

Relative Wages and Employment of Health Therapists

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Abstract

The health care sector, and many of the occupations within it, is changing rapidly. Of particular interest are differences between workers, and the wages they earn, in the health sector. The growth of home healthcare has caused a shift in the location of treatment of patients, especially with respect to therapists. This paper examines the relative earnings of health therapists over the 1990s. It compares the real wages and relative wages of therapists to a random sample of all other occupations as well as a random sample of other health occupations. This allows an evaluation as to whether there have been any real gains, or unexplained differential associated with being a therapist after education and other human capital culprits have been adjusted for. Two models are used, one compares the adjusted wage differential, and the other creates a real wage index to account for the wage differences between therapists and the control group.

Simple means indicate that the higher wage of therapists could be due to higher levels of education, being married, or having a higher percentage of white workers. The results indicate two very different trends for therapists. One trend for speech, respiratory, and "other" therapists indicates relatively little change in real wages over time as compared to both a non-healthcare comparison group and compared to a healthcare comparison group. The occupational and physical therapist groups, however, show a trend of increasing wages throughout the 1990s. Even controlling for education differences and experience, there is a difference in the relative wages of the different therapist groups that is unaccounted for. It is concluded that it was the actual usage of the physical and occupational therapists, or the types of conditions they treated that increased the demand for these therapists. This increase in demand could be due to an increase in demand for higher skilled workers, aging population, substitution away from relatively more expensive physicians, or indirect effects of changes in Medicare reimbursement. A longer time frame is needed to further test this latter hypothesis.

I. Introduction

The health care sector, and many of the occupations within it, is changing rapidly. Of particular interest are differences between workers, and the wages they earn, in the health sector. Studies have shown that healthcare occupations, such as nurses, make "premiums" compared to other groups of similar education and background. While this has been true among more homogenous groups, such as nurses, it is not known if these results apply to more heterogeneous groups such as therapists.

Therapists have, in the past, been one of the fastest growing professional groups within the health care industry (Sekscenski, 1981). Therapists, consist of a variety of occupations. These include physical therapists, respiratory therapists, occupational therapists, speech therapists, and other smaller groups. Educational requirements differ between the groups with some requiring masters and others requiring only associates degrees. While hospitals employ some of all of the groups, several are almost exclusive to hospitals, while some are more pervasive in private companies or schools.

Changes in the health care sector such as reduced Medicare reimbursement and the increased power of managed care have caused many hospital administrators to look for ways to cut costs. Since the four main groups of therapists have nominal mean salaries between \$34,000 and \$56,000, they are often targets for cutbacks. This is evidenced by recent changes in the Medicare reimbursement policy to limit many therapist reimbursement amounts (Newman, 2000).

The healthcare industry is changing rapidly. As the largest cohort in the country's history enters retirement, they will use substantially more healthcare services than they ever have before. This includes all types of therapy, as heart attacks and strokes often

involve more than one type of therapy. New advances in medicine and lower infant mortality also increase the usage of therapists for young people.

The growth of home healthcare has caused a shift in the location of treatment of patients, especially with respect to therapists. While specific types of therapists may be more able to provide quality care outside of the hospital setting, each of the groups have made some shift into home health care. Shifts in billing from Medicare Part A to Part B have allowed some therapists to make relatively high wages compared to others.

These changes produced demand-induced increases in real wages for registered nurses over the 1980s above and beyond what could be explained with the normal human capital models. Because increased occupational training is often a lagging effect of shortages in specific fields, these higher wages often pervade for several years. Because of the similarities between therapists and nurses in education, primary working locations, and the high percentage of females, it has been hypothesized that the two would react similarly to any possible shortages.

This paper examines the relative earnings of health therapists over the 1990s. It compares the real wages and relative wages of therapists to a random sample of all other occupations as well as a random sample of other health occupations. This allows an evaluation as to whether there have been any real gains, or unexplained differential associated with being a therapist after education and other human capital culprits have been adjusted for.

The next section provides a background on the health therapist occupation in general as well as a brief overview of the health care industry. This section also gives a description of some of the similarities and differences between different groups of

therapists and a brief overview of the previous research in this area. Section three discusses the models used to measure the relative real wage differential and to create an adjusted real wage index and also explains how each model is created. Section 4 describes the data used for the study. It explains the origin of the data, how the data were arranged, as well as giving descriptive statistics on different groups and subgroups. Section 5 includes the basic regression underlying the study, a Chow test, and the regression results for the two different models. This section also discusses the results from the models and what indications this may have on the study. The final section is the conclusion section. This section gives some indications and possible explanations for the findings presented in section 5. This section also points out problems with the study and gives implications for future work.

II. Background

A. The Health Therapist Occupation

Therapists aid in the rehabilitation of individuals who have lost mobility or some function of a normal healthy individual. This can range from a physical disability to breathing abnormalities to difficulty in doing normal household chores to even hearing and speaking. The goal of the therapist is to return normal abilities to individuals to the fullest extent possible. This often does not mean "curing" a problem, but instead improving an existing situation. It is important to describe each of the different groups, including their treatment patterns, educational requirements, and normal work environments.

The respiratory therapist is one of the less well know therapists, with about 86,000 positions held in the U.S. in 1998¹. Also known as inhalation therapists, the primary duty of respiratory therapists is to evaluate, treat, and care for patients with breathing disorders. These therapists treat all types of patients, ranging from premature infants whose lungs are not developed, to elderly people whose lungs are diseased and failing. They provide temporary relief to chronic asthma and emphysema patients, check blood pH levels, provide emergency treatment to those suffering from heart attacks, strokes, or other respiratory trauma. These therapists are, therefore, involved in preventative measures as well as treatment regimens for patients.

About 90% of respiratory therapists are found in hospital environments, with the remaining 10% being found in home health or nursing care facilities. Respiratory therapists tend to work the normal 35-40 hour week, with many working shift-work as hospitals tend to require. The educational requirements for respiratory therapists tend to be slightly less than other types of therapists. Most training schools are two-year associate degree tracked programs, with slightly more than 40 states requiring licensure. Certification is voluntary through the National Board for Respiratory Care only to graduates of CoARC-accredited programs. Most employers require general positions to be Certified Respiratory Therapists (CRT), which can be obtained through examination once an applicant has obtained a 1, 2, or 4 year degree.

Speech therapists are more prevalent than respiratory therapists, with over 105,000 positions held in 1998. These therapists primarily work to prevent and treat a great deal of disorders of the head and neck. Some of the many facets of their job include

¹ Data found at the Bureau of Labor Statistics' online Occupational Outlook Handbook. The URL for this page is <http://stats.bls.gov/ocohome.htm>.

speech, language, cognitive, communication, voice, swallowing, fluency, with a specialization group called audiologists treating auditory, balance, and other neural systems.

Speech therapists also work with a wide range of patients, from the newborns to the elderly. More focus is on the two extremes of ages in patients, with focus on the young who have some speech or hearing disability to the old to are primarily treated for hearing loss due to high noise exposure. The problems treated by speech therapists can be congenital, developmental, or acquired over time.

Most speech-language therapists and audiologists provide direct clinical services to patients through the use of specialized clinics. Over 70% of the services are provided in schools or clinics with the remaining amount being found in offices, private practices, and hospitals. Most therapists tend to work 40 hours a week, usually during the normal business hours, with some working on a contractual basis. Speech-language pathologists primarily work with people who cannot make speech sounds or cannot make them clearly. They also work with patients who have cognitive or swallowing and eating problems. Audiologists work with people who have hearing, balance, or related problems. They treat those who have hearing disorders as well as those who have lost hearing over time due to overexposure to loud noises or degenerative hearing diseases.

Many states require licensure for these therapists (44 for speech-language and 49 for audiologists) and almost all require a master's degree. In order to earn a Certificate of Clinical Competence in Speech-Language Pathology or Audiology, a person must have a graduate degree, 375 hours of clinical experience, complete a 36-week postgraduate

clinical fellowship, and pass a written examination. If that isn't enough hurdles, as of 2012 audiologists will be required to have a doctoral degree in order to be certified.

Occupational Therapists, with only 73,000 positions held in 1998, are the smallest of the main classification of therapists. Occupational therapists (OTs) primarily work with individuals to improve their ability to perform daily living tasks and tasks in working environments. Individuals who have conditions that are physically, mentally, developmentally, or emotionally disabled are common patients of OTs. OTs may use physical exercises to improve motor skills, memory exercises to aid those with short-term memory loss, or instruct patients with permanent functional disabilities on the usage of wheelchairs or in eating and dressing themselves. In general, OTs seek to help clients recover daily activities to the fullest extent possible.

Most of the occupational therapist positions are within hospitals, including rehabilitation and psychiatric hospitals. A large portion of occupational therapist clients are in the 75 year and older group, which is a group at high risk for disabling incidents. All of the U.S. states regulate occupational therapy, requiring at least a bachelor's degree in the field, and a passing grade in the certification examination.

The most well known, and most prevalent at 120,000 positions in 1998, physical therapists are the most widely used type of therapist. This fact is primarily due to the nature of their work. Working primarily to restore, maintain, and promote overall fitness and health, they prevent or limit permanent physical disabilities of patients suffering from injuries or disease. Therapists gradually increase muscle usage and flexibility through the use of stretches, electrical stimulation, hot packs, cold compresses, traction, and deep-tissue massages.

Over two-thirds of all physical therapists are employed in either hospitals or physical therapist offices, with the remaining portion being employed by home health agencies or rehabilitation centers. Due to the high number of therapists employed by hospital type facilities, their normal 40-hour weeks often include evenings and weekends. All states require physical therapists to pass a licensure examination after graduating from no less than a 4-year accredited program².

B. The Health Care Industry

In 1983 Medicare instituted a new prospective payment system (PPS) based on diagnosis related groups (DRGs). This in effect limited the amount of money that would be reimbursed for any given illness and complications. This change forced hospitals to change their treatment regimens for acute care. In response, many hospitals decreased the average length of stay and shifted post operative and post acute care to secondary care facilities. These types of institutions were long term care, home healthcare, nursing homes, and other skilled nursing facilities. This led hospitals to have higher quality therapy and nursing services for the shortened stay period, and also increased the demand for therapists due to the increase in treatment venues.

Following this change in Medicare reimbursement, many of the secondary care providers increased treatment prices and frequency in order to extract as much revenue from Medicare as possible. Since Medicare Part A was cost-based and unrestricted for the first 100 days of post acute care, the care providers could pass all costs onto the Health Care Financing Administration (HCFA) for reimbursement. With the increased demand for therapists, wages increased to entice an increase in supply. Many new PT and LPTA programs were started to meet the rising demand for therapists similar to the

² op cit.

findings on nurses from Schumacher (1997). However, there was a lag in the increase in supply due to the training time involved, this allowed wages to increase further before supply reached demand.

Changes in the way Medicare reimburses for therapist services have adversely affected almost all of the different groups. Caps that have been instituted by Medicare and other managed care facilities have cut the billing amounts and total time per patient down to levels that are unprecedented. In the early 1990s, the HCFA introduced a hourly cap on PT salaries to \$50, but limits were not put on other therapists such as occupational and speech until 1997-1998. Limits on Part A of Medicare have injected life into the home health industry still covered by Part B. Traditional locations of treatment such as hospitals and nursing homes have given way to increased home health care. However, with the recent \$1500 limits on overall reimbursement for therapy services in 1999, the recent shift in home healthcare could be short lived.

Since DRGs were instituted hospital managers have been under pressure to decrease the cost of providing care. Staffing costs often comprise over half the hospitals' operating costs. For this reason, staffing is often targeted for cost cuts, with therapists and registered nurses at the center of the cuts (Robertson et al., 1997). An article in the USA Today (internet, June 5, 2000) indicates that the general cost of seeing the doctor has soared in the past ten years. The 1990 cost was \$583, in 1995 it was \$739, so far in 2000 it is \$906, and is projected to be \$1,172 by 2005. The general trend in the healthcare industry is centered on cost reduction, with HMOs being a main player in the industry.

Many health providers shifted to a market based guide for the supply of health services, and this cost cutting was compounded by the possible healthcare market reform. The transition from the traditional fee-for-service to the managed care has caused some hospitals to layoff workers (Schumacher, 1997). Beurhaus (1993) found that the rate of increase in the annual change in hospital cost per adjusted admission has fallen, and in fact actually decreased in 1994. Many therapists were decreased to part-time, took salary cuts, or were laid off outright, with many therapists being unemployed or underemployed (G. Newman, telephone interview, June 2, 2000).

With the baby-boomers beginning to reach retirement age, many insurance providers, including Medicare and Medicaid are feeling the pinch. It is commonly accepted that as people age they tend to require increased levels of medical treatment. For this reason, this large change in the demographics of the U.S. is extremely important. At the same time, with drug costs escalating, many insurance companies are looking towards more traditional treatment in place of drug treatments.

C. Previous Literature

Most literature on the topic of wage differentials tends to concentrate on several well-known issues that are common within the human capital umbrella. Generalized studies on nurses, which many assume behave similarly, tend to concentrate more on market power of unions within the healthcare market (Hirsch & Schumacher, 1998), and the hospital bargaining structure (Schwarz & Koziara, 1992), especially within the monopsony power framework (Hirsch & Schumacher, 1995). While it is important to recognize these important factors in determining wages, we must focus on other important facets of the typical healthcare worker. One such facet is examining the reason

behind the recent growth in the therapist occupation. There has been limited research into a wage analysis of therapists over time or in comparison to other occupational opportunities. The main question of interest is to determine if therapists have enjoyed the same dramatic increases in wages over time as their nursing counterparts have. This paper attempts to address this question.

The expansion that began in the healthcare market during the 1970's dramatically increased the demand for all healthcare occupations while wages tended to stay depressed (Sekscenski, 1981). This demand continued to increase, and due to the law of demand, the wages began to increase and this began to entice more people into these occupations, especially nursing. Changes in things like the Social Security Amendments and the prospective payment system used by Medicare changed the number and type of patients that hospitals treated to fewer, yet more acute illnesses. This changed the type of people that were hired by hospitals and therefore changed the demand for such occupations as registered nurses (Schumacher, 1997). Since therapists have similar education level alternatives, such as a two-year associate's degree or a four-year degree, many people consider them to be very similar. This paper attempts to determine how similarly the therapist market changed over this changing period of time.

The backbone for this paper comes from the initial findings of Gary Becker and his Human Capital Theory. Researchers typically adjust for common differences between people such as education, age, experience, sex, and race yet still find differences between groups which is often attributed to things such as discrimination. One of the most widely studied discrimination topics is the gender gap. Within the therapist occupation, as well as in the healthcare sector in general, studies have shown that there seems to be an

unexplained gender gap in earnings (Zincone & Close 1978). This is particularly important in the healthcare field because the technical occupations are so predominantly female. Rider et al. (1988) indicate that men accounted for less than 5% of the professional membership, a number that has remained virtually constant for the last 20 years. They associate the lack of advancement and low relative wages associated with therapist positions account for much of the low proportion of males in the occupation.

However, with more and more males entering these fields, other hypotheses have come to light such as the omitted ability variable. This theory implies that once all measurable human capital variables have been adjusted for, the remaining differences in groups can sometimes be attributed to some inherent omitted ability variable that is correlated with some of the independent variables. This is corrected however by creating instruments to proxy this unobservable ability variable. Once this is done, the conclusion is drawn that at least some of this difference can most likely be attributed to this difference in ability between workers and their subsequent earnings (Schumacher & Hirsch, 1997).

Another avenue of research has been into the effect of unions on the wages of health care workers. Traditional views were more monopolistic in nature, with doctors and the American Medical Association (AMA) taking on the role of the monopolist forcing hospitals and consumers to pay higher rates due to this, thus securing higher rents for the monopolist. There has also been substantial research into the roles that unions play in creating a monopoly type of power towards the hospitals on the parts of other traditionally less organized occupations. Research indicates that indeed, unions do have a small but significant effect on the bargaining power in many health care labor markets

(Hirsch & Schumacher, 1998). On the other hand there has also been research into the possibility that many hospitals may have a type of monopsony power, but thus far the results have shown that this does not seem to be the case (Hirsch & Schumacher, 1995).

While interesting and informative, relatively little research has been devoted towards studying the wages of therapists over time in comparison to other opportunities. These prior studies were all cross-sectional instead of a time series type of analysis. Some earlier research was done on the growth of females in general in the work force over time indicates that due to increases in wages, females have been entering the labor force in increasing numbers (Smith & Ward, 1985). However, recent research indicates that for RN's, since demand was so high in the early 1980, over time wages increased dramatically compared to other similar occupations (Schumacher, 1997).

For these reasons, a model that incorporates variables designed to adjust for these effects are included. A priori expectations are for the trends of therapists to be very similar to those of RNs. In particular, expectations for dramatic increases over the early 1990's would seem to indicate these types of trends.

III. Methods

Models

We use two different approaches to account for the wage differences between therapists and the control group. The first uses an equation of the following form:

$$\ln W_{in} = \sum_{j=1}^J \lambda_j X_{ij} + \theta_y THERAPIST_{iy} + \varepsilon_{iy} \quad (1)$$

In this model, $\ln W_{in}$ is the log real wage for worker i in occupation n , and X is a vector for all pertinent human capital variables that may affect wage. Normal variables included in this vector often include: age, education, gender, race, and so on. The λ represents the coefficients of these variables, and ε is the normal error term we associate with normal OLS. This error term is well-behaved based upon the OLS assumptions about ε such as it is uncorrelated with the independent variables and that it is normally distributed with a constant variance of σ^2 . The dummy variable THERAPIST accounts for the difference between therapists' wages and the control group holding years constant, with the θ_y coefficient indicating the amount of difference.

Nine regressions were run for each year. The coefficients for each θ_y associated with the nine years can then be plotted to analyze trends in the differential associated with being a therapist over time. This forces the same types of returns to schooling and other personal and job related characteristics for both groups, but does not hold the changes in the wage constant over time. This is facilitated by the inclusion of the dummy variable for therapists instead of running a model with only therapists in it. To test for differences between the individual groups of therapists, a set of nine regressions was run for each of the five therapist categories.

Next, we calculate an adjusted wage index between the control group and the therapist group. We do this with the following equation:

$$\ln W_{in} = \sum_{j=1}^J \lambda_j X_{inj} + \sum_{y=2}^Y \gamma_y YEAR_{iny} + \varepsilon_{in} \quad (2)$$

In this model X again references the same vector of variables as found in Model 1. The variable YEAR in the regression, is a vector for the nine dummy variables for each of the years in the study. The coefficients on the year dummies, γ , indicate the differences in earnings between years even after other variables are adjusted for. It should be mentioned that in order to compare the two groups without a dummy variable, two separate versions of this model must be run; one for therapists as a group, one for each therapist group separately, one for the healthcare control, and one for the control group respectively. The coefficients on each group can then be compared to reveal if the growth of the groups have grown at the same rate or not over time. Since this is a semi-log model, we must perform the operation $(\exp^{\gamma_y})100$ to convert to a percentage index.

IV. **Data and Descriptive Statistics**

A. CPS Data

The data are from the Current Population Study (CPS) from the Bureau of the Census. A 30% random sample was generated from the 1.7 million observations included in the survey for a total of 339,161 valid observations. This paper examines therapist wages over the years 1989 to 1998. Real wage was created by dividing the 1998 consumer price index (CPI) by the base year (1983) CPI and multiplying that by the hourly wage rate. Before that could be done however, since the hourly wage was not a variable in the data set, it was constructed by dividing usual weekly earnings by usual weekly hours worked. The therapist variable is a dummy variable coded 1 if a person is a therapist of any type and 0 if they are not. The control group consists of a random sample of non-healthcare related occupations, while the healthcare control group consists

of a random sample of those the CPS codes as in the healthcare industry but not a therapist. Further description of this variable can be found in Table 3.

B. Descriptive Statistics

Table 1 displays real wages by year for each group of workers. The mean real wages for the groups tend to follow one of two patterns. For respiratory and "other" therapists, real wages make only marginal changes over the ten year period. However, the other three types of therapists show greater increases over the same ten-year period with physical therapists making the largest gains. Speech, occupational, and physical started in 1989 with mean real hourly wages of \$19.12, \$18.79, and \$17.90 respectively. By 1998 however, these same professions had increased to \$21.84, \$22.70, and \$22.72, completely reversing in order.

Occupational and physical therapists show steady increases over time in real wage. While the speech therapist occupation does enjoy increases in its real wage, the increases aren't very steady over time, with some downs as well as ups. The other two groups, show a relatively stagnant wage over the ten year study period. These results indicate that the lowest paid therapists showed the least amount of growth in wages over time.

These wage levels are higher than both the general occupation control group and the health occupation control group across all years. These two control groups start and end at lower levels than those of all types of therapists. It is also important to mention that while the control groups' wages remain relatively flat, the total therapist group actually increases with three of the five individual groups experiencing substantially

more growth than the others. These increases, however, do not account for differences in education, age, or any other inherent differences between the groups.

Table 2 displays mean characteristics for each group of workers, with Appendix 1 providing variable definitions. Differences between the total therapist group and the other occupational control group are not trivial. Therapists have, on average, 2.65 more years of education, but have 4.5 less years of experience. Therapists are more likely to be married and are composed of about 8% more whites than the control group. Both groups do not show high levels of unionization, at 16%, and the therapists make about \$5.07 more per hour in real wage.

Similar trends exist when comparing the healthcare control group to all therapists. Therapists tend to have slightly more education, but there is over 5.3 fewer years of experience for therapists than for the healthcare control. Both groups have similar marital status averages and race mix, with the healthcare control group carrying a few more blacks than the therapist groups. One surprising feature is that therapists are 5% more likely to be in a union than other healthcare workers are. Again, the real wage for therapists is much higher (\$4.77 US) than those of other health care workers.

It would seem from these numbers, that the higher wage of therapists could be due to higher levels of education, being married, or having a higher percentage of white workers. However, simple means don't solve these issues. In order to test for whether these do in fact make a significant difference, we must use multiple regression techniques.

The Bureau of Labor Statistics' Employment and Earnings report publishes yearly employment figures for many occupations. Upon examination of the data for therapists,

there seems to be trend of increasing numbers during the years of 1989-1998. Table 3 lists the total number of individuals within each group of therapists. Also included in that table is a percentage and corresponding number of therapists employed within a hospital setting. Numbers were published for most of the therapist groups, with smaller groups such as speech and occupational only reported in few or no years. Since the number of therapists working in hospitals was not reported, it was derived by multiplying the percentage of workers employed by hospitals per year in the sample by the total number as reported by the employment report.

The increasing number of therapists is especially prevalent in the physical therapist group, with an increase from 55,000 in 1989 to 87,000 in 1998. It is especially interesting that the percentage of physical therapists employed by hospitals decreases from 52% in 1989 to 39% in 1998. These trends are most prevalent and most complete in the physical therapist category, but are present in the other categories as well. These numbers indicate that even though there are dramatic increases in the number of therapists over the study period (over a 30% increase in the total), smaller proportions seem to be employed by hospitals.

V. **Results**

A. Basic Regression

As a basic regression, a model was run pooling therapists across all years. This regression included basic demographic and socio-demographic variables. Human capital theory merited the inclusion of education, experience, experience squared, marital status, union status, region, and industry.

In this basic regression, many of the variables are significant at better than the 1% level (Table 4). Since the dependent variable is the natural log of real wages, we can interpret the coefficient of the independent variables as approaching the percentage change in the dependent variable for a one unit change in the independent variable, *ceteris paribus*.

For therapists there is about a 9% increase in the real wage for every additional year of education. Initially experience adds about 2% to wages, but this effect diminishes with experience, as seen by the negative sign on experience. Non-whites earn less than whites, while the only statistically significant difference coming from blacks, who earn over 4% less. Union members tend to earn about 5% more than non-union members. This regression also indicates that, *ceteris paribus*, the "other" therapists outside of the four main groups earn between 9%-31% less. The hospital dummy is just significant at the 5% level, and indicates that the therapist which works in the hospital usually earns about 2% more than one who doesn't. The hospital finding could be a proxy for working conditions, or shift work, which is much more common in hospitals. These findings are after traditional causes of variation in wages have been adjusted for.

For the healthcare comparison group, there is about a 12% increase in the real wage for every additional year of education while one year of experience only adds about 2%. The sign on experience squared is negative, and non-whites earn less than whites, with blacks earning over 4% less. Union members tend to earn about 10% more than non-union members, which indicates that unions may be more effective or more frequent than in the therapist occupation. Those who work in hospitals in the healthcare control group have higher percentage returns to working there as compared to the therapists

group. With earning almost 15% more by being employed by a hospital, this is a sizable difference.

In the non-healthcare comparison group, there is about a 9% increase in the real wage for every additional year of education while one year of experience adds about 3%. The sign on experience squared is negative, and non-whites earn less than whites, with blacks earning over 4% less. Union members tend to earn about 14% more than non-union members. This is 4% higher than the healthcare control group, which may indicate stronger union presence in the non-healthcare market. The industry dummies indicate that for mining and construction occupations, the real wage is about 40% and 29% higher than those who work in professional groups.

This regression assumes coefficients on the right-hand side variables are constant across all 10 years in the study. Also, it assumes that the wage structure is equal for all five groups of therapists.

B. Chow Test

We test this second assumption by constructing a Chow test. It is important to test to see if there are statistically significant differences between the five groups of therapists. If so, then pooling them would bias the results. Therefore a special form of the F-Test, the Chow test, must be used. The general form of the Chow Test is as follows:

$$F = \frac{SSR_R - SSR_{UR} / r}{SSR_{UR} / (N - k)}$$

The restricted model in the Chow test is the model that allows for all therapists to be grouped into one main group. This corresponds to the null hypothesis that each of the groups are equal. The unrestricted model is actually a series of separate regressions, one for each therapist group. The residual errors from each of these models were added together to create the unrestricted model residual sum of squares.

When this model was run, an F-statistic of 6.50 was calculated. Given a critical value of 3.02 for this particular model's degrees of freedom, the null hypothesis can be easily rejected at better than the 1% level. This indicates that it is appropriate to consider the therapist groups separately.

C. Relative Wage Differentials (therapists vs. control)

In an attempt to extract further information, equation 1 was run to create the relative wage differentials between the therapists and the occupational control group. This is shown in Figure 1. It is evident that in comparison to the control group, the grouped therapist's relative wage differential was relatively constant over the period with a slight increase in the early 1990s that appears to have decreased some in the later 1990s.

When individual groups of therapists are looked at however, a very different trend is discovered. Respiratory, speech, and "other" therapists show basically flat wage differential over the period showing no noticeable trend. Physical therapist and occupational therapist groups, however, appear to have experienced growth in real wages over the period.

It is important to note that the relative wage index holds the traditional human capital variables constant. These results indicate that once we have adjusted for

education, experience, and other usual causes of differences in wage, there is still a relative increase in occupational and physical therapist wages over time.

Similar findings are recorded when the relative wage model is run against the healthcare comparison group. Thus, it appears that the trends here are unique to therapists and not the health sector as a whole. From Figure 3, it is clear that both speech and "other" types of therapists actually make less than the average healthcare worker. It is possible to view the groups of therapists as three distinct sets. The first set would be the speech and "other" group who make less than the healthcare comparison group. The second set would be the respiratory therapist, of which the wages remain relatively constant and fall in the last few years. The third set would be physical and occupational therapists. This last group seems to trend upward through almost all of the study. Again, there seems to be something different about these two groups, once we have adjusted for normal human capital differences.

D. Adjusted Earnings Index (therapists vs. control)

To test for differences across years, equation 2 was run, creating an adjusted wage index. Table 5 displays the results of the adjusted real wage index (1989 = 100) for the individual therapist groups, therapists as a whole, a health profession comparison group, and a non-healthcare comparison group. Due to sample size issues, there is some erratic movement among many of the groups, but some clear trends are evident. Almost all groups experience some real wage growth from 1989 until 1992. At this time, many of the groups, including the comparison group level off and decrease. However, both occupational and physical therapists wage continue to increase throughout the study.

Even though the adjusted wage index adjusts for the time frame, the returns to education and other human capital variables are forced to be equal for therapists and non-therapists. Even with the difference between the two models, we can observe similar trends. There seems to be something happening to occupational and physical therapists in the middle to late 1990s that is different than that of other therapists.

As seen in Figure 1, the healthcare comparison group has a similar trend to the non-healthcare comparison group. Until 1992 the healthcare comparison group wages grew slightly, and after that point they declined throughout much of the remaining study. While in comparison, many of the therapist groups had relatively little growth with some experiencing a decline in wage. Once again, to the contrary, occupational and physical therapists enjoyed increasing wages throughout almost all of the study. This indicates that adjusting for time but holding things like education constant across groups, physical therapists and occupational therapists seem to be earning above average wages over this time frame.

E. Discussion

These results indicate two very different trends for therapists. One trend for speech, respiratory, and "other" therapists indicates a decrease in real wages over time as compared to both a non-healthcare comparison group and compared to a healthcare comparison group. The occupational and physical therapist groups seem to share a different trend of increasing wages throughout the 1990s. Even controlling for education differences and experience, there seems to be a difference in the relative wages of the different therapist groups that is unaccounted for.

Background on the therapist occupation, and specifically physical therapists, indicates that there should have been some decrease in therapist wages in the early 1990s and then again in the late 1990s due to changes in Medicare reimbursement. This was evident in speech, respiratory, and "other" therapists. Physical therapists and occupational therapists showed signs of real wage growth until 1995 when it leveled off and possibly began to decline. Since the HCFA instilled salary equivalents on 1/30/98 for PT, OT, ST, & RT at \$50.65, \$48.06, \$46.23, and \$40.01 per hour respectively, this indicates a possible future decline in these occupations. Salary equivalents are a type of hourly cap used by the HCFA for figuring costs for Medicare reimbursement purposes.

With the average life expectancy increasing, and the ensuing increase in the aging population, it is possible that some of the growth in the demand for OT and PT occupations may be due to the nature of the occupations themselves. Both occupations treat ailments that are often associated with the aging population. Problems with performing daily tasks, regaining mobility or function that was lost due to disease or trauma are highly associated with, while not limited to, the elderly. This difference between these therapists and other therapists is too important to leave out from the discussion.

Given these differences, the unexplained real wage growth prior to that period, above that of other therapists and control groups, is most likely attributable to factors beyond human capital or reimbursement changes and more due to increased demand for the therapist services in non-hospital markets³.

IV. Conclusions

³ Although the mean level of education for Occupational and Physical therapists, these were found to be relatively constant over time.

This study, attempts to analyze real wages across therapist groups to see what effects, if any, changes in the healthcare market have made to these wages over time. The study was constructed over a ten year (1989-1998) with five therapist groups as defined by the CPS data set. A look at the means indicated that occupational, speech, and physical therapists experienced increases in the mean real wage with respiratory and "other" therapists experiencing stagnant wages over the study period. However, upon examining a basic regression with a dummy variable for the grouped therapists, there seemed to be very little difference between them and the control group. Upon examination of a Chow test, it was determined that the groups were statistically different and therefore should be compared separately.

By comparing the groups separately in both an adjusted wage index and by comparing relative real wages to both a non-healthcare and healthcare control group, it was evident that occupational and physical therapists were realizing higher relative wages for their services. Changes in the reimbursement policy of Medicare and cuts in hospital staffing should have decreased these wages beginning in the early 1990s. However, more extensive caps on Medicare reimbursement in 1998 may possibly have larger effects on wages in the future. Some of the decline in the last few years of the study may be due to the salary equivalents and the newer caps for total reimbursement for therapy services, but more data is needed to make such a generalization.

The sustained growth throughout most of the 1990s seemed to be more focused on the supply and demand issues indirectly resulting from the changes in Medicare reimbursements. Due to the changes in Medicare reimbursement for Part A, many new types of private health care providers arose, separated from hospitals. These types of

providers included nursing homes, home health, hospices, and rehabilitation clinics. Due to the increased usage of therapists, particularly physical and occupational, the demand increased dramatically following these changes. Unfortunately, there was a lag in the supply of therapist training, so these higher wages prevailed throughout much of the 1990s.

Therefore, it was the actual usage of the physical and occupational therapists, or the types of conditions they treated that increased the demand for these therapists. Since physical and occupational therapists could more easily justify the usage of their services to Medicare, they were more fully utilized in hospitals under the acute care clause of Medicare. They were also utilized in the private practices because they could be used for long term care in rehabilitating patients.

With an aging population, there is support for an ever-increasing demand for health services in general. This could have a spillover effect on the demand for higher skilled labor in general, which would cause an increase in the demand for the more skilled care of therapists. As the earlier article from the USA Today newspaper explains, the cost of a visit to the doctor has grown exponentially over the past decade. With many of the treatments, that were previously only available from doctors, becoming normal therapist treatments there may be some substitution away from doctors. This increased demand from the substitution away from the relatively more expensive physicians into less expensive therapists, such as physical therapists, could explain some of the increase in wages. It is important to note that while the total number of therapists has increased, the proportion in hospitals has decreased substantially. This further supports the idea that

therapists are moving into areas that benefit from the changes in Medicare reimbursement which frequently substitutes for hospital and physician services.

These findings further support labor economics findings with regard to supply and demand in general. These findings are similar to those found in the nursing occupation with the proliferation of RNs and the subsequent decline of LPNs as noted in Schumacher's (1997) paper. One main limitation to this paper is the unavailability of later data, so as to further study the Medicare caps that were instituted at the end of the study period. While there were decreases around the time of the institution of some of the caps, it is not wise to draw assumptions based on this limited data. Due to the number of observations of therapists in the sample data set, it is possible that this decline may be due to other factors or spuriousness. This data should be revisited in 5-7 years to verify if the caps instituted have had the effect that the HCFA intended.

Table 1
Real Wage By Therapist Group and Year

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Therapists	17.34	17.69	17.84	19.19	18.52	19.50	19.56	18.71	19.48	19.89
Control	13.80	13.79	13.76	13.66	13.56	13.83	13.75	13.71	13.90	14.15
Health Ctrl	13.57	13.61	13.86	13.82	13.96	14.19	14.48	14.53	14.36	14.54
Speech	19.12	18.68	18.81	20.58	20.16	21.30	21.83	19.13	20.05	21.84
Occupational	18.79	18.32	18.66	21.10	19.64	20.88	22.17	22.16	22.04	22.70
Physical	17.90	17.87	19.26	19.88	20.27	22.54	22.82	21.51	21.72	22.72
Respiratory	16.11	17.45	17.14	18.44	16.73	16.82	16.87	16.46	17.73	16.80
Other	15.03	16.47	15.40	16.22	16.17	15.84	14.11	15.15	16.36	15.39
Note: Real wage calculated in 1998 dollars										

Table 2
Means by Group

	Therapists	Occupational	Physical	Speech	Respiratory	Other	Control	Healthcare
Education	15.92 (1.92)	15.95 (1.35)	15.91 (1.78)	17.52 (1.11)	14.39 (1.463)	15.84 (2.11)	13.27 (2.58)	13.76 (2.43)
Experience	14.33 (9.63)	12.38 (9.15)	12.79 (9.66)	14.08 (9.12)	16.37 (8.96)	15.61 (10.44)	18.86 (12.46)	19.71 (11.92)
Married	0.62 (.486)	0.62 (.487)	0.64 (.481)	0.68 (.468)	0.63 (.484)	0.53 (.499)	0.59 (.492)	0.61 (.488)
Previously Married	0.13 (.336)	0.11 (.309)	0.09 (.283)	0.12 (.324)	0.17 (.379)	0.16 (.371)	0.15 (.363)	0.19 (.396)
White	0.86 (.343)	0.91 (.285)	0.86 (.345)	0.93 (.257)	0.81 (.391)	0.82 (.382)	0.78 (.412)	0.76 (.427)
Black	0.06 (.244)	0.03 (.180)	0.04 (.199)	0.03 (.166)	0.10 (.295)	0.11 (.318)	0.09 (.294)	0.13 (.337)
Other	0.03 (.179)	0.03 (.164)	0.05 (.220)	0.02 (.134)	0.04 (.200)	0.02 (.143)	0.04 (.202)	0.05 (.211)
Union	0.16 (.368)	0.12 (.325)	0.06 (.237)	0.39 (.487)	0.09 (.281)	0.16 (.364)	0.16 (.367)	0.11 (.313)
Rwage	18.86 (8.60)	20.82 (8.20)	20.81 (9.84)	20.26 (9.33)	17.04 (6.279)	15.59 (6.90)	13.79 (9.21)	14.09 (9.33)
N	5,697	684	1,471	1,206	1,193	1,143	309,900	28,800

--Note: Standard errors in parentheses

--Control refers to the non-healthcare comparison group, healthcare refers to the healthcare occupation comparison group, therapists include all categories of therapists, and each of the other groups refers to that particular therapist group.

Table 3
Total Employment and Derived Hospital Employment Numbers

Year	Therapists		Physical		Occupational		Speech		Respiratory		Other	
	Total	% Hosp	Total	% Hosp	Total	% Hosp	Total	% Hosp	Total	% Hosp	Total	% Hosp
1989	230	0.5	55	0.52	n/a	0.48	0	0.17		0.9	52	0.41
1990	234	0.48	56	0.5	n/a	0.45	0	0.11	50	0.88	56	0.42
1991	247	0.45	63	0.38	n/a	0.39	0	0.09	63	0.89	52	0.43
1992	279	0.47	77	0.43	n/a	0.51	53	0.15	57	0.88	0	0.39
1993	300	0.47	81	0.44	n/a	0.48	51	0.1	73	0.87	0	0.35
1994	308	0.45	70	0.43	n/a	0.38	66	0.07	80	0.91	0	0.37
1995	344	0.44	96	0.42	n/a	0.45	67	0.12	79	0.92	0	0.3
1996	337	0.38	83	0.37	n/a	0.3	68	0.11	76	0.85	0	0.28
1997	316	0.39	70	0.44	n/a	0.31	71	0.11	65	0.84	0	0.29
1998	362	0.39	87	0.39	n/a	0.34	75	0.08	83	0.81	0	0.28

** Note: Hospital employment was constructed by multiplying the percentage of hospital workers in the CPS dataset by the total number of workers in that category. Total numbers were taken from the Bureau of Labor Statistics' Employment/Earnings Report.

** N/A refers to occupations that are not tracked separately by the Bureau of Labor Statistics due to small employment numbers.

Table 4
Basic Regression

Variable Name	Only Therapists	Health Control	Non-Health Control
Education	.0939 (.003)	.1188 (.001)	.0950 (.0003)
Experience	.0234 (.002)	.0236 (.0007)	.0275 (.0002)
Year (1989-1998)	.0061 (.001)	-.0024 (.0009)	-.0038 (.0003)
Experience Squared	-.0005 (.00004)	-.0003 (.00001)	-.0005 (.000005)
Married	.0643 (.013)	.0847 (.0074)	.0954 (.002)
Not Married	-.0028 (.019)	.0306 (.009)	.0168 (.003)
Race (omitted White)			
Black	-.0459 (.022)	-.1396 (.008)	-.1122 (.003)
Other	-.0005 (.029)	-.0404 (.012)	-.0589 (.004)
Union Member	.0510 (.015)	.1036 (.008)	.1477 (.002)
Region (omitted South)			
Northeast	.0188 (.020)	.0765 (.010)	.0674 (.003)
Mid-Atlantic	.0423 (.019)	.0680 (.009)	.0807 (.003)
East-North-Central	-.0203 (.018)	-.0034 (.009)	.0162 (.003)
West-North-Central	-.1135 (.021)	-.0853 (.010)	-.0895 (.003)
East-South-Central	-.0608 (.029)	-.0598 (.013)	-.0973 (.004)
West-South-Central	-.0785 (.023)	-.0642 (.011)	-.0550 (.003)
Mountain	-.1354 (.021)	-.0456 (.011)	-.0440 (.003)

Pacific	.0616 (.020)	.1091 (.011)	.1185 (.003)
Hospital	.0238 (.012)	.1499 (.005)	
Industry (omitted Professional)			
Mining			.3952 (.010)
Construction			.2839 (.004)
Manufacturing			.1988 (.003)
Transportation			.2352 (.003)
Wholesale Trade			.1557 (.004)
Retail Trade			-.1081 (.003)
Finance			.1598 (.004)
Business/Repair Services			.0911 (.004)
Recreational Services			-.1611 (.005)
Public Administration			.1848 (.004)
Therapists (omitted TNEC)			
Respiratory	.2214 (.018)		
Occupational	.3051 (.019)		
Physical	.2760 (.015)		
Speech	.0924 (.017)		
N	5696	28,782	309,872
R ²	.2506	.3614	.3738
Note - standard errors in parentheses			

Appendix 1 Variable Definitions

Variable	Definition
YEAR	Includes years 1989 through 1998
AGE	Restricted to be those between 16 and 90
RACE	1=White, 2=Black, 3&4=Other Race
WKHOURS	Usual number of hours worked per week (restricted to be >0)
MAJACT	Major act engaged in last week (restricted to be 1-3) 1 -Working 2 -With a job, not at work 3 -Looking for job 4 -Housework 5 -School 6 -Unable to work 7 -Other (including retired)
WKEARN	Usual earnings per week (nominal)
UNION	Union status; 1=union member
CPI_89	Consumer Price Index (1989=100)
SCHOOL	Years of schooling
MARITAL	Marital Status 1-Married 2-Separated 3-Never Married
IND3	3 digit industry codes 10-31=Agriculture, Forestry and Fisheries 40-50=Mining 60=Construction 100-392=Manufacturing 400-472=Transportation, Communications, and Utilities 500-571=Wholesale Trade 580-691=Retail Trade 700-712=Finance, Insurance, and Real Estate 721-760=Business and Repair Services 761-802=Personal, Entertainment, and Recreational Services 812-894=Professional and Related Services 900-991=Public Administration
THEREP	Nominal variable including all 5 types of therapists 1=Inhalation therapists 2=Occupational Therapists 3=Physical Therapists 4=Speech Therapists 5=Therapists Not Else Classified
THEREP2	Dichotomous form of THEREP variable; 1=a therapist of any type
CTRL	Control Group; 1=Not a therapist

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Figure 1
Relative Wage Differentials of Therapists to Non-Healthcare Comparison Group

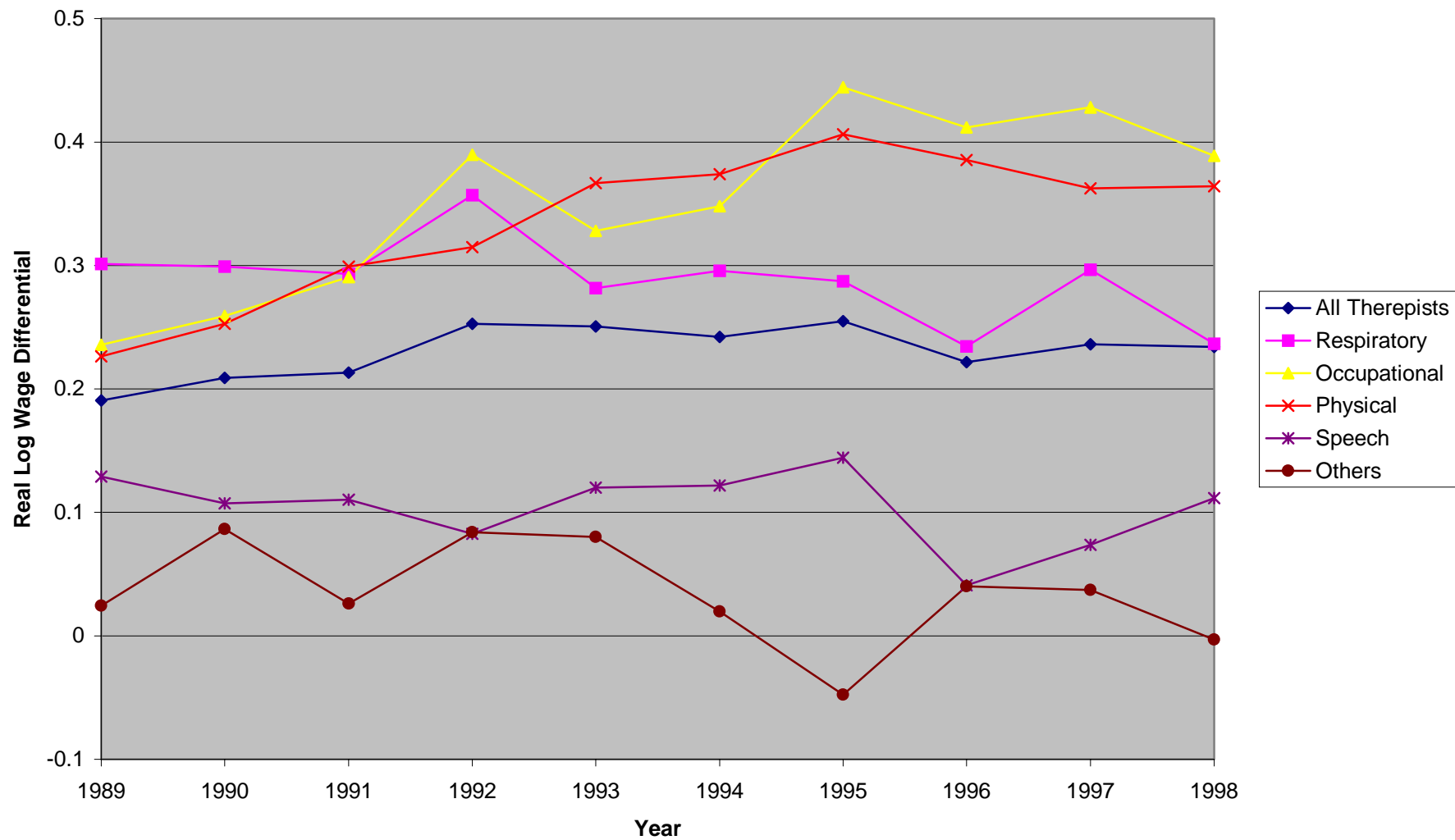
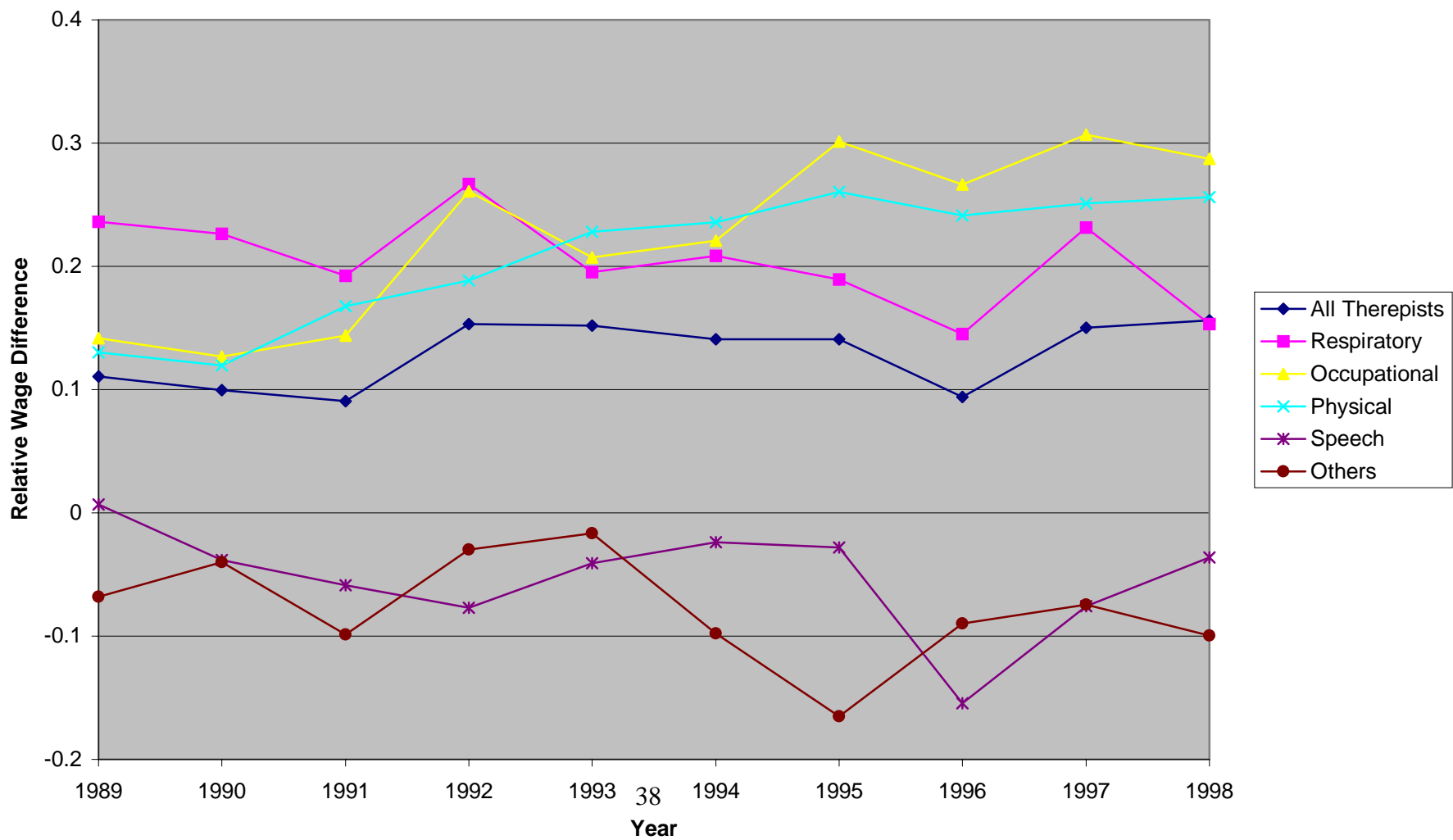


Figure 2
Relative Wage Difference to Healthcare Comparison Group



year	Therapist	Therapist	Control	Control	Respiratory	Respiratory	Occupational	Occupational	Physical	Physical	Speech	Speech	All Others
	0	100	0	100	0	100	0	100	0	100	0	100	0
1989													
1990	0.0214 (0.0258)	102.1631	-0.0054 (0.0035)	99.46146	0.014154 (0.0474)	101.4255	0.011158 (0.0693)	101.122	0.049506 (0.0524)	105.0752	-0.02711 (0.0534)	97.32561	0.072479 (0.0343)
1991	0.0228 (0.0254)	102.3062	-0.0171 (0.0035)	98.30454	0.003643 (0.0458)	100.365	0.015112 (0.0730)	101.5227	0.07178 (0.0516)	107.4419	-0.00353 (0.0533)	99.64762	0.026888 (0.0543)
1992	0.0771 (0.0249)	108.015	-0.00285 (0.0036)	99.71541	0.083182 (0.0462)	108.674	0.148801 (0.0686)	116.0442	0.086816 (0.0497)	109.0696	-0.0118 (0.0522)	98.82654	0.098996 (0.0544)
1993	0.0563 (0.0247)	105.7915	-0.0395 (0.0036)	96.127	-0.00148 (0.0439)	99.85261	0.072914 (0.0694)	107.5638	0.118406 (0.0502)	112.5701	0.003972 (0.0521)	100.398	0.07941 (0.0533)
1994	0.0496 (0.0245)	105.0851	-0.05 (0.0036)	95.12294	0.007206 (0.0441)	100.7232	0.048039 (0.0698)	104.9212	0.12315 (0.0505)	113.1054	0.019576 (0.0500)	101.9769	0.011373 (0.0534)
1995	0.0569 (0.0239)	105.855	-0.0525 (0.0037)	94.88543	-0.01065 (0.0441)	98.94075	0.170758 (0.0681)	118.6204	0.148525 (0.0480)	116.0122	0.036373 (0.0502)	103.7043	-0.06742 (0.0514)
1996	0.0314 (0.0246)	103.1898	-0.0507 (0.0037)	95.05638	-0.04628 (0.0453)	95.47794	0.144306 (0.0669)	115.5238	0.139251 (0.0512)	114.9413	-0.07323 (0.0505)	92.93833	0.022895 (0.0528)
1997	0.0671 (0.0248)	106.9402	-0.0393 (0.0037)	96.14622	0.025025 (0.0498)	102.5341	0.129723 (0.0673)	113.8513	0.141817 (0.0516)	115.2366	-0.01746 (0.0511)	98.26925	0.063211 (0.0527)
1998	0.0827 (0.0243)	108.6216	-0.0119 (0.0037)	98.81705	-0.02327 (0.0449)	97.70006	0.175373 (0.0653)	119.1691	0.155814 (0.0491)	116.8609	0.029199 (0.0519)	102.9629	0.027462 (0.0523)