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The Impact of Managed Care on the Gender Earnings Gap among Physicians

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Abstract:

Important differences in labor market characteristics suggest that men and women physicians may be viewed as imperfect substitutes in the labor market. Concerns about efficiency and cost-cutting, which have led to the adoption of managed care practices, may have (unintentionally) favored female physicians. Using data from the Young Physicians Survey, the author compares changes in the gender earnings gap for physicians in states with high versus low managed care growth during the 1980s. She finds that the gender gap in hourly earnings among physicians in states with high managed care growth narrowed by 10 percentage points relative to states with low managed care growth. Moreover, Census data show that this finding holds only for physicians and not for other professions requiring advanced degrees. Further analysis shows that managed care appears to affect the relative earnings of male and female physicians by compressing the overall distribution of physician earnings. Together, these results suggest that the spread of managed care has been a factor in improving the relative earnings of female physicians. More broadly, these results suggest that market changes can have important consequences for the gender earnings gap when there are large pre-existing differences between men and women within a profession.

Keywords: gender, wage differentials, physicians, managed care, health care

JEL Classifications: J16, J31, J44, L22, I11

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I. Introduction

At various times throughout U.S. history, economic changes have had profound, if unintended, consequences on women's labor force opportunities. As the industrial economy developed, women were able to increase their participation in the paid labor force in both the domestic trades and emerging factories (Goldin 1990). Expanded educational opportunities, such as the high school movement during the late nineteenth century, enabled women to increasingly find work in nonagricultural and nonindustrial occupations such as office clerks, secretaries, and retail sales (Goldin 2006). The advent of reliable contraception in the early 1960s in the form of the "pill" allowed women to make additional investments in human capital and to gain access to professional careers in business, law, and medicine (Goldin and Katz 2002).

More recent changes in the economy, while less dramatic, also have the potential to improve women's labor force experiences. For example, during the 1980s the advent and spread of managed care significantly increased product market competition in the health care industry. In 1980 over 90 percent of privately insured individuals in the U.S. were covered by "unmanaged" indemnity insurance—by 1992 that share had shrunk to just 4 percent (Cutler and Zeckhauser 1999). At the same time, the fraction of physicians who were female and their relative earnings compared to male physicians increased rapidly. According to the American Medical Association (AMA), the number of female physicians nearly doubled during the 1980s, with the overall share of female physicians rising from 11.6 percent in 1980 to 16.9 percent in 1990 (AMA, 1970, 1981, 1992, 1997). Despite considerable remaining gender differences among physicians in labor market characteristics—such as hours worked, patient mix, specialty

field, and practice setting—the ratio of female to male annual earnings increased rapidly during the 1980s. Whereas in 1977 female physicians earned only 61 percent of the annual incomes of similar male physicians in their field, by 1990 that ratio had improved to 72 percent. Adjusted for hours worked, the female to male hourly wage ratio improved from 78 percent to 88 percent over the same period (Kehrer 1976; Langwell 1982; Baker 1996).

Yet a substantial number of articles have documented similar trends among *all* college-educated U.S. women. The relative earnings of female college graduates showed little change until 1979, and then improved markedly during the 1980s (Mincer and Polachek 1974; Gunderson 1989; Goldin 1990; Blau 1998). However, one important difference is that the gender earnings gap among physicians continued to improve rapidly through the mid-1990s as HMO enrollments continued to rise (see Figure 1). In contrast, the improvement in the gender earnings gap among all college-educated workers in the United States stalled after 1989.

Thus, it is possible that the widespread adoption of managed care in the 1980s may have had a differential impact on the labor market outcomes of female versus male physicians in ways that (unintentionally) favored female physicians. For example, managed care emphasizes the use of low-cost preventive care services over high-cost diagnostic tests and specialty care, potentially increasing the demand for primary care physicians, of whom a disproportionate fraction are female. In addition, managed care reimbursement practices shift some of the financial risk for the cost of care from insurers to providers, making self-employment—a practice arrangement disproportionately favored by male physicians—less profitable than in the past. Managed care also compresses the distribution of physician earnings by limiting both the quantity of services provided and the range of fees charged, thereby raising the relative incomes of those physicians at the bottom of the distribution, a group that taken as a whole is more likely to be female. Finally, managed care imposes more uniform standards on medical practices through the use of

treatment guidelines, productivity targets, utilization reviews, and selective contracting. Such standards may have reduced the differences in the practice styles of men and women physicians, thereby reducing the gender gap in physician earnings arising from pre-existing differences in productivity.

To test these theories, I use the cross-state variation in health maintenance organization (HMO) enrollments to focus on whether recent changes in the U.S. health care industry have led to changes in the gender wage differential among physicians. To do so, I employ a differences-in-differences (DD) methodology that compares changes in the female/male earnings differential for physicians working in states with high managed care growth to those among physicians practicing in states with low managed care growth. Increased competition in the health care industry, proxied by the growth of managed care, would be expected to reduce the disparity in earnings between male and female physicians, all else equal. A third difference can also be taken to control for factors associated with states with high managed care growth that would lead to improvements in the relative earnings of all professional women. This is done by performing a differences-in-differences-in-differences (DDD) analysis comparing the differential change in the gender wage gap between high- and low-growth managed care states of the treatment group (physicians) to that of various control groups such as other professionals in male-dominated occupations (e.g. lawyers) or other professionals with advanced degrees (e.g. beyond a bachelor's degree).

II. Changes in the U.S. Health Care Industry and the U.S. Market for Physician Services

One of the most important changes in the health care industry since 1980 has been the transition from a traditional indemnity-based insurance system to "managed care." Under traditional indemnity insurance providers were compensated on a fee-for-service basis where either all or a large percentage of the provider's fee is reimbursed by the insurer (see Table 1).

Until the 1980s, virtually all fee-for-service physician payments were based on a schedule of "usual, customary, and reasonable" (UCR) limitations determined by profiles of physician services and charges by geographic area. Yet the fee limitations imposed by insurers were weak and affected only those fees at or near the very top of the distribution. For example, many insurers used a 90th percentile cutoff for determining payments to physicians under their indemnity plans. Thus a physician would be paid their actual fee unless it was higher than the fees submitted by 90 percent or more of the other physicians billing for the same procedures or services in the same locality.

Moreover, under traditional indemnity insurance the financing function of the payer or insurer was separate from the service delivery function of the provider, an arrangement that resulted in few payer-imposed limitations on services provided to patients. Because insurers had less information about health needs and medical technology than providers, insurers could not guarantee that only cost-effective care would be provided. Thus, under traditional fee-for-service reimbursement, patients and physicians could make treatment decisions that might marginally improve health outcomes while largely ignoring the marginal costs associated with such care.[1]

In contrast to the traditional indemnity-based insurance system, under managed care the functions of paying for and providing medical care are combined in the form of managed care organizations such as HMOs, PPOs, and IPAs.[2] Managed care organizations contract with a select network of physicians and hospitals and are able to control costs by negotiating UCR-type discounts with providers at the 60th or 70th, rather than the 90th, percentile. Hospitals and

[1] It has also been suggested that physicians could "induce demand" among their patients by recommending overly complex or expensive treatments (Fuchs 1978).

[2] HMOs (health maintenance organizations), PPOs (preferred provider organizations, and IPAs (independent practice associations are the three main types of managed care organizations. See Table 1 for their distinguishing characteristics.

physicians agree to limit their fees in exchange for inclusion in the network. In return, managed care organizations encourage their insured patients to select participating providers by using financial incentives such as lower deductibles and/or coinsurance rates, thereby increasing patient volume for physicians and hospitals within the network.

Some managed care organizations also negotiate at-risk compensation arrangements with providers rather than discounts from existing UCR limits, thus transferring some of the risk of the cost of care to physicians. For example, HMO patients are asked to select a participating primary care physician from a list of family/general practitioners, general internists, pediatricians, or in the case of female patients, obstetricians/gynecologists. The HMO then establishes a schedule of monthly per-member amounts that it will pay to each participating primary care physician in exchange for delivering primary care services and managing specialty referrals—a practice known as capitation. Specialists, in contrast, are usually compensated on a fixed fee schedule per procedure.

Managed care also discourages excessive utilization of medical services and procedures by monitoring providers carefully, penalizing them if they are profligate, and offering g them financial incentives to provide only necessary care. For example, physicians who contract with HMOs are given financial rewards for achieving certain cost utilization objectives such as shorter hospital stays, fewer laboratory tests, or less invasive surgical procedures per 1,000 members. Managed care organizations also use physician profiling to monitor practice patterns and selectively contract with providers on the basis of cost-efficiency and resource utilization. In some managed care organizations physicians are instructed to apply formal written practice guidelines to common medical conditions and procedures such as asthma management and mammography screening. All of these measures serve to minimize the individual variation in physician practice styles that can lead to excessive costs.

Given the cost savings associated with managed care practices, the growth of such plans has outpaced that of indemnity plans over the last three decades, making managed care the dominant form of financing health care delivery in the United States. In 1970, approximately 3 million people were enrolled in HMOs—by 1996 that number had swelled to roughly 60–70 million people with an additional 80–90 million enrolled in PPOs (Lee 1997). Ideally, one would use total enrollments across managed care organizations to capture the growth of managed care penetration over time. However, only limited data on HMO enrollments are available for the time period of this study. Assuming that managed care enrollments across types of organizations are correlated, the percentage of the U.S. population enrolled in HMOs can be used as a proxy for the level and growth of managed care penetration.

Looking at HMO enrollments reveals a considerable state-level variation within each region over this period that will be used as the main source of identification in this study. Between 1980 and 1990, HMO enrollments were distributed unequally across the country yielding significant geographic variation (see Table 2). States in the New England, Middle Atlantic, Mountain, and Pacific regions saw the largest increases in managed care penetration while states in the southern and central regions lagged behind.

III. How Might Managed Care Affect the Gender Earnings Gap Among Physicians?

There are four mechanisms by which managed care might be expected to affect the gender earnings gap among physicians. First, managed care organizations effectively limit the earnings power of the physicians who contract with them, and this arrangement potentially improves the relative (although not the absolute) position of women within the distribution of physician earnings. For example, the market for physician services has been characterized as imperfectly competitive due to distortions on both the demand and supply sides of the market (Baker and Brown 1999). Traditional insurers delegated the responsibility for physician

selection to patients and gave physicians little incentive to limit expenditures on health care. These perverse insurance incentives were also compounded by informational asymmetries, as patients relied on their physicians for treatment recommendations and had little incentive to acquire more information on cost-effective treatment options because insurers paid for most of their care. As a result, physicians were able to sell differentiated, imperfectly substitutable products, and this ability gave them some degree of market power. Under this traditional indemnity-based system male physicians may have been able to earn significant rents relative to their female colleagues if they were able to charge more for their services. By discounting fees or imposing capitation restrictions, managed care may limit the hourly earnings of high-rent (high-fee) physicians, most of whom would be men.

Second, managed care may also affect the relative demand for different specialties and/or alter the profitability of various practice settings in ways that favor female physicians. For example, managed care encourages the greater use of less costly preventive care services, a shift that possibly increases the relative demand for primary care physicians such as family practitioners, general internists, and pediatricians—medical specialties chosen by a high fraction of female physicians.[3] Similarly, managed care reimbursement practices typically transfer some of the risk for the cost of care from the managed care organization to the physician, making self-employment, a practice arrangement favored by male physicians, less profitable than in the past. Thus the spread of managed care may narrow the earnings gap between male and female physicians simply because a high fraction of female physicians are in primary care specialties and/or in employee settings.

[3] According to the American Medical Association, a primary care physician is a physician who "serves as the initial contact between the member and the medical care system" and is "responsible for coordinating the treatment of members assigned to his or her panel."

Third, managed care may reduce the level of discrimination that female physicians face in the market. Given that the market for medical services can be characterized as imperfectly competitive, hospitals or other employers of physicians, male physicians, or even consumers may have been able to discriminate against women and take some surplus (producer or consumer) in the form of discrimination. Increased competition associated with the spread of managed care may have eliminated this surplus from the market, thereby making it more costly for employers, colleagues, and consumers to act on their discriminatory preferences.

Fourth, managed care dictates more uniform standards for medical practices and procedures, guidelines which may reduce pre-existing stylistic differences in how male and female physicians practice medicine. For example, previous research has found that some portion of the earnings differential between men and women physicians can be attributed to women physicians seeing fewer patients per hour than men (Langwell 1982).[4] Thus, through the use of treatment guidelines, productivity targets, utilization reviews, and selective contracting, managed care may impose certain productivity constraints on physicians that could reduce gender differences. According to a 1995 Commonwealth Fund survey of 1,710 physicians, 35 percent of female physicians reported being dissatisfied with the amount of time they could spend with patients compared with 28 percent of male physicians (Collins, Schoen, and Sandman 1997). Yet in the sample of young physicians analyzed in this paper, women physicians see the same number of or even more patients per hour than their male colleagues—even within the same specialty fields and practice settings (see Table 3). Without additional information on the comparative work practices of male and female physicians, it is unclear whether managed care

[4] One should keep in mind that this is an imprecise method of measuring productivity because it fails to account for differences in physician quality, case-mix, nonphysician labor inputs, and capital inputs, all of which have an impact on the ultimate productivity of a given medical practitioner.

affects the gender earnings gap among physicians through changes in the practice and delivery of health care.

IV. Empirical Methodology and the Young Physicians Survey

Figure 1 plots the female to male annual earnings ratio for physicians along with HMO enrollments as a percentage of the U.S. population from 1976 to 1996. Although there is considerable variation in the gender gap among physicians, there is no significant secular trend in either series until the early 1980s. Both series then begin to increase sharply and follow a similar trend through the mid-1990s. Taken as a whole, the two series appear to move together.

To assess the impact of recent changes in the health care industry on the relative earnings of female physicians, I use the geographical variation in the growth of managed care across the United States during the 1980s. To proxy for changes in managed care penetration I use the growth in HMO enrollments as a percentage of each state's population. Although this measure does not capture changes in the growth of other types of managed care organizations, such as PPOs, it is likely to reflect state trends in all managed care enrollments. In addition, because this measure is used most frequently by other researchers, it enables me to compare my results with those in previous studies.

The basic approach is to examine whether the female-male earnings gap for physicians narrowed more in states with high managed care growth relative to states with low managed care growth by using a differences-in-differences strategy:

$$\Delta(\ln W_{FH} - \ln W_{MH}) - \Delta(\ln W_{FL} - \ln W_{ML}).$$

In this equation $\ln W$ represents log earnings, the F and M subscripts refer to females and males, and the H and L subscripts refer to high-growth and low-growth managed care states. To do this I divide the states into "high" and "low" categories, as shown in Figure 2, based on their growth in HMO penetration relative to the nation as a whole. States with high managed care growth

(termed "high growth") are defined as those states where the HMO enrollments as a percentage of population grew faster than the national average during the 1980s.[5] The possibility that other factors associated with the high growth states were responsible for raising the relative earnings of *all* professional women, not just female physicians, is addressed by comparing the change in the relative earnings of female physicians to that change for other female professionals residing in high growth versus low growth states.

There are two reasons for focusing on high versus low growth states rather than using the growth in managed care as a continuous variable. First, this approach reduces the measurement error associated with using the growth in HMO enrollments as a proxy for the spread of managed care. Second, because HMO growth does not capture other types of managed care growth, the dummy variable approach is easier to interpret if the classification of high versus low growth states is generally correct. In contrast, the continuous variable measure coefficient may need to be rescaled if HMO growth understates the overall rate of managed care growth. In sum, the dummy variable approach is a simple and easily interpreted methodology given the crude continuous measure of managed care growth that is available. For robustness, both sets of estimates will be presented.

I use two data sources of information on physician earnings and characteristics. The first is the Young Physicians Survey (YPS), formally titled *Practice Patterns of Young Physicians*, a survey that was jointly administered by the Robert Wood Johnson Foundation, Mathematica Policy Research, and the AMA. The second is the decennial federal population censuses (1980, 1990, and 2000). The YPS was designed to investigate the factors influencing the career decisions of young physicians. It is a nationally representative survey of physicians (about 4,000

[5] Between 1980 and 1990 these high growth states included Arizona, California, Colorado, Connecticut, Delaware, Illinois, Iowa, Maryland, Massachusetts, Michigan, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, and Wisconsin.

men and 2,000 women) under 40 years of age who have been practicing medicine continuously for two to five years. The YPS covers a wide range of topics including specialty, practice setting, hours, income, and other professional and demographic characteristics.[6] One drawback of the YPS is that it was conducted in 1987 and 1991, yielding only a short time period during which the spread of managed care could have affected the gender gap among physicians.[7]

The sample means for basic demographic and professional characteristics from the YPS are shown in Table 3. Male and female physicians differed little in terms of demographic and labor market characteristics. They are similar in age—about 35 years old—and have similar levels of practice experience—about 3.4 years. In 1986 female physicians had a lower rate of board certification than their male colleagues, but by 1990 equal proportions of men and women, about 76 percent, were board-certified physicians. Women physicians earned about one-third less income than men on an annual basis and about 15 percent less in terms of hourly earnings. The difference between the annual and the hourly earnings gap is largely due to gender differences in weeks and hours worked. Women physicians worked on average one week less per year and 7 to 10 hours less per week than their male counterparts.[8]

Part of the remaining difference in both hourly and annual earnings can be attributed to the different specialties and practice settings of male and female physicians. Women are more likely to be primary care physicians (general/family practitioners, general internists, and pediatricians) whereas men are more likely to be medical and surgical subspecialists (cardiologists and neurosurgeons for example). Women physicians are also more likely to

[6] See the data appendix for additional details of the Young Physicians Survey.
[7] A later survey of young physicians was conducted by the AMA in 1997. However, the sample was not comparable to earlier years, covering only the 75 largest metropolitan areas in the United States.
[8] In each year, I exclude physicians who were no longer practicing or were still in a training program. In addition, physicians who reported working less than 20 hours per week or 30 weeks per year were also excluded. See the data appendix for further details.

choose salaried positions in institutionalized settings such as HMOs, hospitals, universities, public health clinics, and in government. These work environments tend to offer more regular schedules, fewer hours, and an established patient base in exchange for less prestige and lower incomes. In contrast, male physicians are more likely to work in traditional solo or group practice office-based settings, which involve full or partial ownership of the practice. As a result, male physicians are more apt to receive fee-for-service reimbursements and share in the income of group practices than female physicians. Women physicians also have a higher percentage of patients who are African-American, Hispanic, covered by Medicaid, or entirely without insurance coverage.

The 5 percent sample of the decennial Census of Population provides the second source of physician data used in this paper. The advantage of the 1980 and 1990 censuses is that these cover a longer period and thus capture larger changes in managed care penetration. In addition, the census data includes individuals of all ages so it is possible to test whether managed care has had a similar impact on all physicians, not just young physicians. More importantly, the Census contains information on individuals in other professional occupations, yielding placebo groups that can be used to control for factors associated with high-growth managed care states that may affect the incomes of all professional women. One disadvantage of the Census is that it imposes top-coding on reported earnings, artificially reducing the income near the top of the distribution which is disproportionately composed of men.[9] Also, the Census does not contain information on specialty or practice setting, characteristics which explain much of the earnings gap between male and female physicians.

[9] See the data appendix for details on the proportion of the sample that is affected by top-coding.

V. Analyzing the Impact of Managed Care on Physician Earnings and the Gender Gap

Table 4 reports the raw differences-in-differences (DD) results using the Young Physicians Survey.[10] I examine three outcome measures: the gender gap in annual earnings, hourly earnings, and hours worked per week. The YPS survey asked physicians to report net income from their medical practices including "all income from fees, salaries, retainers, bonuses, and other forms of compensation, after expenses but before taxes." Contributions to profit sharing or other deferred compensation plans were excluded. Hourly earnings were calculated by dividing annual earnings by the number of weeks worked per year and the number of hours worked per week.

The raw estimates in Table 4 show that between 1986 and 1990 the gender earnings gap among physicians narrowed more in high-growth versus low-growth managed care states, with almost all of the gains driven by an improvement in hourly earnings. The differences over time in column (2) show that female physicians in low-growth managed care states saw their hourly earnings rise by only 3.8 log points (3.9 percent) between 1986 and 1990, compared with a gain of 17.9 log points (19.5 percent) percent for female physicians in high-growth states, resulting in a positive second difference of 14.1 log points (15.6 percent). In contrast, the hourly earnings of male physicians followed similar trends in both low-growth and high-growth states—increasing by 9.4 and 10.5 log points respectively (about 10 to 11 percent). Taking the triple difference between men and women shows those women physicians in states with high managed care growth saw their relative hourly earnings improve by 13 log points (13.8 percent) compared with women physicians in states with low managed care growth. Column (3) of Table 4 shows that

[10] It should be noted that the set of states with managed care growth greater than the national average is slightly different for the period between 1986 and 1990. These states include Arizona, California, Colorado, Connecticut, Delaware, Hawaii, Iowa, Maryland, Massachusetts, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, Washington, and Wisconsin.

the improvement in the gender gap in hourly earnings was offset slightly by an increase in the gap in hours worked per week, although the change is not statistically significant. Figure 3 shows a basic scatter plot of changes in the gender gap in hourly earnings versus changes in HMO market penetration. Dropping the outlying states from the regression reduces the magnitude of the coefficient slightly, but does not qualitatively change the results.[11]

To account for relative improvements in the earnings of female physicians that can be attributed to improvements in observable characteristics, I translate the difference-in-difference-in-difference estimates in Table 4 into a regression framework:

$$ln\ W_{ijt} = \beta_0 + \beta_1 X_{ijt} + \beta_2 \tau_t + \beta_3 \delta_j + \beta_4 FEMALE_i + \beta_5 (\tau_t \bullet \delta_j) + \beta_6 (\tau_t \bullet FEMALE_i)$$

$$+ \beta_7 (\delta_j \bullet FEMALE_i) + \beta_8 (\tau_t \bullet HIGHMC_j \bullet FEMALE_i) + \varepsilon_{ijt}, \qquad (1)$$

where *i* indexes individuals, *j* indexes states, and *t* indexes years. The dependent variable, $ln\ W_{ijt}$ is log real earnings (or log hours) and *X* is a vector of observable characteristics. The variable τ_t equals 1 for 1990 and 0 otherwise, and δ_j represents a full set of state dummy variables. *HIGHMC* is a dummy variable that equals 1 for high managed care growth states (and 0 otherwise) and *FEMALE* is a dummy variable equaling 1 for female physicians. A stochastic error term is represented by ε_{ijt}.

In equation (1), the time and state fixed effects control for the time series changes in wages and the time-invariant characteristics of the states, respectively. The female dummy controls for the time-invariant characteristics of female physicians. The second-level interactions control for changes over time in each state, changes over time for all female physicians, and the time-invariant characteristics of female physicians in each state. The triple

[11] For example, dropping Minnesota (MN), South Carolina (SC), North Dakota (ND), and Montana (MT)—individually or altogether—changes neither the magnitude nor the significance of the main results in any qualitative way.

interaction term captures the variation in wages specific to female physicians (relative to males), in high-managed care states (relative to low), in 1990 (relative to 1986).[12]

Table 5 reports the coefficient on the triple interaction term from equation (1) for various specifications that include different sets of controls. Column (1) includes only the basic demographic and professional controls which include age, experience and its square, race, ethnicity, board certification, marital status, and children. The experience and family-related variables are also interacted with the female dummy to account for the different returns that men and women with family responsibilities receive in the labor force (Sasser 2005).[13] Controlling for these observable characteristics reduces the magnitude of the impact of managed care on the gender earnings gap but does not diminish the significance of the result.

Columns (2) and (3) add controls for medical specialty and practice setting respectively, which are important factors in explaining the gender gap among physicians. The growth of managed care continues to have a sizeable impact on the relative incomes and earnings of male and female physicians despite the addition of these controls. Column (4) shows that when all the controls are included, moving from a low-growth managed care state to a high-growth managed care state reduces the hourly earnings gap between male and female physicians by 0.10 log points (10.5 percent). This improvement reduces the initial overall gap in hourly earnings among physicians in 1986 by about two-thirds.[14] In terms of annual net income, managed care

[12] Note that by including time and state fixed effects, I am controlling for changes in economic and health system conditions at the state level. Although it would be useful to control for market conditions at the county or MSA level, such detailed geographic identifiers are not publicly available for the 1986 survey.

[13] Interactions for other covariates were not included since separately estimated wage regressions for males and females with only the basic covariates (not the DDD interactions) showed that the coefficients on most of the variables were not statistically different across the two groups, with the exception of the experience and family-related variables.

[14] Note that the initial overall gap in hourly earnings among physicians in 1986 is –0.148 log points as reported in the top row of Table 4.

improves the relative incomes of women physicians by 7.1 log points (7.3 percent), reducing the initial overall gender gap in annual earnings among physicians by about one-fifth.[15]

As mentioned earlier, one can also use the growth in HMO enrollments as a percentage of population as a continuous variable by replacing the dummy variable in equation (1) with the actual change:

$$\ln W_{ijt} = \beta_0 + \beta_1 X_{ijt} + \beta_2 \tau_t + \beta_3 \delta_j + \beta_4 FEMALE_i + \beta_5 (\tau_t \bullet \delta_j) + \beta_6 (\tau_t \bullet FEMALE_i)$$

$$+ \beta_7 (\delta_j \bullet FEMALE_i) + \beta_8 (\tau_t \bullet HMO_j \bullet FEMALE_i) + \varepsilon_{ijt} . \quad (2)$$

Table 6 reports both the dummy variable and the continuous estimates of the impact of managed care on the hourly earnings gap for various specifications. In order to compare the coefficients from the two approaches, the coefficients using the continuous variable measures are evaluated for the average difference in HMO growth between the high-growth and the low-growth states. Comparing these estimates to the dummy variable estimates from the previous specification shows that the results are strong and similar. Controlling for demographic and professional characteristics as well as for specialty and practice setting, the continuous variable results show that the relative earnings of women physicians in states with high managed care growth improved by 9.6 percent compared with the relative earnings of women physicians in states with low managed care growth.[16]

Nevertheless managed care penetration and physician incomes may be simultaneously determined. If forward-looking HMOs consider current and expected future health care expenditures when deciding whether to enter or expand operations in a market, then HMOs may choose to locate in high expenditure areas only if they can provide highly cost-effective care.

[15] Note that the initial overall gap in hourly earnings among physicians in 1986 is –0.312 log points as reported in the top row of Table 4.

[16] The continuous variable results for annual earnings and hours worked per week are also similar to those reported using the dummy variable methodology.

Alternatively, the demand for HMOs by purchasers of health care coverage may be higher in high expenditure areas given that HMOs are generally viewed as an effective cost containment measure. To account for these possibilities, previous studies employed a two-stage least squares approach using instruments for HMO market share such as the average number of employees per firm who are likely to purchase coverage for their workers and the degree of concentration in hospital markets (Baker 1994; Dranove, Simon, and White. 1998; Simon, Dranove, and White 1998; Mitchell and Hadley 1999). The rationale behind using employer characteristics to instrument for HMO growth is that larger firms are likely to be better informed about different insurance options and able to use their purchasing clout to offer a wide range of health plan options to their employees (Baker 1994). Likewise, there is also evidence that managed care organizations foster competition between providers to secure lower prices (Dranove, Satterthwaite, and Sinclair 1986), but that this competition proves less effective in areas where payers have fewer hospitals to choose from (Melnick et al. 1992).

To instrument for changes in HMO penetration between 1986 and 1990, I include the 1986 level of the average number of employees per firm and a Herfindahl index measuring the degree of concentration in each state's hospital market in 1985.[17] Comparing the instrumental variables estimates to the previous continuous variable estimates, Table 6 shows that the two sets of estimates are quite similar. When all the controls are included in the regression, managed care reduces the differential in hourly earnings between male and female physicians by 9.8 percent. However, it is still possible that the gender wage gap for all professionals evolves differently in states with larger firms or more concentrated markets. This issue is further explored in the next section.

[17] For more information on the source and construction of these variables please see the data appendix. An F test rejects the hypothesis that the coefficients of both variables are jointly equal to zero.

VI. Robustness Check: Comparing the Experiences of Physicians to Other Professionals

Could the impact of managed care on the relative earnings of female physicians simply reflect other factors associated with states that improved the earnings of all professional women? Indeed, an extensive literature has demonstrated a similar narrowing of the gender wage gap among college-educated workers in the United States during the 1980s (Mincer and Polachek 1974; Gunderson 1989; Goldin 1990; Blau 1998). In particular, past research has shown that changes in unobservable characteristics among women contributed to narrowing the "unexplained" portion of the gender wage gap among all college-educated U.S. women during the 1980s (Blau and Kahn 1997). Such unobserved characteristics might include a stronger career commitment and improvements in the ability or underlying productivity of women relative to men. If these changes in the unobservable characteristics of professional women are somehow correlated with the spread of managed care to certain states, then the previous estimates of the impact of managed care on the gender earnings gap among physicians would be upwardly biased.

To account for this possibility, I use a placebo group within each state to control for factors associated with states with high managed care growth that might lead to improvements in the relative earnings of all professional women. Specifically, I compare the differential change in the gender earnings gap between high and low growth states of the treatment group (physicians) to that of various control groups such as other professionals in traditionally male-dominated occupations like lawyers or all professionals with advanced degrees.

To obtain comparable information on the earnings of physicians and other professional women I use the 5 percent samples of the 1980, 1990, and 2000 Census. In each year, the samples are restricted to full-time workers 35 to 54 years of age with advanced degrees working

in managerial and professional occupations (as defined by the Census).[18] Annual earnings were calculated as the sum of both wage and salary and business income, where top-coded values were adjusted by multiplying the top-coded value of each source of income by 1.5.[19] Hourly earnings were calculated by dividing annual earnings by weeks worked during the previous year and hours worked last week.

Table 7 reports the differences-in-differences estimates for the hourly earnings of physicians, lawyers, and other professionals with advanced degrees (excluding physicians) for the 1980–1990, 1990–2000, and 1980–2000 periods. Controlling for basic demographic characteristics, women physicians in states with high managed care growth saw their relative incomes improve by 16.4 log points (17.8 percent) between 1980 and 2000, compared to women physicians in states with low managed care growth.[20] This difference was largely due to a narrowing of the gender gap in the high managed care states during the 1980–1990 period, when managed care was growing rapidly in some parts of the United States. Note that these estimates are larger than those generated from using the Young Physicians Survey. This is partly due to the fact that the data cover a longer observation period during which larger increases in HMO penetration occurred. In addition, the Census does not contain detailed information on physician specialties and practice settings, factors that are important in explaining the gender wage gap among physicians.[21]

[18] The age restriction is imposed to eliminate individuals who are still in residency training as well as individuals who are partially retired. An advanced degree holder is defined as having 18 or more years of education in the 1980 Census or having earned a master's, doctorate, or other professional degree in the 1990 or 2000 Census.

[19] All results presented here were also estimated without the topcode adjustment as well as using median regression. In no case did this qualitatively change any of the findings. See the data appendix for further details on top-coding.

[20] Significant results have also been obtained by pooling five year intervals of the Current Population Survey for 1978 through 1982 and 1988 through 1992.

[21] Demographic controls contained in the Census include a quartic in experience, race, ethnicity, urbanicity, and marital and parental status.

Performing the same experiment for a similar sample of lawyers or professionals with advanced degrees shows that the growth of managed care has had no effect on the improvement in the gender earnings gap for either group. Taking the difference between physicians and either group, one finds that managed care continues to have a large and positive effect on the gender earnings gap among physicians. These results suggest that the spread of managed care has been a factor in the relative improvements in hourly earnings of women physicians *aside* from other forces that affected all professional women.

VII. Potential Explanations for the Impact of Managed Care on the Gender Earnings Gap

A. Changes in the Overall Distribution of Physician Earnings

Managed care organizations have an immediate impact on the incomes of physicians who contract with them and thus may affect the relative position of women within the distribution of physician earnings. Reimbursement practices such as capitation (fixed fee per enrollee) or discounted fee-for-service arrangements place greater constraints on the fees physicians can charge compared with traditional fee-for-service arrangements. For example, Baker (1994) finds that in areas with greater HMO market penetration, physicians charge lower fees for a routine office visit with an established patient. Compensation may also be linked to the physician's pattern of clinical decision making and/or resource utilization, effectively limiting the ability of physicians to provide care beyond what is considered "medically necessary."

Thus, assuming that some physicians were able to earn rents in the past, managed care may have limited the hourly earnings of high-rent (high-fee) physicians, a disproportionate fraction of whom would have been men. A similar phenomenon has been shown to exist in the banking industry. Black and Strahan (2001) find evidence suggesting that increased competition from deregulation reduced the ability of firms to allocate rents disproportionately to males. In addition, the greater homogeneity of services provided by physicians would also be expected to

lower the price dispersion (fees) among physicians. This implies that as managed care penetration increases, one should observe a decline in the gender gap in hourly earnings as well as a reduction in the dispersion of hourly earnings among male physicians.

To determine what proportion of the change in the gender earnings gap among physicians can be attributed to gender-specific factors, such as improvements in labor market qualifications or reduced discrimination, versus changes in the overall distribution of physician earnings, I decompose the gap using a technique pioneered by Juhn, Murphy, and Pierce (1991). To begin, consider separate male and female wage equations for workers *m* and *f* respectively and year *t* can be written as:

$$Y_{mt} = X_{mt}B_t + \varepsilon_{mt} \quad (3a)$$

$$Y_{ft} = X_{ft}B_t + \varepsilon_{ft} \quad (3b)$$

where Y represents log earnings, X is a vector of explanatory variables, B is a vector of coefficients, and ε_{it} is a stochastic error term. The male-female log earnings gap for year t is then:

$$D_t = Y_{mt} - Y_{ft} = \Delta X_t B_t + \Delta \varepsilon_t , \quad (4)$$

where the *m* and *f* subscripts refer to male and female averages, respectively, and a Δ prefix signifies the average male-female difference for the variable immediately following. Alternatively, it is possible to rewrite this formulation based only on a male wage equation, which allows one to decompose the difference in the gender pay gap into a portion due to gender specific factors and a portion due to changes in the overall level of wage inequality. Using the male wage equation in effect simulates what the wage equation in a nondiscriminatory labor

market would look like. [22] Following the notation of Juhn, Murphy, and Pierce (1991), the male-female log earnings gap for year t is then:

$$D_t = Y_{mt} - Y_{ft} = \Delta X_t B_t + \Delta \theta_t \sigma_t , \quad (5)$$

where θ_{it} is a standardized residual with mean zero and variance one in each year, and σ_t is the residual standard deviation of male earnings for that year which represents the level of male residual earnings inequality. Note that this technique assumes that the estimated male-denominated prices of both measured and unmeasured characteristics will affect men and women similarly.[23]

The difference in the gender earnings gap between years 0 and 1 can then be decomposed as:

$$D_1 - D_0 = (\Delta X_1 - \Delta X_0)B_1 + \Delta X_0(B_1 - B_0) + \Delta\theta_0(\sigma_1 - \sigma_0) + (\Delta\theta_1 - \Delta\theta_0)\sigma_1. \quad (6)$$

The first term in equation (6) reflects the contribution of changing male-female differences in physicians' observed labor market qualifications such as experience, board certification, medical specialty, and practice setting. Given the rather short four-year time horizon separating the 1997 and 1991 YPS, this factor is expected to account for only a small part of the improvement in the earnings gap. The second term reflects the impact of changing prices for these observed labor market qualifications on males. For example, given that women physicians are less likely to be self-employed, a decrease in the male return to self-employment would weight the female self-employment deficit less heavily. The third term measures the contribution to the change in the gap that would result if the percentile rankings of the female residuals had remained the same and only the extent of the male residual earnings inequality had changed. The last term measures

[22] Note that instead it is also possible to use the female wage equation as the starting point, as discussed in Blau and Kahn (1997) who first applied the technique to decomposing the gender gap.

[23] Suen (1997) has criticized this technique as misleading in its interpretation of the decomposition of the wage residuals into a portion reflecting the prices versus the quantities of unmeasured skills for low-wage groups such as women. However, Blau and Khan (2003) implement a more direct test of these relationships and find empirical evidence to support their earlier findings using the Juhn, Murphy, and Pierce decomposition.

the effect of changing differences in the relative wage positions of men and women after controlling for observable characteristics. It represents the contribution to the change in the gender gap that would result if the level of residual male wage inequality had remained the same and only the percentile rankings of the female earnings residuals had changed.

Table 8 shows the above decomposition of the *change* in the hourly earnings gap among physicians between 1986 and 1990. The top half of the table shows some basic descriptive statistics indicating the change over time in the unexplained portion of the male and female earnings distributions for both the low and high growth states, represented by the residual standard deviation from separate male and female wage regressions. The first two rows indicate that the male residual standard deviation of earnings fell by roughly 0.03 log points in the high-growth states but increased by approximately 0.04 log points in the low-growth states. In contrast, the next two rows show that the female residual standard deviation was relatively stable for both high and low growth states. This suggests that managed care may have compressed the earnings distribution of physicians in the upper tail (e.g. the males).

Moreover, the top half of Table 8 also indicates that the relative position of women within the male earnings distribution in the high growth states changed. This is indicated in rows four through eight which show the mean female residual from the male wage regression and the corresponding percentile within the male distribution. The mean female residual from the male earnings equation increased by 0.08 log points for women in the high growth states but was virtually unchanged in the low growth states.[24] This corresponds to women in the high growth states moving from roughly the 47th percentile to the 50th percentile of the male earnings

[24] This residual is the conventional measure of discrimination, although it may also include omitted productivity differences between women and men not accounted for by other explanatory variables.

distribution. In contrast, the percentile ranking of women in the low growth states was virtually unchanged over time.

The lower half of Table 8 decomposes the change in the gender earnings gap into the change in observed characteristics $(\Delta X_1 - \Delta X_0)B_1$, the change in the observed prices of those characteristics $(\Delta X_0(B_1 - B_0)$, the change in the dispersion of the wage distribution (holding constant the relative positions of men and women within the distribution) $(\Delta\theta_0(\sigma_1 - \sigma_0)$, and the change in the relative positions of men and women within the distribution (holding constant the level of male residual inequality) $(\Delta\theta_1 - \Delta\theta_0)\,\sigma_1$. The results show that in the high growth states, very little of the change in the gender earnings gap was due to changes in the observed physician characteristics or the observed prices accruing to those characteristics. Although women physicians in these states showed relative improvements in their professional characteristics in terms of practice setting, this gain was more than offset by a worsening in terms of specialty field. The observed prices effect shows the opposite result. While the male return to specialty decreased slightly, the male return to practice setting increased considerably, offsetting more than half of the gain in relative earnings due to the improvements in women's labor market characteristics.

What about the other two terms? Recall that the top half of Table 8 shows that in 1986 women physicians in the high growth states were comparable to men at about the 47th percentile of the male residual earnings distribution. Had each female physician remained at her 1986 percentile in the male earnings distribution, the male-female differential would have decreased by about 0.02 log points. However, women physicians practicing in the high growth states in fact moved up to about the 50th percentile in the male residual earnings distribution. Holding the level of male residual earnings inequality constant, this upward movement reduced the gender earnings gap by about 0.053 log points. Adding the wage structure components (the

change in observed prices of characteristics and the change in the dispersion of the distribution), one finds that the wage structure components accounted for about one-third of the improvement in the gender earnings gap among physicians in the high-growth managed care states. The remaining two-thirds of the improvement is attributed to gender-specific factors, the change in observed physician characteristics, and the relative position of women within the distribution, that moved women up within the male earnings distribution.

In contrast, gender-specific factors accounted for a little less than half of the widening of the gender earnings gap in the low-growth states, with wage structure components accounting for the remainder. Nearly all of the gender-specific portion of the gap was due to changes in observable characteristics as women physicians in these states shifted into lower-paying specialties relative to men. Very little of the change was due to women physicians moving lower within the male earnings distribution. Likewise, most of the wage structure portion was due to increases in the returns to specialty field and practice setting, variables that placed greater weight on the observable characteristics where women were at a disadvantage relative to men. Less than 10 percent of the change was due to a general widening of the earnings distribution for male physicians.

B. Changes in the Demand for Physicians by Specialty and Practice Setting

Since managed care plans impose restrictions on the coverage of certain services and on the ability to gain access to specialty care, these organizations encourage their patients to consume a different bundle of services than what had been consumed by traditional indemnity-insured patients. In particular, managed care emphasizes the use of preventive care services and discourages the use of specialty care and high-cost diagnostic tests, thus increasing the relative demand for primary care physicians such as family practitioners, general internists, and

pediatricians. Managed care practices such as gatekeeping also ration patient access to specialists and increase the scope of care covered by primary care physicians.

Given that a high fraction of female physicians are in primary care specialties, this increase in the demand for primary care physicians associated with the spread of managed care may have narrowed the earnings gap between male and female physicians. According to the AMA, the fraction of primary care physicians that are women increased from 13.2 percent in 1980 to 22.0 percent in 1990. In addition, the incomes of primary care physicians rose more rapidly in states with high managed care growth while the incomes of specialists and hospital-based physicians were either unaffected or grew more slowly in such states (Simon, Dranove, and White 1998).

Similarly, the spread of managed care could also narrow the earnings gap between male and female physicians simply because a higher fraction of female physicians work in salaried settings as employees, a practice setting that is attractive under managed care. This is because managed care organizations transfer some or all of the risk for the cost of care to physicians by discounting and capitating the amount of fees that are reimbursed. Thus, self-employment, a practice arrangement favored by male physicians, has become less profitable than in the past. Indeed, the net income of self-employed solo practitioners is now roughly equivalent to that of employee physicians, reducing the financial incentives to set up one's own practice (Gonzalez 1998). Not coincidentally, AMA survey data show that the share of physicians who are self-employed dropped from 72 percent in 1988 to 58 percent in 1996.

To account for these compositional effects on the impact of managed care on the gender earnings gap, additional terms are added to the earlier dummy variable regressions from equation (1). What has been added to each regression is the impact that managed care may have on the different groups that are expected to benefit from managed care practices, such as primary care

physicians and physicians in employee settings, a high fraction of whom are women. For example, in terms of equation (1) from above, the regression equation which takes into account the impact of managed care on primary care physicians (PCP) is:

$$\begin{aligned} ln\ W_{ijt} = {} & \beta_0 + \beta_1 X_{ijt} + \beta_2 \tau_t + \beta_3 \delta_j + \beta_4 FEMALE_i + \beta_5 (\tau_t \bullet \delta_j) + \beta_6 (\tau_t \bullet FEMALE_i) \\ & + \beta_7 (\delta_j \bullet FEMALE_i) + \beta_8 (\tau_t \bullet HIGHMC_j \bullet FEMALE_i) + \beta_9 PCP_i + \beta_{10} (\tau_t \bullet PCP_i) \\ & + \beta_{11} (HIGHMC_j \bullet PCP_i) + \beta_{12} (\tau_t \bullet HIGHMC_j \bullet PCP_i) + \varepsilon_{ijt} . \end{aligned} \quad (7)$$

Yet it could be the case that women physicians are more likely to work within particular segments of these two broad categories for which demand is growing more rapidly under managed care. This would suggest that performing more detailed interactions of these specialties and settings could reduce the differential impact of managed care on female physicians. The last column of results in Table 9 controls for the impact of managed care separately on each primary care specialty (e.g. family/group practitioner, pediatrician, and general internist). The results show that managed care has a positive (although not statistically significant) effect on the hourly earnings of both pediatricians and general internists. Yet despite the addition of these detailed controls, managed care continues to have a large and positive effect on the hourly earnings of female physicians, although the coefficient is reduced in both magnitude and significance.[25]

In contrast, the last column of Table 9 also indicates that managed care has a strong and negative effect on the hourly earnings of employee physicians, especially those working in group practices. This may be the result of an increase in the supply of employee physicians as fewer new physicians are placed on the partnership track (Kostreski 1996). However, the impact is not

[25] Consistent with the findings of Simon et al. (1998), limiting the sample to only primary care physicians (PCPs) shows that the impact of managed care on the relative earnings of women is stronger *within* this group. This is not surprising given that PCPs, compared to specialists, receive a greater percentage of their revenue from managed care and are more likely to derive at least some revenue from capitation (Strunk and Reschovsky 2002). Thus the compression effects of managed care are likely to be greater on the distribution of earnings for primary care physicians.

statistically significant as the sample is being divided into smaller and smaller cells. More importantly, controlling for the negative effects of managed care on employee physicians does not diminish the positive effect that managed care has on the earnings of female physicians.

Finally, changes in managed care penetration may also have affected the location decisions of physicians, especially young physicians who are still establishing their practices, thereby altering the characteristics of physicians by geographical area. Indeed, a study of young physicians during their first five years of practice found that between 1989 and 1994 new primary care physicians were significantly more likely to locate in market areas with high rather than low HMO penetration relative to specialists (Escarce et al. 1998). However, that does not appear to be the case for this sample of young physicians. Between 1986 and 1990, the YPS shows that high and low managed care states experienced similar increases in the proportion of physicians who chose primary care specialties. Moreover, of the individuals in 1986 who were re-interviewed in 1990, only 9 percent of the men and 8 percent of the women had migrated between states. More importantly, less than 5 percent of either sex had moved from a state with low managed care growth to a state with high managed care growth or vice versa during the intervening four years.

C. Reduction in Discriminatory Preferences

Persistent discrimination against women physicians has been well-documented by the medical literature and has been shown to affect hiring practices, admission to residency programs, and patient preferences (Tesch et al. 1995; Lenhart et al. 1991; Shiffman and Frank 1995). It is possible that managed care may have limited the ability of employers, colleagues, and consumers to discriminate against women physicians. Changes in market power in areas where managed care grew rapidly may shrink the pool of rents within the health care industry, forcing employers to eliminate discriminatory hiring and wage setting practices in order to

remain viable in the market. Evidence of this link between competition and discrimination has been explored by Black and Brainerd (2004). They find that the residual gender wage gap narrowed more rapidly in concentrated versus competitive manufacturing industries experiencing similar trade shocks. This is because concentrated industries faced little competitive pressure initially such that trade benefitted women in those industries more by reducing the ability of firms to discriminate.

Managed care also restricts consumer choice by requiring enrollees to select physicians within the network who are still taking new patients. Likewise, physicians contracting with managed care organizations are required to refer managed care patients to other physicians within the network subject to availability. Thus managed care practices may have reduced discriminatory wage differentials arising from unfair employment practices, "old boy" referral networks, or outdated social norms governing consumer preferences.

To test some of these possibilities, Table 10 reports the coefficient on the triple interaction term from equation (1) for various groups of physicians depending on their medical specialty and practice setting.[26] The top portion of the table tests the impact of managed care on consumer discrimination by comparing the coefficients for various specialty groups. In the past, female physicians may have been encouraged to specialize in fields, such as pediatrics, that "are believed to call for qualities commonly attributed to women" (Ducker 1978). There is also evidence that female patients prefer to be treated by female physicians, and that these preferences are particularly apparent in certain specialties such as obstetrics/gynecology (Chandler, and Dabbs 2000; Thorne 1994; Weyrauch, Boiko, and Alvin 1990). Conversely, popular perceptions of gender stereotypes suggest that patients may prefer surgeons and medical

[26] The basic specification controls for the demographic and professional characteristics described earlier while the full specification also controls for specialty and practice setting within the groups being studied.

subspecialists, such as cardiologists, to be male. One could also imagine that there would be little ability to exert preferences either way for specialties such as pathology, radiology, and emergency medicine.[27] Given these types of prejudicial preferences, one would expect that if managed care reduced the ability of consumers to discriminate based on outmoded norms, then the improvement in the gender earnings gap should be greatest among women physicians specializing in those fields where there was a pre-existing preference for male physicians. The results show that this is not the case. In fact the opposite is true—the gap narrowed more among physicians in specialties where there was believed to be a pre-existing preference for female practitioners.

The lower portion of Table 10 tests the impact of managed care on employer discrimination by comparing the coefficients for various practice settings. Physicians who are solo practitioners obviously face no employer discrimination. Similarly, physicians who are part-owners in a group practice should face little discrimination from their partners if there are no significant barriers to leaving the group and starting a solo practice. Thus one would expect that if managed care makes it more costly for employers to discriminate, then the improvement in the gender earnings gap should be greatest among physicians who are employed by HMOs, hospitals, government, and group practices. Yet the hourly earnings results show that the gender gap narrowed more for self-employed physicians in group practices than for employee physicians.

Nonetheless, these results are rather weak tests for detecting a possible reduction in discriminatory practices against women physicians that might be traced to the growth of managed care organizations. Few of the coefficients in the table are statistically significant

[27] In the case of pathology, the patient is already deceased and unable to express their preferences. In the case of emergency medicine, constraints on the availability of physicians and the need for urgent treatment might restrict the ability to act on one's discriminatory preferences.

because of the relatively small number of physicians within specialty and practice setting groups. Moreover, it is still possible that male physicians may discriminate against their female colleagues by choosing to refer patients to male rather than female physicians. Fortunately, because the YPS contains a minority oversample, it is possible to perform the same experiment on African-American and Hispanic physicians, another group traditionally discriminated against. Limiting the sample to male physicians, I find that managed care has no statistically or economically significant effect on the relative earnings of minority physicians. Given these results it would appear that managed care does not affect the gender gap through the reduction of discriminatory preferences and practices.

VIII. Conclusion

The evidence presented in this paper argues that the growth of managed care has had a sizeable impact on the gender earnings gap among physicians. Using the cross-state variation in the percentage of the U.S. population enrolled in HMOs, I employ a differences-in-differences methodology to compare changes in the gender gap for physicians in states with high managed care growth to changes in the gender gap for physicians in states with low managed care growth. When controlling for demographic and professional characteristics as well as specialty and practice setting, regression estimates show that managed care reduces the differential in hourly earnings between male and female physicians by 10 percentage points. The effect reduces the initial overall gender gap in hourly earnings by two-thirds and narrows the gap in annual earnings by about one-fifth.

Moreover, these results do not simply reflect other factors associated with states which experienced rapid growth in HMO enrollments that would lead to improvements in the relative earnings of all professional women. Performing the same differences-in-differences analysis for lawyers or other professionals with advanced degrees demonstrates that the gender earnings gap

for these groups did *not* narrow more rapidly in states with high managed care growth. Taking the triple difference between physicians and either group shows that managed care continues to have a positive and significant effect on the relative earnings of female physicians. Furthermore, time series evidence shows that while the improvement in the gender gap among all college-educated workers has stalled since the early 1990s, the gender gap among physicians has continued to narrow as HMO enrollments have continued to rise.

Further analysis shows that managed care appears to affect the relative earnings of male and female physicians by compressing the overall distribution of physician earnings. Female physicians in the high-growth managed care states moved up in the male residual earnings distribution while the earnings of female physicians fell in low-growth managed care states. Decomposing the gender earnings gap shows that changes in the wage structure can account for about one-third of the improvement in the gender earnings gap among physicians in the high-growth managed care states. The remaining two-thirds are attributed to gender-specific factors which moved women up in the male earnings distribution. These gender-specific factors are partly related to the impact of managed care on the relative demand for different specialty fields and practice settings. Including detailed interactions for primary care specialties reveals that managed care has a separate positive effect on the earnings of pediatricians and general internists.

The limited evidence presented here also suggests that managed care does not appear to affect the gender earnings gap among physicians through changes in the relative productivity of men and women physicians. Although in the past female physicians saw fewer patients per hour on average than their male colleagues, this difference does not appear to apply to this sample of young physicians. Without additional information on the clinical practices of male versus female

physicians it is unclear whether managed care affects the gender earnings gap among physicians through changes in how medicine is practiced.

Finally, although there is considerable evidence that women physicians continue to face some level of discrimination in the labor market, it does not appear that managed care improves their relative earnings by reducing discriminatory forces in this market. The gender gap in hourly earnings narrowed more among self-employed versus employee physicians. Moreover, limiting the sample to male physicians who are African-American, Latin American, or Hispanic, I find that managed care has no statistically or economically significant effect on the relative earnings of minority physicians.

In summary, the evidence presented in this paper clearly demonstrates that the spread of managed care, aside from other forces affecting all professional women, has been a significant factor in improving the relative earnings of women physicians. More broadly, these results suggest that market changes can have important consequences for the gender earnings gap when there are large pre-existing differences between men and women within a profession.

References

American Association of Health Plans. 1995. *HMO & PPO Trends Report.* Washington, DC: AAHP, 1997.

American Medical Association. 1970. *Distribution of Physicians in the United States.*

American Medical Association. 1981, 1992, 1997. *Physician Characteristics and Distribution in the United States.*

American Medical Association. 1990, 1996. *Physician Marketplace Statistics.*

Area Resource File (ARF). 1985. US Department of Health and Human Services, Health Resources and Services Administration, Bureau of Health Professions, Rockville, MD.

Baker, Laurence. 1994. "Does Competition from HMOs Affect Fee-For-Service Physicians?" Working Paper No. #4920. Cambridge, MA: National Bureau of Economic Research.

Baker, Laurence. 1996. "Differences in Earnings Between Male and Female Physicians." *New England Journal of Medicine* 33(4): 960–964.

Baker, Laurence, and Martin Brown. 1999. "The Effect of Managed Care on Health Care Providers." *RAND Journal of Economics* 30(2): 351–374.

Black, Sandra, and Philip Strahan. 2001. "The Division of Spoils: Rent-sharing and Discrimination in a Regulated Industry." *The American Economic Review* 91(4): 814–831.

Black, Sandra, and Elizabeth Brainerd. 2004. "Importing Equality? The Impact of Globalization on Gender Discrimination." *Industrial and Labor Relations Review* 57(4): 540–559.

Blau, Francine D. 1998. "Trends in the Well-Being of American Women, 1970–1995." *Journal of Economic Literature* 36(1): 112–165.

Blau, Francine D., and Lawrence M. Kahn. 1997. "Swimming Upstream: Trends in the Gender Wage Differential in the 1980s." *Journal of Labor Economics* 15(1, Part 1): 1–42.

Blau, Francine D., and Lawrence M. Kahn. 2003. "Understanding International Differences in the Gender Pay Gap." *Journal of Labor Economics* 21(1): 106–144.

Chandler, Peter J., Carol Chandler, and Marci L. Dobbs. 2000. "Provider Gender Preference in Obstetrics and Gynecology: A Military Population." *Military Medicine* 165(12): 938–940.

Current Population Survey. Washington, DC: U.S. Bureau of the Census.

Collins, Karen Scott, Cathy Schoen, and David R. Sandman. 1997. *The Commonwealth Fund Survey of Physician Experiences with Managed Care.* New York: The Commonwealth Fund.

Cutler, David M., and Richard J. Zeckhauser. 1999. "The Anatomy of Health Insurance." Working Paper No. #7176. Cambridge, MA: National Bureau of Economic Research.

Dranove, David, Carol J. Simon, and William D. White. 1998. "Determinants of Managed Care Penetration." *Journal of Health Economics* 17(6): 729–745.

Dranove, David, Mark Satterthwaite, and Jody Sindelar. 1986. "The Effect of Injecting Price Competition into the Hospital Market: The Case of Preferred Provider Organizations." *Inquiry* 23(4): 419–431.

Ducker, D.G. 1978. "Believed Suitability of Medical Specialties for Women Physicians." *Journal of the American Medical Women's Association* 33(1): 25, 29-30, 32.

Escarce, José, Daniel Polsky, Gregory D. Wozniak, Mark V. Pauly, and Phillip Kletke. 1998. "Health Maintenance Organization Penetration and the Practice Location Choices of New Physicians: A Study of Large Metropolitan Areas." *Medical Care* 36(11): 1555–1566.

Fuchs, Victor R. 1978. "The Supply of Surgeons and the Demand for Operations." *Journal of*

Human Resources 13(supplement): 35–56.

Goldin, Claudia. 1990. *Understanding the Gender Gap*: *An Economic History of American Women.* New York: Oxford University Press.

Goldin, Claudia. 2006. "The Quiet Revolution That Transformed Women's Employment, Education, and Family." *AEA Papers and Proceedings:* 1–21.

Goldin, Claudia and Lawrence F. Katz. 2002. "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions." *Journal of Political Economy* 110(4): 730–770.

Gonzalez, Martin ed.. 1998. "An Analysis of Physician Net Income: A Comparison of High and Low Earners." *Physician Marketplace Statistics 1997/98,* Chicago, Ill: American Medical Association, Center for Health Policy Research.

Gruber, Lynn R., Maureen Shadle, and Cynthia L. Polich. 1988. "From Movement to Industry: The Growth of HMOs." *Health Affairs* 7(3): 197–208.

Gunderson, Morley. 1989. "Male-Female Wage Differentials and Policy Responses," *Journal of Economic Literature* 27(1): 46–72.

Hadley, Jack. 1991. *Practice Patterns of Young Physicians, 1991* [United States]. ICPSR06145-V2.Ann Arbor, MI: Inter-University Consortium for Political and Social Research (distributor), 1998.

Historical National Population Estimates, July 1, 1900 to July 1, 1999. Washington, DC: U.S. Bureau of the Census.
Available at http://www.census.gov/population/estimates/nation/popclockest.txt.

Holoweiko, Mark. 1996. "Which Doctors Are Quitting Medicine?" *Medical Economics* 73(23):176–8, 181-191.

InterStudy. 1996. *The Competitive Edge, Part II: Industry Report,* 6.2, September.
.
Juhn, Chinhui, Kevin M. Murphy, and Brooks Pierce. 1991. "Accounting for the Slowdown in Black-White Wage Convergence." In *Workers and Their Wages: Changing Patterns in the United States*, ed. Marvin H. Kosters, pp. 107–143. Washington, DC: AEI Press.

Kehrer, Barbara. 1976. "Factors Affecting the Income of Men and Women Physicians: An Exploratory Analysis." *Journal of Human Resources* 11(4): 526–545.

Kostreski, Farrah. 1996. "More Physicians Being Offered Salaried Positions: Income Guarantees Declining." *Internal Medicine News*, August, p.46.

Kraus, Nancy, Michelle Porter and Patricia Ball. 1991. *Managed Care: A Decade in Review 1980–1990.* St. Paul, MN: InterStudy Publications.

Langwell, Kathryn M. 1982. "Factors Affecting the Income of Men and Women Physicians: Further Explorations." *Journal of Human Resources* 17(2): 261–275.

Lee, Jason S. 1997. "Managed Health Care: A Primer." CRS Report for Congress, Congressional Research Service. Washington, DC: The Library of Congress. Available at http://www.law.umaryland.edu/marshall/crsreports/crsdocuments/97-913_EPW.pdf.

Lenhart, Sharyn, Freida Klein, Patricia Falcao, Elizabeth Phelen and Kevin Smith. 1991. "Gender Bias Against and Sexual Harassment of AMWA Members in Massachusetts." *Journal of the American Medical Women's Association* 46(4): 121–125.

Melnick, Glenn A., Jack Zwanziger, Anil Bamezai, and Robert Pattison. 1992. "The Effects of Market Structure and Bargaining Position on Hospital Prices." *Journal of Health Economics* 11(3): 217–233.

Mincer, Jacob and Solomon Polachek. 1974. "Family Investments in Human Capital: Earnings of Women." *Journal of Political Economy* 82(2, Part 2): 76–108.

Mitchell, Jean M., and Jack Hadley. 1999. "Effects of Managed Care Market Penetration on Physicians' Labor Supply Decisions." *Quarterly Review of Economics and Finance* 39(4): 491–511.

Practice Patterns of Young Physicians,, 1987 [United States] [Computer File], 2nd ICPSR version. Chicago, Illinois: American Medical Association, Education and Research Foundation (producer), 1987. Ann Arbor, Michigan: Inter-University Consortium for Political and Social Research (distributor), 1998.

Practice Patterns of Young Physicians, 1991 [United States] [Computer File], ICPSR version. Washington, D.C.: Jack Hadley, Georgetown University Center for Health Policy Studies, (producer), 1993. Ann Arbor, Michigan: Inter-University Consortium for Political and Social Research (distributor), 1998.

Sasser, Alicia C. 2005. "Gender Differences in Physician Pay: Tradeoffs Between Career and Family." *Journal of Human Resources* 40(2): 477–504.

Shiffman, Melissa, and Erica Frank. 1995. "Harassment of Women Physicians." *Journal of the American Medical Women's Association* 50(6): 207–211.

Simon, Carol J., David Dranove and William D. White. 1998. "The Effect of Managed Care on the Incomes of Primary Care and Specialty Physicians." *Health Services Research* 33(3, Part 1): 549–569.

Strunk, Bradley C., and James D. Reschovsky. 2002. "Kinder and Gentler: Physicians and Managed Care, 1997–2001." Tracking Report No. 5. Washington, DC: Center for Studying Health System Change. Available at http://www.hschange.com/CONTENT/486/486.pdf.

Suen, Wing. 1997. “Decomposing Wage Residuals: Unmeasured Skill or Statistical Artifact?” *Journal of Labor Economics* 15(3): 555–566.

Tesch, Bonnie J., Helen M. Wood, Amy L. Helwig, and Ann Butler Nattinger. 1995. “Promotion of Women Physicians in Academic Medicine: Glass Ceiling or Sticky Floor?” *Journal of the American Medical Association* 273(13): 1022–1025.

Thorne, Susan. 1994. “Women Show Growing Preference for Treatment by Female Physicians.” *Canadian Medical Association Journal* 150(9): 1466–1467.

U.S. Bureau of the Census. *County Business Patterns*, 1987.

U.S. Bureau of the Census. *Current Population Survey*, various years.

U.S. Bureau of the Census. “Historical National Population Estimates, 1980-1990.”

Weyrauch, Karl F., Patricia E. Boiko, and Barbara Alvin. 1990. “Patient Sex Role and Preference for a Male or Female Physician.” *The Journal of Family Practice* 30(5): 559–562.

Data Appendix

A. Data on State Characteristics

1. HMO Market Penetration

HMO market share was computed as the ratio of total enrollees to total population in each state. Data on HMO enrollments by state came from published reports of an annual survey of HMOs conducted by InterStudy, a private managed care research firm. Data on total population by state was obtained from the U.S. Census Bureau web site (http:// www.census.gov).

2. Instruments for HMO Market Penetration

Data on the average number of employees per firm for 1986 was obtained from the County Business Patterns files.

Data on the number of hospital beds and the number of hospitals in each bed size category for 1985 were obtained from the 1998 Area Resource File. This data was used to construct a Herfindahl index measuring the degree of concentration in each state's hospital market in 1985. First, each hospital bed size category was assigned the mid-point of its size range. (For example, the 100-199 category was assigned 150 beds.) The total number of hospital beds in a county was then calculated by multiplying the number of hospitals in each bed size category by the mid-point of the appropriate size range. The market shares of similarly sized hospitals were calculated by dividing the mid-point of the size range by the total number of hospital beds. The county-level Herfindahl index is defined as the sum of the squared market shares:

$H_{ij} = E\, s_{ij}^2$ where s_{ij} = hospital *i*'s share of total beds in county *j*.

The state-level Herfindahl index was then calculated as a weighted average of the Herfindahl index in each county in the state where the weights are the proportion of the state population in each county.

B. Data on Physician Earnings and Characteristics

1. Young Physicians Survey – 1987 and 1991

The Young Physicians Survey was first conducted in 1987 using a random sample of physicians drawn from the AMA Physician Masterfile who were below the age of 40, had recently completed their graduate medical training (residency), and had been in uninterrupted practice for two to five years. The entire study sample consisted of a simple random sample of 9,000 physicians plus a minority oversample of about 2,000 African-American and Hispanic physicians. Multivariate logit analysis of the respondents showed that age, specialty, place of medical school graduation, and AMA membership were significant determinants of response. Based on this analysis, a two-step weighting procedure was designed to align these four characteristics of the respondent sample to that of the eligible population, and then to weight the random sample versus the minority sample so as to achieve the appropriate weighted proportion of minority respondents.

The YPS was also conducted in 1991 and was composed of a random sample of physicians from the 1987 sample who were reinterviewed in 1991, having 6-9 years of experience, as well as a new sample of young physicians under age 40 with at most five years of experience. Unlike the 1987 sample which consists of physicians under the age of 40 with 2-5 years of experience, the 1991 sample consists of physicians up to age 44 with 2-9 years of experience. In order to examine the impact of managed care on the labor market outcomes of new physicians, I restrict the analysis to include only the new sample of physicians in 1991. This ensures that the comparison over time being made is between two samples of similarly selected physicians.

In each year, the survey collected information on physicians' professional and practice characteristics including specialty, practice setting, weeks and hours worked, number of patients, net incomes and fees, as well as marital status and number of children. Physicians who were no longer

practicing or were still in a training program were excluded from the sample. In addition, physicians who reported working less than 20 hours per week or 30 weeks per year were also excluded. Such physicians are generally considered inactive under AMA guidelines and have such low levels of labor force attachment that their earnings data are likely to be unreliable. For similar reasons, physicians whose reported net incomes, weeks worked per year and hours worked per week resulted in hourly wages below the minimum wage were also excluded from the sample.

Dependent Variables: Annual Earnings, Hourly Earnings, Hours Worked Per Week

Annual earnings were reported by physicians as income from medical practice including "all income from fees, salaries, retainers, bonuses, and other forms of compensation, after expenses but before taxes." Contributions to profit sharing or other deferred compensation plans were excluded. Hours per week were reported by the physician as hours worked for their most recent complete week of practice in which they worked their "normal work schedule", excluding weeks when they were sick or on leave. Hours per week were reported by the physician as hours worked for their most recent complete week of practice in which they worked their "normal work schedule", excluding weeks when they were sick or on leave. Hourly earnings were calculated by dividing annual earnings by the number of weeks worked per year and the number of hours worked per week. All earnings values were adjusted by the implicit price deflator to reflect 1990 dollars.

Independent Variables

Practice experience was calculated as the current year minus the year in which the respondent finished their graduate medical training (residency).

Dummy variables for race, ethnicity, marital status, and children were also included in the regressions. The last two variables were also interacted with the female dummy to account for the different returns men and women with family responsibilities receive in the labor force.

Controls for specialty field included dummies for family/general practice, general internal medicine, internal medicine subspecialty, surgery, pediatrics, obstetrics/gynecology, psychiatry,

anesthesiology, pathology, radiology, and other unspecified specialties. Family/general practice was the omitted category in regressions controlling for specialty.

Controls for practice setting included dummies for solo practice, group practice (self-employed), group practice (employee), HMO, hospital, academic, government, and other unspecified settings. Group practice (self-employed) was the omitted category in regressions controlling for practice setting.

2. Federal Population Censuses – 1980, 1990 and 2000

Samples were taken from the 5 percent 1980 and 1990 Public Use Microdata Series. Table A.1 summarizes the sample restrictions.

Table A.1
Summary of Sample Restrictions

Age:	35-54 years old*
Employment Status:	Civilian, non-institutional, not currently in school
Labor Force Status:	Full-time, full-year workers Defined as 30 hours per week, 50 weeks per year
Education:	Holds an advanced degree (beyond B.A. or B.S.) Defined as having 18 or more years of education in the 1980 Census. Or having earned a master's, doctorate, or other professional degree (J.D., M.B.A., M.D., etc.) in the 1990 and 2000 Census.
Occupation:	Managerial and professional occupations Occupation code 1-199 in 1980 or 1990.
Earnings:	Sum of wage and salary and business income Greater than ½ of the real value of the minimum wage in 1980
Other Exclusions:	Individuals with imputed wage and salary or business income Individuals with missing data for any regression variables

* The age restriction is imposed to eliminate individuals who are still in residency training as well as individuals who are partially retired. The median age at which women physicians plan to partially retire is 55, compared with 60 for males (Holoweiko, 1996). There are also very few women physicians over the age of 54 in either the 1980 or the 1990 censuses.

Top-coding

Wage and salary income as well as business income (non-farm) were adjusted for top-coding by multiplying 1.5 times the top-coded value for each source of income and assigning that value to individuals who were top-coded in the sample. Top-coded values were adjusted in this way so as to

maintain consistency across the samples. Table A.2 indicates the percentage of observations in each year and occupation category that were affected by the top-code as well as the top-code values. All results presented in the paper were also estimated without the top-code adjustment. In no case did this qualitatively change any of the findings.

Table A.2
Percentage of Observations Affected by the Top-codes

	1980	1990	2000
Physicians	21.9%	31.5%	30.7%
Male	24.5%	37.3%	37.4%
Female	3.5%	10.7%	12.7%
Lawyers	8.8%	16.4%	16.0%
Male	9.8%	20.3%	20.5%
Female	0.8%	4.4%	5.9%
All Professionals	4.2%	5.8%	5.6%
Male	6.2%	10.1%	10.1%
Female	0.2%	0.9%	1.2%
Topcode			
Wage and salary income	$75,000	$140,000	$175,000
Business income	$75,000	$90,000	$126,000

Dependent Variable

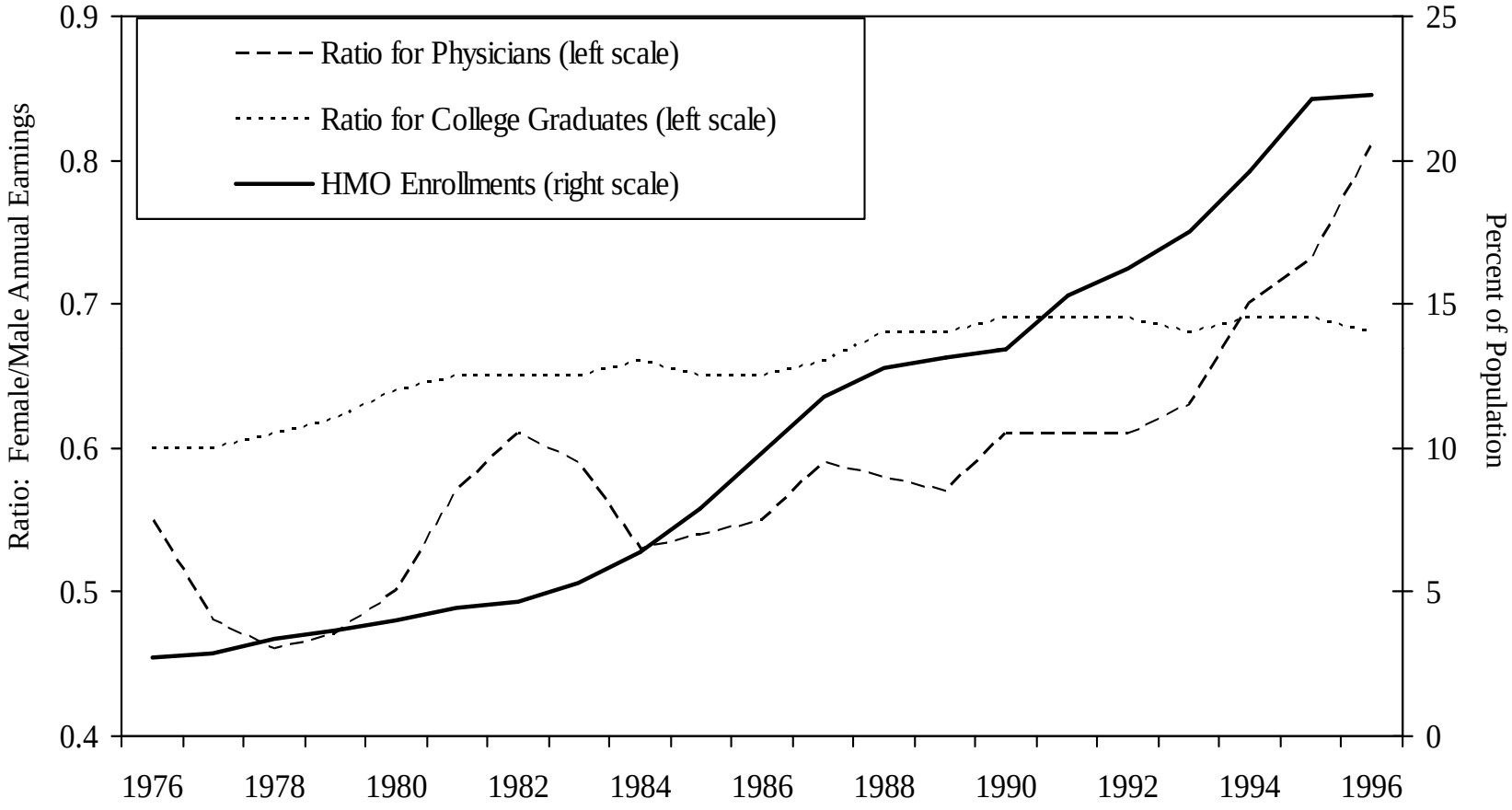
Hourly earnings were calculated by dividing annual earnings by weeks worked last year and hours worked last week. Total annual earnings were calculated as the sum of wage and salary income plus business income. Negative values for business income were allowed. All earnings values were adjusted by the implicit price deflator to reflect 2000 dollars.

Independent Variables

The experience variable refers to "potential" experience, and is calculated as age minus years of education minus 6. Dummy variables for race, ethnicity, urbanicity, marital status, and children were also included in the regressions. The experience variables and the family variables were also interacted with the female dummy to account for the different returns men and women with family responsibilities receive in the labor force.

Figure 1

Changes in the Female/Male Earnings Ratio and Managed Care Enrollments Over Time

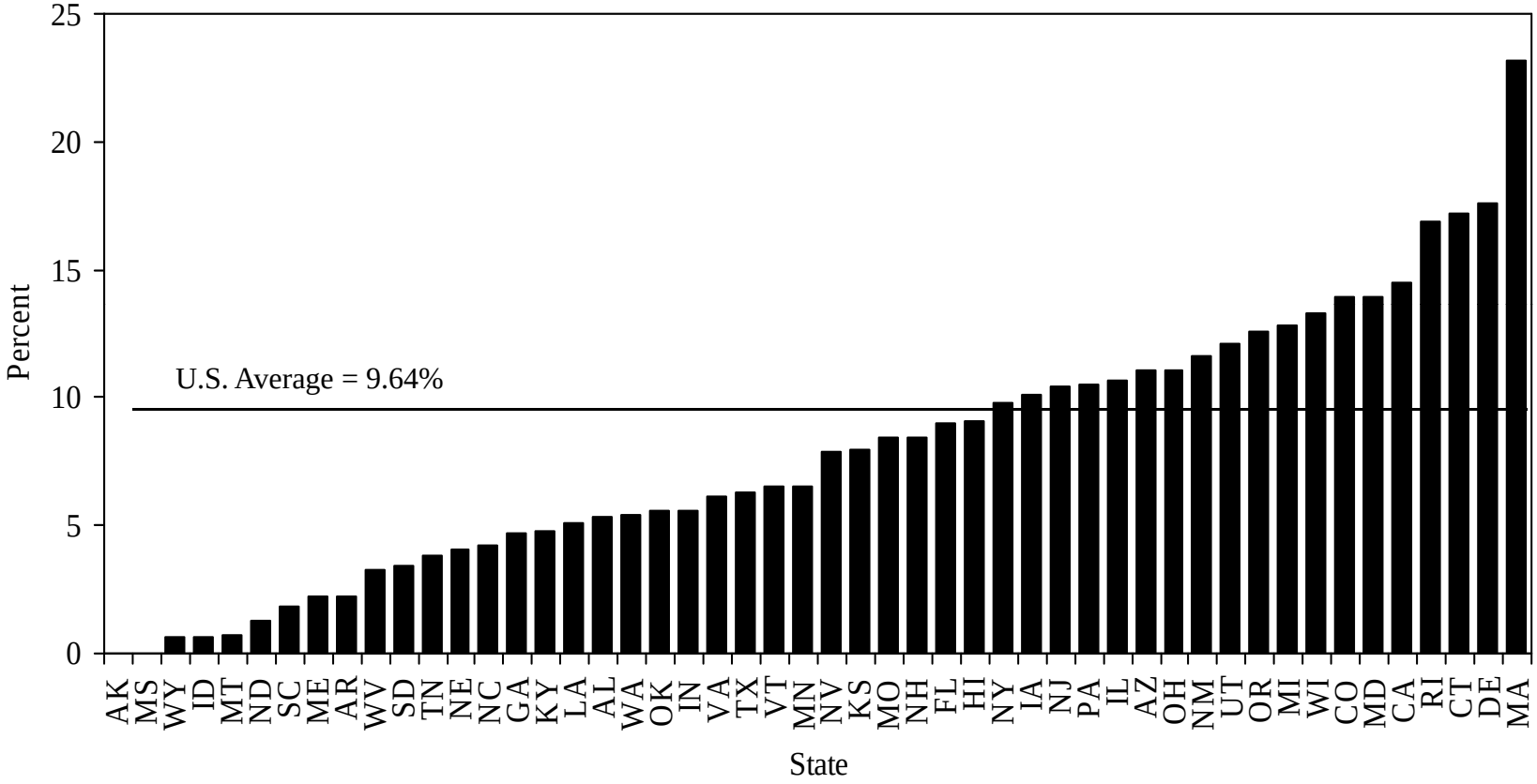


Sources:
Ratio for female physicians and college graduates are author's calculations using data from the U.S. Bureau of the Census, Current Population Survey. HMO enrollments from Gruber, Shadle, and Polich. (1988), American Association of Health Plans (1995), and InterStudy(1996).

Note: Female/male earnings ratios are five-year moving averages as calculated by the author.

Figure 2

Growth in HMO Enrollments as a Percentage of Population by State, 1980-1990

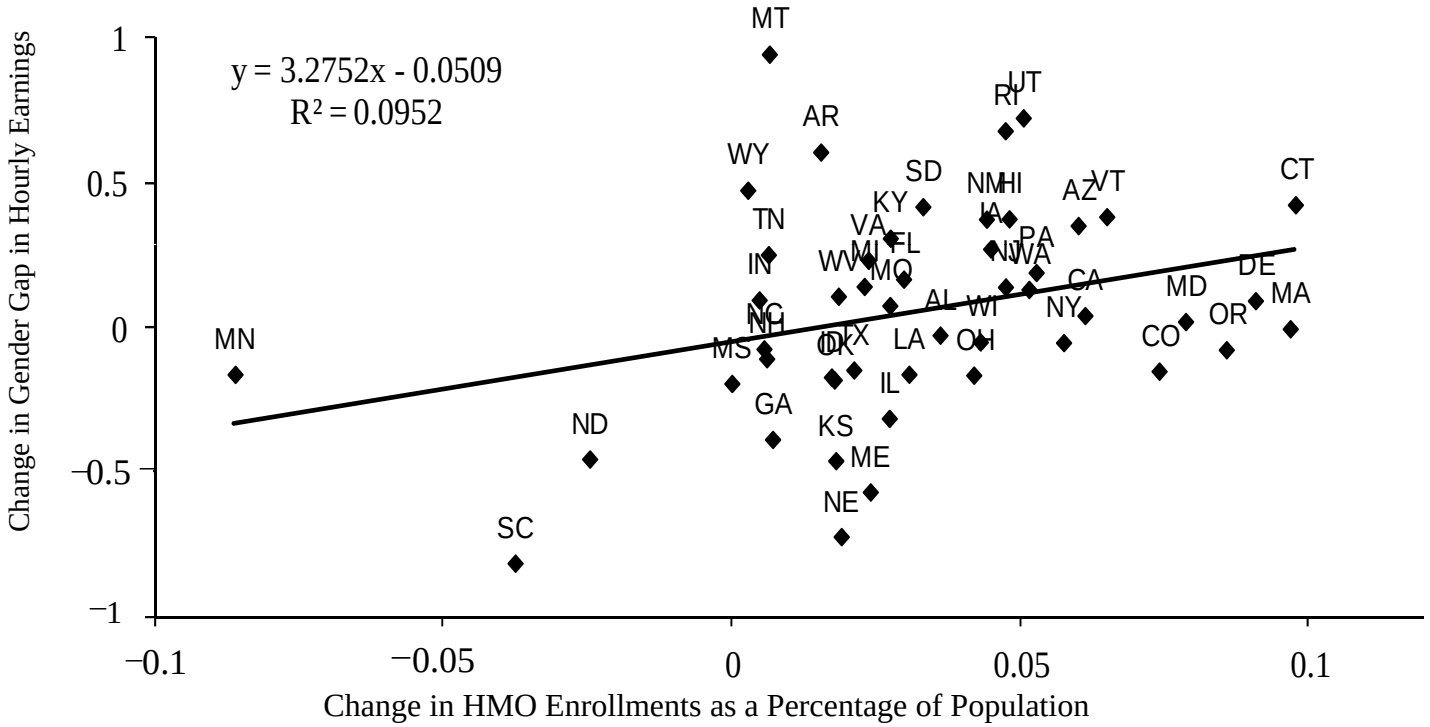


Sources:
HMO enrollments by state are from Kraus, Porter, and Ball (1991).
Population data from the U.S. Bureau of the Census, *Historical National Population Estimates 1900-1999.*

Note: Ratio of HMO enrollments to population are author's calculations.

Figure 3

Changes in the Gender Gap in Hourly Earnings for Physicians versus Changes in HMO Enrollments as a Percentage of Population



Sources:
HMO enrollments by state are from Kraus, Porter, and Ball (1991).
Population data from the U.S. Bureau of the Census, *Historical National Population Estimates 1900-1999.*
Data on physician earnings are from the Young Physicians Survey, 1986 and 1990.

Notes:
Gender Gap = log female hourly earnings – log male hourly earnings.
Change in HMO enrollments as a percentage of population are author's calculations.

Table 1
Key Characteristics of Health Insurance Plans in the United States

Characteristics	Indemnity Plans	Managed Care Plans		
		PPO	IPA/Network HMO	Group/Staff HMO
Role of Insurer	pay bills	pay bills form network	pay bills form network monitor utilization	provide care
Payment of Providers	fee-for-service	discounted fee-for-service	capitation	salary
Relationship with Providers	open - no network or contract	selective contracting	network	network
Choice of Providers	patient	patient	gatekeeper in network	gatekeeper in network
Cost sharing with patient	moderate deductible 20% coinsurance	low in network high out of network	low in network high out of network	low in network
Limits of Utilization	<u>Demand Side</u> cost sharing with patients	<u>Supply Side</u> price discounts from providers	<u>Supply Side</u> fixed price utilization review gatekeeping	<u>Supply Side</u> fixed price utilization review gatekeeping treatment guidelines

Source: Author's summary of Lee, 1997.

Notes:
This classification scheme is not an exhaustive list of the types of managed care organizations and their characteristics.
PPO stands for Preferred Provider Organization, IPA stands for Independent Practice Association, and HMO stands for Health Maintenance Organization.

Table 2
HMO Enrollment as a Percent of Population by State and Region, 1980, 1986, and 1990

	6/30/1980	6/30/1986	7/1/1990		Change 1986-90	Change 1980-90
New England						
Connecticut	2.4	9.8	19.6		9.8	17.2
Maine	0.4	0.2	2.6		2.4	2.2
Massachusetts	2.9	16.4	26.0		9.7	23.2
New Hampshire	1.1	9.0	9.6		0.6	8.4
Rhode Island	3.6	15.8	20.5		4.7	16.9
Vermont	0.0	0.0	6.5		6.5	6.5
Middle Atlantic						
New Jersey	2.0	7.6	12.4		4.7	10.4
New York	5.4	9.5	15.2		5.8	9.8
Pennsylvania	1.2	6.4	11.7		5.3	10.5
East North Central						
Illinois	1.9	9.9	12.6		2.7	10.7
Indiana	0.5	5.6	6.1		0.5	5.6
Michigan	2.5	13.0	15.3		2.3	12.8
Ohio	2.3	9.2	13.4		4.2	11.1
Wisconsin	8.4	17.4	21.7		4.3	13.3
West North Central						
Iowa	0.2	5.8	10.3		4.5	10.1
Kansas	0.0	6.2	8.0		1.8	8.0
Minnesota	9.8	24.9	16.3		-8.6	6.5
Missouri	2.2	7.8	10.6		2.7	8.4
Nebraska	1.1	3.3	5.2		1.9	4.1
North Dakota	0.4	4.2	1.7		-2.5	1.3
South Dakota	0.0	0.1	3.4		3.3	3.4
South Atlantic						
Delaware	0.0	8.6	17.6		9.1	17.6
District of Columbia	NA	NA	NA		NA	NA
Florida	1.3	7.4	10.3		3.0	9.0
Georgia	0.1	4.1	4.8		0.7	4.7
Maryland	2.0	8.0	15.9		7.9	13.9
North Carolina	0.5	4.2	4.8		0.6	4.2
South Carolina	0.2	5.7	1.9		-3.8	1.8
Virginia	0.0	3.7	6.1		2.4	6.1
West Virginia	0.7	2.2	4.0		1.8	3.3
East South Central						
Alabama	0.0	1.8	5.4		3.6	5.3
Kentucky	0.9	3.0	5.7		2.7	4.8
Mississippi	0.0	0.0	0.0		0.0	0.0
Tennessee	0.0	3.1	3.8		0.6	3.8
West South Central						
Arkansas	0.0	0.7	2.2		1.5	2.2
Louisiana	0.5	2.6	5.6		3.1	5.1
Oklahoma	0.0	3.8	5.6		1.8	5.6
Texas	0.6	4.8	6.9		2.1	6.3
Mountain						
Arizona	5.3	10.4	16.4		6.0	11.1
Colorado	6.2	12.8	20.2		7.4	13.9
Idaho	1.1	0.0	1.8		1.7	0.6
Montana	0.0	0.0	0.7		0.7	0.7
Nevada	0.0	9.8	7.9		-1.9	7.9
New Mexico	1.3	8.5	12.9		4.4	11.6
Utah	1.7	8.7	13.8		5.1	12.1
Wyoming	0.0	0.3	0.6		0.3	0.6
Pacific						
Alaska	0.0	0.0	0.0		0.0	0.0
California	15.4	23.9	30.0		6.1	14.5
Hawaii	14.3	18.6	23.4		4.8	9.1
Oregon	11.9	15.9	24.5		8.6	12.6
Washington	8.9	9.2	14.3		5.2	5.4
United States	**3.8**	**9.8**	**13.5**		**3.7**	**9.6**

Sources: Kraus, et.al., 1991; U.S. Bureau of the Census, 1999.
Note: Ratio of HMO enrollments to population are the author's calculations.

Table 3
Sample Means of Characteristics of Young Physicians with 2 to 5 Years of Experience

	Men		Women	
	1986	1990	1986	1990
Number of Observations	3085	1645	834	634
Demographics				
Age	34.77	34.88	34.56	34.61
Black	0.03	0.03	0.05	0.07
Hispanic	0.04	0.05	0.04	0.04
Married	0.86	0.84	0.77	0.75
Has a child	0.73	0.71	0.60	0.57
Labor Market Characteristics				
Board certified	0.71	0.76	0.63	0.76
Ever had a malpractice claim filed	0.15	0.12	0.11	0.07
Experience (years)	3.44	3.47	3.35	3.41
Weeks worked per year	47.83	47.48	46.96	46.55
Hours worked per week	59.05	59.62	51.88	49.65
Patients per hour	1.89	2.20	1.97	2.19
Net annual earnings (current dollars)	111,789	124,704	79,960	85,145
Hourly earnings	41.89	46.51	34.73	40.10
Specialty and Practice Setting				
Primary Care Specialties	0.43	0.40	0.48	0.56
Medical and Surgical Subspecialties	0.40	0.37	0.31	0.25
Hospital Based Specialties	0.18	0.23	0.17	0.15
Self-employed	0.64	0.44	0.47	0.29
Employee	0.36	0.55	0.53	0.67
Market Characteristics				
% Patients who are African-American	17.50	18.10	19.56	21.68
% Patients who are Hispanic	9.05	10.05	11.71	10.91
% Patients on Medicare	31.24	29.53	20.80	22.34
% Patients on Medicaid	11.72	15.78	15.69	19.45
% Patients uninsured	10.03	12.32	11.82	13.45

Source: Author's calculations from the Young Physicians Survey, 1987 and 1991.

Notes:
In each year, physicians who were no longer practicing, who were still in a training program were excluded from the sample.
Physicians who worked less than 20 hours per week or 30 weeks per year, or had hourly wages below the minimum wage were also excluded.

Table 4
Raw DD Estimates of the Impact of Managed Care on the Gender Earnings Gap for Physicians, 1986 to 1990

	1			2			3		
	Log Annual Earnings			Log Hourly Earnings			Log Hours Worked Per Week		
	1986	1990	Difference Over Time	1986	1990	Difference Over Time	1986	1990	Difference Over Time
Female-Male Log Wage Differential	-0.312	-0.365	-0.053	-0.148	-0.133	0.014	-0.145	-0.210	-0.065
Female Physicians									
States with Low Managed Care Growth	4.302	4.277	-0.024	3.440	3.478	0.038	3.918	3.871	-0.046
	[392]	[294]		[392]	[294]		[392]	[294]	
States with High Managed Care Growth	4.223	4.333	0.111	3.411	3.589	0.179	3.877	3.813	-0.063
	[442]	[340]		[442]	[340]		[442]	[340]	
Difference Across States	-0.079	0.056		-0.030	0.111		-0.041	-0.058	
Difference-in-Difference			**0.135** **			**0.141** **			**-0.017**
			(0.067)			**(0.062)**			**(0.051)**
Male Physicians									
States with Low Managed Care Growth	4.610	4.703	0.093	3.581	3.675	0.094	4.069	4.074	0.005
	[1523]	[808]		[1523]	[808]		[1523]	[808]	
States with High Managed Care Growth	4.535	4.645	0.110	3.563	3.668	0.105	4.014	4.028	0.014
	[1562]	[837]		[1562]	[837]		[1562]	[837]	
Difference Across States	0.076	0.058		0.018	0.007		0.054	0.046	
Difference-in-Difference			**0.017**			**0.011**			**0.009**
			(0.049)			**(0.050)**			**(0.022)**
Difference-in-Difference-in-Difference			**0.118** *			**0.130** *			**-0.025**
			(0.065)			**(0.076)**			**(0.056)**

Source: Author's calculations from the Young Physicians Survey, 1987 and 1991.

Notes:
*Indicates significance at the 10 percent level, **at the 5 percent level.
Cells contain means for the groups indicated. The difference-in-difference-in-difference estimator is the difference-in-difference from the upper panel minus that in the lower panel.
Robust standard errors, clustered by state and year, are given in parentheses directly below the coefficients. The number of observations in each cell are given in square brackets.
In each year, physicians who were no longer practicing or who were still in a training program were excluded from the sample.
Physicians who worked less than 20 hours per week or 30 weeks per year, 20 hours per week or 30 weeks per year, or had hourly wages below the minimum wage were also excluded.
States with high managed care growth had growth in HMO enrollments as a percentage of population that was greater than the national average (3.7 percent) between 1986 and 1990.
These include Arizona, California, Colorado, Connecticut, Delaware, Hawaii, Iowa, Maryland, Massachusetts, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, Vermont, Washington, and Wisconsin.
The remaining states had managed care growth that was below the national average during the period.

Table 5
DDD Estimates of the Impact of Managed Care on the Gender Earnings Gap for Physicians for Various Specifications

	Coefficient on Female*1990*High Growth Managed Care State			
Specification	**1**	**2**	**3**	**4**
Dependent Variable				
Log Annual Earnings	0.088 *	0.071	0.092 **	0.071 *
	(0.049)	(0.046)	(0.047)	(0.042)
Log Hourly Earnings	0.111 **	0.093 **	0.122 **	0.100 **
	(0.050)	(0.047)	(0.049)	(0.046)
Log Hours Worked Per Week	-0.042	-0.041	-0.044	-0.045
	(0.037)	(0.036)	(0.037)	(0.036)
Controls				
Demographic and Professional Characteristics	X	X	X	X
Specialty Field		X		X
Practice Setting			X	X
Number of Observations	6,198	6,198	6,198	6,198

Source: Author's calculations from the Young Physicians Survey, 1987 and 1991.

Notes:
*Indicates significance at the 10 percent level, **at the 5 percent level.
All regressions include a full set of state dummy variables, a dummy variable for 1990, and a female dummy variable.
Second level interactions are captured by interacting each state dummy with the 1990 dummy and the female dummy separately, as well as interacting female and time.
The coefficient reported in the table is that on the triple interaction: female*1990*dummy for whether the individual lives in a high growth managed care state.
Demographic and professional characteristics include age, race, ethnicity, board certification, experience and its square, marital status and children.
Experience, marital status and children are interacted with the female dummy to account for the different returns men and women receive in the labor force for these characteristics.
Specialty choice includes 10 categories where family/general practice is the omitted category.
Practice setting includes 7 categories where group practice with part ownership is the omitted category.
In each year, physicians who were no longer practicing, who were still in a training program were excluded from the sample.
Physicians who worked less than 20 hours per week or 30 weeks per year, or had hourly wages below the minimum wage were also excluded.
States with high managed care growth had growth in HMO enrollments as a percentage of population that was greater than the national average (3.7 percent) between 1986 and 1990.
Robust standard errors, clustered by state and year, are given in parentheses directly below the coefficients.

Table 6
Continuous Variable Estimates of the Impact of Managed Care on the Gender Earnings Gap for Physicians

	Coefficient on Female * 1990 *HMO Growth			
Specification	**1**	**2**	**3**	**4**
Dependent Variable = Log Hourly Earnings				
Dummy Variable Estimates	0.111 **	0.093 **	0.122 **	0.100 **
	(0.050)	(0.047)	(0.049)	(0.046)
Continuous Variable Estimates	2.007 **	1.604 **	2.327 ***	1.850 ***
	(0.750)	(0.657)	(0.776)	(0.677)
Evaluated for high versus low growth states	0.104	0.083	0.121	0.096
Instrumental Variables Estimates	1.923 **	1.478 **	2.386 ***	1.889 ***
	(0.755)	(0.679)	(0.779)	(0.696)
Evaluated for high versus low growth states	0.100	0.077	0.124	0.098
Controls				
Demographic and Professional Characteristics	X	X	X	X
Specialty Field		X		X
Practice Setting			X	X
Number of Observations	6,198	6,198	6,198	6,198

Source: Author's calculations from the Young Physicians Survey, 1987 and 1991.

Notes:
*Indicates significance at the 10 percent level, **at the 5 percent level.
All regressions include a full set of state dummy variables, a dummy variable for 1990, and a female dummy variable.
Second level interactions are captured by interacting each state dummy with the 1990 dummy and the female dummy separately, as well as interacting female and time.
The coefficient reported in the table is that on the triple interaction: female*1990*dummy for whether the individual lives in a high growth managed care state.
Demographic and professional characteristics include age, race, ethnicity, board certification, experience and its square, marital status and children.
Experience, marital status and children are interacted with the female dummy to account for the different returns men and women receive in the labor force for these characteristics.
Specialty choice includes 10 categories where family/general practice is the omitted category.
Practice setting includes 7 categories where group practice with part ownership is the omitted category.
In each year, physicians who were no longer practicing, who were still in a training program were excluded from the sample.
Physicians who worked less than 20 hours per week or 30 weeks per year, or had hourly wages below the minimum wage were also excluded.
States with high managed care growth had growth in HMO enrollments as a percentage of population that was greater than the national average (3.7 percent) between 1986 and 1990.
Robust standard errors, clustered by state and year, are given in parentheses directly below the coefficients.

Table 7
DDD Estimates of the Impact of Managed Care on the Gender Earnings Gap for Physicians Over Time

	Dependent Variable: Log Hourly Earnings		
	1980-90	**1990-00**	**1980-00**
DDD: Female * time * high managed care state			
Physicians			
coefficient	0.140 ***	-0.011	0.164 ***
standard error	(0.060)	(0.051)	(0.060)
number of observations	10,289	16,924	14,675
Lawyers			
coefficient	-0.069	-0.064	0.023
standard error	(0.114)	(0.069)	(0.058)
number of observations	12,222	23,907	33,788
All professionals			
coefficient	0.006	0.018	0.032
standard error	(0.028)	(0.023)	(0.027)
number of observations	155,332	289,157	227,883
DDDD: Female * time * high managed care state * physician			
Physicians versus lawyers			
coefficient	0.164	0.007	0.172 *
standard error	(0.121)	(0.079)	(0.095)
number of observations	22,511	40,831	48,463
Physicians versus all professionals			
coefficient	0.164 *	-0.057	0.148 *
standard error	(0.098)	(0.069)	(0.087)
number of observations	165,621	306,081	242,558

Source: Author's calculations from the 1980, 1990, and 2000 Decenniel Census.

Notes:
*Indicates significance at the 10 percent level, **at the 5 percent level.
All regressions include a full set of state dummy variables, a dummy variable for 1990, and a female dummy variable.
Second level interactions are captured by interacting each state dummy with the 1990 dummy and the female dummy separately, as well as interacting female and time.
The coefficient reported in the table is that on the triple interaction: female*1990*dummy for whether the individual lives in a high growth managed care state.
All regressions also control for a quartic in experience, race, ethnicity, marital status, children, and living in an urban area.
Experience, marital status and children are interacted with the female dummy to account for the different returns men and women receive in the labor force for these characteristics.
The sample includes individuals, 35 to 54 years old, with advanced degrees, who worked full-time (30 hours per week and 50 weeks per year).
The sample excludes those who were students or not in the labor force.
Having an advanced degree is defined as having 18 years of education in the 1980 Census or having earned a master's, doctorate, or professional degree in the 1990 or 2000 Census.
"All professionals" are individuals who are in a professional occupation, as defined by the Census occupation codes.
States with "high" managed care growth are those with growth in HMO enrollment as a percentage of population greater than the national average.
Between 1980 and 1990, these include Arizona, California, Colorado, Connecticut, Delaware, Illinois, Iowa, Maryland, Massachusetts, Michigan, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Rhode Island, Utah, and Wisconsin.
Robust standard errors, clustered by state and year, are given in parentheses directly below the coefficients.

Table 8
Decomposition of Changes in the Gender Earnings Gap Among Physicians, 1986-90

	States with Low Managed Care Growth	States with High Managed Care Growth	Difference (High - Low)
Descriptive Statistics			
Male residual standard deviation[a]			
1986	0.4878	0.4974	0.0096
1990	0.5200	0.4602	-0.0598
Female residual standard deviation[b]			
1986	0.4587	0.4505	-0.0082
1990	0.4555	0.4582	0.0027
Mean female residual from male wage regression			
1986	-0.0622	-0.0736	-0.0114
1990	-0.0638	0.0018	0.0656
Mean female residual percentile within male distribution[c]			
1986	46.1	47.2	1.1
1990	46.9	49.8	2.9
Decomposition of Change			
Change in differential	0.0561	-0.0736	-0.1297
Observed characteristics (X's)			
All characteristics	0.0273	0.0023	-0.0250
Demographic and professional variables	-0.0084	-0.0001	0.0083
Specialty field variables	0.0508	0.0227	-0.0281
Practice setting variables	-0.0151	-0.0203	-0.0052
Observed prices (B's)			
All prices	0.0272	-0.0005	-0.0276
Demographic and professional variables	-0.0070	-0.0035	0.0035
Specialty field variables	0.0115	-0.0084	-0.0198
Practice setting variables	0.0227	0.0113	-0.0113
Dispersion of the distribution	0.0024	-0.0225	-0.0249
Relative positions of men and women within distribution	-0.0008	-0.0530	-0.0522
Sum wage structure	0.0296	-0.0230	-0.0525
Sum gender-specific	0.0265	-0.0506	-0.0772
Total	0.0561	-0.0736	-0.1297

Source: Author's calculations from the Young Physicians Survey, 1987 and 1991.

Note:

[a]Estimated using male wage regressions.

[b]Estimated using female wage regressions.

[c]Computed by assigning each woman a percentile ranking in the indicated year's residual male wage distribution and calculating the female mean of these percentiles.
The change in the differential is the change in the male-female log wage differential between 1986 and 1990.
X is a vector of explanatory variables, B is a vector of estimated coefficients from the male wage equation.
Physicians who worked less than 20 hours per week or 30 weeks per year, or had hourly wages below the minimum wage were also excluded.
States with high managed care growth had growth in HMO enrollments as a percentage of population that was greater than the national average (3.7 percent) between 1986 and 1990.

Table 9
Accounting for the Impact of Managed Care on Primary Care and Employee Physicians

	Dependent Variable = Log Hourly Earnings		
	Coefficient on Dummy Variable with 1990*High Growth Managed Care State		
Including Primary Care Specialty Interactions			
Female	0.100 **	0.096 **	0.084 *
	(0.046)	(0.048)	(0.050)
Primary Care Physician	-----	0.011	-----
		(0.063)	
Family/Group Practitioner	-----	-----	-0.064
			(0.096)
Pediatrician	-----	-----	0.068
			(0.100)
General Internist	-----	-----	0.027
			(0.076)
Including Employee Setting Interactions			
Female	0.100 **	0.110 **	0.102 **
	(0.046)	(0.047)	(0.046)
Employee Physician	-----	-0.063	-----
		(0.071)	
HMO Employee	-----	-----	-0.047
			(0.112)
Hospital Employee	-----	-----	-0.034
			(0.116)
Government Employee	-----	-----	-0.062
			(0.150)
Group Practice Employee	-----	-----	-0.105
			(0.082)
Including Both Sets of Interactions			
Female	0.100 **	0.103 **	0.107 **
	(0.046)	(0.049)	(0.047)
Primary Care Physician	-----	0.012	-----
		(0.063)	
Employee Physician	-----	-0.069	-----
		(0.071)	
Primary Care * Employee Physician	-----	-----	-0.057
			(0.072)
Number of Observations	6,198	6,198	6,198

Source: Author's calculations from the Young Physicians Survey, 1987 and 1991.

Notes:
*Indicates significance at the 10 percent level, **at the 5 percent level.
All regressions include a full set of state dummy variables, a dummy variable for 1990, and a female dummy variable.
Second level interactions are captured by interacting each state dummy with the 1990 dummy and the female dummy separately, as well as interacting female and time.
The coefficient reported in the table is that on the triple interaction: female*1990*dummy for whether the individual lives in a high growth managed care state.
All regressions include controls for age, race, ethnicity, board certification, specialty, practice setting, experience and its square, marital status, and children.
Experience, marital status and children are interacted with the female dummy to account for the different returns men and women receive in the labor force for these characteristics.
Regressions including primary care specialty interactions include dummies for primary care specialties as well as second level interactions with 1990 and high managed care state.
The coefficient reported is that on the triple interaction term of the primary care dummy * 1990 * high growth managed care state. Employee setting interactions are defined analogously.
In each year, physicians who were no longer practicing, who were still in a training program were excluded from the sample.
Physicians who worked less than 20 hours per week or 30 weeks per year, or had hourly wages below the minimum wage were also excluded.
States with high managed care growth had growth in HMO enrollments as a percentage of population that was greater than the national average (3.7 percent) between 1986 and 1990.
Robust standard errors, clustered by state and year, are given in parentheses directly below the coefficients.

Table 10
OLS Estimates of the Impact of Managed Care on the Gender Earnings Gap for Physicians
By Specialty Group and Practice Setting

	Dependent Variable		
	Log Annual Net Income	**Log Hourly Earnings**	**Log Hours Per Week**
All Physicians	0.071 *	0.100 **	-0.045
	(0.042)	(0.046)	(0.036)
By Specialty Group			
Female preferred specialties	0.288 ***	0.244 *	0.021
Pediatrics, obstetrics/gynecology	(0.098)	(0.138)	(0.080)
Male preferred specialties	-0.044	-0.130	0.061
Surgery, specialized internal medicine	(0.151)	(0.114)	(0.111)
Neutral specialties	-0.178	-0.032	-0.185 **
Pathology, radiology, emergency medicine	(0.151)	(0.153)	(0.089)
By Practice Setting			
Self-Employed			
Solo practice	0.170	0.050	0.067
	(0.161)	(0.172)	(0.099)
Group practice	-0.093	0.132	-0.223 ***
	(0.102)	(0.108)	(0.067)
Employees			
In HMOs, hospitals, government, and group practices	0.065	0.022	0.022
	(0.070)	(0.072)	(0.048)

Source: Author's calculations from the Young Physicians Survey, 1987 and 1991.

Notes:
*Indicates significance at the 10 percent level, **at the 5 percent level.
All regressions include a full set of state dummy variables, a dummy variable for 1990, and a female dummy variable.
Second level interactions are captured by interacting each state dummy with the 1990 dummy and the female dummy separately, as well as interacting female and time.
The coefficient reported in the table is that on the triple interaction: female*1990*dummy for whether the individual lives in a high growth managed care state.
All regressions include controls for age, race, ethnicity, board certification, specialty, practice setting, experience and its square, marital status, and children.
Experience, marital status and children are interacted with the female dummy to account for the different returns men and women receive in the labor force for these characteristics.
In each year, physicians who were no longer practicing, who were still in a training program were excluded from the sample.
Physicians who worked less than 20 hours per week or 30 weeks per year, or had hourly wages below the minimum wage were also excluded.
States with high managed care growth had growth in HMO enrollments as a percentage of population that was greater than the national average (3.7 percent) between 1986 and 1990.
Robust standard errors, clustered by state and year, are given in parentheses directly below the coefficients.