Are Women Overinvesting in Education? Evidence from the Medical Profession

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Recent literature finds that women earn significantly lower returns to professional degrees. Does this render these degrees poor investments for women? We compare physicians to physician assistants, a similar profession with lower wages and training costs, mitigating some selection issues. The median female (but not male) primary-care physician would have been financially better off becoming a physician assistant. While there is a wage gap, our result occurs primarily because most female physicians do not work enough hours to rationalize medical school whereas most men do. We discuss robustness issues and nonwage returns to education that may rationalize these investments by women.

I. Introduction

The last three decades have witnessed an extraordinary change in male versus female educational attainment. In 1976, women represented 45 percent of bachelor's degrees awarded in the United States; by 2006, women earned 58 percent of bachelor's degrees (NCES 2007, table 265). Women are also earning an increasing share of professional degrees. The fraction of women earning a master of business administration (MBA) increased from 12 percent in 1976 to 43 percent in 2006 (table 290). Similarly, women constituted only 24 percent of first-year medical students in 1976 (Dube 1977) but 48 percent of medical students in 2006.

Despite this increased participation of women, a growing literature documents significantly lower earnings for women holding professional degrees than for men. This literature also finds that the male-female earnings gap appears to increase significantly in the time since degree. For example, Bertrand, Goldin, and Katz (2010) document that male and female MBAs from a top program have nearly identical earnings at the outset of their careers, after which male earnings rise to a nearly 60 log points advantage relative to women 10 years after the MBA. This

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finding of a widening gender earnings gap over the course of the career has been similarly documented among lawyers (see Wood, Corcoran, and Courant 1993) and for a wider variety of workers (for a recent example, see Manning and Swaffield [2008]). Most relevantly for our purposes, numerous studies document a substantial earnings gap between male and female physicians (Wallace and Weeks 2002; Ash et al. 2004; Weeks and Wallace 2006; LoSasso et al. 2011; Esteves-Sorenson and Snyder 2012). Further exacerbating this gap, Sasser (2005) demonstrates that when female doctors have children, their earnings decline significantly relative to those of male doctors because of a decline in hours worked.

The focus in much of this literature has been on disentangling the causes of male-female differences in postdegree earnings. Specifically, researchers have attempted to decompose differences in earnings into differences in hours, differences in accumulated work experience, differences in job characteristics, and unexplained differences in hourly wages. While this literature documents significant differences in the experiences of women versus men after earning professional degrees, it stops short of addressing the important question of whether, given their lower returns to education, professional degrees are a positive net present value (NPV) investment for most women. If the returns from undertaking such degrees were small or even negative for the majority of women, this would raise important questions about why the number of women undertaking these degrees has swelled.

Unfortunately, it is difficult to answer the question of whether professional degree investments pay off financially for women. An important issue of selection pervades all assessments of the returns to education (see Card [2001] for a survey). Put simply, it is difficult to assess what those individuals who earned professional degrees would have earned had they not undertaken professional degrees. Presumably, women who earn professional degrees do not do so at random, and selection may take place on variables that are unobservable to the econometrician. An NPV analysis comparing women who earn college degrees to women who earn professional degrees then may find implausibly high returns to professional education. For example, estimates of the NPV of a medical school education that do not take these selection issues into account report the NPV of attending medical school to be well in excess of $1 million (see, e.g., Jolly 2005).

Some research has addressed this selection issue by controlling for as many observable characteristics of those who do and do not take degrees as possible. For example, Arcidiacono, Cooley, and Hussey (2008) have significant demographic data for individuals who took the Graduate Management Admission Test and are able to examine their wage experiences whether or not those individuals enroll in an MBA program. This strategy is attractive, but such data are not necessarily available for all professions, and as Card (2001) suggests, issues of uncontrolled selection may remain.

In this paper, we adopt a different approach. We compare male and female returns to undertaking a medical degree in two specific and similar professions: physicians engaged in primary-care fields and physician assistants in those same fields. Members of both of these occupations have undertaken a specialized professional degree program, both of which require well-above-average undergraduate performance. However, the physician assistant (PA) program represents a much shorter up-front investment than a medical school program (generally 2 years vs. a 4-year medical education plus residency). Also, these are also both occupations in which individuals are relatively flexible to choose work settings with hours from part-time to much more than full-time. Of course, selection issues remain, and we discuss below how to interpret them in the context of our analysis.

Using data from the Robert Wood Johnson Community Tracking Physician Survey of 2004–5 and the American Academy of Physician Assistant's (AAPA) annual survey for 2005 (both for practitioners engaged in primary care), our results suggest that while undertaking medical school was a positive NPV investment (vs. entering a PA program) for the median male doctor, the PA profession would have financially dominated medical school for the median female doctor. Importantly, the low returns for investment in medical education for women are unlikely to be driven by selection. While PA programs and medical school programs both require well-above-average undergraduate performance, we show that individuals entering medical school appear (unsurprisingly) positively selected on ability on average (college grade point average [GPA] and test scores) relative to individuals entering PA programs. Thus, despite this selection (which presumably raises the measured returns to medical school), we find that a PA program financially dominates medical school for most women.

These results can be decomposed into two parts. One reason that in our data medical school is a better NPV investment (over a PA program) for men but not for women is that men gain a somewhat bigger boost in hourly wages as a doctor (vs. a PA) than women do. Our estimates suggest that the median man in our sample with 10 years of experience earns a premium of over $25 per hour as a physician rather than as a PA with 10 years of experience. In our data the corresponding median female earns a premium of only $16 per hour as a doctor rather than as a PA.

However, a larger part of the difference in male versus female returns to entering medical school stems from differences in hours worked. In our data, the median male physician with 10 years of experience works 11 hours per week more than the median female physician in our sample with 10 years of experience. Simply put, the majority of women physicians do not appear to work enough hours earning the physician wage premium to amortize that profession's higher up-front investments. We document that a popular methodology in the literature (coding workers by whether or not they work "full-time full-year") will not account for these differences. Of course, if women are acting rationally when choosing a medical career, it must be that they gain a benefit that is not included in the purely financial earnings benefits that we measure. We discuss possible additional returns to women earning a medical degree below.

Our paper proceeds as follows. Section II describes our data. Section III presents evidence about the selectivity of PA versus medical school programs. Section IV lays out our basic NPV analysis for primary-care PAs and physicians. Section V decomposes the difference in returns to medical school for men versus women into components attributable to wages and to hours. Section VI discusses alternative medical professions such as pharmacists. Section VII discusses the extent to which our results are robust to a consideration of physicians entering surgical specialties and other robustness issues. Section VIII reviews the implications for our estimates in determining the number of hours a physician must work to justify medical school as an investment. Section IX tentatively examines why a woman might pursue a professional degree that appears to be a negative NPV financial project for the median woman and then presents conclusions.

II. Data

Our analysis focuses on a comparison of the investments and outcomes of physician assistants and physicians in primary-care fields. A physician assistant should not be confused with a medical assistant. Medical assistants undertake routine clinical and clerical tasks. Physician assistants are medical professionals who diagnose and treat illness under the supervision of a physician and who may, in all 50 states and the District of Columbia, write prescriptions. The first PA program commenced at Duke University in 1965, graduating the first PAs in 1967. The program was initially designed to provide civilian medical training to field medics who had received significant medical training and experience during the Vietnam conflict. The curriculum was designed to mimic the fast-track physician training that had been in place during World War II (see AAPA 2011).

We compare the educational investments, income, and hours of physicians and physician assistants in primary-care fields for different levels of experience. In order to complete this analysis, we required detailed data on the hours and incomes of physician assistants (in primary-care fields) by experience level, the hours and income of primary-care physicians by experience level, and information on the cost and hours commitment of enrollees at PA school and medical school. We also examine the requirements for program entry; data for that analysis are described in Section III. We also examine pharmacists as an alternative health care profession; data for that analysis are described in Section VI.

For physicians, we use data from the restricted-use version of the Community Tracking Physician Survey (CTPS) for 2005 (with data from 2004). This is a telephone survey sponsored by the Robert Wood Johnson Foundation and conducted by the Center for Studying Health System Change. The restricted-use data set allows us fuller access to physician incomes than the public-use data set. The data set contains detailed information on hours and weeks worked, wages, specialty, year of graduation, year began practicing medicine, and other employment characteristics for approximately 6,000 surveyed physicians. Hours spent on direct patient care and total hours spent in medically related activities are reported separately. In order to be included in the study, physicians could not be federal employees, fellows, or (most important for our purposes) residents. The survey mechanism also excluded physicians working fewer than 20 hours per week. From this survey, we focus our analysis on physicians who report themselves to be engaged in primary care (although in Sec. IV we use these same data to examine physicians in other specialties for robustness). Primary-care physicians generally report their specialty as internal medicine or pediatrics. The CTPS uses the American Medical Association (AMA) Masterfile[1] to determine the representativeness of its sample of physicians and provides sampling weights that researchers can use to achieve national representativeness.[2] While care is taken in creating the survey, there are certain outlier observations that we, following other researchers, exclude from analysis. In particular, we exclude physicians who worked fewer than 26 weeks in the prior year, physicians who reported working more than 100 hours per week, and physicians who reported an hourly wage of less than $10 per hour.

There are several other data sets that have been used to study physician compensation, but they were not as suitable for our purposes as the CTPS. Importantly, the AMA abandoned its Socioeconomic Tracking Survey in 2001. We have compared our data to the data presented in the Medical Group Management Association's (MGMA) Physician Compensation and Production Survey (2005). While the MGMA database surveys a broader cross section of physicians and contains detailed earnings data, it contains data on only the clinical service hours of physicians, not total hours engaged in professional activities. It also does not detail

[1] The Masterfile establishes a record of every individual entering an accredited medical school. Records are added for individuals who graduate from foreign medical schools and meet credentialing requirements necessary to work in the United States. The Masterfile is the resource used in the profession to track physician credentials and identify potential fraud.

[2] We report our observations without usage of the sampling weights; our results are robust to using the sampling weights.

hours by experience level. While we do not use these data, our results are very similar to results obtained substituting the available MGMA data for the CTPS data.

We chose to examine physician assistants in part because of the availability of detailed data on wages by experience level and gender. To obtain data for physician assistants, we obtained a custom analysis from the AAPA (http://www.aapa.org/research/index.html) for its 2005 census data (as with the CTPS, the survey was conducted in 2005 and referred to 2004 information). The AAPA survey uses the AAPA Masterfile (constructed very similarly to the AMA Masterfile) to determine both members and nonmembers of the AAPA who were believed to be eligible to practice as PAs as of December 31, 2004. The AAPA census uses a mailed survey form. In 2005, the AAPA received survey form responses from 22,502 individuals, 35.9 percent of all PAs who were mailed a survey form. Our data on hours and earnings include all PAs who report working at least 1 hour in the survey.

For both doctors and PAs, we focus on individuals working in primary care. Among PAs, 31 percent work in primary care, 23 percent in surgical subspecialties, 11 percent in emergency medicine, and the balance in other subspecialties. As with doctors, PAs who work in primary care (and thus are included in our sample) are lower paid, on average, than those who work in other specialties. For example, the AAPA survey for 2010 reveals a median salary for primary-care PAs of $85,000, $97,000 for PAs in surgical subspecialties, and $101,000 for emergency medicine. As in medicine, since there may be rationing of entry into these “higher” positions, we do not include these higher-paid subspecialties in our analysis.

For the analyses that follow, we conduct a calculation of the NPV of entering the profession. In order to calculate this NPV, we require data on the costs of attending school in addition to the detailed data on posteducation earnings. In order to conduct this analysis, we assume that the doctor or PA enrolls in the appropriate program at Duke University (a school that educates both physicians and PAs), using tuitions for the 2006–7 academic year.[3] We assume that students receive no financial aid. There is no database that we are aware of that calculates hours worked at school activities for students in medical or PA programs. Thus, for the PA program’s 2 years and for the first 2 years of medical school, when students are involved in classroom activities, we set the hours worked at 40 (our results are not sensitive to this choice).

An important exclusion from our physician earnings data is doctors during their residency period. The primary-care physicians in our data generally report commencing postresidency practice a median of 4 years after completing medical school (although the mean number of years

[3] As long as we use the same university’s tuition for PA and doctor calculations, the relative magnitude of the doctor and PA NPVs is relatively stable across schools.

is greater than 5). We calculate median wages for internal medicine residents and median hours using the AMA's Fellowship and Residency Electronic Interactive database. Because the American Association of Medical Colleges (AAMC) recommends that medical school students doing clinical service observe the same hours limits that were adopted by residency programs in 2002, we assume that medical students in their third and fourth years work hours identical to those of first-year internal medicine residents. Consistent with the reported length of residency in our sample, we assume that primary-care physicians complete a 4-year residency and are paid the median wages for internal medicine residents.

An important set of decisions surround physician inactivity. In order to calculate whether embarking on a medical education was "worth it," we need to account for physicians who drop out of the labor force (or reduce their hours below 20 hours per week). Obviously, this happens to most physicians who survive into the retirement years but can happen at younger ages as well. To address this issue, we examined two additional data sources. First, the AMA Masterfile contains information on the rates of physician inactivity by age and gender. The AMA defines "inactive" as working fewer than 20 hours per week—the same as the CTPS data. Second, Staiger, Auerbach, and Buerhaus (2009) compare the AMA Masterfile and the US Census Bureau Current Population Survey (CPS) and identify substantial lags in the Masterfile in identifying a physician's transition to inactivity. We use the AMA Masterfile's estimates of physician inactivity by gender and age, applying the corrections discussed on pages 1676–77 of Staiger et al.'s article for physicians older than 55. Operationally, we use these inactivity corrections to adjust the distribution of hours reported in the CTPS. For example, if the Staiger-corrected Masterfile suggests that 5 percent of the physicians in a group are inactive, we define the median hours worked by the physicians in that group as the hours worked by the 45th percentile physician in the CTPS data. We make no adjustments for mortality and assume that physicians retire at age 65.[4]

Note that in using wages by experience for a single time point, we do not account for inflation and assume that the experience path of wages will be the same for physicians and PAs going forward as at the time of our data (2004). Because the wages are, effectively, real wages, the appropriate interest rate for our NPV calculations is the real interest rate. Given the prevalent student loan rates at the time that the youngest physicians in our data set attended medical school and contempora-

[4] Owing to discounting, our analyses are not that sensitive to varying assumptions about the end of the physician career. Since our calculations will use PA wage rates recalculated to physician hours, we do not need to account for PA inactivity rates.

neous inflation rates, we determined 4 percent to be a conservative real interest rate.[5]

III. Identification and Selection

Our analysis of the NPV of undertaking a medical school education confronts many identification issues. In particular, we discuss below the nonrandom selection of individuals into the medical profession, the assumptions required to justify our use of cross-sectional data, and issues of hours measurement.

As discussed above, any comparison of the returns to pursuing a doctor of medicine (MD) degree to the earnings of a typical 4-year college graduate may suffer from important selection issues. For example, estimates of the NPV of a medical school education that do not take selection into account report the NPV of attending medical school to be in excess of $1 million (see, e.g., Jolly 2005). However, as we document below, those who gain entry to medical school are much better students, on average, than the typical 4-year college graduate and would be likely to earn more than the typical college student even without an investment in medical education.

We ameliorate (but do not eliminate) these selection issues by comparing the earnings of physicians to the earnings of physician assistants, a group that has undergone similar training, albeit for a shorter period of time. PA students are taught, as are medical students, to diagnose and treat medical problems. The education consists of classroom and laboratory instruction in the basic medical sciences (such as anatomy, pharmacology, pathophysiology, clinical medicine, and physical diagnosis), followed by clinical rotations.

Unsurprisingly, however, the characteristics of PA students are not identical to those of medical students. In particular, PA programs have less stringent entry requirements than most medical schools, and one can infer that there are some individuals who, on the basis of their undergraduate record, would be rejected at most US medical schools but accepted at many PA programs.

Table 1 reports the average GPA of accepted applicants to medical school and matriculants to PA schools for the 2008–9 academic year. The data for matriculants to PA programs are obtained from the Twenty-Fifth Annual Report on Physician Assistant Education Programs in the United States (Physician Assistant Education Association, 2008–9). The

[5] It is important to note that the choice of interest rate is not particularly crucial; we can think of adjustments to the interest rate as affecting the percentiles of the work hours distribution that would find medical school to be a positive NPV investment. For example, for a 3 percent interest rate, medical school is a positive NPV investment for the woman physician who supplies the median number of work hours in our sample but is not a positive NPV investment for the woman physician who consistently supplies the 40th percentile number of hours.

TABLE 1
School-Reported Median GPAs of PA Program Matriculants and Accepted Applicants to Medical Schools, 2008–9

Percentile	Medical School	PA School
10th	3.59	3.10
25th	3.67	3.27
50th	3.72	3.40
75th	3.78	3.50
90th	3.82	3.60
Mean	3.71	3.38
Observations	126	103

Note.—Each school reports a median GPA. To construct the table, we ranked all medical schools by their reported median GPA. Note that the data for PA programs are for matriculants but the data available for medical schools are for accepted applicants. However, the mean GPA of all medical school matriculants in that same year is 3.67.

data for accepted applicants to medical schools are from the 2008–9 edition of the *Medical School Admission Requirements Book* (AAMC, 2008–9). Most schools report only the median GPA to our data sources. Thus, the GPA in table 1 for the median school represents the GPA for the median student at the median school. Obviously, schools may differ substantially in, for example, the minimum undergraduate GPA that they are willing to accept.

Table 1 shows that the median student at the median medical school has an undergraduate GPA of 3.72 and the median student at the median PA school has an undergraduate GPA of 3.4. It is useful to benchmark the frequency with which such GPAs occur in the undergraduate population. Data on the overall distribution of undergraduate GPAs are surprisingly scant. Data published by the National Center for Education Statistics (NCES) for undergraduates for the 1999–2000 academic year suggest that 11.3 percent of undergraduates at 4-year colleges report earning "mostly A's," 11.1 percent earn "A's and B's," and 26.6 percent earn "mostly B's" (NCES 2002, table 2.3). Becker, Hubbard, and Murphy (2010) report from the High School and Beyond Study of the NCES that approximately 31 percent of males and 37 percent of females earn GPAs greater than or equal to 3. They report that approximately 9 percent of males and 13 percent of females earn GPAs greater than or equal to 3.5. Although this information is dated and imperfect, it seems safe to assume that both PA programs and medical schools draw from at least the upper third of undergraduate performers, and more likely the upper quarter.[6]

Thus, while our usage of physician assistants allows us to correct for

[6] Unfortunately, most PA programs require the Graduate Record Examination whereas medical schools require the Medical College Admission Test, so a comparison of standardized test scores is not possible.

the selection issues that contaminate any comparison of physician earnings to ordinary college graduates, we are fairly confident that we still on net undercorrect for selection. As one of our central findings is that the median female primary-care physician would have been financially better off becoming a PA, the remaining selection issues, we believe, render our analysis conservative. On the basis of the evidence on admissions requirements, if those individuals who attended medical school instead became PAs, there is no reason to believe that they would earn less than the median primary-care PA to whom they are compared.

As described in our data section, data constraints require us to use cross-sectional cohort data as a proxy for panel data. Thus, we have two basic identification assumptions: First, the wages earned and hours worked by older cohorts of physicians today are indicative of the wages that will be earned and hours worked by younger cohorts of physicians in the future. Second, the wages earned by older cohorts of physician assistants are indicative of the wages that will be earned by younger physician assistants in the future. Part of our finding of low returns to medical education for women stems from our finding that women physicians earn somewhat lower wage premia over women physician assistants than male physicians earn relative to male physician assistants. Thus, one might be particularly concerned about our identification assumptions if the gender wage gap among physicians is gradually narrowing so that women physicians will earn higher wage premia over women physician assistants in the future, thus making entry into the medical profession more attractive today in NPV terms. Indeed, in an influential analysis of the Survey of Young Physicians, Baker (1996) claimed that the gender hourly wage gap for young physicians has fallen to the point where in 1990 no gender gap remained in adjusted hourly wages. However, recent studies have found contradictory results; for example, McMurray et al. (2000) found that young female doctors earned significantly less than their male counterparts in 1995. Esteves-Sorenson and Snyder (2012) carefully reconcile these findings and show that, in fact, the experience and specialty-adjusted gender wage gap was large in 1997 (13 percent) and has, if anything, increased since then. They find that previous studies had not carefully adjusted their findings for the fact that women both work fewer hours and earn less per hour than men and that these differences have changed across time. Thus, we interpret this recent evidence as supportive of our key identifying assumptions.

It is important to note that there is also a gender wage gap between male and female physician assistants in our data. Our methodology compares the lifetime value of becoming a female doctor to the lifetime value of becoming a female PA, and similarly, we compare the lifetime value of becoming a male doctor to the lifetime value of becoming a male PA. If the male-female PA wage gap were to narrow in the future, it would have the opposite effect on our results, rendering the PA profession more financially attractive relative to the physician profession for women than even our current results suggest.

An additional issue is whether becoming a physician assistant is the appropriate comparator to becoming a doctor. For example, individuals who foresee working fewer hours in the future may choose to become physician assistants. Indeed, such sorting almost surely takes place (see Chen and Chevalier [2008] for evidence on this point). In our AAPA data, for each experience bin, the median male and the median female PA works fewer hours per week than the median male and median female doctor. However, such sorting does not affect our results. In this paper, we examine whether doctors recoup their higher up-front investments in training relative to PAs. To do this, we compare the wages and hours worked by doctors to the earnings that a PA would have earned if the PA had worked the doctor's hours. We show that for women, the median doctor does not outearn, over the lifetime, a PA who worked the woman doctor's hours. We demonstrate that this is largely due to the fact that, in contrast to men, the woman doctor does not amortize the doctor-PA wage premium over sufficient hours to recoup the large initial investments required to become a doctor. In Section VI, we will return to this issue of sorting into professions by planned hours worked.

One might also question whether becoming a physician assistant is the appropriate comparator to becoming a doctor simply because many doctors, if they had been refused entry to medical school, might have taken an entirely different path, such as becoming a lawyer, MBA, and so forth. This may be true. However, given that gaining entry to a PA program requires course work and preparation similar to those for gaining entry to an MD program but that it is overall less difficult to gain entry to a PA program, we are confident that entering the PA profession is an available option in the choice set to all new medical students. Thus, our finding can be interpreted as simply showing that the median woman primary-care physician forgoes an option that is available to her with higher lifetime income. One could alternatively compare the NPV of becoming a doctor to the NPV of becoming an MBA or other professional. However, it is much more difficult to infer whether a successful medical school applicant would also have been a successful business school applicant; the requirements of pre-entry course work and experience differ substantially.

Below, we will discuss the robustness of our findings to an examination of alternative health care professions other than physician assistant. We selected the PA profession as our central comparator for several reasons. First, as discussed above, there is a similarity in the kind of work and practice setting. Second, the PA profession has relatively well-defined training requirements. The vast majority of PA programs are 2-year programs requiring a baccalaureate degree for entry. Licensure requirements have not changed substantially in recent years. Third, the existence of the annual census of PAs and the statistical capabilities of the AAPA allowed us to create the subspecialty, gender, and experience cohort-specific data that we use for analysis.

IV. Basic NPV Calculations

We compare by gender the educational investments, income, and hours of primary-care physicians and physician assistants for varying levels of experience. Clearly, one might be interested in the full distribution of incomes to account for uncertainty and other characteristics of the data; we focus only on hourly earnings and hours because of data constraints and to isolate the hours mechanisms of interest. Table 2 shows a summary of the data used in the NPV calculation. We note here some interesting features of the summary statistics. The male-female hourly wage gap is negligible for new doctors but grows wider over time. This echoes the results in the previous literature on doctors (see, e.g., Wallace and Weeks 2002; Ash et al. 2004; Weeks and Wallace 2006; LoSasso et al. 2011; Esteves-Sorenson and Snyder 2012). It also echoes other results in the literature for highly educated women; for example, the widening gender wage gap is found in longitudinal data by Wood et al. (1993) for lawyers, by Bertrand et al. (2010) for MBAs, and by Manning and Swaffield (2008) for a broader cross section of professionals. Indeed, in our data, the wage differential for new doctors actually favors females. However, the wage gap widens over time. Second, table 2 shows that, while female physicians report working nearly as many weeks as male physicians, the median female physician works substantially fewer hours than the median male physician for all experience groups. This finding in our data set is consistent with findings for physicians in other data sets that track hours. For example, using data from the US Census CPS, Staiger, Auerbach, and Buerhaus (2010) report that from 2006 to 2008, male physicians reported working 51.7 hours per week whereas female

TABLE 2
Data for NPV Calculations across Medical Careers by Gender

			Hours		Weeks		Wages			
Activity PA	Activity Dr.	Age Range Both	Male Dr.	Female Dr.	Male Dr.	Female Dr.	Male PA	Male Dr.	Female PA	Female Dr.
School	School	23–24	65*	65*	46	46	Tuition	Tuition	Tuition	Tuition
Working	School	25–26	65*	65*	46	46	36.68	Tuition	35.67	Tuition
Working	Residency	27–30	65*	65*	46	46	36.68	15.00	35.67	15.00
Working	Working	31–35	50	40	44.46	44.61	42.12	57.53	40.76	58.55
Working	Working	36–40	55	50	48.02	47.55	42.19	60.79	41.12	58.55
Working	Working	41–45	56	45	47.41	47.06	44.57	67.87	42.12	57.25
Working	Working	46–50	50	42	48.25	45.89	44.69	68.05	42.12	62.68
Working	Working	51–55	50	48	47.85	47.32	44.69	83.1	42.12	61.72
Working	Working	56–65	40	40	47.75	47.83	44.69	74.49	42.12	47.94
Retired	Retired	66+	0	0	0	0	0	0	0	0

* Hours are imposed by the school or hospital during a training period.

TABLE 3
NPV Outcomes by Gender, Doctor versus PA

	Men	Women
PA wage	$1,971,653	$1,682,774
Doctor wage	$2,233,407	$1,671,217

Note.—Calculations use data in table 2, tuitions from Duke University for PA and medical schools, and a 4 percent annual interest rate. All NPVs are calculated using the median hours worked by a doctor of that gender.

physicians reported working 44.4 hours per week (across experience categories).

Tables 2 and 3 summarize our NPV calculations.[7] For male and female doctors we calculate mean hourly wages in the CTPS data by experience bin. We use experience groups of 1–5 years, 6–10 years, 11–15 years, 16–20 years, 21–25 years, and 26+ years. Data are weighted for national representativeness using the weights provided by the CTPS. We similarly calculate mean reported weeks worked by experience bin. For the data on hours worked, however, the CTPS is censored at 20 hours per week. Thus, we calculate median hours worked adjusting for the censoring as described in Section II.

For physician assistants, the AAPA gathers data on typical hours worked per week for primary and secondary clinical employers and total income from the primary clinical employer. While 19 percent of male PAs and 12 percent of female PAs report having more than one clinical employer, the AAPA does not collect data on earnings from these employers. The median PA in our data, both male and female, works approximately 40 hours per week. We calculate an hourly wage for each PA using the hours and earnings from the primary clinical employer, and we assume that PAs are paid for 50 workweeks. We then calculate mean hourly wages by experience bin and gender. For the PAs, experience bins are grouped at <5 years of experience, 6–10 years, 11–15 years, 16–20 years, and >20 years of experience.

As explained before, while doctors do have higher wages and earnings postgraduation, they also tend to work longer hours postgraduation, have a longer training period, and work very long hours in the training period. We use these data to analyze the NPV of becoming a doctor versus a PA. To do this, we calculate the present discounted value of becoming a male or female primary-care physician using our data on mean wages by experience group and gender, mean number of weeks

[7] This analysis is similar to the analysis we presented in Chen and Chevalier (2008). There, however, we were primarily interested in sorting on differential taste for leisure. We did not examine gender issues, did not adjust for attrition from the sample, and used a different data set for doctor hours and compensation.

worked by experience group, and gender and adjusted median hours by experience group and gender.

In order to compare the NPV of becoming a doctor to the NPV of becoming a PA, we consider the actual costs of PA school and medical school. We then calculate the earnings that a male versus female doctor would have earned as a PA if the doctor earned the male or female PA wage at the doctor's annual hours. That is, we find that a male doctor with 6 years of postresidency experience earns $60.79 per hour in our data and works 2,641 hours per year. The male PA earns $42.19 per hour. We calculate what the male doctor would have earned at the doctor's hours but PA wages. That is, the PA's annual wages are scaled up as if the PA could work additional hours each week at the mean PA wage. An inspection of advertisements from Google suggests that moonlighting opportunities for PAs are common. As discussed above, a significant number of PAs report working as a PA in two or more jobs; thus, it seems likely that PAs can adjust their hours. Of course, the advantage of the doctor profession is higher earnings postresidency. The advantage of the PA profession is that there are a number of years in which the doctor's earnings are negative (years 3 and 4 of medical school) or small (during residency) when a PA would have completed training and earns positive wages.

Our results in table 3 show that the median male doctor does, indeed, earn a higher NPV from being a doctor than he would from being a PA. However, the female doctor earns a marginally higher NPV from being a PA. That is, the median primary-care female physician in our data does not fully amortize her up-front costs of medical school and training. She would have been financially better off becoming a PA.[8]

V. Decomposing Differences in the Returns to Medical School

What accounts for the different result for male versus female doctors? As seen in the data in table 2, there are two relevant differences between male and female doctors. First, male doctors earn higher hourly wages than female doctors at all experience levels after the lowest experience bin. While there is a gender wage gap for PAs, it is much smaller in both absolute and percentage terms than the gender wage gap for doctors. Second, male doctors earn those wages over many more hours than women doctors. The up-front investment required of male and female doctors is the same; the male doctor works sufficiently many hours at a high wage to amortize the up-front investment.

Both the gender gap in wages and the gender gap in hours contribute to our result that the median female doctor would have been financially

[8] Our analysis ignores taxes. Since the tax code is convex in income and since tuitions must be paid (or repaid) with posttax dollars, an analysis including taxes would generally favor the PA profession over the doctor profession.

TABLE 4
DECOMPOSITION OF GENDER DIFFERENCES IN DOCTOR NPVS

	Wages	
Hours	Men	Women
Men	$2,233,407	$1,939,612
Women	$1,943,126	$1,671,217

Note.—All NPVs are calculated using the median hours worked by a doctor of that gender. These calculations are equivalent to a standard Oaxaca decomposition.

better off being a PA whereas the male doctor would be worse off becoming a PA. It is useful to decompose the gender gap in doctor NPVs into these two factors and their relative contributions. We do this in table 4 by examining the share of the difference in NPVs that is eliminated by giving female doctors their male counterparts' wages and what share is eliminated by forcing them to work the hours of their male counterparts. This is equivalent to an Oaxaca decomposition and results in a nearly even load on wage differences versus hours differences. Specifically, we find that if women physicians earned women's wages but worked men's hours, they would close 52 percent of the NPV gap between male and female doctors.

This decomposition, however, may understate the importance of male-female hours differences in driving the lower NPV for female doctors. Note that this analysis takes as given the male and female doctor wages at different years of experience. However, some of the differences in wages between male and female doctors may plausibly be due to differences in accumulated experience between male and female doctors. This would be consistent with our finding, and the finding in the literature, that female and male doctors begin their careers at wage parity, with differences in wages emerging later. For example, the hourly wage gap between male and female doctors with 15 years' experience is 15.6 percent. However, in our data a male doctor with 15 years' experience has accumulated many more total hours of experience postresidency than a female doctor.

Specifically, the median male doctor in our data has accumulated 37,594 hours of experience by 15 years postresidency, whereas the female doctor does not achieve that number of cumulative hours until year 19. Thus, the more appropriate comparator may be the wage gap between the male doctor with 15 years' experience and the female doctor with 19 years' experience. In our data, this cumulative experience-comparable wage gap is 7.9 percent, or roughly half of the years-experience wage gap. This type of comparison does not appear to have been completely articulated in the literature. Since identifying the exact functional form of the wage-cumulated experience function for males and females would require richer panel data than we possess, we do not undertake such an analysis here but posit that this may be a fruitful avenue for future research.[9]

The importance of these results is not necessarily in finding that the median woman physician would have been better off becoming a PA. This precise finding is sensitive to the interest rate and the exact earnings of physicians in our sample. Rather, it is important to recognize that a large number of female physicians are working few enough hours that the financial payback on their educational investments is doubtful. In our data, at a 4 percent interest rate, the median hours worked for women is close to the crossover point: female doctors who work as much as the 60th percentile female doctor outearn PAs by a small amount ($25,000 over a lifetime). In contrast, the vast majority of male doctors outearn their male PA counterparts in the NPV sense. For male doctors with 12 years of experience, the 25th percentile works 48 hours per week (more than the median woman, who works 45 hours per week). Many studies that examine earnings differences between men and women employ a methodology of coding workers' hours as being either full-time full-year (FTFY) or not, depending on whether or not they report working at least 35 hours per week.[10] In our data, both the median male and median female doctor work at least 40 hours per week in every experience bin. Despite both being "full-time," men and women nonetheless work substantially different numbers of hours in our data. The commonly used methodology of estimating earnings equations with no controls for hours worked (apart from restricting the sample to FTFY workers) would conclude that men's wages are much higher relative to women's wages than they actually are.[11]

[9] Staiger et al.'s (2009) analysis of the CPS shows that women doctors worked a constant 86 percent of the hours of male doctors in their analysis of 1986–88 data, in their analysis of 1996–98 data, and in their analysis of 2006–8 data. Thus, if much of the gender wage gap is due to lower accumulated experience for women, this component of the gender wage gap would not be expected to close in the near future.

[10] For a recent example that cites many others, see Hubbard (2011).

[11] For a broader cross section of professions, it is understandable why the FTFY convention has been adopted. Calculating hourly wages directly may be unattractive in circumstances in which salaried workers may not be able to recall their hours with accuracy or in settings in which the productivity of incremental hours may not be transparent. For example, there is a well-known disparity (and upward bias) in surveys that ask about typical hours worked when compared to the number of hours of work recorded in diary studies such as the American Time Use Data. However, for primary-care physicians, the technology translating incremental hours into incremental income is so straightforward (seeing incremental patients) and recording this time via appointments is so central to the practice's business model, we posit that hours calculations are substantially more reliable than they may be in other professional settings. We conclude that in this setting, much of the gender earnings gap is simply due to some FTFY workers working more hours (and seeing more patients) than others.

VI. Alternatives to the Physician Assistant Profession

Our analysis thus far has focused on the choice between becoming a primary-care physician and becoming a physician assistant in a primary-care field. As discussed above, we chose the PA profession for analysis in part because of the similarity in the nature of the work and the similarity in the type of human capital required to perform the work. Furthermore, we chose the PA profession because of the availability of census data and the willingness of the AAPA to allow us to perform custom analysis on the raw data. Finally, we also selected the profession because of the well-defined training requirements for entering the profession. Of course, our analysis raises the question of whether our results would be similar if we had chosen a health care occupation other than physician assistant.

Table 5 provides summary data on the training required and wages for alternative medical professions. It is important to note that we describe the "usual" training requirements of each profession, but there is considerable variation around the usual training requirements for some of these professions. For example, in order to become a registered nurse, there are Associate in Nursing programs, Bachelor in Nursing programs, and Master in Nursing programs. The bachelor programs are the most common, but there is considerable variation. Nurses with more training have different employment opportunities than nurses with less training; however, we do not have detailed census data to sort out how wages and training are related. As expected, table 5 suggests that, in general, professions requiring greater up-front investment in training yield, on average, higher wages.

Table 5 also suggests that individuals making career choices should sort on planned future hours. Loosely, those who plan to supply many hours over the career should choose careers with high up-front investments and high hourly wages; those who plan to supply few hours over the career should choose careers with lower up-front investments and

TABLE 5
Alternative Comparators: BLS Data

Profession	Hourly Wage Percentile			Median Annual Salary	Usual Post–High School Training Years
	25th	50th	75th		
Internist	65.88	*	*	*	12
Dentist	48.39	67.81	*	$141,040	8
Pharmacist	47.50	53.64	60.45	$111,570	7
PA	35.12	41.54	48.89	$86,410	6
Registered nurse	25.47	31.10	37.99	$64,690	4

Source.—May 2010 Bureau of Labor Statistics Occupational Employment Statistics.
Note.—BLS wage data exclude the self-employed. As described in the text, there is significant variation around the "usual" training years for some professions.
* Cells are top-coded.

TABLE 6
HOURS WORKED BY GENDER, DOCTORS AND PAs

Activity PA	Activity Dr.	Age Range Both	Median Hours per Week: Male Dr.	Male PA	Female Dr.	Female PA
Working	School	25–26	65*	44.5	65*	40
Working	Residency	27–30	65*	43	65*	40
Working	Working	31–35	50	41.5	40	40
Working	Working	36–40	55	40.5	50	40
Working	Working	41–45	56	40	45	40
Working	Working	46–50	50	40	42	40
Working	Working	51–55	50	40	48	40
Working	Working	56–65	40	40	40	40
Retired	Retired	66+	0	0	0	0

Note.—For PAs, these hours are taken from the 2004 AAPA census and represent reported hours worked at a PA's primary clinical employer. Fifteen percent of PAs report working for a second clinical employer.
* Hours are imposed by the school or hospital during a training period.

lower hourly wages. This issue is modeled in Chen and Chevalier (2008). We do not have detailed evidence on hours supplied by gender for most of the professions in table 5. However, we do know that doctors, on average, work more hours than PAs. This is summarized in table 6. Male doctors work much more than male PAs; female doctors work somewhat more than female PAs. This contributes to our finding that the median female primary-care physician does not work enough hours to financially amortize her up-front investments in becoming a doctor (vs. a PA).

We turn now to an analysis of the profession of pharmacist. Pharmacists provide an interesting comparator to both the PA and the medical profession because the training requirements are higher than those required to become a PA but lower than those required to become a physician. In order to conduct an NPV analysis for entry into the pharmacy profession, we once again require data on training costs and post-training wages. While we can conduct an analysis of the pharmacy profession, we do not have access to the exceptional data that we have available for PAs. We obtain data on pharmacists from Mott et al. (2008), who obtained confidential access to the National Pharmacist Workforce Survey of 2004 (thus our pharmacist data conform in time to our physician and PA data). The National Pharmacist Workforce Survey obtains a list of pharmacists through a medical marketing vendor (in contrast to the licensure census maintained by the AMA and the AAPA).

Unfortunately for comparison purposes, the training requirements for pharmacists have evolved over time. Historically, most pharmacists earned the bachelor's of pharmacy degree. For example, Mott et al. report that 79 percent of survey respondents held the BPharm degree as their highest degree. However, beginning in 2006, new pharmacists must earn the PharmD degree to sit for the licensing examination (however, previously licensed pharmacists may still hold the BPharm degree). The BPharm degree is no longer being awarded. The PharmD program is typically a 4-year program. However, a bachelor degree is not strictly required for entry in many PharmD programs. According to the Bureau of Labor Statistics (BLS 2010), "To be admitted to a PharmD program, an applicant must have completed at least 2 years of specific professional study," but "most applicants have completed 3 or more years at a college or university before moving on to a PharmD program, although this is not specifically required." For our analysis, we assume that pharmacists obtain training for 7 years following secondary school (in contrast to 6 for physician assistants and 12 for physicians).[12]

Mott et al. (2008) report a sample of 55 percent male and 45 percent female pharmacists. The authors provide mean wages for pharmacists with 0–11, 12–22, 23–30, and greater than 30 years of experience. While for our PA data we are able to calculate the male-female wage differential for each experience band, we do not have data by gender and experience band for pharmacists. In wage regression specifications that control for years' experience, years' experience squared, degree earned, and so forth, Mott et al. find point estimates of a 2.6 percent wage premium for men. Thus, we assume a gender wage gap of 2.6 percent that is constant across all experience bins. Note also that Mott et al. provide means rather than medians, and thus we must use means for pharmacists.

As we did with PAs, we ask whether a doctor earning a doctor's hourly wages and working a doctor's hours would earn more or less in an NPV sense than a pharmacist earning a pharmacist's hourly wages and working a doctor's hours. Our results are similar and, indeed, more striking than they were for PAs. For a woman working the median woman doctor's hours, we find that entering the pharmacy profession would have generated a higher NPV of $48,000 than becoming a primary-care physician. However, for men, we find that becoming a primary-care physician generates a higher NPV of $258,000.

While we find that the pharmacy profession dominates the doctor profession by $48,000 for a woman working the median doctor's hours, recall that we find that the PA profession dominates the doctor profession by $12,000. Of course, the relative financial attractiveness of higher-training, higher-wage professions decreases as fewer lifetime work hours are supplied. For a woman who works only as much as the 35th percentile woman doctor in our data, becoming a PA dominates becoming a doctor by $72,000 whereas becoming a pharmacist dominates becoming a doctor by $93,000. The benefit of becoming a PA over a doctor

[12] We were unable to obtain historical data for tuitions for a pharmacy school and a medical school at the same institution for 2007–8 to compare to our physician data. Current data suggest that pharmacy tuitions are roughly the same as medical school tuitions in institutions that have both, and we use medical school tuitions to proxy for pharmacist training costs.

TABLE 7
NPV Outcomes by Gender, Surgeons versus Doctors and PAs

	Men	Women
PA wage	$1,470,861	$1,285,045
Doctor wage	$2,257,628	$2,040,553
Surgeon wage	$3,355,050	$2,619,645

Note.—Calculations use tuitions from Duke University Medical School and a 4 percent annual interest rate. All NPVs are calculated using the median hours worked by a surgeon of that gender.

improves relative to the benefit of becoming a pharmacist over a doctor as the hours supplied fall.

VII. Other Physician Specialties

An important robustness issue surrounds the issue of specialty. One might argue that some of the primary-care physicians that we study would have entered more lucrative specialties (such as surgical specialties) but were rationed out of those specialties by rationing of residency slots. Perhaps doctors who enter surgical and other specialties are sufficiently well compensated that the possibility of being able to enter one of those professions would have rendered medical school ex ante attractive.

Fortunately, our CTPS database also contains information about doctors in higher-wage specialties, the most well represented being surgeons. Unfortunately, in our data, women are quite sparsely represented in the surgical specialties. For the primary-care physicians studied above, our usable data sample contains 612 women and 996 men. For the surgical specialties, we have only 72 women and 745 men. From the point of view of our NPV comparisons, the most relevant characteristic of surgeons is that they earn higher wages than primary-care physicians but also face a longer training period. In our data, the median surgeon reported 2 more years in residency than the median primary-care physician did (and this was true for both genders). It is worth noting that the mean time in training activities is longer than the median; we use the more conservative medians in our calculations. Table 7 summarizes our NPV calculations for surgeons. For the median male surgeon, the surgical career offers an NPV advantage over the PA career of $1.9 million. As in our methodology in table 3, we generate a common hours basis by calculating the earnings of the PA at the doctor's hours but the PA's wage.[13] For the median female surgeon, the surgical career offers an NPV advantage over the PA career of $1.3 million. At first glance,

[13] We continue to use the primary-care PA's wages, although PAs who specialize in surgery report wages approximately 17 percent greater than the PAs in our sample.

TABLE 8
Decomposition of Gender Differences in Surgeon NPVs

	Wages	
Hours	Men	Women
Men	$3,438,954	$2,811,051
Women	$3,214,901	$2,619,645

Note.—All NPVs are calculated using the median hours worked by a surgeon of that gender. These calculations are equivalent to a standard Oaxaca decomposition.

this would suggest that becoming a surgeon is much more lucrative for the typical woman than becoming a primary-care physician. However, surgery appears to also select female physicians who are willing to supply longer hours. For example, the median 50-year-old female surgeon reports working 60 hours a week, much more than the 40 hours a week the median female PA works.

This means that the hours difference between men and women is relatively small for both PAs (where for most levels of experience the median man and woman both work 40 hours a week) and surgeons, although very few women appear to select into surgery. We can see this reflected in the corresponding decomposition of the gender difference in male and female surgeon NPVs, summarized in table 8. While 52 percent of the NPV difference between men and women primary-care physicians was explained by differences in hours (table 4), only 27 percent of the similar difference in surgeon NPVs can be explained by a gender difference in hours worked (table 8), again neglecting feedback effects from cumulative hours worked (experience) into wages. However, for women, a large part of the NPV difference between becoming a surgeon and becoming a primary-care physician is due to the different hours choices of women who select into the two professions. In our data, female surgeons have nearly a $1 million NPV advantage over women primary-care physicians. However, this advantage would be reduced to $580,000 if female primary-care physicians worked surgeon's hours (at a primary-care physician's wage).

VIII. Hours Needed to Justify Medical School as an Investment

Our analysis leads to the obvious question: How many hours must a person work, on average, to amortize the up-front cost of an investment in medical school? That is, on average, how much must a person work after graduating from a costly medical school and residency investment in order for that investment to have made financial sense? For each pair of medical careers and for each gender wage profile, equating NPVs leads to a minimum number of hours per week. This computation takes

TABLE 9
WORK HOURS NEEDED TO AMORTIZE UP-FRONT TRAINING COSTS

Up-Front Cost		Hours/Week Needed to Amortize Up-Front Cost		Percentage of Those Who Invest That Work Enough Hours	
Low	High	Men	Women	Men	Women
PA	Doctor	33.7	45.8	86	41
Doctor	Surgeon	5.1	4.4	Censored	Censored
PA	Surgeon	18.2	24.0	Censored	93

Note.—All hours cutoffs are calculated using a 46-week work year. Percentiles labeled "censored" are impossible to calculate because our data censor hours worked from below at 20 hours a week.

as given the years-experience wage profile of each gender and, hence, is likely a conservative way to compare men and women since women at the same number of years of experience have, on average, accumulated fewer hours of experience.

Table 9 summarizes these calculations, both in terms of hours and in terms of which percentage of people making those investments end up working enough to have justified those investments. The top row reiterates what our earlier NPV calculation showed: while 86 percent of men who become primary-care physicians work enough hours (33.7 a week) to justify the investment, only 41 percent of women do (work at least 45.8 hours a week). Interestingly, since being a surgeon requires only an additional 2 years of residency in order to earn a much higher hourly wage, for both male and female doctors, almost any amount of planned hours worked would justify the incremental investment in becoming a surgeon. Men need to plan to work only at least 5.1 hours a week and women only 4.4 hours. These numbers are much higher when comparing surgeons to PAs since a career as a PA requires so much less of an up-front investment in schooling and residency. In order to justify not becoming a PA, male surgeons need to work at least 18.2 hours a week and women at least 24 hours. Our data set censors individuals working fewer than 20 hours per week. We do find that 2 percent of the female surgeons in our limited data work more than 20 hours per week and fewer than 24.

IX. Discussion and Possible Explanations for Our Findings

Our results suggest that many, if not most, women primary-care physicians do not work enough hours to fully amortize their up-front investments in medical education versus the plausible alternative career of becoming a physician assistant. This raises the issue of whether these findings bear any relationship to the NPVs for obtaining other professional degrees such as doctor of law (JD) and MBA.

This is difficult to determine. Of course, both the MBA and JD require much lower up-front initial investments than a medical career. On the other hand, there is substantial evidence that female doctors “drop out” of their professions less than women lawyers and (especially) women MBAs. For example, Herr and Wolfram (2009) find, in a sample of Harvard graduates, that 94.2 percent of MD mothers remain working in their late 30s as compared to 79 percent of JDs and 72 percent of MBAs. The AMA Masterfile similarly shows very low attrition rates for young women doctors, approximately 3 percent of the 45–54-year-old age cohort. Nonetheless, while our results are not driven by high drop-out rates from the medical profession, they are driven by the shorter hours of female professionals.

We show that the median female primary-care physician in our sample’s earnings does not quite justify the investment in medical school over PA school. Of course, this raises the question of why women who will work less than the median woman and are interested in pursuing primary care enter medical school. In this sense, our work is related to the important paper by Becker et al. (2010). The authors point out that the financial benefits to college education appear to be roughly at parity to the financial benefits to college education for men for women who remain full-time in the labor force. As Becker et al. note, “While the college wage premium may be the same for men and women, college men are still more likely than college women to reap this benefit” (218). They consider the male-female differential in life expectancy benefits from college education, marriage benefits from college education, and benefits to children’s human capital from college education. They conclude that male-female differentials in these benefits are not sufficient to explain the surge in college education among women and that “total college benefits appear to remain lower for women than for men” (225). They conclude that differences in the costs of attending college, particularly the effects of noncognitive skills on the disutility of attending college, must account for the fact that women now attend college in greater numbers than men.

Any of the non–labor market benefits that Becker at al. (2010) entertain could play a role in the decision of women who will not work “enough” hours to amortize a medical school investment to nonetheless enter medical school. For example, while Becker et al. reject marriage market opportunities as an explanator of women’s college attendance, it is possible that differential marriage market opportunities between female doctors and female physician assistants are large. Furthermore, if women doctors systematically marry wealthy husbands, low subsequent labor supply may be an optimal response to the income effect. Bertrand et al. (2010) find evidence consistent with this in their study of MBAs; they show that MBA women whose spouses earn more than $200,000 per year are more likely to drop out of the labor force than MBA women whose spouses earn less.[14] The issue of marriage market returns to post-baccalaureate education warrants further investigation.

Additionally, another possible explanator of our findings is that women earn utility from pursuing the work of doctors above the utility that they would earn from their work as PAs and that this counteracts the small financial disadvantage of entering the medical profession. There is some evidence in other fields that individuals are willing to accept a wage decrement in order to obtain a "more interesting "position (see, e.g., Stern 2004). It is difficult to dispute this hypothesis.

Another interesting set of explanations surround real options, uncertainty, and the life course. When women enter the medical profession, they may not know how many hours they plan to supply. Indeed, given the age at which most people enter medical school, they may not know whether or not they will get married or have children. Of course, in an environment of uncertainty the medical degree could be very valuable. In effect, the MD creates an option to supply incremental hours at high wages should the individual's circumstances be such that supplying those hours is attractive. That is, the project of undertaking the medical degree could be a negative NPV project (relative to becoming a PA) yet have sufficiently positive option value to warrant undertaking.

Alternatively (or additionally), it is possible that women who enter the medical field systematically overestimate the extent to which they will supply labor in the future. Such a finding would be consistent with results of Hoffman (2011*a*, 2011*b*), who provides evidence from field experiments that truckers undertake training in part because of a systematic overestimation of the hours that they will subsequently drive. Hoffman's results are related to a broader literature that suggests that overconfidence can lead to overentry in competitive games and markets, summarized by Camerer and Lovallo (1999).

We note one interesting piece of evidence that suggests that those entering the PA profession might be considering work/family issues differently than those entering the medical profession. Data from the AAPA and the AAMC suggest that students entering PA school are much more likely to be married than students entering medical school. For the new PA students, 38.5 percent of the men were married and 21.3 percent of the women were married. For medical schools, 10.9 percent of the men were married upon entry versus 7.8 percent of the women. This is partially due to the differing age distribution at PA school versus medical school. While both types of institutions have a median age at entry of 23, the mean age at entry is younger for medical students (23.6) than it is for PAs (25.2). Lindsay (2005) reports results from a survey

[14] Bertrand et al. (2010) do not summarize the earnings of spouses of women MBAs, although one can infer from the categorizations used in their table 5 that MBA women in their sample, on average, marry men with earnings much higher than the median college graduate.

of female PAs suggesting that a significant number of PAs choose the profession because it allows women to "practice medicine" without the "demanding schedule" of the physician training and posttraining period. Her study includes a tabulation from the 2002 PA survey demonstrating that female PAs work significantly fewer hours than their male counterparts, and she suggests that lifestyle flexibility may account for the recent (and rapid) feminization of the PA profession.[15]

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[15] The PA profession originated as an attempt to provide medical professionals to the military during World War II, and the first PA program, founded at Duke in 1965, recruited ex–military personnel and was exclusively male. By 2002, approximately 68 percent of new graduates of PA programs were female. While the medical profession has shown an increase in the number of women, it has been less dramatic. The AAMC (2008) reports that 6.9 percent of medical school graduates in 1965 were women, a number that had climbed to 44 percent by 2002.

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