Customer Discrimination in the Market for Physicians in the USA

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In this paper I study the gender wage gap of self-employed physicians in the USA. The data from CTS Physicians survey show that self-employed female physicians earn 13% less than self-employed male physicians, but no such difference exists in the salaried sector. I develop a model of simultaneous wage determination in private practice and salaried sector in presence of customer discrimination. The model predicts that female physicians charge lower price than male physicians if there is customer discrimination in the market. The model also predicts adverse selection among male physicians in the hospital sector. Only the very low ability male physicians will work for hospitals who benefit from high ability female physicians in the workplace driving the wages up.

Keywords: physicians, gender, wages, customer discrimination, private practice

INTRODUCTION

Motivation

Medicine is one of the most sought after career choices for women. According to the American Association of Medical Colleges, the percentage of women admitted to medical schools has gone up from 22 percent in 1975 to 48 percent in 2011-12 (Physician Specialty Data Book – AAMC (2012)). Given the increasing proportion of women in medicine, we would expect the labor market outcomes for female physicians to catch up with male physicians given their increasing proportion in the total physician population. However, research on this subject shows that female physicians still earn less than male physicians. The latest Medscape report on physician earnings for 2017 shows that female physicians earn around 28 percent less than male physicians (Medscape Physician Compensation Report 2018). In this paper we compare the hourly income of female physicians to that of male physicians using data from the Community Tracking Physician Survey.

The income of a physician depends on factors such as specialty choice, practice setting and other personal characteristics. The wage data shows that female physicians on average earn 9 percent less than male physicians. Interestingly, if we break the data into self-employed and salaried physicians, the earning differential of self-employed physicians increases to 16 percent. The difference in hourly wages for salaried physicians is almost negligible. The data also show that women are less likely to be self-employed. In this paper we theorize that female physicians face customer discrimination in the health care market, which lowers their average earnings and forces them to move into the salaried sector.

Salary in the hospital sector doesn't differ across the two groups of physicians. The intuition is that it is difficult for an employer to discriminate against its employees based on gender or race due to anti-discrimination laws (The Equal Pay Act of 1963 prohibits employers from discriminating on the basis of

gender or race) and hence the wage of both groups is similar. On the other hand, self-employed physicians have more control over their pricing and marketing strategies. In the presence of customer discrimination, female physicians will charge lower prices to their customers, which will result in lower mean income compared to their male counterparts. The data also shows that black physicians do considerably worse than white and Asian physicians in the self-employed sector, so this model could also help in explaining racial income disparities among self-employed physicians.

Literature Review

Previous work on the gender wage gap among physicians has focused mostly on the existence of differences in earnings, but the papers have not explored the possible explanations for such a gap. My motivation for this paper comes from Borjas and Bronars' (1982) paper in which they developed a model of customer discrimination in the self-employment sector for black entrepreneurs. Their work focuses on price determination in the presence of customer discrimination and its effect on income and ability distributions of self-employed individuals of different races. They do not study the impact of discrimination on the ability distribution in the salaried sector. This paper extends the model to include the effect of discrimination on the income and ability distributions in both self-employed and salaried sectors. I show that the degree of discrimination will have a positive effect on the ability distribution in the salaried sector as more low ability male physicians move to private practice. However, the wages in the salaried sector will remain low as the hospitals charge the prevailing (lower) female price to attract all customers.

Discrimination studies (Lazear and Rosen 1990) show how labor market discrimination results in not only a gender wage gap, but it also leads to high ability women being passed over for promotion and other high impact positions. Studies have shown that over the decades, the proportion of explained difference in earnings, associated with difference in observable characteristics, has steadily increased (Goldin (1989), Blau and Kahn (2017), Altonji and Blank (1999)). This implies that the unexplained differences in earnings, which is often attributed to discrimination, has been gone down during this time. However, it is important to note that the unexplained gender wage gap persists even today.

As mentioned above, gender wage gap may exist due to differences in inherent characteristics of men and women. There is evidence that shows productivity differences between men and women could arise due to multitude of reasons. One of the reasons of this difference is the traditional family structure where women are expected to put in more hours working in the household as compared to men (Becker (1985), Behrman (1997)). This results in many women working part time or fewer hours in the labor market. To address this issue, I use data on full time physicians and study the effect on hourly wages of these physicians.

Another explanation for the gender wage gap can be attributed to the occupation choices of men and women. Previous studies have shown that women often select into low paying occupations, which leads to a wide wage gap (Baker and Fortin (2001), Altonji and Blank (1999). Some of the studies show the relation between social norms and occupation choices of men and women (Akerlof and Kranton (2002, 2004, 2005). For example, historically, women are more likely to sort into traditionally feminine occupations like nursing, secretarial work, while men work in fields like law enforcement, construction and defense services. There is also a branch of social psychology literature which show that women are usually more risk averse than men. Given the risk-reward tradeoff, this leads to their self-selection into low paying occupations (Polachek (2005), Grazier and Sloane (2008)). However, recent studies have shown that technological advancement and globalization (Greenwood (2005)) has reduced the sorting into various occupations as well as the discrimination in labor market (Black and Brainerd (2004), Black and Strahan (2001)). Goldin (2006) argues that due to increased labor force participation of women in the last few decades, the workplace has made changes to make it more conducive to women, which has helped in reducing the occupation sorting. She calls it the grand convergence

In order to account for this self-selection into different occupation categories, some studies have analyzed the gender pay gap in narrower occupation categories. Wood, Corcoran and Courant (1993) compare male-female salaries among lawyers to show that even after controlling for various personal and

professional variables, there is still a large unexplained gender gap. More recent study on lawyers, Azmat and Ferrer (2015), however, show that most of the pay gap can be explained based on performance differences. They show that male lawyers bring in more revenue and thus are rewarded accordingly. My paper is an extension of this branch of the literature on gender wage gap focusing on one group of professionals, that is, physicians.

There have been several studies on difference in earnings between male and female physicians in the last few decades. Esteves-Sorenson and Snyder (2012) use the same CTS data to study the gender wage gap among physicians. Their results are similar to this paper, that is, they find a 13 percent gender wage gap among new licensees. This gap increases to 28 percent after 8 years of practicing medicine. They control for practice setting and specialty choices of the physicians but don't specifically look at entrepreneurs only. They also don't provide a theoretical explanation for this wage gap.

I can argue that part of the physician earning gap can be explained by differences in personal characteristics of the physicians. Ohsfeldt and Culler (1986) use the 1982 physician income data to show that personal characteristics explain some, but not all, of the gender wage gap. Their empirical specification includes practice setting and specialty choice variables, including a dummy for self-employed physicians, and still finds a 13 percent unexplained wage gap. Their model shows that self-employed physicians earn more than salaried physicians, but they don't compare the earnings of male and female self-employed physicians. The regression results in this paper are similar to their work, but I extend these results to explain the selection of female physicians in the salaried sector.

Another line of literature shows that there is a motherhood penalty for women (Anderson, Binder, Kraus (2002), Avellar and Smock (2003)). Research has shown that birth of a child leads to extended breaks from labor market for the mother, which in turn has a negative effect on her wages. Sasser (2005) studies the labor market effects of marriage and child bearing for female physicians. She finds that married female physicians earn 11 percent less than married male physicians. The gender wage gap among physicians with one child is 14 percent. She concludes that most of the fall in earning can be attributed to fewer hours worked by female physicians rather than adverse selection in the market.

Baker (1996) uses 1992 young physician socioeconomic survey data to show that in some specialties, primarily dominated by women, the wage gap is almost zero. Bashaw and Heywood (2001), in response to this study, argue that since female physicians work fewer hours than male physicians, their marginal productivity should be higher. This should result in higher hourly earnings. They use log annual hours as their dependent variable and keep log of annual hours worked as an independent variable. They show that based on their specifications the gender gap persists. However, like Ohsfeldt and Culler, they also do not provide an explanation for this gap. They run separate regressions for male and female physicians, which show that self-employed physicians (both male and female) earn more than salaried physicians. in the end, there is substantial literature showing that there is a big unexplained wage gap between male and female physicians and this article uses economic theory and empirical analysis to show the possible explanation for this gap.

THEORETICAL MODEL

I develop a model of customer discrimination in this paper. It is an extension of Borjas and Bronars' (1982) model of customer discrimination in the self-employment of black physicians. The model is modified to represent the characteristics of the labor market for physicians.

There is a continuum of physicians of mass 1 in the market, divided into two groups $j = m, f$, where m=male and f=female . Let λ be the fraction of male physicians in the total physician population. Let i be the index for individual physician.

Physicians can choose between two types of employment options, $o = s, \mathrm{e}$ where s refers to self-employed physicians, who may own a group or solo practice, and e refers to physicians who work for an employer at a fixed salary. Patients are divided into two groups, the first group of patients prefer going to a male doctor, and the second group of patients are indifferent to the personal characteristics of a doctor.

The second group chooses their doctor based only on the price charged by the physician. The discriminating group is made up of both males and females. In our model the male self-employed physicians are able to charge a higher price due to customer discrimination.

Patient Behavior

Patients can search for self-employed physicians and choose the best option, or they can go to a hospital and get randomly assigned to a physician. Since patients of the discriminating group prefer male physicians, if the per unit price of health service produced by a female physician is p, then these patients perceive the price to be $\frac{p}{1-d}$, where $0 < d < 1$ is the coefficient of discrimination.

I conjecture that all patients have the same valuation for physician services denoted by R. This implies that the maximum price the discriminating group will be willing to pay a female physician is $R(1-d)$. For all other physician-patient combination the maximum reservation value for a buyer is R.

Given the framework above, I can characterize the reservation value R_j of the two groups of patients for physician j as follows:

$$R_m^{disc} = R_m^{indif} = R_f^{indif} > R_f^{disc} \tag{1}$$

Patients are utility maximizers, risk neutral and have zero discount rate in an infinite horizon model. There is imperfect information in the market, which implies that patients do not know the price and gender of the physician. They can acquire this information only at a cost of $C. Patients randomly contact a physician to inquire about their price, and other personal characteristics like age, gender and race.

I assume that physicians of both groups adopt an integrated selling strategy; that is, they charge the same price to all consumers. This is done for computational ease, since the focus of this paper is to show the selection mechanism for physicians into private practice and the salaried sector. This assumption implies that some patients will never visit a male physician, since they charge a higher price. For simplification I ignore this aspect of the model.

Physician Behavior

A physician's utility function is characterized in equation 2 below. It shows the utility of a physician of group j in employment type o such that:

$$U_{jo} = Y_{jo} - \phi_j H_{jo}^2; \tag{2}$$

Here Y_{jo} is the earned income of physician of group j in practice setting o, H_{jo} is the number of hours worked. Total income is defined as $Y_{jo} = w_{jo} * H_{jo}$, where w_{jo} is the hourly income of a physician in employment type o. ϕ_j is the disutility associated with working. I assume that female physicians have a higher disutility from working more hours than male physicians (Sasser, 2005). There is empirical evidence for this conjecture. Self-employed male physicians work the greatest number of hours, and even self-employed female physicians work more hours than all salaried physicians.

The optimal number of hours worked by a physician is therefore $H_{jo}^{k*} = \frac{w_{jo}^k}{2\phi_j}$. I can see that female physicians will work fewer hours, as their disutility from working is higher. The indirect utility function

for a physician after substituting H_{jo}^{k*} is $U_{jo}^{k*} = \frac{w_{jo}^{k2}}{4\phi_j}$. I can compare the utilities from the two types of employment to understand a physician's choice. A physician chooses self-employment over the salaried sector if the utility derived from working in private practice is at least as high as the utility from working for a hospital.

Physician Productivity in Self-Employed Sector

Let β be the per hour quantity of output produced by a physician. Output can be defined as number of patient visits, or number of billings generated, etc. I assume all self-employed physicians adopt an integrated selling strategy; that is, they price their services so all patients would be willing to purchase from them. Note that the price charged by the physician is net of advertising costs aimed to attract new patients. Given this framework, the offer price distribution p_j, which is the price charged by physician of group *j* to the patient of either group will have the following property.

$$p_m > p_f = p_m(1-d); \text{ where } p_m = R \tag{3}$$

Physicians differ in their ability to produce health services. The distribution of β is discrete with two ability levels, high and low, denoted by the superscript *k*. Also, the ability distribution for both groups is the same; i.e., the fraction of high ability individuals denoted by θ is the same across the two groups.

A physician also engages in marketing and promotional activities for her services. I conjecture that a physician hires staff that assist her in selling her services, and that run the day to day business at the clinic. In addition, a self-employed physician has to undertake some management and administrative duties in managing the staff. This activity takes valuable time away from the doctor, which they would have otherwise used for production. I define the managerial cost of self-employed physicians (*x*) in terms of loss of output in a given time; i.e., they are able to produce $\beta' = \beta - x$ in a given amount of time. Note that the unit of measurement of β and x is same.

I further assume that physicians differ in their managerial ability. The ability distribution $G(x)$ is uniform between $[0,1]$. Note that a higher *x* implies poor management skills, so physicians with low value of *x* are more likely to enter self-employment. Also, *x* can be interpreted as disutility from working in private practice. I discuss this aspect in detail in a sub-section. Since output cannot be negative, I assume that $\beta^l \geq 2$.

Choice of Employment

A physician chooses self-employment over working for a hospital if $w_s \geq w_e$. That is, the hourly income she can make in private practice is at least as high as the hourly income she can make in a hospital. I can write the hourly income of the two groups of physicians, given the prices and net productivity of these physicians. The hourly income of a physician in private practice and in the salaried sector is given in equations 1.4 and 1.5 respectively.

$$w_{js}^k = p_j(\beta^k - x) \tag{4}$$

$$\bar{w}_e = p_f(\bar{\beta}_e - \bar{x}_e) \tag{5}$$

Equation 4 shows that for each ability level, given the prices in relationship 3, male physicians will earn more than female physicians in the self-employed sector as I have assumed that the ability distribution is same across groups. $\overline{w}_e$ is the hourly wage in the salaried sector, where $\overline{\beta}_e$ is the expected ability in the hospital sector given the prices for both male and female physicians. The hospitals will base the hourly wages on the mean ability level of physicians who enter their sector. An added advantage for the physicians from working in the hospital sector is that they will not have to spend time on administrative activities. The hospital takes that responsibility away from them and in return charges a flat fee of $\overline{x}_e$ per hour such that physicians' hourly income is reduced by the amount $\overline{x}_e$. The hospital charges a price equivalent to the price charged by female physicians (p_f) in self-employed sector.

Given equations 4 and 5, a physician chooses private practice as long as $\left((\beta^k - x\ )\mathrm{p}_j\right) \geq \overline{w}_e$. Note that there is no group and ability subscript on $\overline{w}_e$ since hospitals pay the same wages to physicians irrespective of group affiliation. I can solve the inequality to find the minimum cutoff of *x*, which makes the self-employed sector more remunerative than the hospital sector.

$$x^k_{j\min} = \beta^k - \left(\frac{w_e}{\mathrm{p}_j}\right) \tag{6}$$

There will be four different cutoff points for physicians in two different groups with two ability levels. I can see that for higher β, more physicians will choose to own their practice, since the cutoff value of $x^k_{j\min}$ will be higher. Also, since female physicians charge lower prices, fewer female physicians will stay in the self-employed sector, as they cannot charge a high enough price to offset the high cost of managing the clinic.

Average Ability in the Salaried Sector

I can see that physicians in the interval $[x^k_{j\min}, 1]$ enter the hospital sector. The hospitals then adjust the wage they pay to these physicians based on the average ability of physicians who enter their sector. I can write the average ability level in the hospital sector using probabilities of selecting into hospital sector. I can define the fraction of physicians of ability level *k* from group j entering the hospital sector as E^k_j;

$$E^h_f = \theta(1-\lambda)(1-x^h_{f\min}); E^h_m = \theta(\lambda)(1-x^h_{m\min});$$
$$E^l_f = (1-\theta)(1-\lambda)(1-x^l_{f\min}); E^l_m = (1-\theta)(\lambda)(1-x^l_{m\min})$$

Thus, the total number of physicians employed in the hospital sector *i* is $E = E^h_f + E^h_m + E^l_f + E^l_m$.

$$\overline{\beta}_e = \frac{E^h_f + E^h_m}{E}\beta_h + \frac{E^l_f + E^l_m}{E}\beta_l \tag{7}$$

where $0 < x^k_{j\min} < 1 \forall j,k$ to ensure interior solution.

Wages in the hospital sector will be based on average ability level defined in equation 7. Figures 1, 2, 3 and 4 show the numerical solution for some of the variables mentioned above. I discuss the predictions of the model based on these figures in the next subsection.

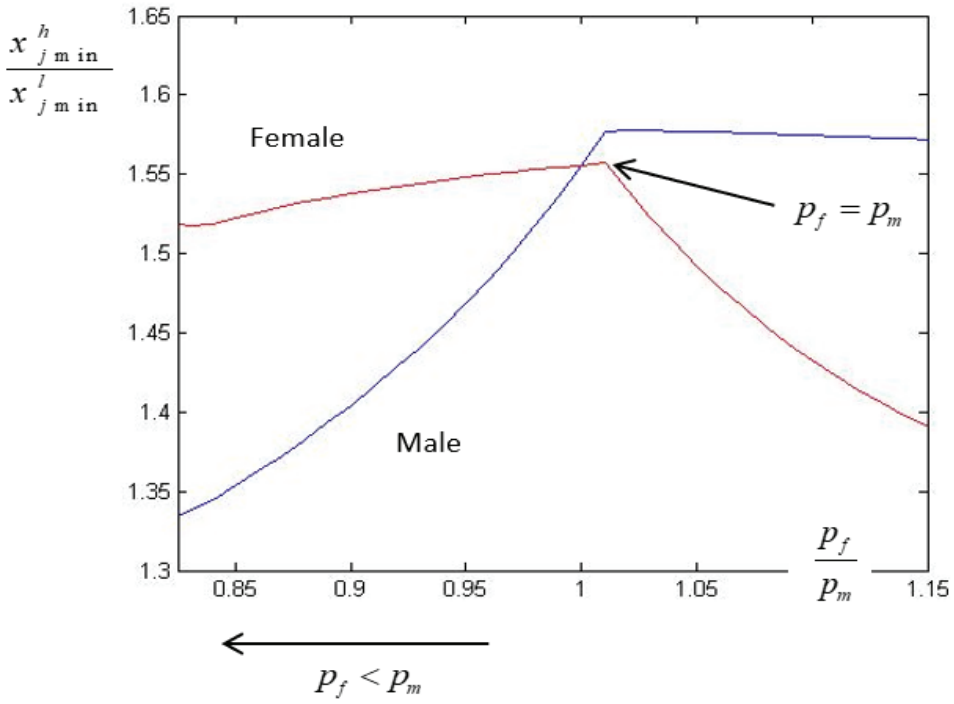
Predictions of the Model

I have summarized the predictions of the model in this section. The discussion focuses primarily on the case of discrimination against female physicians; however, similar conclusions can be drawn if there is discrimination against male physicians.

Proposition 1: *across types, effect of no discrimination in the two sectors* ($p_f = p_m$) $x^k_{j\min} = x^k_{q\min} \forall j \neq q$.

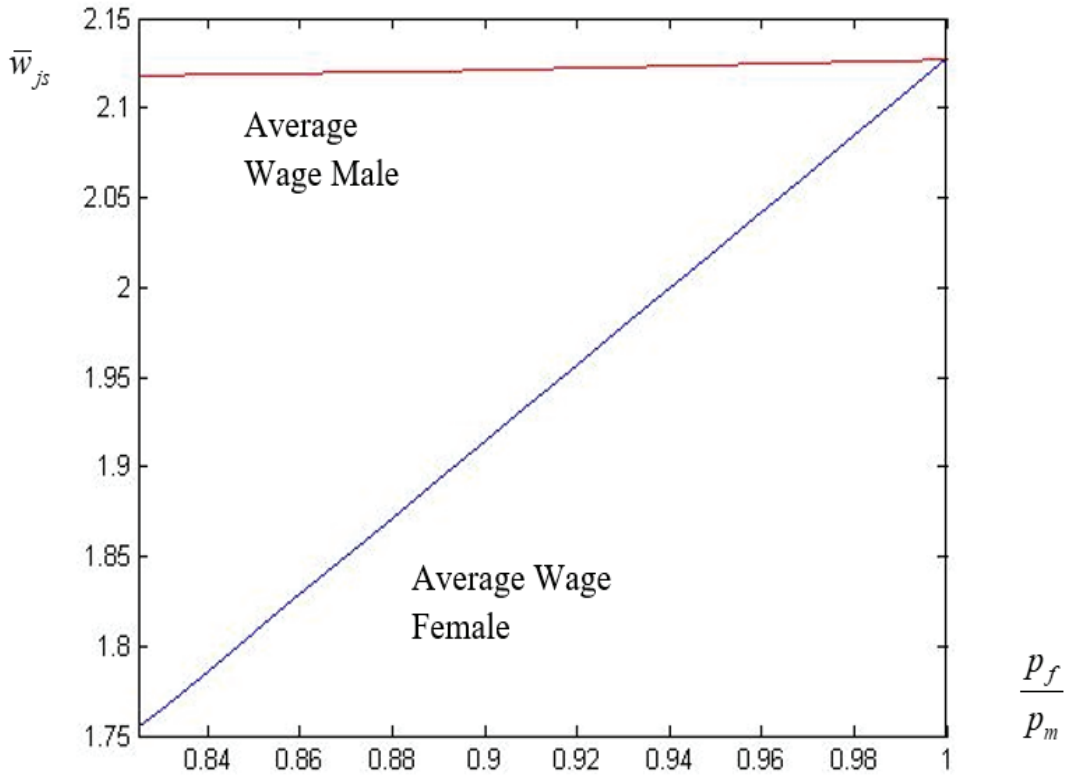
Note: as the fraction of high and low ability physicians who choose private practice is same across groups, the average ability of both groups is same in private practice, and as a result in the hospital sector also.

FIGURE 1
RATIO OF HIGH ABILITY TO LOW ABILITY PHYSICIANS IN PRIVATE PRACTICE



Notes: The curves show the ratio of fraction of high ability to low ability physicians who enter private practice for both male and female. The two curves intersect when $p_f = p_m$, which implies the average ability of both groups in private practice is the same at this point. Moving to the left of this point $p_f < p_m$, indicating patients discriminate against female physicians and thus these physicians charge a lower price to attract all patients.

FIGURE 2
AVERAGE WAGES OF BOTH GROUPS IN PRIVATE PRACTICE



Notes: the figure shows the average hourly income in private practice for male and female physicians. We only show the case where there is discrimination against female physicians. As we can see, the hourly income of self-employed male physicians remains steady while the hourly income of self-employed female physicians' falls as discrimination goes up.

In Figure 1 the two curves representing ratio of fraction of high ability to low ability physicians intersect at $p_f \neq p_m$. If the price charged by male and female physicians is the same, then there are no group differences in selection into different employment settings. Also, the average ability in the hospital sector is at its minimum at this point. This is because as the hospital starts charging lower prices due to discrimination against one group, average ability in the sector goes up. This point is made clear in the next proposition.

Proposition 2: *across types, effect of discrimination in the two sectors* ($p_f \neq p_m$) *when* $x^k_{m\min} > x^k_{f\min} \forall k$

Average ability of male physicians in private practice falls at a greater rate than average ability of female physicians. The average ability in the hospital sector depends upon the fraction of low and high ability physicians from both the groups who choose to work as an employee. Figure 1 shows that in private practice, the ratio of high ability to low ability physicians reaches a maximum when there is no discrimination in the market; that is, when $p_f = p_m$.

The discrimination coefficient goes up as we move left. In this range $p_f < p_m$ indicating discrimination against female physicians is increasing. The curve slopes downward in this range. The intuition behind the slope of the curve is that when hospitals pay a lower price to their physicians, the lower ability male physicians leave the hospital sector to work in private practice. The average ability of female physicians in the hospital sector remains steady, but only the lowest ability male physicians work for a salary, leading to adverse selection of male physicians in that sector. These male physicians are essentially benefiting from the presence of high ability female physicians, whose outside option of working in private practice is not as good as that of a male physician.

Proposition 3: *across group and across ability effect in the two sectors when* $p_f \neq p_m$ $x^h_{m\min} > x^l_{f\min}$, *but the relationship between* $x^h_{f\min}$ *and* $x^l_{m\min}$ *depends upon degree of discrimination*.

Low ability male physicians leave the employment sector to work in private practice. When the discrimination coefficient (see above) is low, then a lower fraction of low ability male physicians work in private practice, but as this coefficient increases their number start increasing and begins to catch up with high ability female physicians in private practice. This also provides further evidence of adverse selection of male physicians in the salaried sector in the previous proposition.

Proposition 4: *Across sectors, effect of discrimination on average wages of the two groups, when* $\bar{w}_{ms} > \bar{w}_{fs}$ *and* $\frac{\partial \bar{w}_e}{\partial p_f} < 0$.

Female physicians charge lower prices, and as a result their average income in private practice goes down as shown in Figure 2. The gap between male and female physicians in private practice increases as the discrimination coefficient increases. On the other hand, hospitals pay wages that depend on the average ability of physicians working at price p_f. Even though average ability in the sector goes up as discrimination goes up as discussed in proposition 2 above, the average wage in the sector still goes down.

Alternative Theories

In the previous subsections I have developed a model to explain the empirical observation in the data. However, there could be other explanations for the low average income and lower proportion of female physicians in private practice. In this section I discuss some of these theories and evaluate them based on the model and the data that we have used.

First, as discussed in section above, women may have greater disutility from working in private practice because of greater administrative responsibilities and higher number of hours worked. This will drive more female physicians away from private practice, towards the hospital sector. In our model, the managerial cost represented by *x* can be interpreted as the disutility from working in private practice. If I assume the female physicians have a higher mean *x* (or higher disutility from working in private practice) then according to equation 6, a greater number of female physicians will choose to work in the salaried sector. I also have to look at the average earnings of female physicians in this context. If the price charged by both groups is the same, then the average income in private practice may also differ between the two groups. We need to explore this point further to understand what is causing the change.

Similarly, even if I conjecture that the ability distribution differs across the two groups such that female physicians have lower average ability (lower θ). If we look at equation 6 we see that the fraction of physicians who choose private practice doesn't depend on θ. The fraction of high and low ability physicians who work in private practice will therefore remain the same across groups. A higher θ will explain higher mean earnings for male physicians in the self-employed sector.

We can see that some of these alternative theories can explain some but not all results from the data. The ones that can explain all the changes need to be examined in detail to understand the extent of the wage gap.

We now move to the empirical section of the paper to test the results of the theory. We start by describing the dataset that we have used for our analysis, followed by the empirical framework.

DATA

Data Description – CTS Physician Survey

I use the restricted data files of the Community Tracking Survey (Physicians), a project of Health System Change, for the years 1996-7, 1998-9, 1999-2000, and 2004-5. CTS Physician survey includes responses from a sample of active full time physicians, who have completed their medical training, are currently working in the USA, and provide direct patient care for more than 20 hours every week. The survey collects information on the physicians' basic demography like age, gender and race; medical practice arrangements, revenue sources, level of compensation, physicians' allocation of time, career satisfaction, etc. The specialties are divided into three broad categories: primary care, medical specialty, and surgical specialty. A primary care physician is identified as one working in one of the following sub specialties: internal medicine, pediatrics, family practice, psychiatry, and ob-gyn.

The survey covers sixty communities across the country based on their geographic and demographic constituents, but it does include weights that can be used to get national level estimates. The summary statistics are consistent with the AMA Masterfile data on physicians; i.e., that female physicians constitute roughly 1/3 of all young physicians.

For empirical analysis, I dropped all variables with missing income variable and everyone with annual income lower than $20,000. Also, the annual income variable is top coded at $400,000. I limit our analysis to younger physicians only, that is, physicians who are 45 years old or younger. Women started entering the profession much later, in the 80s. Female physicians who entered the labor force earlier most likely faced a much different work environment, both at hospitals and in private practice. Therefore, any comparison of older physicians may overstate results.

TABLE 1
SUMMARY STATISTICS

	Female	Male
	1996-2001	1996-2001
N	8529	20617
	Mean (S.D.)	Mean(S.D.)
Hourly Income	55.25 *(34.7)*	65.25 (*38.3*)
FMG (%)	18.81 *(39)*	18.3 (*38*)
Age	39.77 *(5.6)*	41.4 (*5, 5)*
Experience	8.16 (*5.4*)	10.2 (*6)*
White (%)	73.19	80.2
Black (%)	6.6	3.4
Asian (%)	15.48	11.3
Hispanic (%)	5	5.3
Solo (%)	26.05	31.3
Group (%)	24.5	32.3
HMO (%)	7.3	5.6
Medical School (%)	11.78	7.78
Hospital (%)	17	13.17
Other (%)	13.3	9.73
PCP (%)	71.1	54.5

Table 1 shows the proportion of doctors who enter private practice. Female physicians primarily choose salaried employment as compared to male doctors. As predicted in proposition 2, almost 2/3 of all female physicians are employed in the hospital sector compared to less than ½ of male doctors.

TABLE 2
SUMMARY STATISTICS (HOURLY INCOME BY EMPLOYMENT CATEGORY)

Variables	Female			Male		
	Employed	Full Owners	Part Owners	Employed	Full Owners	Part Owners
Solo	52.27 (29.3)	53.2 (30)	55.4 (40.4)	56.7 (53.4)	65.8 (43.4)	65.8 (33)
Group	53.8 (29)	64.18 (33)	61.2 (28.8)	58.02 (30)	78.3 (38.2)	76.38 (31.2)
HMO	55.5 (21.7)		68.49 (28.2)	60.6 (27.9)		74.6 (48.8)
Hospital	56.4 (42.5)			61 (36.4)		
Medical School	49.7 (29.7)			55 (26.7)		
Other	55.3(35)			59.8(28.4)		
Total	5653	1572	1304	9451	5705	5512

Table 2 shows the hourly income of male and female physicians in different occupation settings. It is quite clear from the Table that in every category, female physicians earn much less than male physicians. The difference is less pronounced in the hospital category.

Empirical Framework

TABLE 3
LOGIT REGRESSION: PROBABILITY OF BEING EMPLOYED IN A HOSPITAL VS. BEING IN PRIVATE PRACTICE

VARIABLES	(1) Regression Coefficient	(2) Odds Ratio
	Employed (Salaried) Physicians	
Female	0.632***	1.880685
	(0.0295)	(00555)
Age	-0.0174***	0.9827
	(0.00390)	(0.00389)
Experience	-0.196***	0.821
	(0.00880)	(0.0072)
Experience Squared	0.00661***	1.006
	(0.000364)	(0.0003)
FMG	-0.147***	0.863
	(0.0335)	(0.0288)
PCP	0.315***	1.369
	(0.0262)	(0.035)
Constant	1.468***	4.339
	(0.136)	(0.5906)
Observations	29, 115	29, 115

Notes: The logit regression shows the odds ratio for a physician to be employed as opposed to being self-employed. FMG stands for foreign medical graduate and PCP is an indicator variable for being a primary care physician. The regression includes appropriate weights and controls for location fixed effect.

Before we move on to the OLS regression results, let's look at the logit regression given in Table 3. This regression gives empirical evidence to our theoretical prediction in proposition 2: that female physicians have a greater likelihood of working in the employed sector. The odds ratio for female variable is 1.88 and is statistically significant. We can now move on to look at the wage equation and our basic empirical model.

I run an ordinary least squares regression to measure the impact of demographic variables like age, experience and gender, and other practice setting variables on the wages of physicians. The data includes information on number of hours worked in a week, and number of weeks worked in a year, which is used to calculate the dependent variable, log hourly income.

Wage Equation:

$$y_{ijor} = \alpha_0 + \alpha_1 Female_i * Own_i + \alpha_2 Male_i * Own_i + \alpha_3 Male_i * Employed_i \ldots$$
$$\ldots + \alpha_4 X_{ijok} + \alpha_5 S_{io} + \delta_r + \varepsilon_{ijor} \quad (8)$$

Here, y_{iok} is log hourly income of the i^{th} physician, working in r^{th} location, in practice setting O. X is a vector of personal characteristics like age, experience and race. S is a dummy variable indicating if the physician is a primary care practitioner. α_1, α_2 and α_3 measure the earnings of female owners, male

owners and employed male physicians as compared to employed female physicians in the dataset. δ_r is the control for location choice of the physician.

Table 4 gives the regression results of the main specification above. We can see that without controlling for any other factor, male physicians in the salaried sector seem to do better than their female counterparts by about 8 percent. Also, there is no discernable income difference between female private practitioners and salaried female physicians. Even when I control for personal characteristics like age and experience there is little variation in the coefficients.

Column 5 of Table 4 gives the results of our full specification. There is considerable difference between the results in column 1 and column 5. The coefficient on employed male physicians is negative but not significantly different from zero indicating that income of physicians, both male and female, in the salaried sector is similar to that which is predicted in our model. This is consistent with our assumption that hospitals pay the same wages to all physicians irrespective of the group or type of physician. The results also show that female owners have the worst outcome among all the sub groups of physicians. This follows from proposition 4 in the theory section. It shows that in the presence of customer discrimination the average wage of self-employed female physicians will be lower than that of self-employed male physicians. However, they earn even less than salaried female physicians, which follows from proposition 2. We see that average ability in the hospital sector goes up as discrimination against female physicians goes up. Hospital employees are paid based on this average wage, so their average income is higher than income of female physicians working in private practice. However, the size of the income difference may not be fully explained by the discrimination theory, so I will have to look at other possible theories that can explain this kind of difference.

The rest of the results in Table 4 are as expected. Primary care physicians earn almost 30 percent less than non-primary care physicians. Returns to experience is positive but declining over time as evident from a negative coefficient on the experience squared term. The coefficient of the dummy variable for black physicians is negative and significant. Black physicians on average earn 5 percent less than white physicians in the data. On the other hand, Asian physicians tend to do slightly better than white physicians.

TABLE 4
OLS REGRESSION OF LOG HOURLY INCOME ON INTERACTION TERMS OF GENDER AND EMPLOYMENT SETTING CHOICE

	(1)	(2)	(4)	(5)
VARIABLES	Log Hourly Income			
Female*Owner	0.0204	-0.0208	-0.0803***	-0.0969***
	(0.0214)	(0.0214)	(0.0200)	(0.0238)
Male* Owner	0.268***	0.207***	0.0956***	0.0841***
	(0.0136)	(0.0140)	(0.0141)	(0.0172)
Male*Employed	0.0803***	0.0639***	0.00970	-0.00573
	(0.0136)	(0.0135)	(0.0128)	(0.0155)
FMG		-0.0379***	-0.00348	-0.00722
		(0.0124)	(0.0116)	(0.0148)
Experience		0.0539***	0.0505***	0.0540***
		(0.00289)	(0.00281)	(0.00350)
Experience Squared		-0.00190***	-0.00169***	-0.00187***
		(0.000128)	(0.000124)	(0.000161)
Black				-0.0560**
				(0.0276)
Asian				0.0296*
				(0.0180)
PCP			-0.289***	-0.294***
			(0.00853)	(0.0106)
Constant	3.899***	3.672***	3.815***	3.817***
	(0.0176)	(0.0197)	(0.0201)	(0.0241)
Observations	29, 114	29, 114	29, 114	20, 202
R-squared	0.068	0.106	0.184	0.194

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
Notes: This regression corresponds to the wage equation presented in Empirical Framework section. The control group is employed female physicians and the dependent variable is log hourly income. The regression includes appropriate weights and controls for location fixed effect.

Table 5 explains the wage gap within owners and employed physician earnings more clearly. Columns 1 and 2 of this table show that female physicians earn less than male physicians in both types of employment settings. However, as I control for specialty choices and other personal characteristics, the story that our model outlines begins to emerge. Male owners earn around 16 percent more than female owners, and there is no noticeable difference in earnings between male and female employed physicians. This is consistent with proposition 4. Also, employed physicians are paid similar wages irrespective of their group. This is consistent with proposition 4 that hospitals pay wages based on the average ability of physicians working for them.

TABLE 5
OLS REGRESSION OF LOG HOURLY INCOME ON DATA DIVIDED INTO EMPLOYMENT SETTINGS (SELF EMPLOYED VS. EMPLOYED PHYSICIANS)

VARIABLES	(1) Owner	(2) Employed	(3) Owner	(4) Employed	(5) Owner	(6) Employed
	Log Hourly Income					
Female	-0.245***	-0.0702***	-0.231***	-0.0543***	-0.162***	-0.0134
	(0.0234)	(0.0164)	(0.0236)	(0.0164)	(0.0220)	(0.0159)
Black	-0.244***	-0.0193	-0.225***	0.000224	-0.135***	0.00680
	(0.0515)	(0.0367)	(0.0496)	(0.0361)	(0.0452)	(0.0345)
Asian	-0.0193	-0.0612***	0.0587*	-0.0185	0.0775***	-0.00965
	(0.0330)	(0.0185)	(0.0328)	(0.0208)	(0.0294)	(0.0201)
FMG			-0.0981***	0.0179	-0.0227	0.0144
			(0.0243)	(0.0194)	(0.0226)	(0.0181)
Experience			0.0661***	0.0546***	0.0536***	0.0508***
			(0.00612)	(0.00429)	(0.00582)	(0.00431)
Experience Squared			-0.00254***	-0.00190***	-0.00183***	-0.00175***
			(0.000267)	(0.000207)	(0.000253)	(0.000207)
Practice Setting Variable						
Group					0.175***	0.0424
					(0.0160)	(0.0307)
HMO						0.128***
						(0.0344)
Hospital						0.108***
						(0.0253)
Medical School						-0.0745***
						(0.0270)
Other						0.0808***
						(0.0267)
PCP					-0.382***	-0.233***
					(0.0161)	(0.0138)
Constant	4.148***	4.001***	3.833***	3.727***	3.886***	3.778***
	(0.0224)	(0.0184)	(0.0357)	(0.0239)	(0.0366)	(0.0298)
Observations	9, 411	10, 791	9, 411	10, 791	9, 411	10, 791
R-squared	0.080	0.031	0.113	0.092	0.234	0.156

Notes: The data is divided into employed physicians and self-employed physicians. Solo practice is the control group for practice setting variables. PCP is an acronym for Primary Care Physician.

Also, Table 5 suggests that our model fits well for self-employed black physicians. Black owners earn much less than white owners, but in the hospital sector there is no such income gap. This result gives further evidence in favor of my model of customer discrimination. If I assume that a small group of patients discriminate against black physicians then using the results from the model, I can show that more black physicians enter the hospital sector where they earn same fixed income like everyone else.

TABLE 6
OLS REGRESSION OF LOG HOURLY INCOME ON INTERACTION TERMS OF RACE AND EMPLOYMENT SETTING CHOICE

VARIABLES	(1) Log Hourly Income	(2)	(3)	(4)
Black*Owner		-0.117**	-0.139***	-0.117**
		(0.0531)	(0.0511)	(0.0492)
Asian*Owner *		0.114***	0.113***	0.106***
		(0.0327)	(0.0324)	(0.0301)
White*Owner		0.163***	0.106***	0.0828***
		(0.0129)	(0.0129)	(0.0125)
Black*Employed		-0.0381	0.0173	0.0289
		(0.0370)	(0.0359)	(0.0334)
Asian* Employed		-0.0695***	0.0114	0.0221
		(0.0181)	(0.0201)	(0.0201)
Female			-0.128***	-0.0777***
			(0.0143)	(0.0135)
FMG			-0.0356**	-0.0147
			(0.0159)	(0.0150)
Experience			0.0595***	0.0528***
			(0.00359)	(0.00352)
Experience Squared			-0.00219***	-0.00184***
			(0.000165)	(0.000162)
Black	-0.148***			
	(0.0305)			
Asian	-0.0686***			
	(0.0181)			
PCPFLAG				-0.294***
				(0.0108)
Constant	4.033***	3.966***	3.740***	3.867***
	(0.0143)	(0.0155)	(0.0210)	(0.0212)
Observations	20, 202	20, 202	20, 202	20, 202
R-squared	0.033	0.056	0.112	0.181

Notes: the regression is based on a similar wage equation presented in the article but instead of female the group of interest is black physicians. Employed White physicians is the control group.

Table 6 shows specification similar to the one presented in Table 4, except the variable of interest is the race variable and the interaction between employment type and race. As discussed above, Table 6 results are similar to the one presented in Table 4 and indicate possibility of customer discrimination against self-employed black physicians. The control group in this regression is employed white physicians. Column 4 of the table shows that the income of both black and Asian salaried physicians is not different from white employed physicians. The same cannot be said about black owners. Their earning outcome is the worst amongst all the racial subgroups. Both white and Asian entrepreneurs earn much more (10 percent approximately) than white employed physicians. The coefficient for black owners is negative 11 percent. That is, black owners on average earn 11 percent less than salaried black physicians.

TABLE 7
OLS REGRESSION OF LOG HOURLY INCOME ON INTERACTION TERMS OF GENDER AND EMPLOYMENT CHOICE WITH SUB-CATEGORIES OF SELF-EMPLOYED PHYSICIANS

VARIABLES	(1)	(2)	(3)	(4)	(5)
	Log Hourly Income				
Female*Full Owner	-0.0385	-0.0898***	-0.0894***	-0.127***	-0.151***
	(0.0241)	(0.0243)	(0.0241)	(0.0230)	(0.0268)
Female*Part Own	0.0936***	0.0620*	0.0160	-0.00662	-0.0139
	(0.0327)	(0.0325)	(0.0333)	(0.0302)	(0.0363)
Male* Full Owner	0.199***	0.129***	0.126***	0.0576***	0.0423**
	(0.0158)	(0.0164)	(0.0162)	(0.0156)	(0.0194)
Male* Part Owner	0.339***	0.283***	0.231***	0.154***	0.145***
	(0.0148)	(0.0150)	(0.0168)	(0.0163)	(0.0199)
Male*Employed	0.0805***	0.0628***	0.0620***	0.00957	-0.00549
	(0.0136)	(0.0135)	(0.0134)	(0.0129)	(0.0155)
FMG		-0.0269**	-0.0221*	0.000244	-0.00353
		(0.0123)	(0.0122)	(0.0116)	(0.0147)
Experience		0.0546***	0.0550***	0.0507***	0.0544***
		(0.00289)	(0.00290)	(0.00282)	(0.00350)
Experience Squared		-0.00190***	-0.00191***	-0.00168***	-0.00188***
		(0.000128)	(0.000127)	(0.000124)	(0.000160)
Black					-0.0501*
					(0.0278)
Asian					0.0280
					(0.0178)
Group			0.0915***	0.0869***	0.0757***
			(0.0123)	(0.0118)	(0.0146)
Primary Care Physician				-0.288***	-0.294***
				(0.00851)	(0.0106)
Constant	3.898***	3.664***	3.644***	3.818***	3.819***
	(0.0176)	(0.0197)	(0.0197)	(0.0202)	(0.0242)
Observations	29, 114	29, 114	29, 114	29, 114	20, 202
R-squared	0.077	0.117	0.121	0.187	0.198

Notes: Dependent variable is log hourly income and the regression includes interaction terms of gender and occupation choice (similar to table 4 except the owners category is broken into full time owners and part time owners).

Table 7 breaks down the results into narrower categories. It shows how the outcome changes if I break down the owner variable into two sub groups: full owners and part owners of practices. Overall results are consistent with proposition 4. Again, the control group is female employed physicians. The Table shows that within the two groups, full owners perform worse than part owners. Female full owners earn the least among all subgroups. Even female part owners do better than female full owners. This suggests the possibility that another theory beside customer discrimination may be present in the market. Tables 9 and 10 show that full owners have to put in more hours than any other group of physicians. If I assume that female physicians have a higher disutility of working than male physicians, it can help to explain some of the income gap. Male part owners are the highest earners. This is because as a full owner of the practice, you have a limited capacity to produce and manage staff at the same time. A part owner

may be able to negotiate for less administrative work, since there will be other owners to take up the responsibility. Our model explains this part of the problem as well.

TABLE 8
OLS REGRESSION OF LOG HOURLY INCOME ON SUB SPECIALTY OF OBGYN AND ALL OTHER SPECIALTY GROUPS

	All Specialties		OBGYN	
VARIABLES	Owners	Employed	Owners	Employed
Female	-0.173***	-0.0134	-0.0484	0.153**
	(0.0275)	(0.0159)	(0.120)	(0.0772)
FMG	0.0109	0.0144	0.336**	0.270**
	(0.0311)	(0.0181)	(0.131)	(0.124)
Experience	0.0415***	0.0508***	0.0614*	0.0607***
	(0.00938)	(0.00431)	(0.0342)	(0.0203)
Experience Squared	-0.00132***	-0.00175***	-0.00267*	-0.00179*
	(0.000399)	(0.000207)	(0.00152)	(0.00101)
Asian	0.0966**	-0.00965	0.189	0.178
	(0.0391)	(0.0201)	(0.142)	(0.129)
Black	-0.133**	0.00680	0.198	-0.0935
	(0.0562)	(0.0345)	(0.149)	(0.120)
PCP	-0.375***	-0.233***		
	(0.0227)	(0.0138)		
Group	0.249***	0.0424	0.175	0.254*
	(0.0272)	(0.0307)	(0.178)	(0.151)
HMO		0.128***		0.449***
		(0.0344)		(0.155)
Medical School		-0.0745***		0.223
		(0.0270)		(0.148)
Hospital		0.108***		0.290**
		(0.0253)		(0.136)
Other	0.105	0.0808***	-0.497	0.343**
	(0.0679)	(0.0267)	(0.326)	(0.143)
Constant	3.898***	3.778***	3.684***	3.577***
	(0.0542)	(0.0298)	(0.200)	(0.145)
Observations	8, 705	10, 791	226	298
R-squared	0.205	0.156	0.372	0.392

Notes: the results presented in this table compare the outcomes of OBGYN physicians to physicians in other specialties. The reason we include this table is to see how the outcomes of female physicians change when we look at a specialty area where they are in high demand.

TABLE 9
OLS REGRESSION FOR NUMBER OF HOURS WORKED ON INTERACTION TERMS OF GENDER AND EMPLOYMENT SETTING CHOICE

VARIABLES	(1) HRSMED	(2)	(3)	(4)
Female*Full Owner	5.004***	5.001***	4.755***	4.309***
	(0.687)	(0.688)	(0.692)	(0.821)
Female*Part Own	2.231***	2.122***	1.957***	1.319
	(0.753)	(0.761)	(0.750)	(0.887)
Male* Full Owner	10.78***	10.77***	10.23***	10.02***
	(0.475)	(0.475)	(0.479)	(0.599)
Male* Part Owner	9.232***	9.111***	8.498***	8.289***
	(0.451)	(0.480)	(0.485)	(0.586)
Male*Employed	6.187***	6.183***	5.768***	5.516***
	(0.409)	(0.409)	(0.407)	(0.490)
FMG	-0.466	-0.454	-0.276	0.680
	(0.368)	(0.368)	(0.368)	(0.517)
Experience	-0.0449	-0.0437	-0.0785	-0.134
	(0.0783)	(0.0784)	(0.0777)	(0.0939)
Experience Squared	-0.00771**	-0.00774**	-0.00588*	-0.00265
	(0.00351)	(0.00351)	(0.00348)	(0.00431)
Black				2.890***
				(0.908)
Asian				-2.364***
				(0.572)
Group		0.212	0.158	0.205
		(0.338)	(0.337)	(0.408)
PCPFLAG			-2.418***	-2.582***
			(0.252)	(0.313)
Constant	52.42***	52.37***	53.80***	54.18***
	(0.575)	(0.582)	(0.592)	(0.692)
Observations	29, 114	29, 114	29, 114	20, 202
R-squared	0.076	0.076	0.082	0.088

Notes: the dependent variable, HRSMED is the number of hours per week spent on practicing medicine. This regression is presented to show the difference in number of hours worked by different groups of physicians.

TABLE 10
OLS REGRESSION FOR NUMBER OF HOURS WORKED ON INTERACTION TERMS OF GENDER AND EMPLOYMENT SETTING CHOICE

VARIABLES	(1) HRSPAT	(2)	(3)	(4)
Female*Full Owner	5.242***	5.209***	5.051***	4.685***
	(0.658)	(0.665)	(0.668)	(0.795)
Female*Part Own	3.560***	2.375***	2.268***	1.871**
	(0.702)	(0.696)	(0.691)	(0.821)
Male* Full Owner	9.103***	8.990***	8.643***	8.735***
	(0.449)	(0.447)	(0.452)	(0.561)
Male* Part Owner	9.041***	7.726***	7.331***	7.066***
	(0.442)	(0.454)	(0.456)	(0.555)
Male*Employed	3.783***	3.741***	3.474***	3.283***
	(0.402)	(0.400)	(0.397)	(0.475)
FMG	0.326	0.461	0.576	1.219**
	(0.352)	(0.351)	(0.351)	(0.477)
Experience	-0.288***	-0.276***	-0.298***	-0.402***
	(0.0769)	(0.0771)	(0.0770)	(0.0936)
Experience Squared	0.00373	0.00340	0.00460	0.0103**
	(0.00343)	(0.00344)	(0.00344)	(0.00432)
Black				2.055**
				(0.847)
Asian				-1.837***
				(0.531)
Group		2.292***	2.257***	2.374***
		(0.317)	(0.316)	(0.385)
PCPFLAG			-1.559***	-1.711***
			(0.247)	(0.306)
Constant	45.51***	45.03***	45.95***	46.72***
	(0.548)	(0.556)	(0.569)	(0.666)
Observations	29, 114	29, 114	29, 114	20, 202
R-squared	0.079	0.083	0.085	0.088

Notes: the dependent variable HRSPAT is the number of hours per week spent on treating patients. This regression is presented to show the difference in number of hours worked by different groups of physicians.

Table 8 shows the regression for the subspecialty OBGYN and compares it to all other specialties. I include this category to present the likelihood of discrimination against male physicians. Obstetrics and gynecology is a specialty where patients will have a preference for female physicians. We can see that in the owners' category, female physicians are slightly worse off than male physicians, but this difference is not significant. Among the employed physicians however, the results are quite different. Female physicians earn almost 15 percent more than male physicians in this specialty. Hospitals are legally bound to not discriminate against women and other minorities, but if the customers have a preference for employees belonging to the protected group, then they can pay these workers higher wages to retain them. Although legally the hospitals are not allowed to discriminate based on gender or race, there has been some research done that shows that employers may favor female workers in a female dominated occupation.

The last two tables (9 and 10) show the number of hours each group of physicians spend in treating patients and in performing other medical services. It is clear that owners put in more hours compared to employees. Male physicians tend to work more hours irrespective of their employment choice. Female employees work fewer hours compared to female owners. If we assume that women have higher disutility from working, this could be another reason for over-representation of women in the hospital sector. However, it does not explain the performance of black entrepreneurs in the market, as there is no reason to believe that black physicians prefer to work fewer hours than white physicians.

CONCLUSION

This paper studies the gender earning gap of self-employed physicians. The data from CTS Physicians survey shows that self-employed female physicians earn 13 percent less than self-employed male physicians. The gender income gap in the salaried sector is almost zero and insignificant. We assume that hospitals cannot discriminate between employees on the basis of gender or race. If we assume male and female physicians have similar ability distributions, then this pattern suggests that something other than institutional discrimination is going on in the self-employed sector.

We develop a model of wage determination in the self-employed and salaried sectors, which shows that in the presence of customer discrimination, more male physicians, both high and low ability, sort into private practice. The average ability of physicians in private practice goes down as discrimination against female physicians goes up. Also, because of the presence of customer discrimination, returns to ability for female physicians are lower in private practice. Male physicians, on the other hand, are better off in the self-employment sector, as their outside option of working in the salaried sector is weakened due to discrimination. The model can be extended to explain lower earnings of black self-employed physicians in the healthcare market. The data supports the predictions of theory for both groups, female physicians and black physicians.

Although the model helps explain a lot of the empirical results, there are other possible theories that need further exploration. The most important of these theories is that women have a higher disutility from working as compared to men. Since an average self-employed physician works a greater number of hours, this may lead to women moving away from private practice.

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