Differential Income Advantages in the U.S. Market for Physicians: Male vs. Female returns to Board-Certification.

Sterling Witzke
Stanford University, Department of Economics
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Previous studies have shown that minorities benefit more from market signals than majorities do. Other studies have applied this to the medical field and have proven that female physicians benefit more from board-certification than male physicians. This study examines whether this result is still true, as females have become less of a minority in the medical field. I find the greater relative advantage from board-certification that females used to enjoy over the advantage males used to enjoy no longer exists. Using data from the Practice Patterns of Young Physicians Survey, I find that male and female physicians enjoy equal economic advantages over their non-certified counterparts.

Introduction

Board-certification trends and incentives are topics that have received considerable attention in economic literature. Board-certification, overseen by the American Board of Medical Specialties (ABMS) and its twenty-four approved member boards, is not a degree. Certification does not bestow any legal licenses to practice, nor does it impose any limitations on the practice of a licensed physician (Langwell 1979).

There are, however, several advantages associated with certification. For example, Wilensky and Rossiter found that after controlling for age, region, and specialty, board-certification increased a physician's annual income by $13,000. The authors also argued that in addition to income advantages, board-certified physicians enjoy advantages such as enhanced standing in the medical community, an increase in patient referrals, wider hospital staffing privileges and membership into various professional societies. Physicians may also be certified in more than one area, leading to even more staffing privileges and societal memberships (Wilensky and Rossiter 1983).

In the medical field, board-certification can serve as an important market signal because it is likely to be less costly to obtain by a more highly skilled physician than one who is less skilled. Board-certification offers a type of quality assurance, because being certified means that the physician has successfully passed a thorough evaluation of his or her skills and experience in his or her specialty. For example, while some patients may have a bias against a female physician because she is a minority, a patient may be more likely to overcome this bias if he or she can be assured of the quality of the female physician's services. Board-certification offers this type of assurance and lets the patient know that the female physician is at least as skilled as other board-certified physicians,

male or female. Board-certification also assures that the physician has completed three to seven additional years of training after completing medical school, depending on the specialty (ABMS 2005). The quality differences that board-certification can suggest, therefore, allow certification to be used as an effective market signal. The quality differences board-certification signals can lead to wage differentials for various groups of employees because of productivity level uncertainty faced by employers, and disparities in signaling costs faced by employees (Ohsfeldt, Culler and Becker 1987).

Such wage differentials can also arise because of affirmative action constraints. If potential employers face such a constraint, board-certification may be used as a market signal in order to evaluate potential employees. These employers may use certification as an indication of how costly terminating a physician who performs poorly would be. Because an affirmative action constraint gives minority workers a type of protected status, such workers are more costly to fire if they perform badly than a similarly poorly performing majority worker (Ohsfeldt, Culler and Becker 1987).

Such market signals and their relationship to wage differentials and affirmative action constraints have long been of interest to many economists. Golbe (1985), for example, studied black-white wage differentials arising due to uncertainty about productivity levels and differential signaling costs. Golbe argued that, even without discrimination, differences in the earnings of majority-minority workers can result because of differing market signals or affirmative action constraints. Because a firm will offer an employee a wage equal to that employee's expected value to the firm, the wage offered depends on the type of market signal the employee gives. Thus minority workers, under Golbe's model, are expected to have a higher earnings advantage associated with a

specific high productivity market signal than a majority worker in the presence of affirmative action or differential signaling costs.

In the medical field, the earnings advantage associated with market signals such as those that Golbe studied is specifically important. When patients are dealing with issues of health and their own bodies, there is a greater demand for quality assurance than may be necessary in other occupational fields. Thus, the wage offered to a physician (whether male or female) who gives a high productivity market signal should be higher than that offered to a physician who gives a low productivity market signal. For physicians, a high productivity market signal would be board-certification. The mathematical proof behind this wage argument is adapted from page 844 of Golbe (1985). Consider a model in which employers cannot observe productivity levels (high productivity is denoted u_H and low productivity is denoted u_L) directly. Instead, they can only observe two productivity signals (a high productivity signal, denoted y_2, or a low productivity signal, denoted y_1). Assume p_L is the proportion of low productivity physicians in the sample, and p_H is the proportion of high productivity physicians. Also assume that a fraction, q_1, of low productivity physicians give the low productivity signal y_1, and the fraction, q_2, of high productivity physicians give the signal y_1. "The conditional probabilities of productivity given the signal *y* are:

$$p(u_L| y_1) = q_1p_L /[q_1p_L + q_2(1-p_L)]$$

$$p(u_L| y_2) = (1- q_1) p_L / [(1- q_1) p_L + (1- q_2)(1- p_L)]$$

$$p(u_H| y_1) = q_2(1-p_L)/ [q_1p_L+ q_2(1- p_L)]$$

$$p(u_H| y_2) = (1- q_2)(1-p_L)/ [(1- q_1) p_L + (1- q_2)(1- p_L)] \qquad (1)$$

The expected product (and wage) of a worker with signal y_1 is:

$$W(y_1) = W_1 = u_L p(u_L | y_1) + u_H p(u_H | y_1)$$

The expected product (and wage) of a worker with signal y_2 is:

$$W(y_2) = W_2 = u_L p(u_L | y_2) + u_H p(u_H | y_2);$$

Using the equations in (1) it can be proven that $W_2 > W_1$" (Golbe 1985). While Golbe was dealing with black-white wage differentials, this mathematical analysis can be easily adapted to study physicians' wage differentials in the presence of board-certification. Certification is considered a high productivity signal and would replace y_2 in the model, whereas a physician who is not certified would give a low productivity signal, y_1. The mathematical results still show that $W_{Cert} > W_{Non.}$

Ohsfeldt, Culler, and Becker tested this mathematical analysis by studying male-female differences in earnings advantages using physician board-certification as a market signal. Although other economists had previously written about board-certification advantages, Ohsfeldt, Culler, and Becker were the first to specifically study the effect of gender on said advantage.

Using a 1982 sample consisting of 4,084 male physicians and 325 female physicians from the AMA's Socioeconomic Monitoring System and the AMA's Physicians Masterfile, the authors concluded that both male and female board-certified physicians enjoyed a significantly higher earnings advantage than their respective non-board-certified physician counterparts. Their findings that board-certified, female physicians enjoyed a greater earnings advantage over non-board-certified, female physicians relative to the earnings advantage of board-certified, male physicians to non-certified, male physicians supports Golbe's earlier analysis that minorities benefit more

from high productivity market signals. These results held true for both employee and self-employed physicians. For self-employed physicians, board-certified males earned 13.9 percent more than non-board-certified, male physicians, whereas female, board-certified physicians earned 24.4 percent more than their non-board-certified counterparts. For employee physicians, board-certified males earned 13.4 percent more than non-board-certified males, whereas board-certified females earned 18.3 percent more than their non-board-certified counterparts (Ohsfeldt, Culler and Becker 1987).

Board-certification and its associated income advantages were of much interest to economists during the 1980s. However, virtually no literature has been devoted to the topic recently. While Ohsfeldt, Culler and Becker found support for Golbe's theory that minorities enjoyed greater advantages from market signals than majorities using 1982 data, this paper will test whether their findings were still applicable a decade later.

Table 1: Male and Female Percent Medical School Graduates

Percent Medical School Graduates	1982	1987	1991
Male	74.1	66.9	62.7
Female	24.3	32.1	36.5
No response	1.6	1.0	0.8
Total	100	100	100

Source: American Association of Medical Colleges (AAMC)

When their study was conducted in 1982, approximately 24.3 percent of medical school graduates were female. In 1987, the percentage of females graduating from United States medical schools was 32.1 percent, and by 1991 the percentage of female graduates had increased to 36.5 percent (Table 1).

It is my hypothesis that, since Ohsfeldt, Culler, and Becker's study, as females have become less of a minority in the medical field, female physicians' relative income

advantage from board-certification over the male physicians' advantage should have decreased.

Data

The data presented in this paper is taken from the 1987 and 1991 Practice Patterns of Young Physicians Survey conducted by the American Medical Association Education and Research Foundation. The data set contains merged data from the Young Physicians Survey, the American Medical Association Masterfile, and the Association of American Medical Colleges' Student and Applicant Information Management System (SAIMS). The dataset classifies a young physician as a physician younger than 40 who recently completed medical training. The physician must also have been practicing continuously for greater than one, but less than six years. The Young Physicians Survey provides information about physicians' current practice arrangements, marital status, family background, medical training, and current income and expenses. The American Medical Association Masterfile and the SAIMS dataset offer information on board-certification status, grade point averages, birthplace, and AMA membership.

The 1987 Young Physicians Survey contains a sample of 5,865 physicians, including 4,543 male physicians and 1,322 female physicians (63 percent response rate). The 1991 Young Physicians Survey contains a sample of 6,053 physicians, including 4,484 male physicians and 1,569 female physicians (69.8 percent response rate). After omitting observations with missing data, a usable sample of 5,167 physicians was obtained from the 1987 Young Physicians Survey (3,994 males and 1,173 females). A

usable sample of 5,002 physicians was obtained from the 1991 Young Physicians Survey (3,708 males and 1,294 females).

Multivariate Analysis

In order to evaluate the gender-specific economic advantages associated with board-certification, an hourly income equation for self-employed and employee physicians is estimated. This is done with both the 1987 and the 1991 datasets. For the purposes of this study, a self-employed physician is one who is either a sole practitioner, or a full or part owner of his or her medical practice. The dependent variable of the hourly income equation is the log of hourly income. Hourly income is calculated by dividing total net income (after expenses but before taxes) by the product of the number of weeks worked during the year and the average hours worked per week. The 1991 hourly income equation is estimated using a weighted, ordinary least-squares regression analysis. As the 1987 weights are unavailable, all 1987 results assume that all independent variables accurately reflect the unavailable weights. The variables included in the hourly income equations are defined in Table 2. The remainder of this section discusses these variables.

For the purposes of this study, the most important variable is the board-certification variable, boardcert. Boardcert is a dummy variable set to one if the physician is board-certified. I expect board-certification to increase a physicians' income and therefore expect the coefficient on boardcert to be positive.

In order to account for the overall effects of being self-employed on a physicians' income, the variable selfemp is included in the hourly income equation. Selfemp is a

dummy variable set to one if the physician is self-employed. The coefficient on selfemp is also expected to be positive.

Table 2: Variable Descriptions

Variable	Description
lnwage	Log of hourly income
selfemp	Physician who is full or part owner of his/her medical practice
male	Male physician
boardcert	Board certified physician
board_male	Board certified, male physician (board*male)
age	Age of physician
genpract	General/family practice
intmed	Internal medicine
nosubspec	Specialty with no reported subspecialties (dermatology, immunology, neurology)
medsubspec	General medical subspecialty
gensurg	General surgery
surgspec	Surgical specialty (plastic surgery, vascular surgery, cardiovascular surgery)
ped	Pediatrics
obgyn	Obstetrics/Gynecology
rad	Radiology
psych	Psychiatry
anesth	Anesthesiology
path	Pathology
other	Other specialties

To control for differences among specialties, including varying market demand and differing pay structures, a set of dummy variables representing specific specialties is included in the hourly income equation. To simplify analysis, sub-specialties are grouped into thirteen larger specialty categories, with each category having its own dummy variable. These thirteen dummy variables represent the physician's primary specialty.

An additional dummy variable, male, is included to account for income differences solely attributable to gender with no correlation to board certification. This dummy variable is set equal to one if the physician is male. Board_male is an interaction variable included to estimate the interaction between the dummy variables boardcert and

male. The variable, age, is also included to account for income differences attributable to a physician's age.

Results

The results of the overall, 1987 and 1991 least squares estimates of hourly earnings are reported in Table 3, where the variables dropped in each of the regressions are also noted. Overall, I find that board-certified, female physicians in 1987 enjoyed a 35.5 percent earnings advantage over non-certified females. However, I find that men in 1987 had no statistically significant difference in their board-certification earnings advantage from the certification advantage females enjoy. Thus, overall, the 1987 OLS results show that male and female physicians enjoy the same economic advantages from board-certification. In monetary terms, this means that female, board-certified physicians earned $2.61 more an hour than their non-certified counterparts. In this same year, the male advantage was approximately the same, with male, board-certified physicians earning $2.43 more an hour than their non-certified counterparts. These results are consistent with Ohsfeldt, Culler and Becker's 1982 findings that both male and female physicians have statistically significant higher earnings than non-board certified physicians. However, in this case, there is no difference in the advantages they enjoy.

In 1991, the data shows that board-certified, female physicians enjoy a 14.1 percent ($3.14 per hour) earnings advantage over non-certified females. As with the 1987 data, I again find that men have no statistically significant difference in their earnings advantage from board-certification than the advantage from which females benefit. This is consistent with Laurence Baker's study using the 1991 Survey of Young

Table 3: Overall Regression Results

	1987	1991
	lnwage	lnwage
selfemp	0.186	0.219
	(11.07)**	(9.49)**
male	0.041	0.008
	-1.28	-0.16
boardcert	0.099	0.141
	(2.79)**	(2.82)**
board_male	-0.01	-0.048
	-0.25	-0.84
age	0.023	0.028
	(6.55)**	(5.54)**
genpract	-0.285	-0.187
	(5.21)**	(2.78)**
intmed	0.269	-0.117
	(4.30)**	-1.82
nosubspec	dropped	-0.116
	(.)	-1.49
medsubspec	0.232	0.112
	(3.29)**	-1.39
gensurg	-0.045	0.291
	-0.71	(4.25)**
surgspec	-0.244	-0.164
	(4.41)**	(2.32)*
ped	-0.089	0.179
	-1.59	(2.26)*
obgyn	-0.182	0.442
	(2.76)**	(5.41)**
rad	0.153	0.155
	(2.74)**	-1.96
psych	-0.248	0.386
	(4.36)**	(5.30)**
anesth	-0.061	dropped
	-1.01	(.)
path	0.214	0.345
	(3.42)**	(4.47)**
other	0.157	0.109
	(2.53)*	-1.54
Constant	-4.38	-4.475
	(32.37)**	(23.44)**
Observations	5165	2493
R-squared	0.14	0.18

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%
T-tests have been run on all variables, and prove that all changes between 1987 and 1991 are statistically significant, except in the specialty, obgyn.

Physicians and the AMA's 1991 Socioeconomic Monitoring System Survey. In this study, Baker found that young female and male physicians with similar characteristics earn equal hourly income (Baker 1996). Thus my results show that, overall, the advantage board-certified, female physicians enjoy over non-certified, female physicians is no larger than the economic advantage board-certified, male physicians enjoy over non-certified, male physicians. As the data shows, not only has the relative female advantage from board-certification over the male advantage decreased from 1982 to 1991, but both the 1987 and 1991 data show that it has disappeared altogether, resulting in male and female physicians enjoying the same overall earnings advantage from board certification.

These overall results hold true for both employee and self-employed physicians for both 1987 and 1991 data. The results for employee physicians are shown in Table 4, and for self-employed physicians in Table 5. For both employee and self-employed physicians, there is no statistically significant difference in the female versus male earnings advantage from board-certification. In 1987, both male and female, board-certified, employee physicians enjoyed a 12.2 percent earnings advantage over non-board-certified, employee physicians. In monetary terms, this means female, board-certified, employee physicians earned $3.85 more per hour than non-certified, employee females, while men enjoyed a statistically similar advantage ($3.07 per hour). In 1991, both male and female, board-certified, employee physicians earned 21.3 percent more than non-certified physicians. In monetary terms, female, board-certified, employee physicians earned $4.69 more per hour than non-certified, employee, female physicians. Male, board-certified, employee physicians earned $1.33 more an hour than their

Table 4: Overall Employee Regression Results

	1987	1991
	lnwage	lnwage
selfemp	0	0
	(.)	(.)
male	-0.006	0.036
	-0.16	-0.61
boardcert	0.122	0.213
	(2.94)**	(3.75)**
board_male	-0.01	-0.098
	-0.21	-1.47
age	0.022	0.026
	(5.16)**	(4.32)**
genpract	0.11	-0.11
	-1.52	-1.33
intmed	0.409	-0.073
	(4.93)**	-0.93
nosubspec	0.272	-0.309
	(3.26)**	(3.09)**
medsubspec	0.551	dropped
	(6.28)**	(.)
gensurg	0.212	0.288
	(2.70)**	(3.33)**
surgspec	0.103	-0.112
	-1.42	-1.32
ped	0.204	0.242
	(2.80)**	(2.39)*
obgyn	dropped	0.391
	(.)	(3.89)**
rad	0.311	0.205
	(4.12)**	(2.21)*
psych	0.101	0.368
	-1.37	(4.06)**
anesth	0.165	-0.009
	(2.08)*	-0.09
path	0.413	0.36
	(5.19)**	(4.07)**
other	0.463	0.098
	(5.77)**	-1.15
Constant	-4.634	-4.481
	(27.41)**	(18.97)**
Observations	2609	1518
R-squared	0.08	0.14

Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%
T-tests have been run on all variables, and prove that all changes between 1987 and 1991 are statistically significant.

non-certified counterparts. (While these numbers may seem quite different, the null hypothesis that these two earnings numbers are statistically equal cannot be rejected).

In both 1987 and 1991, neither male nor female self-employed physicians enjoyed any earnings advantages over their non-certified counterparts. In monetary terms, females enjoyed a $2.24 per hour advantage, while men enjoyed a $1.89 advantage from certification. However, neither of these advantages is statistically significant at any of the standard significance levels. Thus, for both male and female physicians who are self-employed, it appears as though board-certification bestows no statistically significant income advantages. This can be explained by Golbe's mathematical analysis of the correlation between wages and market signals. Wages are not correlated with market signals for self-employed physicians because there is no outside employer unable to directly observe productivity. Instead, the employer can observe productivity directly and doesn't need to rely on market signals because, for self-employed physicians, the employer is the same as the producer.

The result that board-certification bestows no significant economic advantages for self-employed female physicians holds true for both 1987 and 1991 data within each of the thirteen individual specialties. This result also holds true for all self-employed male physicians in 1987. Interestingly, while there is no statistically significant earnings advantage for female, self-employed, obstetricians/gynecologists, 1991 data shows that board-certified, male OBGYNs actually enjoyed an 83.5 percent earnings advantage over their non-certified counterparts. This means that while female, board-certified, self-employed, OBGYNs have only a slight, $1.40 an hour advantage that isn't statistically

Table 5: Overall Self-Employed Regression Results

	1987	1991
	lnwage	lnwage
selfemp	0	0
	(.)	(.)
male	0.103	-0.087
	-1.94	-0.93
boardcert	0.05	-0.059
	-0.81	-0.61
board_male	0.011	0.123
	-0.16	-1.14
age	0.024	0.033
	(4.29)**	(3.73)**
genpract	-0.461	-0.64
	(3.47)**	(4.27)**
intmed	0.294	-0.53
	(2.10)*	(3.63)**
nosubspec	dropped	-0.303
	(.)	-1.91
medsubspec	0.109	-0.137
	-0.71	-0.85
gensurg	-0.057	-0.055
	-0.39	-0.37
surgspec	-0.399	-0.633
	(2.98)**	(3.95)**
ped	-0.175	-0.245
	-1.3	-1.55
obgyn	-0.215	0.181
	-1.53	-1.07
rad	0.133	-0.294
	-1	-1.67
psych	-0.419	0.049
	(3.07)**	-0.32
anesth	-0.093	-0.251
	-0.67	-1.2
path	0.271	dropped
	-1.88	(.)
other	0.058	-0.197
	-0.41	-1.25
Constant	-4.165	-3.932
	(17.41)**	(11.49)**
Observations	2556	975
R-squared	0.17	0.2

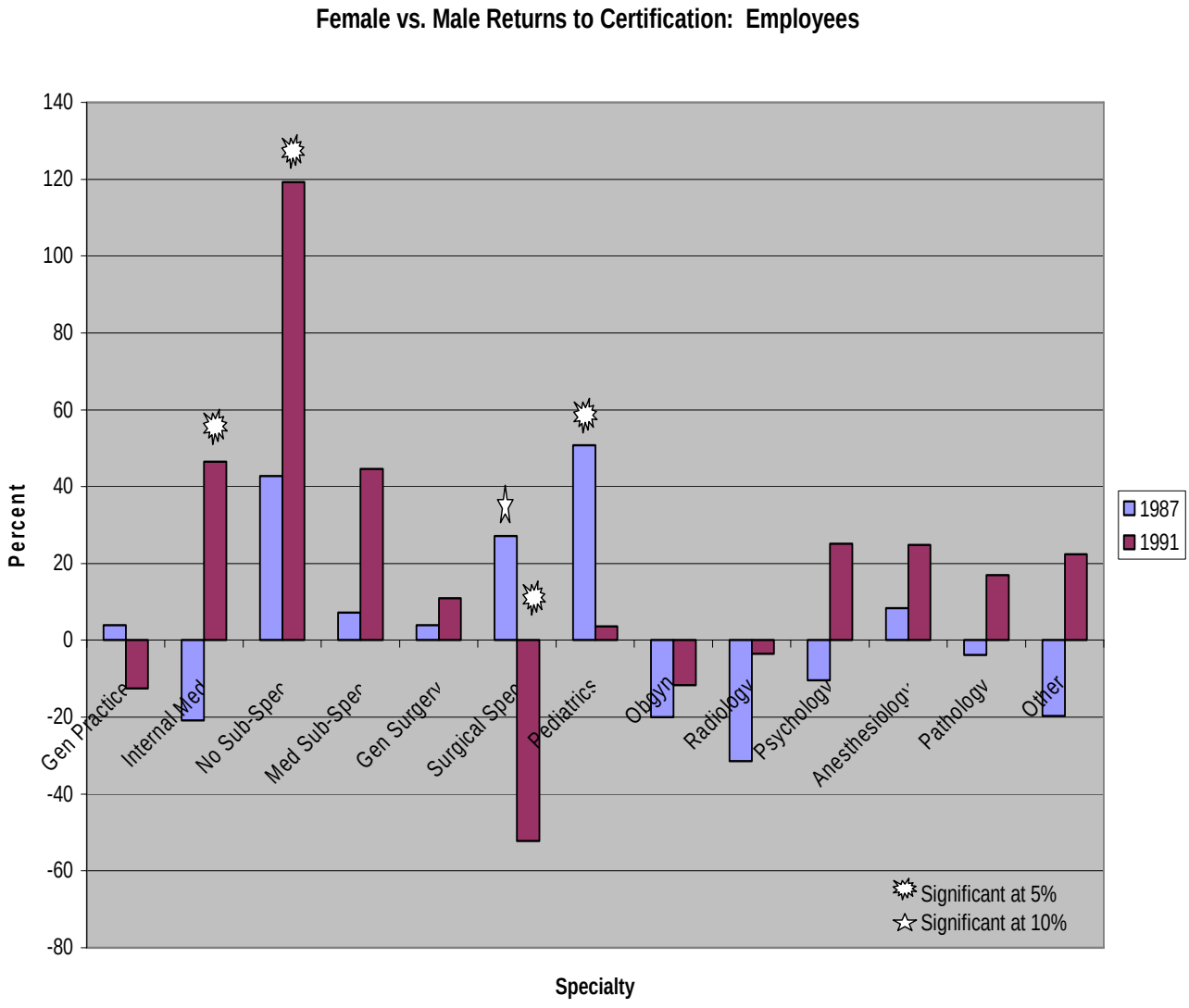
Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%
T-tests have been run on all variables, and prove that all changes between 1987 and 1991 are statistically significant.

significant, their male counterparts enjoy an astounding, statistically significant $52.44 per hour earnings advantage. While the result may at first seem extreme, this is consistent with Golbe's theory that minorities benefit more from market signaling than majorities do. Because females are more likely to be comfortable with a female OBGYN, there tend to be more practicing female physicians in the field than males. As there are fewer male OBGYNs, it is to be expected that male physicians would enjoy greater economic benefits from the quality assurance that board-certification offers than females would, as the data shows.

Evaluations for employee physicians within each of the thirteen individual specialties become slightly more complex. In 1987, within pediatrics, female, employee physicians enjoyed a statistically significant 49 percent earnings advantage over non-certified, female pediatricians ($14.09 per hour). Male, board-certified, employee pediatricians, on the other hand, earned approximately the same as non-board-certified male pediatricians ($.37 per hour). In 1991, female, employee pediatricians enjoyed a 22.6 percent earnings advantage ($12.28 per hour) over their non-certified counterparts, while male, employee pediatricians earned 18.9 percent ($9.58 per hour) more than their non-certified counterparts. However, the 1991 results are not statistically significant at any of the standard significance levels. (Employee specialty results are summarized in Chart 1).

Within anesthesiology in 1987, men and women had the same earnings advantage from board-certification, with both certified male and female employee anesthesiologists earning 32.8 percent more than their non-certified counterparts. In monetary terms, female, board-certified, employee anesthesiologists earned $10.30 more per hour than

their non-certified counterparts, while male, board-certified, employee anesthesiologists enjoyed an $8.37 per hour advantage over their non-certified counterparts. In 1991, board-certified, female anesthesiologists earned 64.3 percent ($18.1 per hour) more than their non-certified counterparts, while board-certified male anesthesiologists earned 39.5 percent ($12.96 per hour) more than theirs. However, again, the 1991 results are not statistically significant at the standard significance levels.



In 1987, employee females practicing a surgical specialty had a 29.5 percent income advantage over non-certified females, earning approximately $9.27 more per hour than their counterparts. Male employees practicing a surgical specialty, on the other hand, had only a 2.4 percent earnings advantage associated with board-certification ($1.06 more per hour). In 1991, the advantage from certification for employee males practicing a surgical specialty increased to 20.6 percent ($5.29). In this same year, the data shows that board-certified, employee females practicing a surgical specialty actually earned 34.6 percent less than their non-certified counterparts ($14.26 per hour). However, as board-certification should not be expected to decrease the salary of a physician, this result is highly unlikely and is possibly due to unobserved biases in the selection sample.

Among physicians with no sub-specialty in 1991, board-certified, employee females earned 123.7 percent more than non-certified females. This percentage translates into an $18.62 per hour advantage to certification. (As a caveat, while this number is statistically significant and may seem extreme, after omitting missing data, this regression contains only 53 observations.) Board-certified employee men in 1991, however, enjoyed only a 4.5 percent ($1.81 per hour) earnings advantage. The advantage females enjoyed in 1987 was lower, with board-certified, employee females with no sub-specialty enjoying a 55 percent advantage ($13.07 per hour) over their non-certified counterparts. Males in this year earned 12.3 percent ($4.8 per hour) more than their non-certified counterparts. However, the 1987 results are not statistically significant at any of the standard significance levels.

Within internal medicine, board-certified, employee, female physicians in 1991 had a 43.6 percent ($12.67 per hour) earnings advantage over their non-certified counterparts. The data shows, however, that in this same year, board-certified, employee male physicians actually earned 3.2 percent ($.94 per hour) less than their non-certified counterparts. Again, as board-certification is not expected to decrease a physician's salary, this negative number could potentially be due to biases in the sample selection process. The 1987 results also give an unlikely negative result with board-certified, employee females earning 2.1 percent ($.51) less than their non-certified counterparts. Male, board-certified employees, in contrast, had an 18.6 percent ($7.3 per hour) earnings advantage in this same year. However, the 1987 results are not statistically significant.

Among the group of other specialties, in 1991, employee, board-certified men and women had the same earnings advantage (47.7 percent) over the non-certified counterparts. In monetary terms, board-certified females enjoyed a $17.92 per hour advantage, while males enjoyed a $9.65 per hour advantage. In 1987, the data shows that employee, board-certified, female physicians actually earned 25 percent ($9.05 per hour) less than their non-certified counterparts. Men, on the other hand, enjoyed a 5.5 percent advantage from certification. Again, the 1987 results are not statistically significant, and as it is not expected that obtained certification would decrease a physician's income, this negative number may be a result of unknown biases in the selection sample.

Conclusions

For both 1987 and 1991 data, within all specialties, if a female physician is self-employed, board-certification bestows no statistically significant economic benefits. This

is also true for all 1987, self-employed, male physicians. However, 1991, board-certified, self-employed, male OBGYN have a rather large (83.5 percent or $52.44 per hour) advantage over their non-certified counterparts. As explained previously, this result is consistent with Golbe's findings that a minority physician should have a greater advantage from board-certification than a majority physician.

For employee physicians within the individual specialties, in 1987, females had a larger advantage from certification than males in only two out of the thirteen specialties: pediatrics and surgical specialty. By 1991, employee females still had a larger advantage than males from board-certification in only two of the thirteen specialties, although the specialties changed to internal medicine, and those with no sub-specialty.

Examining all male and female physicians overall, without separating by specialty, I find that for both employee and self-employed physicians, there is no statistically significant difference in the female versus male earnings advantage from board-certification. In 1987, both male and female, board-certified, employee physicians enjoyed a 12.2 percent earnings advantage over non-board-certified, employee physicians. In 1991, both male and female, board-certified, employee physicians earned 21.3 percent more than non-certified physicians. Thus the data has proven my hypothesis that female physicians' overall relative advantage from certification has decreased over time. (Table 6). As the

Table: 6 Board-certification Earnings Advantage

	1982	1987	1991
Employee:			
Men	13.40%	12.20%	21.30%
Women	18.30%	12.20%	21.30%
Relative Female Advantage from Certification	4.90%	0.00%	0.00%
Self-Employed:			
Men	13.90%	0.00%	0.00%
Women	24.40%	0.00%	0.00%
Relative Female Advantage from Certification	10.50%	0.00%	0.00%

data has shown, the earnings advantage of board-certified female physicians over non-board-certified female physicians relative to the earnings advantage of board-certified male physicians to non-certified male physicians has not only decreased, but has disappeared altogether according to both 1987 and 1991 data for both overall self-employed and employee physicians.

This disappearance of the relative female advantage from board certification leads to a dramatic decrease in differential signaling costs. This has important implications within the medical field because it implies that there has been a decrease in female discrimination and/or affirmative action constraints. Although females regain a greater advantage from board-certification than males in only internal medicine and for those with no sub-specialty, given the fact that there is still a large statistically significant advantage from certification for both self-employed and employee physicians overall, it is still in all physicians' best economic interest, whether male or female, to become board-certified.

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