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THE NEW ECONOMICS OF TEACHERS AND EDUCATION

Frederick Flyer
Sherwin Rosen

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ABSTRACT

Rapidly growing costs of elementary and secondary education are studied in the context of the rising value of women's time. The three-fold increase in direct costs of education per student in the past three decades was caused by increasing demand and utilization of teacher and staff inputs, attributable to growing market opportunities of women and changes in the structure of families. Substitution of purchased teacher and staff inputs for own household time in the total production of children's education and maturation is a predictable economic response to these forces. On the supply side, the "flexibility option," that female teachers who take temporary leaves to raise children do not suffer subsequent wage loss upon reentry, is shown to be an important attraction of the teaching profession to women. Other college educated women suffer reentry wage losses of 10 percent per year of leave. The estimated value of flexibility in teaching is 5 percent of life-cycle earnings and will fall as labor force interruptions of women for child-rearing become less frequent. Both supply and demand considerations suggest that the direct costs of education per student will continue to increase in the future, independent of political and other organization reforms of schools.

Frederick Flyer
Department of Economics
New York University
269 Mercer Street
New York, NY 10003

Sherwin Rosen
Department of Economics
University of Chicago
1126 East 59th Street
Chicago, IL 60637
and NBER

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THE NEW ECONOMICS OF TEACHERS AND EDUCATION

Frederick Flyer and Sherwin Rosen[1]

New York University and the University of Chicago

I. INTRODUCTION

The explosion in direct costs of college education in the United States has received much attention lately. Less well known is that the rate of increase in direct costs of elementary and secondary education has been larger and of much longer duration. From 1960 to the present, the per student cost of higher education increased by about 50 percent in real terms. In contrast, elementary and high school costs per student increased by about 180 percent, over three times as much. Average annual per student expenditures in elementary and secondary schools represented 6.4% and 12.0% of median family income in 1960. By 1990 these figures climbed to 11.7% and 17.8% respectively.

The large rise in costs of precollege education have been driven by sharp increases in staff to student ratios. They have nearly doubled in the last 30 years. The growth in the teacher-student ratio alone accounted for over 60% of the increase in school costs since 1960. Teaching services purchased per student climbed steadily throughout the period despite dramatic demographic movements in school enrollments and labor market activities of women. Aggregate school enrollment fluctuated by 17%, female labor force participation rates nearly doubled, and the number of females graduating college increased by about 500%. This paper examines how changes in young women's labor force commitments and human capital investment activity have influenced the market for teachers, and ultimately the cost of precollege schooling. The main point of the work is to show how the economics of educational production is greatly effected by the value of women's time. The expanded occupational opportunities and higher labor force participation rates of women affect both demand and supply of teachers. The evidence indicates that increasing labor market commitments of women increased the demand for teachers and allied staff, as purchased school services were substituted for household produced child services. On the supply side, teaching is a predominantly female profession, so greater market opportunities for women raise the supply price of teaching.

A model that emphasizes uncertainty about occupational outcomes, expected time commitments to market activity, and varying human capital depreciation rates across jobs is used to analyze the attachment of women to the teaching profession. Individuals who anticipate devoting less time to market work over their life-cycle have less incentive to search for favorable occupational matches, holding constant initial human capital endowments, human capital accumulation technologies, and search costs. These individuals act as if they are more risk averse and choose initial occupations with less wage uncertainty. They also have greater incentives to choose jobs that impose smaller future wage penalties for time spent out of the labor force.

An economic structure that focuses on anticipated future life-cycle work intensity is central to studying female labor supplied to teaching, since female teachers spend considerably more time out of the labor force than other college graduates. In NLSY data, female teachers spent 42% more time out of the labor force than other female college graduates and well over twice that of male college graduates. It is known that leaving and reentering the teaching profession is a fairly common practice and that only a small percentage of entrants to the field in any given year are new to the profession (Murnane, et. al. (1991)). Less is known about whether teaching provides more flexible movement between the market and home sector relative to other occupations, and if this "flexibility" option is valued. Another objective of this work is to assess the value and importance of flexibility.

The paper is organized along the usual demand and supply framework. The next section analyzes the recent demand forces at work in the teachers' market. The increase in direct costs of elementary and secondary education, and the rise in teacher-student ratios that ignited it, are empirically documented and linked to increasing female labor force participation rates. Changes in the structure of labor force activity in families led to substitution of more purchased labor in the formal education sector for less self-provided household labor in the informal education sector. Increasing teaching costs are almost completely explained by increasing teacher-pupil ratios. The standard Clark/Kuznets argument of rising general real wages pressing against relatively slow productivity growth in the service sector carries little weight here, since the general level of wages in the economy didn't change much.

The second part of the paper addresses the supply side of the market. An occupational choice model that incorporates anticipated life-cycle market work intensity is applied to NLSY data. A panel of female college graduates are tracked to determine whether transitions between the home and market sector are less costly for female teachers than for other female graduates. The empirical findings are affirmative. Teachers do not suffer wage penalties for time spent out of the labor market, while other female college graduates (including female dominated nursing and administrative support staff occupations) take wage hits of roughly 9% for each year spent out of the market sector. The estimated value of the flexibility option in teaching ranges between one-half to a full year's income, depending on the assumed discount rate and life-cycle work profile.

II. DEMAND FOR TEACHERS AND THE VALUE OF WOMEN'S TIME

Real costs of elementary and secondary education increased by 300 percent between 1960 and 1990. Rising instruction costs were the largest contributor to increasing costs, because the education industry is so labor intensive. Teachers are the most important input by far. The direct costs of elementary and secondary education by function appear in table 1. Real instruction costs more than tripled during the period, accounting for over 62% of the increase in total costs. Costs of other services also grew rapidly. Administration costs for elementary schools were more than 6 times greater in 1990 than in 1960. For secondary schools they were more than 7 times greater.

Expenditures devoted to student health, attendance, speech pathology, and other student services increased more than ten-fold during the 30 year period. Administrative and other school service costs accounted for approximately 14% of total elementary and secondary school costs in 1990 but only for 3% in 1960. Costs associated with nonlabor inputs grew more modestly. Imputed rent and depreciation accounted for nearly 19% of total direct costs in 1960, but fell to less than 11% in 1990. The relative share of costs attributable to plant operation and maintenance remained constant over the period at about 9% in both 1960 and 1990. Roughly 60% of plant operation and maintenance costs in both 1960 and 1990 are attributable to labor inputs.

Aggregate school enrollment increased during the time period. However, changes in the size of the school age population account for less than 9% of the increase in real costs. Costs of precollege education per student in the U.S. have risen dramatically. Table 2 shows the data decade-by-decade. Changes in aggregate enrollment were small relative to the threefold increases in expenditures per student.

The main cause of the increase in expenditures per student was rising school staffs. Table 3 shows that the total staff-student ratio more than doubled between 1950 and 1990, with the majority of this growth occurring between 1960 and 1980. The largest increase was for support staff and other instructional staff, including guidance counselors and teacher aides. But the ratio of classroom teacher to students also increased sharply, by some 60%. The rise in the teacher-student ratio in table 3 is a continuation of a trend that started at the turn of the century. Figure 1 plots the time-series from 1900-1990. This upward trend has accelerated since the mid 1960's, and is the primary factor behind the rise in educational costs.[2]

A. Educational Production in the Household and Public Sectors

The changing classroom dynamic of greater student exposure to teachers, teacher assistants, and school counselors is associated with rising female labor force participation rates during the 20th century. Increased individualized attention by school staff substitutes imperfectly for parents' time at home. For example, Fuchs and Reklis (1993) find that controlling for household characteristics, such as mother's education and marital status, and for such school characteristics as spending per student, labor force participation of mothers indirectly decreases eighth-grade math achievement scores, and teacher/student ratios directly increase them. The correlation between changes in participation rates and changes in teacher-pupil ratios across time illustrates this important point. Substitution implies that teacher-pupil ratios should increase more in periods where labor force participation rates for women increased most. Evidence of this relationship is available from estimating the following regression equation on state data between 1975 and 1990.

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[2]Notice that special education and disability accommodation in the public schools contribute only slightly to the trend in the teacher-student ratio. This is only part of the substitution effect stressed here. See Hanushek, et. al. (1993a) and Flyer and Rosen (forthcoming) for elaboration. Accounting data on teacher-student ratios are not entirely consistent with directly observed average class size. See data appendix.

(1) $$\Delta(T/P)_{ts} = \beta_0 + \Delta(LFP)_{ts} \cdot \beta + \epsilon_{ts}$$

where β_0 is a constant, t refers to the time period (each period is a 5 year interval, e.g., 1975-1980), s refers to the state, $\Delta(T/P)_{ts}$ is the change in the teacher-pupil ratio in period t and state s, and $\Delta(LFP)_{ts}$ is the change in labor force participation rates of females ages 20-50 in state s.

Female labor force participation rates by State are taken from the CPS (see the data appendix). There are 50 states and 3 time periods, or 150 observations overall. The data and the regression line are presented in figure 2. The coefficient estimate of β is .0364 and is significant at the 1% level (including time-dummies in the equation do not affect this result). States that experienced greater growth in female labor force participation experienced greater growth in the teacher-student ratio. According to these estimates, the elasticity of the stock of teachers per student to female labor force participation rates ranged between 0.3 and 0.5. These results are consistent with substitution of staff and teacher time in school for parental time at home in the production of child services.[3]

B. **The Earnings of Teachers**

Acceleration in the growth of teacher-pupil ratios in recent decades was fueled by intensive hiring of young teachers in the 1960's and 70's. New hires were necessary to teach the large number of

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[3]The correlation between changes in female labor force participation rates and changes in teacher-pupil ratios also holds for aggregate U.S. data from 1900-1990. Using intervals of 10 years to measure theses changes yields a simple correlation statistic of over .5.

students entering the system. However, they more than compensated for rapidly growing enrollments and teacher-student ratios increased for the baby boom cohorts. When the last waves of these cohorts flowed through the school systems, hiring activity greatly diminished. The average age of public school teachers rose dramatically during the late 1970's and throughout most of the 1980's,[4] but the teacher-student ratio continued to rise. These demographic movements occurred against a background of expanded occupational opportunities for women. Rising female labor force participation rates increased the demand for school services, and also raised the market opportunity costs for female teachers.

Despite the upward pressure on teacher salaries stemming from an aging workforce and a rise in instructional services provided per student, the real adjusted price of teachers' services did not increase substantially between 1967 and 1989. Figure 3 plots real average salaries (excluding fringe benefits) over the 1967-1989 period for employed elementary and secondary school teachers, and for other college graduates from the March CPS tapes. Real earnings for teachers followed the well-documented pattern for all college graduates, declining during the 1970's and rebounding during the 1980's.

Average earnings of teachers increased relative to average earnings of college graduates between 1967-1989. However differential

[4]The NEA reports that the median age for female teachers in 1976 and 1986 was 33 and 41 respectively. According to CPS data average age for female secondary teachers was 35.9 in 1974 and 41.4 in 1987.

changes in the demographic composition of the teaching and college graduate workforce accounts for virtually all of this: average education and experience levels increased more for teachers than for other college graduates. Index number adjustments (standardized comparisons) reveal that the real wage rate for a unit of teaching human capital has actually declined relative to the effective wage rate for college graduates. Consider the following wage equation:

$$(2) \qquad \log(Y_{it}) = B_t X_{it} + \epsilon_{it}$$

where Y_{it} is earnings of individual i in year t, and vector X_{it} includes controls for education, race, smsa, and an experience cubic. This equation is estimated separately each year (between 1967-89) for female college graduates and female teachers using CPS data. A fixed X vector is combined with the time-varying regression coefficient estimates to project constant-weight log earnings in each year. Using the mean values of X for female teachers in 1967, we impute

$$(3a) \qquad \log \hat{Y}_{elem\ t} = \hat{B}_{elem\ t} \cdot X_{elem\ 1967} \text{ and } \log \hat{Y}_{col\ t} = \hat{B}_{col\ t} \cdot X_{elem\ 1967}$$

$$(3b) \qquad \log \hat{Y}_{sec\ t} = \hat{B}_{sec\ t} \cdot X_{sec\ 1967} \text{ and } \log \hat{Y}_{col\ t} = \hat{B}_{col\ t} \cdot X_{sec\ 1967}$$

The time-series on the log differences in imputed wages for teachers and college graduates defined in equations (3a) and (3b) are presented in figure 4. Similar results are obtained when the X's are measured at their 1976 and 1989 means. The "true" real wage of teachers has declined relative to wages for other college graduates, especially in elementary schools. This relative decline largely occurred during the late 1970's and early 1980's as schools faced dwindling enrollments, after having recently built up their instructional staffs for the baby boom cohorts. The relative wage for teaching services increased from the late 1960's to the mid 1970's and has shown little trend during the latter 1980's. During the entire period, the decline in relative wages was over 15% for elementary school teachers.[5]

It is important to use a fixed X vector to project log earnings across years for teachers and other college graduates because the slopes of their age-earning profiles differ greatly. Figure 5 shows earnings profiles of female teachers and other female college graduates, generated with CPS 1983-1991 data.[6] Female college graduates have much steeper

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[5]The fall in the relative wage of teachers assumes that unobserved quality of teachers has remained constant. There is a little evidence to the contrary. The NLS young women survey provides IQ scores for 230 female college graduate in 1970, ranging in age from 21-26. There are 104 teachers in this group and their average rank is at the 53rd percentile of all female graduates. The NLSY provides AFQT scores for 1064 female college graduates in 1991, ranging in age from 26-33. Female teachers in the 1991 cohort ranked at the 42nd percentile.

[6]An experience cubic is included in a log wage regression estimated separately on female teachers and female non-teachers. It includes controls for hours worked per year, race, smsa, education, and year effects. Average earnings profiles in the figure are generated for whites who live in an smsa, and work

earnings profiles than teachers, so relative earnings differences increase both in absolute and in percentage terms with experience in the interval between the two arrows. If a time-varying X vector is used to project earnings (such as teachers' mean X's in each year), then estimated relative wages of teachers will change just because different points in the profile are being compared. In recent years teachers' average age has increased, so teachers' relative earnings fall when time-varying X's are used in the standardized comparison. A similar problem occurs with teachers' average educational level, since returns to education differ between the groups.

III. The Supply of Teachers

The decline in teachers' relative wages has had a predictable affect on entry of recent female college graduates into the field. Figure 6 illustrates the dramatic decline in the percentage of female college graduates who have entered teaching over the years. Teaching was far and away the most frequently chosen occupation by female college graduates 30 years ago, attracting nearly 50% of them. By 1990 the percentage had dropped well below 10%. Although this downward trend is evident in the 1960's and early 1970's, it accelerated after 1972. At the same time the number of female college graduates increased nearly six-fold between 1950 and 1990. Enrollment in elementary schools peaked in 1970 at nearly 37 million students, up 38% from just 15 years earlier. In that same period the number of elementary teachers grew by 55%, from 827,000 to nearly 1.3 million. The number of females

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2000 hours per year.

graduating college climbed 236% between 1955 and 1970, though it was relatively flat for many years preceding 1955.

The population bubble that entered the school system increased the demand for school services. The resulting increase in teachers' absolute and relative wages itself contributed to the explosive growth of female college attendance, and fueled the growth in the stock of teachers during the period.[7] The growth in the teaching workforce more than offset increases in elementary and secondary enrollment, and teacher-pupil ratios steadily rose despite the wave of baby boom children that flowed through the school system. By the mid 1970's schools were facing dwindling enrollments, and could maintain the high level and ever rising trend in teacher-pupil ratios without new hiring. Absolute and relative wages for teachers dropped substantially from the mid 1970's through the early 1980's and caused new entry into the field to decline, both arithmetically and in percentage terms.

A. The Occupational Decision

Teaching remains a predominantly female profession, especially at the elementary level. Nearly 85% of elementary teachers in 1990 were female. This percentage has changed little over the last several decades, even with the recent decline in relative wages of female teachers and the large inflows of female graduates into other occupations. We

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[7]The supply reaction of more women graduating college (in response to higher demand for teaching services) reinforces upward pressures on the demand for teachers, since changes in female labor force participation rates are positively related to changes in teacher-pupil ratios.

analyze female attachment to the teaching profession with a model that emphasizes uncertainty about occupational outcomes, anticipated future household production, and varying rates of human capital depreciation across jobs. The model shows that the particular occupation that maximizes expected life-cycle earnings depends on expected worklife intensity.

If uncertainty exists with respect to potential wages in different job matches, and search costs are not strongly dependent on future work intensity, individuals who expect to devote less time to market activity in the future will act as if they are more risk averse in choosing an initial occupation. The reason is that gains from wage search are greatest for individuals who expect to work the most hours over their life-cycle, assuming equivalent initial human capital endowments, human capital accumulation technologies, and search costs. The model predicts that women would tend to exhibit greater risk aversion in choosing occupations, since they work fewer hours per year and take more time out of the labor market than men. The model also predicts that individuals who spend more time out of the market sector will be more concerned with relative human capital depreciation rates across occupations, and consequently more willing to accept lower wages for lower rates of depreciation. The effect of human capital depreciation rates on compensating wage differentials was first studied by Polachek (1981).

In the model there are two time periods and two groups of occupations. Individuals know their potential earnings in one occupational group with certainty, but are uncertain about their potential earnings in the other group. Potential earnings within an occupational group are determined by the product of the wage rate R and the person's units of human capital K. Here R_h refers to an individual's wage rate in the group with the uncertain outcome (the high variance occupation is subsequently referred to as h), and R_l is the wage rate in the group with the known outcome (the low variance occupation l). In the absence of occupational mobility, expected earnings associated with entering one of these occupations is:

(4a) $$\text{expected earnings in occupation l} = \theta R_l K$$

(4b) $$\text{expected earnings in occupation h} = \int \theta R_h K f(R_h) dR_h$$

where $f(R_h)$ is the probability density function of prospective wage in the high variance occupation, and θ is the fraction of time devoted to work activity. Investments in human capital are made in the first period. Work occurs in the following period. The person's human capital stock K is determined by:

(5) $$K = (1 - q(1 - \theta))\kappa(I)$$

where I is the amount invested in human capital, $\kappa(I)$ is the usual human capital investment function (Ben-Porath (1967)), with $\kappa'(I) > 0$ and $\kappa''(I) < 0$, and q is the human capital depreciation rate.

Occupational mobility is included by allowing individuals to switch occupational groups once. The cost associated with a move is C. Assume for simplicity that uncertainty of outcome in occupation h is resolved immediately upon entering it, and experience in occupation l provides no information about outcomes in h. Then expected net earnings of initially entering occupation l and h are:

(6) $$V_l = \theta R_l (1 - q(1 - \theta))\kappa(I) - I$$

(7) $$V_h = \int_s \theta R_h (1 - q(1 - \theta))\kappa(I) f(R_h) dR_h + \left(\int_0^s f(R_h) dR_h\right)[\theta R_l (1 - q(1 - \theta))\kappa(I) - C] - I$$

Income maximization requires entry into occupation h if $V_h > V_l$. The person stays in the risky occupation only if the R_h realized ex post is greater than the reservation wage s (as usual, the reservation wage is defined such that earnings associated with staying in occupation h equals prospective earnings associated with leaving it). The reservation wage depends on human capital stock, the fraction of time devoted to market activity, the depreciation rate, the wage rate in l, and the cost of switching occupational groups:

(8) $$s = R_l - [C/\theta(1 - q(1 - \theta))\kappa(I)]$$

B. The Effects of Labor Force Attachment on Choice

The qualitative implications of this model are illustrated in the following case. There are 2 groups of individuals with identical distributions of individual characteristics, with one group supplying a larger fraction of their time to nonmarket activity (θ is lower). The effect of a lower θ for one group results in lower average human capital investments, and a lower propensity to choose the high variance occupation.

The positive relationship between θ and human capital investment I comes from the first order investment condition of equation 7 (or equation 6 if the low variance occupation is chosen). Setting the partial derivative of earnings (equation 7) with respect to investment (I) equal to zero yields:

$$\text{(9)} \qquad \kappa'(I) = \{\theta(1 - q + \theta q)[\int_{*}(R_h - R_l)f(R)dR_h + R_l]\}^{-1}$$

The right hand side of equation (9) is decreasing in θ. Since the optimal value of $\kappa'(I)$ decreases with θ and $\kappa''(I) < 0$, the first order effect of higher θ is higher I. The result that higher levels of work activity over the life-cycle lead to larger investments in human capital was emphasized by Mincer and Polachek (1974). Also see Sandell and Shapiro (1980), Nakamura and Nakamura (1985) and Gronau (1988). That it remains central to economic research on the earnings of women is evidenced in recent papers by Klerman and Leibowitz (1994), Shapiro and Mott (1994), and Shaw (1994).

The increasing propensity to choose the high variance occupation h as θ increases is illustrated by subtracting earnings in l defined in equation (6) from expected earnings in h defined in equation (7), and differentiating the result with respect to θ. The difference between equations (7) and (6) must be positive in order for individuals to initially enter the high variance occupation, and the difference is increasing in θ.

(10) ∂(earnings difference, occupation h - occupation l)/$\partial\theta$ =

$$(1 - q + 2\theta q)\kappa(i)[\int_{s}(R_h - R_l)f(R_h)dR_h] > 0$$

Equation (10) reveals that larger values of θ in a population are associated with larger propensities to enter high variance occupations. Greater commitment to the workforce promote incentives to enter riskier occupations, other things equal.

The model is expanded to incorporate varying human capital depreciation rates by allowing both occupational groups to consist of jobs that vary in q:

(11 a) $$R_l = R_l(q)$$

(11 b) $$R_h = R_h(q,\upsilon)$$

where υ is an error term reflecting wage uncertainty in the high variance occupational group. The wage and human capital depreciation rate are positively related (both $\partial R_l/\partial q$ and $\partial R_h/\partial q > 0$), since jobs with higher q must offer higher gross returns to attract workers. Differences in life-cycle work intensity imply that females will be disproportionately located in jobs with lower q. Polachek (1981) found that female dominated occupations have lower human capital depreciation rates. The model is applied to longitudinal data on college graduates in the next section to examine the "option" aspects of teaching careers. The evidence is that teaching is an occupation with a low human capital depreciation rate that promotes mobility between the home and market sectors.

IV. Labor Force Activity of Teachers and College Graduates

Panel data are needed to examine the mobility option of teaching careers. College graduates from the 1979-91 NLSY with no more than 18 years of education, who worked at least 500 hours in any year after graduation, and who earned hourly wage rates between $3 and $50 (1990 dollars) form the data set. Summary statistics for female teachers, female college graduates, and male college graduates in the sample are presented in table 4. Female college graduates, whether in teaching or not, spend considerably more time out of the labor force than male college graduates (nearly double the time for a sample with an average age of 30). But female teachers on average spend 42% more time out of the labor force than female college graduates in other occupations. Despite the longer portion of time spent out of the labor force, teachers have higher levels of occupational tenure than either male or other female college graduates.

There is less occupational switching by persons who initially enter teaching after graduation, compared with graduates who initially enter other fields. Roughly 60% of women who entered teaching after college did not switch 2-digit occupations as of the last year they were observed in the survey, compared with 25% for other female college graduates and 21% for male college graduates. This is a dramatic difference, especially in light of the fact that teachers in the sample are both older and more experienced than other college graduates, and thus had greater opportunity (more "exposure to the hazard") to switch careers. Higher levels of occupational mobility may indicate greater uncertainty associated with the initial choice, or it may just result from poor classification of occupational categories. For example, individuals may enter career paths after college that involve switching 2-digit occupationally coded jobs, but represent nothing more than well anticipated career promotional tracks. Such distinctions cannot be pursued with these data.[8]

A. Opportunity Costs of Exiting and Reentering Teaching

The higher propensity of teachers to take leaves from work suggests that teaching has relatively low rates of human capital depreciation, since individuals with lower θ rationally choose jobs with lower values of q. If teaching indeed has a relatively low rate of human capital depreciation, then observed earnings losses for teachers who leave and reenter the labor force should be smaller than equivalent losses for college graduates in other occupations. We estimate relative earnings losses associated with leaving the labor force using first differences to eliminate fixed-effects:

$$(12)\quad \ln(w_{it+k}) - \ln(w_{it}) = B \cdot X_{it+k} + \delta \cdot OLF + \alpha T + \gamma \cdot OLF \cdot T + e_i.$$

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[8]The NLSY is not a random sample. Elementary school teachers outnumber secondary school teachers by more than 6:1. Elementary school teachers earn substantially less than other female college graduates: in 1988-91 the average hourly wage of elementary teachers under 34 years old in the CPS is approximately $10.35 per hour, within 23 cents per hour of the wages of NLSY teachers. Because of the disproportionate number of elementary teachers in the data, the results found below may not apply to secondary teachers.

Here i refers to the individual, t is the period when i takes her 1st job after college graduation, t+k is the period when the last wage is observed, X is a vector of personal characteristics that includes education, race, smsa, and a quadratic in occupational tenure and total work experience. OLF is time spent out of the labor force measured in years, and e_i is an individual specific error term. Also included in the regression is a teacher dummy (T) and the interaction of the teacher dummy with OLF. Equation (12) is estimated on female college graduates only.

The estimates appear in table 5. In the first column the teacher dummy is coded as 1 if the individual was a teacher in t+k (the last year in which earnings are observed). The coefficient on OLF is significantly negative. In the first specification it accounted for a 9.5% earnings loss for every year female college graduates spent out of the labor force. The coefficient on the interaction between the teachers dummy and time spent out of the labor force is positive and significant: Teachers who spend time out of the labor force are not penalized in future earnings growth. Other female college graduates are penalized substantially. Even though the interaction effect is larger than the coefficient on OLF, it is inappropriate to extrapolate this estimate since only a small portion of sample teachers spent a year or more out of the labor force. The coefficient on the teachers dummy is significantly negative, indicating that teachers have flatter earnings profiles than female college graduates in other occupations. These results are not greatly affected if males are included in the sample, and hold over a variety of specifications. Estimating equation (12) with teachers defined as individuals whose initial and last observed job are both in teaching also yields the result that time in the home sector does not adversely affect earnings growth. However, if the teacher dummy is defined as the first occupation after college (in year t), then the coefficient on the interaction term between OLF and the teachers dummy is no longer significant. Teachers who leave the labor force and reenter other occupations suffer wage loss for time spent out of the labor force. These results led us to investigate whether other occupations which are also disproportionately staffed by females have relatively low depreciation rates. Equation (12) was estimated separately for NLSY nurses and administrative support workers (Table 5), the other female dominated occupations among college graduates. Estimated human capital depreciation effects do not account for the attractiveness of these fields to women. The coefficient on the interaction term is statistically insignificant for these professions.

B. Biases Associated With Wage Growth Regressions

The estimated effect of time spent out of the labor force on wage growth is biased if there are differences in the relative productivity of teachers and other college graduates who spend time in the home sector. The bias depends on the correlation between changes in unobserved human capital with the level of productivity in the initial job. If the individual specific residuals from a wage regression in the initial period are positively correlated with observed and unobserved future human capital investments, then the absolute value of individual residuals increase over time and first differencing in (12) does not eliminate the correlation between the right hand side variables and the residuals.

The point is illustrated in the followings equations:

$$\text{(13a)} \quad \log W_t = B_t X_{it} + e_{it} = B_t X_{it} + \alpha_t Z_{it} + \epsilon_{it}$$

$$\text{(13b)} \quad \log W_{t+k} = B_{t+k} X_{it+k} + b_{t+k} OLF_{it+k} + e_{it+k} = B_{t+k} X_{it+k} + b_{t+k} OLF_{it+k} + \alpha_{t+k} Z_{t+k} + \epsilon_{it+k}$$

$$\text{(13c)} \quad \log W_{t+k} - \log(W_t) = B_{t+k} X_{it+k} - B_t X_{it} + b_{t+k} OLF_{it+k} + \eta_{it+k}$$

$$\text{(13d)} \quad \eta_{it+k} = e_{it+k} - e_{it} = \{\alpha_{t+k} Z_{it+k} - \alpha_t Z_{it}\} + \{\epsilon_{it+k} - \epsilon_{it}\}$$

Again, t is the period when individual i starts her initial job after college, t+k to the period when the wage is observed again, X is observable human capital characteristics, B is the return on observable human capital, OLF is time spent out of the labor force since the initial period t, b is the wage loss associated with time spent in the home sector, and e is an error term. The error term is decomposed into unobserved human capital Z, with corresponding return α, and an individual, time specific residual error ϵ. The difference in log wages in part (c) corresponds to equation (12). The individual error term η_{it+k} in the log wage difference equation is affected by growth in unobserved human capital.

Suppose observed and unobserved human capital are positively correlated. Then earnings will fan out over time if: (a) individuals with high ability in period t tend to invest more, or (b) if the monetary return to human capital increases between t and t+k. This biases the regression estimates if high quality teachers (relative to college graduates) are the ones spending more time out of the labor force, because the fanning out of cohort earnings distributions exaggerates the ability of teachers to leave and reenter the workforce without penalty. There is evidence that the returns to human capital increased during the 1980's, and that earnings inequality grew within age, occupational, and educational cells (Juhn, Murphy, and Pierce, 1993). This potentially effects the NLSY wage growth estimates since members of that sample entered the workforce in the early to mid 1980's and were last observed around 1990.

We compared wages of workers who spent extended time in the home sector[9] to wages of workers who had more continuous work careers to examine the differences in the types of teachers and other college graduates who leave and reenter the workforce (Table 6). Female teachers and college graduates who spend extended time out of the labor force are relatively low wage workers. Both groups earn low initial wages after college and low wages after several years in the workforce (relative to teachers and college graduates with more continuous careers). However, just as the regression estimates in table 5 imply, teachers who spend extended time in the home sector experience wage growth similar to teachers who work continuously. Conversely, college graduates who spend extended time out of the work force have substantially lower wage growth.

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[9]An individual is defined as spending extended time in the home sector if she is out of the labor force for 50 weeks or more. Only women who worked 4 years or more after college graduation are included in these comparisons. Occupational classification in this context is based on the 1st job after college where reported hours worked are greater than 500.

Average starting wage rates of female teachers who leave and reenter the workforce earn \$1.15 less than female teachers with continuous careers. Their average last wage observed is \$1.22 less than teachers who work continuously. Other female college graduates who leave and reenter the workforce have average starting wages and final observed wages that are \$.46 and \$1.84 below female graduates with continuous careers. These comparisons indicate that the differences in unobservables between teachers and college graduates who leave the labor force are small, and the potential biases in table 5 are likely to be minor. Teaching allows for greater mobility between the home and work sectors.

C. The Option Value of Flexible Market Entry and Exit in Teaching

The estimated value of the flexibility option in teaching depends on the timing and length of anticipated leaves from the work force, the discount rate, the life-cycle earnings profile, and the dynamics of wage losses. Mincer and Ofek (1982) examined the experience of NLS married women in all occupations and education categories who left and subsequently re-entered the labor force in the 1970s. They found that women had wage losses of between 3% to 9% per year spent out of the labor force during their most recent exit. Their earnings growth after reentering was approximately double the normal wage growth at that stage of the life-cycle, so the long term effect of time spent in the home sector eventually amounted to only a 1% wage loss per year spent out of the labor force. Wage losses due to market exit and reentry are not permanent and the rebound after reentry must be incorporated into the option value estimates.

The calculations are made for continuous spells of 2, 3, and 4 consecutive years out of the work force after teaching for 5 consecutive years, and then working uninterruptedly over the remainder of a 40 year career. The value of the option is estimated as the difference between discounted lifecycle earnings without-and-with the wage penalty. Discounted life-cycle earnings with wage penalties are calculated from the table 5 estimate of wage loss for females college graduates in general and Mincer and Ofek's estimates of the rebound. We assume that teachers would have experienced 9.5% short-term wage losses for each year out of the market in some other occupation, and double the normal growth rate upon reentry until wages converge to the level predicted by the uninterrupted experience profile. The experience profiles of teachers are extrapolated from the CPS estimates used to generate figure 5.

The option value estimates for interest rates of 5 and 10 percent appear in table 7. The estimates are $20,100 and $11,800 for a female teacher who spends 3 years out of the labor force. This is 80% of the annual earnings of female teachers under the age of 40 when the interest rate is .05, and a little less than a half a year's earnings when it is .10; or about 5 percent of discounted lifecycle earnings in both cases. It would be smaller proportion of total human capital value for a two year spell and a larger proportion for a four year spell.

D. Risk Aversion

Although young female college graduates on average spend more time out of the labor force then their male counterparts, this difference represents only one portion of the total difference in time committed to the labor force. Time worked by employed female graduates in the NLSY was near nearly 300 hours less in the last observation year than time worked by male graduates. Differences in annual hours worked combined with differences in time spent in the home sector yield dramatic differences in total time worked over the lifecycle. Male college graduates work nearly 25% more hours than female graduates over their careers.[10] If this difference in time commitment to the labor market is anticipated by women in college, the model implies that female graduates will tend to choose professions with more certain payoffs. This proposition was investigated with CPS data from 1976, 1977, 1980, and 1981. We estimate the correlation between percentage female and the coefficient of variation of wages for all 2 digit occupations with at least 25,000 women in them. The coefficient of variation of the hourly wage is estimated using only females in the occupation with at least 16 years of education, who earned at least $2000 (1990 dollars), worked at least 5 weeks, and were between 31-34 years old. It is regressed on the percentage of females in the occupations for 1976-77 and 1980-81 in table 8. Percent female is significantly negatively related to the coefficient of variation.

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[10]This calculation assumes that males and females retire at the same age, and that differences between young males and females in hours worked and portion of time spent in the home sector remain constant over the entire work life. Undoubted there are differences by sex in both of these parameters, but discounting reduces most of their economic effects for the younger workers studied here.

Earning distributions of college educated women who choose occupations with high proportions of females are more concentrated than are earnings distributions of female graduates who choose male dominated professions. The simple correlation is about -0.4 in both sets of years. There is a hint that the relation between percent female and the coefficient of variation of wages has weakened somewhat in recent years. Using a similar decomposition on 1989-90 CPS data yields regression estimates that are no longer significant. We expect the variance of wages in female professions to increase relative to male professions as women's time commitments to the market continue to grow.

It is difficult to argue that differences in male-female ability distributions account for the observed relationship between percentage of females in an occupation and earnings variation, since variation only in female wages are examined. Even if women are more homogenous in terms of some underlying distribution parameters (controlling for observables), this does not explain why male dominated occupations apparently attract a broader array of females with respect to these parameters. Nor does it explain why this relationship has been eroding over recent years. The model presented here is consistent with both aspects of the data.

IV. Summary and Conclusion

The empirical evidence assembled in this study strongly supports the finding that the demand for teachers has increased over time and that the supply price of successive cohorts of teachers has been rising. To summarize:

Demand: The costs per student of elementary and secondary education have increased for more than 30 years. The cost increase is attributable to rising staff-student ratios, not to rising relative wages of teachers. Teacher-pupil ratios have increased in a persistent, trend-like fashion independent of total enrollments in the U.S. school system. Both the trend and interstate differences in teacher-pupil ratios are positively correlated with increasing labor force participation rates of women. Gross relative earnings of teachers increased since 1967 because teachers became more experienced and more educated over time. Standardized comparisons reveal that the relative price of a "standard" teacher's time was relatively flat over the period except for a decline in the late 1970s to early 1980's.

Supply: The teaching profession traditionally has been the primary skilled occupation of women, but that is changing over time. Nearly 50 percent of women graduating college in 1960 entered teaching. In 1990 less than 10 percent entered teaching. One of the attractions of teaching careers to many women is the flexibility option, that wage penalties due to labor force interruptions (associated with care of small children) are small compared to other careers. We found that teachers who took such leaves earned the same wage when they returned to work, but that female college graduates taking leave from other occupations suffered subsequent reentering wage penalties of almost 10% per year of leave. Nurses and secretaries, two other occupations dominated by women, are closer to other college graduates than to teachers in this respect. The value of the flexibility option in teaching for an anticipated 3-year leave is estimated as about 5 percent of a teacher's human capital value. We also showed that people who anticipate devoting less time to labor market activity tend to rationally choose less risky occupations than others. The proposition is supported by the finding that the relative variance in the earnings distributions of women in female dominated occupations is smaller than the earnings variance of women in male dominated occupations.

We conclude with a few observations on the implications of this research.

Teaching is one of the most attractive skilled occupations for women desiring careers that accommodate family considerations. Yet the value of flexibility is only 3-7 percent of teachers' lifecycle earnings, and is not significant for nurses and administrative support staff. These findings suggest that the flexibility option alone does not explain much of the male-female wage differenital. Also, work schedules that are complementary with child-rearing evidently play a large role in the continued attraction of women to teaching. Finally, the value of career flexibility to women has decreased as child-related interruptions have become less frequent (Goldin (1990), Hill and O'Neil (1992)). This trend is likely to continue.

The economics are best interpreted in the context of the remarkable increase in the value of women's time in the past three decades. Substitution of purchased teacher and staff inputs for parental time in educational production is a rational response to the increasing cost of own household time. Increasing labor market opportunities for women will increase the quality-adjusted supply price of teachers in the future. One observation that does not fit so neatly into this interpretation is the decline in the real price of teacher's time in the late 1970's.

However, that temporary anomaly is explained by normal teacher market response to the major demographic events that affected the educational system in the 1970's. The build-up in the absolute stock of teachers caused by the earlier enrollment bubble of the baby boom had to be worked off when those cohorts left the system and total enrollments declined.

The main alternative interpretation of growing expenditures is built upon the political economy of changes in the organization and control of public schools (Hanushek (1981), Hanushek, et. al. (1993b), Peltzman (1993)). It traces the increase in school costs to the politics of the shift in control of schools from parents to teachers, unionization and the political process. Still, this interpretation does not account for the drop in relative wages of standardized teachers to college graduates in the late 1970's any better than the alternative, and raises other anomalies. Teacher unionization jumped enormously between 1960-65 and was relatively flat thereafter, while costs per student rose more smoothly and uniformly. Nonteaching staff grew much more rapidly than teaching staff in the past 30 years. Why would a self-interested union promote greater growth of nonunionized administrative and other staff than of teachers? And changing unionization is a poor explanation for interstate differences in teacher-pupil ratios, but changing labor force participation is a good one.

The two views are not mutually exclusive, but it is important for the future quality of American education to gain greater understanding of the true sources of recent changes in our public school systems. If these changes have been largely political in nature, adopting policies that enable parents to take back control of schools, offering greater school choice, privatization and related reforms are attractive avenues for improving the system. However, if as we think likely, the politics mainly reflect changes in the structure of families, the value of time and the structure of household production, such policies will be less effective than advertised. Parents voluntarily transferring control to others is rational when the labor market and the structure of families has changed as it has. Teachers, staff and parents are imperfect substitutes in the education of children. As parental time inputs into children decrease and schools increasingly take on parental roles, the cognitive outcomes of formal education are sure to be affected. Policies emphasizing only administrative reorganizations of schools, without consideration of the changing intereactions between schools and families, are likely to less effective.

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DATA APPENDIX

1) Cost estimates in table 1 are from the National Center of Education Statistics (NCES) data.[11]

Instruction - The NCES reports total number of fulltime equivalent (FTE) elementary and secondary teachers, their average earnings, and total instructional costs for public schools. Average earnings for both elementary and secondary teachers are multiplied by the number of FTE teachers in each sector, and these earnings totals are summed and subtracted from total instructional costs for public schools. The remaining portion of instructional costs, not accounted for by teacher salaries, are divided between the elementary and secondary sector based on the ratio of aggregate earnings.

Imputed Rent and Depreciation - The social costs of tax exemptions, foregone rent on school real estate, and depreciation on buildings and equipment are imputed from Cohen and Geske's (1990) estimates of school property values. We assume that capital user costs are 10% of property values. Costs are allocated between elementary and

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[11]In the decades 1960-1980 the NCES reported a separate category called "fixed costs". The major components in this category were pension and insurance costs. In order to make cost statistics in these years comparable to 1990 statistics these costs have to be allocated to other current expenditure categories. These costs are divided between instruction, plant operation and maintenance, administrative, and other school services costs based on the percentage of the total estimated wage bill that these categories represented.

secondary schools based on the relative numbers of classrooms employed, calculated as aggregate enrollment at each level divided by the published student-teacher ratio.

Cost of Plant Operation and Maintenance, Administrative and other School Services are taken from the 1993 Digest of Education statistics on public schools current expenditures. Classrooms employed are also used to allocate these costs by school level. Expenditures on custodial workers are not listed separately from expenditures on nonlabor operation and maintenance inputs in the National Center for Education Statistics data. An estimate of the labor component of operation and maintenance costs is backed out of NCES estimates of plant operation and maintenance workers, by assuming that their annual earnings in any given year equal the average annual earnings for full-time employees in all industries.

Transportation and School Supplies - Estimates of student-paid transportation are extrapolated from cost data on school-provided transportation in the Digest of Education Statistics, by assuming that students who do not use school-provided services have the same average costs as those who do. Student expenditures on books and school supplies are estimated by assuming that secondary students purchase 12 books a year and that elementary students purchase 6 books a year. The yearly cost per book comes from the National Center of Education Statistics, Statistics of Public School Libraries / Media Centers, assuming that the average cost of a book purchased by elementary or secondary school libraries equals the average cost per book purchased by their students.

2) Staff-student ratios in table 3 are from the NCES Schools and Staffing Surveys. Time series data in figure 1 are from the Department of Education, National Center of Education Statistics. For about 30 years before the turn of the century, the teacher-pupil ratio steadily decreased.

3) Class size: The increasing teacher-student ratios (from administrative records) do not translate into equivalently decreasing observed average class size. The National Education Association (NEA) reports 29 pupils per elementary school class in 1961, and 24 in 1991. It reports average high school class size of 28 in 1961, while the NCES School and Staffing Survey reports average class size of 22.6 for teachers in departments in 1990-91. These decreases in class size account for roughly half the increase in teacher-student ratios. NEA data indicate that teachers' average yearly class workloads have not diminished in recent decades, and that average time spent in class by students did not change. It is impossible to resolve these reporting discrepancies.

4) Changes in female labor force participation rates by state ,for equation (1), are from the CPS March supplements 1976, 1981, 1986, and 1991. Teacher-pupil ratios are taken from the NCES Digest of Education Statistics, various issues.

5) CPS data used to estimate teachers and college graduates relative earnings include observations ages 22-65, with 16 or more years of education, and earnings over $2000 (1990 dollars).

6) The NLSY data in section III are college graduates with no more than 18 years of education, who worked at least 500 hours in any year after graduation, and who earned wages between $3 and $50 (1990 dollars).

TABLE 1

Estimated Cost of Public Elementary and Secondary Education

{millions of 1990 dollars}

	Instruction Costs	Imputed Rent and Depreciation	Transportation Costs	Student Purchased Books and School Supplies	Administration Costs	Plant Operation and Maintenance	Other School Services	Total Costs
Elementary School								
1960	24,381.0	9,861.2	5,534.0	2,164.7	1,782.8	4,886.8	814.8	49,425.3
1970	48,093.4	13,298.1	8,285.9	2,536.4	4,018.3	8,342.3	1,702.6	86,277.0
1980	54,323.4	13,897.7	8,909.4	2,368.9	5,040.4	10,692.5	3,340.3	98,572.6
1990	72,928.4	15,456.9	12,326.2	2,087.8	11,009.2	13,646.2	8,901.4	136,356.1
Secondary School								
1960	15,635.6	4,144.9	1,643.6	1,637.1	749.3	2,053.9	342.4	26,206.8
1970	39,065.0	6,616.9	3,235.8	2,522.1	1,999.4	4,150.8	847.2	58,437.2
1980	44,321.0	7,877.2	4,187.7	2,416.1	2,856.9	6,060.6	1,893.3	69,612.8
1990	48,393.3	7,512.1	4,655.7	2,022.4	5,350.5	6,632.1	4,326.1	78,892.2

TABLE 2

Estimated per Student Cost of Public Elementary and Secondary Education

{1990 dollars}

	Instruction Costs	Imputed Rent and Depreciation	Transportation Costs	Student Purchased Books and School Supplies	Administration Costs	Plant Operation and Maintenance	Other School Services[1]	Total Costs
Elementary School								
1960	778	315	177	69	57	156	26	1,577
1970	1,310	362	226	69	109	227	46	2,350
1980	1,712	438	281	75	159	337	105	3,106
1990	2,189	464	370	63	330	410	267	4,093
Secondary School								
1960	1,680	445	177	176	81	221	37	2,816
1970	2,725	462	226	176	139	290	59	4,076
1980	2,971	528	281	162	192	406	127	4,667
1990	3,846	597	370	161	425	527	344	6,270

[1] Includes expenditures for health, attendance, speech pathology, and other student services.

TABLE 3

Full-time Equivalent Staff per 100 Students in Public Elemantary and Secondary Schools

Year	Total Staff	Classroom Teachers	Principals and Assistant Principals	Other Instructional Staff [1]	School District Administrators	Support Staff[2]
1950	5.2	3.6	0.2	0.0	0.1	1.2
1960	5.9	3.8	0.2	0.1	0.1	1.7
1970	7.4	4.4	0.2	0.4	0.1	2.2
1980	10.2	5.3	0.3	1.4	0.2	3.0
1990	10.9	5.8	0.3	1.2	0.2	3.4

[1] After 1950 includes librarians, and guidance counselors. Teacher aides were included starting in 1970. Previously these employees were included under classroom teachers, however this does not seriously effect any of the numbers in 1950 or 1960 due to the small size of this group during those years.

[2] Includes clerical personnel, transportation, food service, plant operation and maintenance, health, and recreational staff members.

TABLE 4

Geometric Means of Selected Characterisics for NLSY sample [1]

	Male College Graduates	Female College Graduates (excluding teachers)	Female Teachers
Wage of Last Job (in 1991 dollars)	14.79	12.66	10.12
Log Wage Difference (1st and last job)	.406	.369	.235
Years Out of Labor Force	.27	.48	.68
Occupational Tenure (years)	1.72	1.90	4.41
Work Experience (after college graduation)	5.17	5.26	5.96
Percent Black	.154	.186	.138
Percent not in SMSA (in last year observed)	.114	.107	.227
Education	16.39	16.32	16.75
Age	29.4	29.2	30.0
Number of Observations	709	711	101

[1] Only observations with 16-18 years of education, reported wages between $3-$50, and who worked at least 500 hours after graduation are included.

TABLE 5

Regression Estimates of Log Wage Growth on Time Spent Out of the Labor Force

t statistic in { }, * - 10% significance level ** - 5% significance level	Teachers	Nurses	Adminstrative Support
occupational tenure in field	.0360 {1.854)*	.0300 {1.854)*	.0304 {1.557}
(occupational tenure)^2	-.0065 {-2.532}**	-.0065 {-2.533}**	-.0069 {-2.710}*
total work experience, after college graduation	.0740 {3.452}**	.0836 {3.289}**	.0847 {3.344}**
(total work experience)^2 nonwhite=1	-.0008 {-.46}	-.0011 {-.56}	-.0011 {-.557}
smsa in last job	-.1645 {-2.995}**	-.1776 {-3.213}**	-.1730 {-3.138}
smsa in first job	.0510 {1.037}	.0451 {.920}	.0417 {.852}
education level in first job	.0575 {1.317}	.0444 {1.011}	.0419 {.956}
change in education level between first and last job	.0510 {1.101}	.0464 {.994}	.0394 {.845}
race- 0 is white 1 is nonwhite	.0162 {.398}	.0241 {.586}	.0323 {.783}
occupation dummy	-.2685 {-3.794}**	.0374 {.420}	-.0524 -{1.032}
OLF	-.0996 {-3.773}**	-.0847 {-3.367}**	-.0700 {-2.512}**
Interaction of OLF with occupation dummy	.1762 {2.357}**	.0123 {.085}	-.0638 {-1.080}
R^2	.1927	.1785	.1836
n	811	811	811

TABLE 6

Mean Wages in Starting and Last Jobs for Selected Groups of Female Graduates

	TEACHERS		OTHER COLLEGE GRADUATES	
	Continuous[1] Careers	Non-continuous Careers	Continuous Careers	Non-continuous Careers
Starting Wage (in 1991 dollars)	8.46	7.31	8.34	7.87
Last Wage (in 1991 dollars)	10.39	9.17	13.84	12.00
Experience (years)	7.36	7.61	6.50	6.64
Occupational Tenure (years)	5.57	4.15	2.52	2.34
Average Change in Log Wages	.170	.163	.503	.360
Number of Observations	37	26	431	100

[1] Continuous career means that the individual was out of the labor force for less than 50 weeks, while non-continuous means that the individual was out of the labor force for 50 weeks or more.

TABLE 7

The Option Value of Flexible Market Entrance and Exit for Teaching

	5% discount rate	10% discount rate
Time Spent Out of the Labor Force [1]		
2 years	$11,800	$7,200
3 years	$20,100	$11,800
4 years	$34,600	$18,000

[1] It is assumed that teachers spend either 2, 3, or 4 consecutive years out of the work force after working 5 consecutive years initially, and then work the remainder of a 40 year career uninterupted.

TABLE 8

Coefficient of Variation of Wages Regressed on Percent Female in Occupation[1]

	Data from 1976-77 CPS	Data from 1980-81 CPS
Percent Female in Occupation	-.2268 {-2.278}**	-.2034 {-2.170}**
Constant	.4622 {10.393}**	.5186 {11.885}**
R^2	.1612	.1585
number of observations	28	26
Simple Correlation between Percent Female and Coefficient of Variation of Wages	-.4014	-.3982

[1] Coefficient of variation of occupational wages are calculated using only college educated females, who earn at least $2000 (1990 dollars), are between 31-34 years of age, and work at least 5 weeks and at least 5 hours per week in the occupation.

Figure 1

Teachers per 100 Students in U.S. Public Schools 1900-90

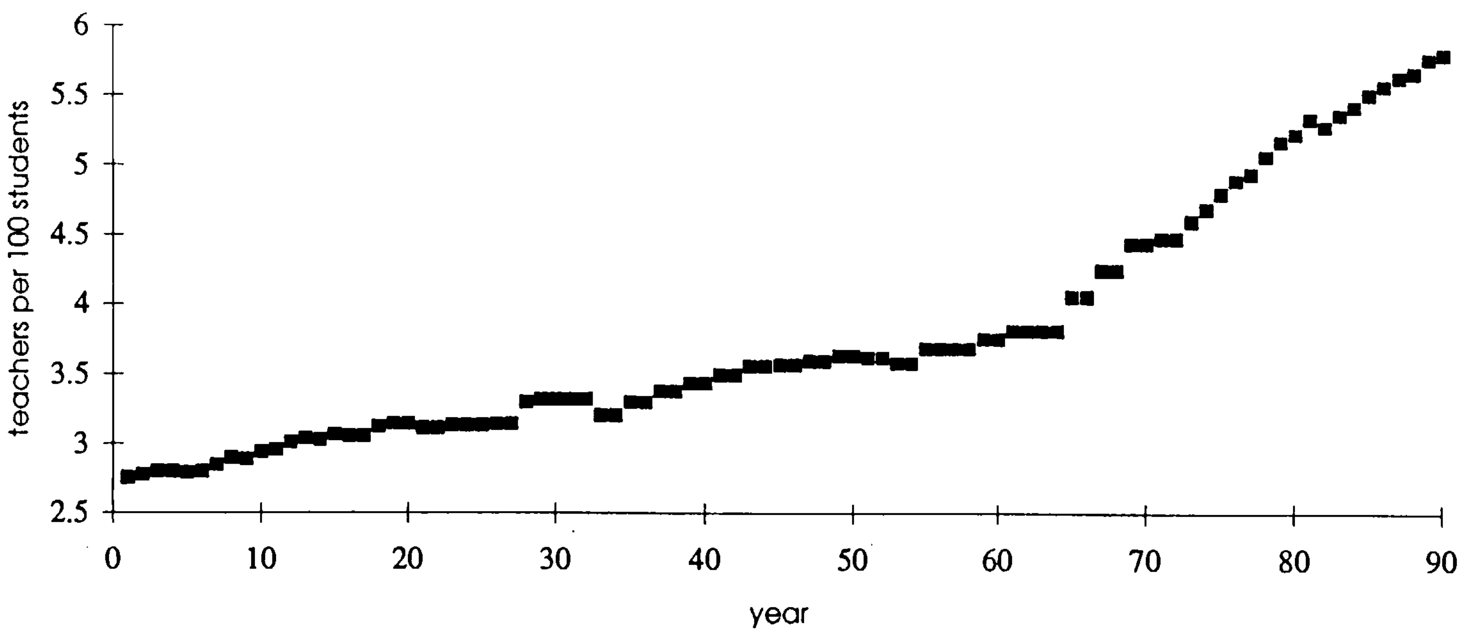

Figure 2

State Data for 1975-1990 (The arrow is the regression projection of equation (1), the coeficient on change in female LFP rates is .0364, the t-statistic is 4.13, R-square=.104, and n=150)

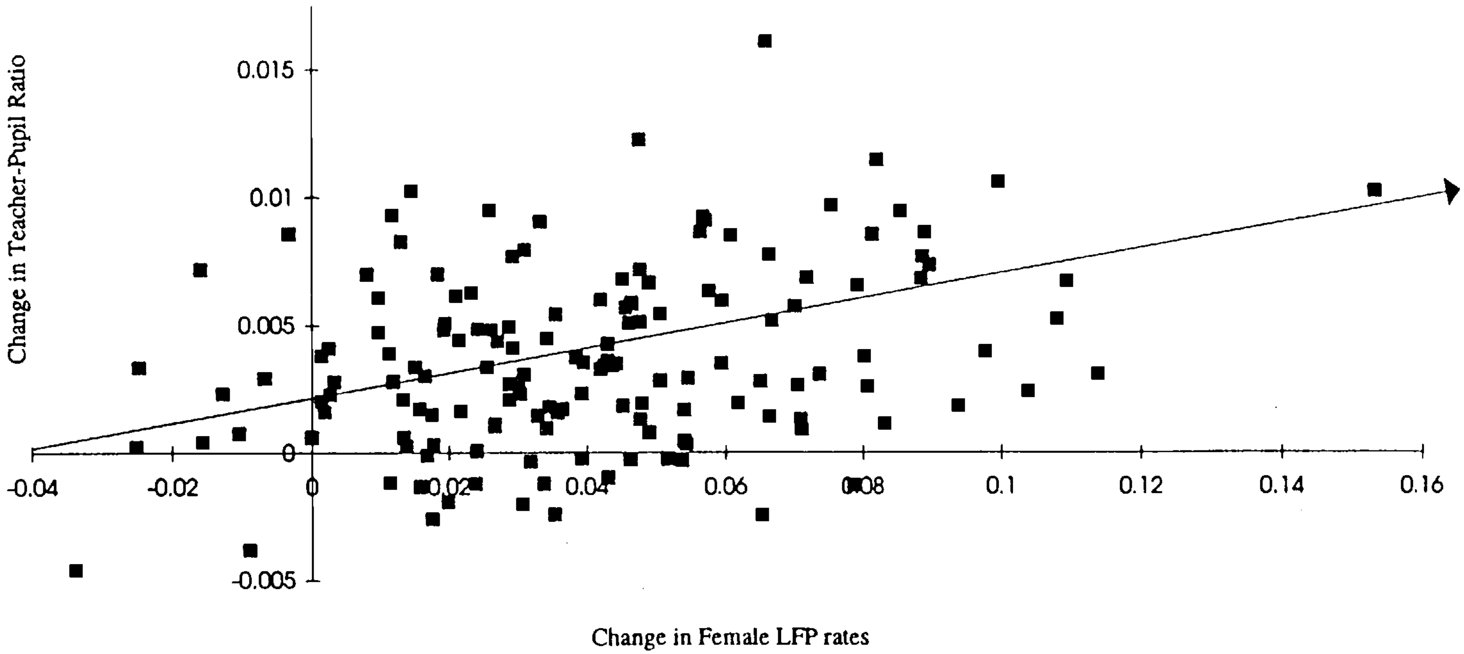

Figure 3

Average Earnings of Teachers and College Graduates, (1990 dollars)

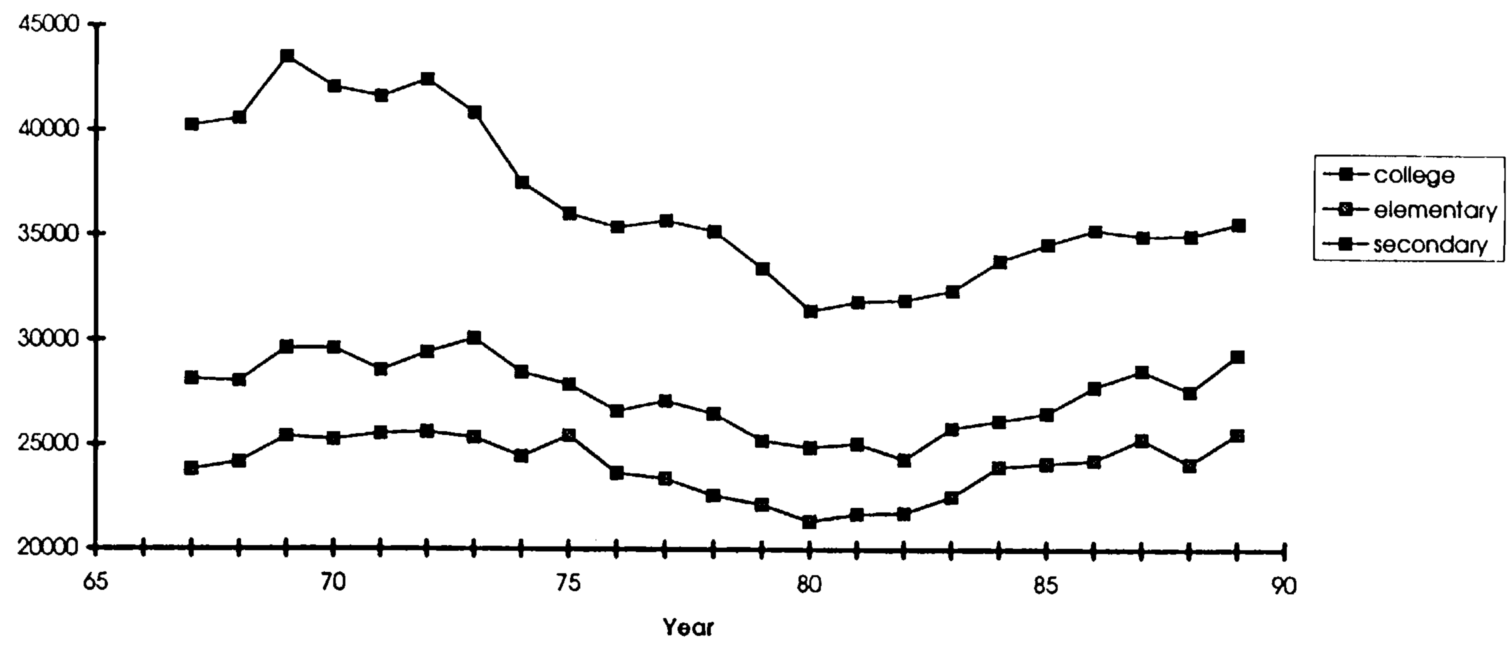

Figure 4

Log Earning Difference between Teachers and College Graduates

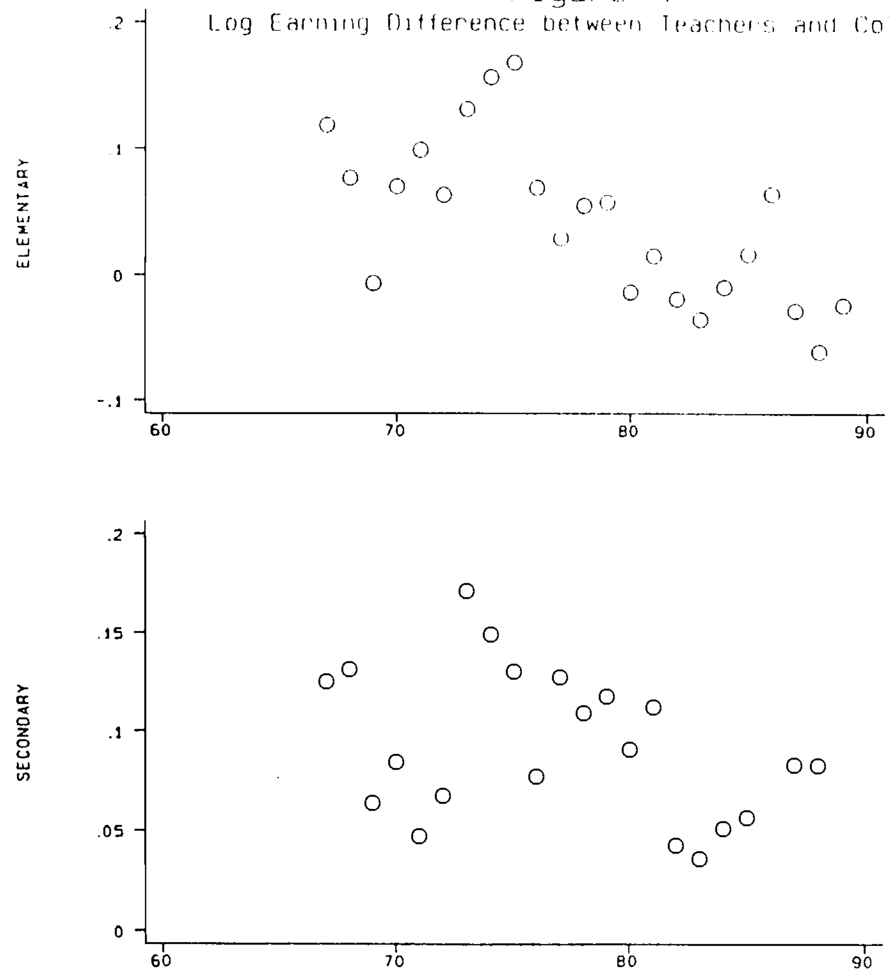

Figure 5

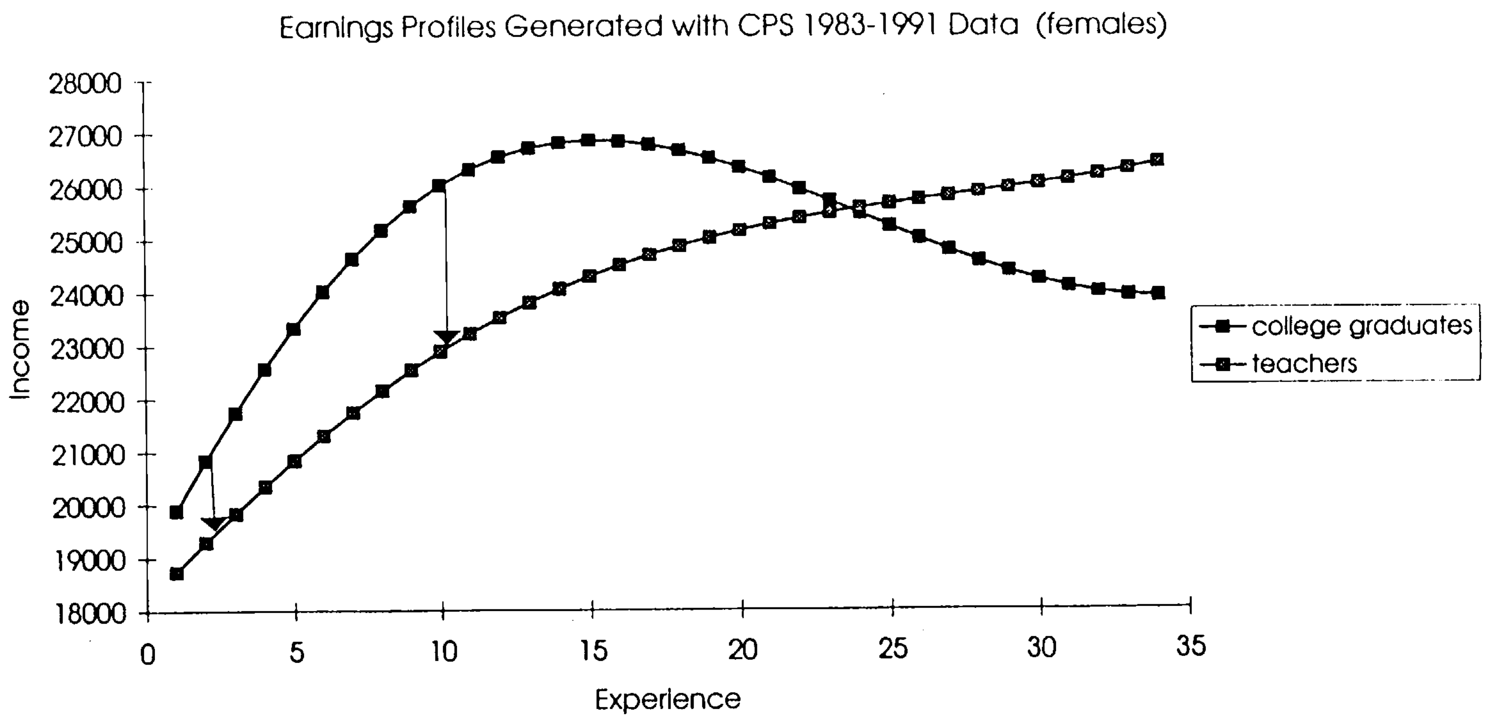
Earnings Profiles Generated with CPS 1983-1991 Data (females)
Income
28000
27000
26000
25000
24000
23000
22000
21000
20000
19000
18000
0
5
10
15
20
25
30
35
Experience
college graduates
teachers

Figure 6

Percent of Female College Graduates, Age 21-29 and Income > 2000$, Classified as Teachers (CPS data)