. The report showed that the estimate for starting teachers' salary was 20% lower than the actual salary[29]. This poor public sentiment reinforces a cycle of declining status of teachers in the U.S. and the perception of the teaching profession as even more underpaid than in reality. These trends would help explain the constant struggle that public schools are facing in attracting talented individuals,

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[29] "Varkey GEMS Foundation." *Global Teacher Status Index*. October 2013

who have an ever-increasing number of higher paying opportunities outside of teaching. The solution to this cyclical problem lies with initiatives to improve either the cultural view of teaching, or increasing teacher compensation on a large scale. The latter solution, I believe, is the more practical one. The findings outlined in my thesis should inform policy makers about the crucial significance of addressing the teacher pay disadvantage in the United States. Any steps taken towards increasing relative teachers' pay will be paramount in restoring the status of the profession, attracting talented individuals to teaching, and ultimately improving student outcomes.

– IMPLICATIONS & OPPORTUNITIES FOR FURTHER RESEARCH -

An increase in compensation would help attract new talent into the teaching force and make the profession an appealing career option to the upcoming generation. However, there are many issues that would surround the implementation of increased salaries. The increase in pay would have to be systematic, over a long period of time, conducive with the federal budget, and aligned with current political and economic policies. The issue of whether or not the pay structure should be geared towards new and incoming teachers or to current teachers would also have to be addressed. Furthermore, an increase in compensation must be paired with other changes in the selectivity of teacher programs while simultaneously considering external factors, such as supply/demand dynamics. Most importantly, funding the increased teacher compensation would be difficult and highly controversial. Convincing the public to accept budget concessions or higher taxes in order to improve teacher salaries will especially challenging. Change on such a large scale may even require complete system restructuring or heavy assistance from the private sector.

Although any substantial change would take time, the ongoing increase in the pay gap for teachers and comparable occupations demands actions. If left untreated, it could result in more prominent issues over time such as a declining economy, higher income inequality, and even scientific and technological retrogress. The objective of increasing teacher compensation is to ultimately improve teacher quality and student outcomes. However, student outcomes are not limited to test scores. Improved teacher quality could result in higher enrollment in college or vocational training, increased economic stimulus for more qualified candidates to enter the workforce, and even positive externalities from influencing children towards a certain career path in low income districts. The impact of successfully implementing the teacher salary and attracting talented individuals would be widespread, ranging from economic, social to cultural benefits. The specific details surrounding these benefits is outside the scope of my thesis, but a whole field of study focuses on the economics of education and addresses such issues.

Opportunities for further research include an in-depth analysis of the data for every state and year. Due to time constraints, I was only able to focus on particular states. However, the vast amount of data available on teacher and other occupational earnings provide a great opportunity to explore additional trends. There can also be exploratory research that further segments and identifies struggling geographic areas – these studies can examine the disparities between urban, suburban, and rural area student outcomes against the mean annual teacher salary over time. Data on various test scores also leaves room to further explore the relationships between relative teacher earnings and student outcomes. Overall, there is a wealth of data that can be leveraged to further examine the decline in teacher compensation and hopefully, research will spur initiatives to seriously address the issue.