

Dissertation Awards

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# Essays on the Economics of Gender

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This dissertation seeks to understand gender disparities in labor market and educational outcomes. Two essays analyze determinants of the low representation of women in historically highly compensated and competitive occupations. The third essay explores whether childhood environmental influences contribute to the female advantage in elementary and secondary educational outcomes that has emerged through-out developed countries.

Chapter 1 studies whether the long hours required by many high-paying professions inhibit women from entering. In order to answer this question, I focus on the medical profession and analyze a policy that capped the average number of hours per week that medical residents could work. I exploit the fact that the policy differentially reduced the residency hours of medical specialties due to prepolicy differences in weekly residency hours across specialties. Using administrative data on the universe of physicians in the United States, I find that when a medical specialty reduced its hours, more women entered the specialty, but there was little change in men's entry. I then investigate why men and women responded differently to a reduction in hours by examining female fertility choices during residency. Linking resident physicians to administrative birth data from two large U.S. states, I find that a reduction in a specialty's weekly hours increased the specialty's female fertility rate in California but had no effect on the specialty's female fertility rate in Texas. A decomposition of the positive response in California suggests that the effect is largely due to compositional changes from the new entrants; women induced to enter a specialty after its hours were reduced were more likely to have children during residency than the previous entrants. Together these results indicate that reducing an occupation's time demands during early career years makes women more likely to enter, in part due to women's preferences over the timing of fertility.

In Chapter 2, coauthored with David Autor, David Figlio, Krzysztof Karbownik, and Jeffrey Roth, we investigate whether childhood environmental influences—family background and neighborhood and school quality—contribute to the female-favorable gender gap in academic and behavioral outcomes. We use an administrative data set from Florida, which links birth certificates to childhood and early adult outcomes. With these detailed data, we are able to control for unobserved heterogeneity in families by comparing the outcomes of boys and girls born to the same mother. We find that there is a robust relationship between family disadvantage, as measured by maternal education and marital status at birth, and gender gaps in absences and suspensions in school, as well as on-time high school graduation. Moreover, this gap emerges postbirth; that is, there is no relationship

between family disadvantage and gender gaps in infant health, and it is not explained by school or neighborhood quality.

Chapter 3 probes why women remain underrepresented in elective offices by analyzing whether there are gender differences in the persistence of politicians in response to an electoral loss. Using California local election returns and a regression discontinuity design, I document the subsequent political involvement of men and women who ran in close elections. I find that losing an initial election induces substantially more attrition among female than male candidates: after an electoral loss, men are 16 percentage points less likely to run in a subsequent election, whereas women are 26 percentage points less likely to run again. In contrast, there is no gender difference in the effect of losing on running again *and* winning a subsequent election. I show that the gender disparity in the decision to run again cannot be explained by differing outside options (i.e., occupations) of men and women or political party involvement, but that the gap is larger in elections for offices that have historically low female representation. To interpret these findings, I offer two models of candidate entry behavior—one rational and one behavioral—and find modest support for the rational model.

## Chapter 1: Hours Constraints, Occupational Choice, and Fertility: Evidence from Medical Residents

Over the last 40 years, there has been a large shift in the occupational choices of women in the United States, with the female share of graduates in law, medical, and business schools rising by a factor of five. Despite the current near-equal representation of women and men entering these professional occupations, there remain persistent earnings disparities between male and female professionals. For example, recent statistics show that highly educated, full-time employed women earn 16–28 percent less than comparable men (Goldin 2014). The paradox of the rapid entry of women into high-paying occupations coupled with the recent stagnation of the gender wage gap has prompted researchers to look *within* occupations to examine the way that jobs are structured and compensated. One hypothesis for the remaining gender wage gap—put forth by Claudia Goldin in her 2014 American Economic Association Presidential Address—is that there are convex returns to working long, continuous, and particular hours in many professional occupations. An occupation's rigid demands could disproportionately affect women, who have a tendency to work fewer hours than men and to sort into positions with more flexible time requirements, likely to accommodate the competing demands of work and family (Gicheva 2013; Goldin 2014).

This chapter investigates whether an occupation's time requirements—particularly during the early years of labor force participation—serve as a barrier to entry for women,

who may view these requirements as incompatible with family formation. The economics literature has widely theorized that women invest in human capital and make occupational choices conditional on their (future) fertility and the pecuniary penalties associated with intermittent or reduced labor supply.<sup>1</sup> Empirical assessment of this hypothesis, however, has presented researchers with a challenge. One typically observes equilibrium sorting behavior, that is, the occupational outcomes of individuals, which are jointly determined by individual preferences, employer preferences, and occupational attributes. For example, women could be less likely to be selected for time-intensive, highly compensated positions due to human capital differences between men and women, or alternatively, employer discrimination. Furthermore, when considering individual preferences, it is not evident whether women are selecting into positions based on the time requirements or another unobserved job attribute correlated with time requirements, such as a competitive work environment.<sup>2</sup>

This chapter addresses these empirical hurdles by focusing on a large professional occupation, physicians, and studying a policy that introduced an arguably exogenous change in the time requirements during the occupation's training period. The medical profession in many ways mirrors the broader trends of male and female professionals. Similar to law and business, the influx of women into medicine has brought the fraction of U.S. medical school graduates who are female to nearly 50 percent. Women and men, however, sort into different types of career paths within medicine, the first stepping stone of which is the choice of a medical specialty. A medical specialty represents not only an individual's future earnings potential and the content and style of professional practice, but also the more immediate time demands during the training period: the length and intensity of medical residency. Due to biological constraints, it may be costly in terms of fecundity for women to delay the timing of fertility decisions relative to the timing of their occupational training period. Conversely, due to the indivisibility of hours within medical residency, women may have access to only limited or costly means to adjust their labor supply or the timing of their career investments relative to their fertility decisions.<sup>3</sup> Consistent with these mechanisms being operative, specialties with higher hours per week during residency have, on average, lower representation of women.

In order to formally investigate whether time requirements during medical residency influence women's specialty outcomes, I leverage the introduction in 2003 of a new policy by the Accreditation Council for Graduate Medical Education (ACGME) that restricted the average workweek of medical residents to 80 hours. The impetus for this reform was notably not related to promoting increased participation of women in time-intensive specialties. Rather, its introduction was triggered by mounting concerns regarding the deleterious consequences of medical resident fatigue for medical

errors and patient safety (ACGME 2002). The motivation for and nature of this policy make it a particularly attractive setting in which to study the effect of an occupation's time requirements on women's propensity to enter an occupation.

Using detailed data on the universe of U.S. medical school graduates from 1993 through 2010, and an empirical design that exploits the timing of the reform and differential reductions in hours across specialties, I find that women are more likely to enter a medical specialty after a reduction in residency hours, whereas there is little change in men's entry behavior. The results indicate that a four hour per week decrease resulted in a 24 percent increase in the mean share of women entering specialties with more than 80 hours per week prepolicy. In contrast, if anything, there is a slight decrease in the propensity of men to select into time-intensive specialties due to the reduction in hours, which could be a direct consequence of the new entry of women displacing men.

To shed light on why women and men respond differently to the reduction in residency hours, I investigate the effect of the reform on family formation decisions. I develop a conceptual framework in which physicians jointly choose their medical specialty and whether to have children during residency. The model demonstrates that a reduction in a specialty's hours can induce more women than men to enter the specialty, but yields ambiguous predictions regarding the effect on the specialty's female fertility rate. The ambiguity arises due to two potentially offsetting phenomena: the effect of the reduction in hours on the fertility of inframarginal women and the effect of the hours reduction on the composition—in terms of the desire to have children during residency—of women who enter time-intensive specialties. Depending on the relative magnitudes of these effects, a specialty's fertility rate can rise, fall, or stay the same in response to a reduction in hours.

In order to empirically investigate the effect of the reform on female residents' fertility, I construct a novel linkage between censuses of early career physicians and administrative birth records from two large states: California and Texas. First, I document that prior to the reform in both California and Texas, there is a negative relationship between a specialty's weekly hours and its female fertility rate during the first three years of residency. Next, I find that a reduction in a medical specialty's hours due to the ACGME duty hour reform causes the specialty's female fertility rate to rise in California, but there is no evidence of an increase in Texas. In California, a four hour per week decrease resulted in 0.02 additional children during the first three years of residency, an increase of 15 percent over the average prereform level. I offer an explanation for the contrasting results in California and Texas based on differences in the composition of postreform entrants into time-intensive specialties in the two states. Finally, I propose an empirical strategy, adapted from Gruber, Levine, and Staiger (1999), to disentangle the

compositional effects from the effect of the hours reduction on the fertility of inframarginal women. The results of this exercise suggest that a substantial portion of the estimated positive effect of the reform on a specialty's female fertility rate in California stems from the divergent fertility choices of new entrants relative to the average entrant: women induced to enter a specialty after its hours were reduced were more likely to have children during residency than the previous entrants.

Overall, these results indicate that reducing an occupation's weekly hours during early career years makes women more likely to enter. Moreover, women's preferences regarding the timing of childbearing are a driving force behind their responsiveness to an occupation's time requirements. Since many professional occupations, including medicine, exhibit high monetary returns to working long hours, these results additionally point to a determinant of the remaining gender wage gap.

## **Chapter 2: Family Disadvantage and the Gender Gap in Behavioral and Educational Outcomes**

(With David Autor, David Figlio, Krzysztof Karbownik, and Jeffrey Roth)

The last four decades have witnessed a swift and substantial reversal of the gender gap in educational attainment in the United States and much of the developed world. Between 1970 and 2010, the high school graduation rate of U.S. women rose 6 percentage points, from 81 percentage points (hereafter points) to 87 points, while the U.S. male high school graduation rate was unchanged (Murnane 2013).<sup>4</sup> Contemporaneously, women have overtaken and surpassed men in higher education; in 2011, the ratio of female to male college attainment ratio among adults aged 25–34 exceeded unity in more than 28 of 34 Organisation for Economic Co-operation and Development (OECD) countries, with a median above 1.4 (OECD 2013). Amid this widely remarked rise in female educational attainment hides an equally striking and comparatively unremarked puzzle: the female advantage in high school graduation and college attainment is larger, and has risen by substantially more, among children of minority families. For example, while the overall female advantage in high school completions among U.S. adults aged 20–24 was 6.2 percentage points in 2010, it was 4.5 percentage points among whites, 12.2 percentage points among blacks, and 7.8 percentage points among U.S. born Hispanics (Murnane 2013, Table 3).<sup>5</sup> Contemporaneous race gaps in college attainment among young U.S. adults are equally pronounced (National Center for Education Statistics 2013, Table 104.20).<sup>6</sup>

What accounts for the systematically larger gender gaps in educational outcomes among minorities? In this chapter, we focus on family disadvantage as a potential explanation, where by family disadvantage we mean cross-group differences in the quality and quantity of available household resources, child-rearing inputs (e.g., nutrition, safety in the home, stimuli), and parental attention. We hypothesize that family disadvantage differentially inhibits the behavioral and academic development of boys relative to girls, either because these outcomes are more elastic to family circumstances among boys than girls, or because differential parental investment in girls relative to boys varies inversely with household socioeconomic status (SES). Our goals in this chapter are to test whether family disadvantage levies a disproportionate effect on the educational and behavioral outcomes of school-age boys relative to girls, to differentiate this hypothesis from a “fetal origins” alternative as well as from a neighborhood-and-school-quality explanation, and to utilize the resulting estimates to quantify the degree to which higher rates of family disadvantage among minority populations can partly explain the larger gender gaps in educational outcomes we observe among minorities.<sup>7</sup>

We draw upon a matched database of birth certificates and academic, disciplinary, and high school graduation records for over one million children born in Florida between 1992 and 2002.<sup>8</sup> Florida is particularly well-suited to this research because it has a large, demographically diverse, and socioeconomically heterogeneous population. Our longitudinal data offer remarkable detail on family characteristics, infant and maternal health at birth, early educational outcomes including assessments of kindergarten readiness at the start of formal schooling, third through eighth grade test scores, absenteeism, disciplinary outcomes, disability, and high school graduation for the oldest cohorts in our sample. Since family disadvantage is imperfectly observable even in this rich database, we combine multiple variables to proxy for this underlying construct, focusing particularly on maternal education and father presence or absence at the time of birth.

In order to address that family environment is intrinsically confounded with congenital and hereditary factors that likely affect children's outcomes independent of their impact on family environment, we employ an empirical approach that contrasts the outcomes of opposite-sex siblings linked by birth and schooling records to the same mother. This strategy provides valid identification of the differential effect of child-rearing environment on boys relative to girls under two conditions. The first is that siblings raised by the same mother are (on average) exposed to the same family environment, an assumption that we find *ex ante* plausible. The second, more stringent, condition is that the gender gap in potential outcomes between siblings is uncorrelated with our measures of family environment at the time of birth; that is, any intrinsic genetic or biological advantage that girls may possess at birth relative to their male siblings is not systemat-

ically larger or smaller in less relative to more disadvantaged families.

We begin by documenting that the cross-race differences in the gender gap in long-term educational attainment emerge early in students' academic trajectories and are apparent in both cognitive and behavioral outcomes. For example, approximately 12 percent of Florida public school children are suspended at least once between third and eighth grade. But suspensions are 7.2 percentage points higher among boys than girls, and an additional 6.3 percentage points higher among black boys relative to black girls. We then implement our primary analysis which, by comparing siblings, demonstrates that boys born to low-SES households perform worse on standardized tests throughout elementary and middle school, have higher rates of absences and behavioral problems, and are less likely to graduate high school than are their sisters.

These within-household differentials are economically large and explain a substantial share of cross-race group differences in the gender gap. Accounting for the differential effect of family disadvantage on boys relative to girls reduces the cross-race suspension gap to 2.9 percentage points—meaning that 3.4 percentage points of the observed black-white gender gap is proximately explained by higher levels of disadvantage to which both black boys and girls are exposed. Among families of comparable SES, we would predict this gap to be 54 percent smaller. Carrying this exercise forward to longer-term outcomes, our estimates of the causal effect of family disadvantage on the gender gap can explain about one-third of the excess high school dropout differential among black males versus black females relative to white males versus white females.

We provide a partial test of the assumption that the gender gap in potential outcomes between siblings is uncorrelated with family environment by analyzing a large set of health outcomes reported on birth certificates: birthweight, Apgar scores, gestational age, congenital anomalies, complications of labor and delivery, abnormal birth conditions, maternal health, and adequacy of prenatal care. In all cases, these at-birth outcomes differ systematically among SES groups: low-SES newborns are delivered in poorer health to less healthy mothers who received less prenatal care and experience more frequent birth complications. Yet, in no case is the brother-sister gap in these outcomes predicted by SES; brothers and sisters appear equally advantaged or disadvantaged by family SES. This finding is especially noteworthy for the outcome of birthweight, which a large literature demonstrates is a sensitive and powerful predictor of newborns' long-term health and educational outcomes into adulthood (Aizer and Currie 2014; Black, Devereux, and Salvanes 2007; Figlio et al. 2014).

While the SES gradient in the gender gap may stem from family environment per se, it may also reflect the differential effect of neighborhood and school quality—both of which

are correlated with family income, education, and marital status—on boys relative to girls. We empirically differentiate among these alternatives by augmenting our main analysis with measures of the nonfamily environment that siblings experience, including measures of school quality produced by the Florida Department of Education, estimates of the causal effect of neighborhoods on economic mobility produced by Chetty and Hendren (2015), and a saturated set of neighborhood indicators (corresponding to zip codes). In all cases, we allow these environmental quality measures to differentially affect outcomes of boys relative to girls. Accounting parametrically or nonparametrically for the neighborhood and school quality differences, we find that the bulk of the within-sibling, SES gradient in the gender gap remains—even while school and neighborhood also have large effects. This leads to our broader conclusion that impoverished child-rearing environments—whether at the household, school, or neighborhood level—appear particularly pernicious for boys.

### **Chapter 3: Gender Differences in Politician Persistence**

The large gains that women in the United States have experienced in many dimensions of their economic lives have not been mirrored by commensurate improvements in their representation in political offices. In 2013–2014, women constituted 24 percent of U.S. state legislators and 19 percent of members of U.S. Congress. When considering county- and city-level offices, female representation rises modestly but does not exceed 30 percent. In contrast, in 2013, women comprised 47 percent of the U.S. labor force and 43 percent of full-time workers. The United States is hardly an outlier among OECD countries; in 2015, women held less than 30 percent of national legislative positions (OECD 2015).

What accounts for the low representation of women in politics? Although there are differences in men and women's baseline interest in running for elective office, there is now considerable evidence that conditional on running, male and female candidates have approximately equal probabilities of winning (Burrell 1992; Ferreira and Gyourko, 2014; Lawless and Fox 2013; Pearson and McGhee 2013). The path to state and federal political offices is, however, rarely characterized exclusively by electoral success. Every U.S. president within the last 50 years has experienced some form of electoral failure, either in state/federal legislative elections, gubernatorial elections, presidential elections, or lost bids for nominations (Pitney 2014). Deciding to run again for office *after* an electoral loss is one path to eventual office-holding. Gender differences in candidates' persistence in politics *after* an electoral loss could therefore be instrumental in explaining disparities in male and female political representation.

This chapter empirically investigates whether there is differential attrition of men and women in response to an electoral loss, and if these gender differences can partly account for the low representation of women in politics. I analyze California local election data from 1995 to 2014. Local politics is a setting well-suited to examining the role of individual candidates' decisions to run for office—distinct from political parties' preferences for candidates—as these elections are formally nonpartisan. In practice, there is limited political party involvement, particularly in smaller localities. Differences in men's and women's capacity and willingness to solicit campaign donations are also of limited concern in this context, as local election campaign budgets are minimal. Furthermore, local elections are a common entry point to politics and allow me to pinpoint a candidate's initial electoral experience. Finally, local politics is often a breeding ground for candidates for state- and federal-level offices. If differential attrition of women at the local level exists, it could also affect the representation of women in higher offices.

To control for unobserved differences between winning and losing candidates, I employ the close election regression discontinuity design pioneered by Lee (2008). First, I document that candidates in California local elections exhibit behavior similar to candidates in state and federal elections; that is, there is a large incumbency advantage. I find a substantial negative effect of losing an initial election of approximately 20 percentage points on the propensity to run in a subsequent election. I then explore whether there is heterogeneity in the responsiveness to an initial electoral loss based on the candidate's gender. I find that the effect of losing an initial election is considerably larger (more negative) for women than men: after an electoral loss, men are 16 percentage points less likely to run in a subsequent election, whereas women are approximately 26 percentage points less likely to run again.

Through a series of empirical tests, I explore mechanisms that could account for the 10 percentage point differential in men's and women's responsiveness to an electoral loss. I rule out the sorting of men and women into running for different types of political offices as a potential explanation. Moreover, there is little empirical support for the contention that men's and women's differing opportunity costs of running or benefits from holding political office account for their disparate responses. Political party involvement (though already limited at the local level) additionally does not appear to drive the results. Geographic differences in localities in which women are elected also provide little explanatory power.

Based on these findings, I put forth two models of candidate entry behavior: one rational and one behavioral. The rational model is based on the premise that voters have imperfect information about candidates' political competence and receive noisy signals of candidate competence prior to

the election. Following Beaman et al. (2009), I assume that the precision of the signal of political competence is lower for female than for male candidates due to the initially lower representation of women in politics. If voters are risk averse, then even conditional on receiving the same signal, female candidates are penalized for the additional risk associated with their noisier signal. When deciding to enter an election, candidates condition their decisions on the expected probability of winning, which results in the deterrence of female candidate entry.

The behavioral model draws on the literature on women's performance in and preference for competitive environments. It has been documented that women are less likely to enter settings in which their returns are determined by tournaments (Niederle and Vesterlund 2007). In addition, there is evidence that women are more likely to incorporate external feedback, particularly negative feedback, into self-evaluations, perhaps due to the fear of conforming to existing stereotypes regarding their group membership (Roberts and Nolen-Hoeksema 1989; Steele 1997). Thus, an initial electoral loss could serve to disproportionately discourage women from running in another election. I attempt to distinguish between these models through an empirical test of a comparative static of the rational model: the gender difference in the effects of losing an election should narrow as the relative precision of the signal of female politicians' competence rises. I find modest support for the model of rational candidate entry, but cannot rule out the behavioral model.

This body of evidence indicates that the differential attrition of women in response to an electoral loss can at least partially account for the low representation of women in political offices. The chapter's findings also suggest that women are behaving rationally: in their decision to enter a race, women are correctly anticipating a form of statistical discrimination that lowers their chances of winning relative to men's, conditional on their ability level. Policies that address the imperfect information that voters have about candidates could help alleviate the initial reluctance of women to enter politics, as well as the differential attrition of men and women in response to an electoral loss. In addition, a policy that mandates a higher level of female representation in political offices could trigger a virtuous cycle by increasing the precision of the signal of political competence for female candidates.

## Notes

1. See, for example, Adda, Dustmann, and Stevens (2011); Francesconi (2002); and Polachek (1981).
2. Some research has demonstrated that women are less likely to enter competitive, winner-take-all environments (Niederle and Vesterlund 2007). Many positions with convex returns to long and continuous hours, such as partner track associates at a law firm, are also characterized by more competitive environments.

3. There are few opportunities to adjust labor supply within a residency program. First there are limited part-time or shared residency positions. Second, it can be costly to take time off from a residency program. Current rules set by medical specialty boards stipulate that an individual must make up time or repeat a residency training year if one is absent from work for more than 4–6 weeks, depending on the medical specialty.
4. High school graduation rates refer to the status completion rate of U.S. born adults aged 20–24, and they include both traditional high school graduates and GED holders. Thus, 1970 graduation rates refer to cohorts born 1947–1950, and 2010 graduation rates refer to cohorts born 1986–1990.
5. By comparison, the gap in 1970 was zero overall, –0.4 percentage points among whites, 5.1 percentage points among blacks, and –2.5 percentage points among U.S.-born Hispanics. Thus, the increase in the gap among whites, blacks, and Hispanics in this 40-year period was 4.9 points, 7.1 points, and 10.3 points, respectively.
6. Whereas white women aged 25–29 were 22 percent more likely to hold a BA than white males in 2010, the corresponding gap was 55 percent among both blacks and Hispanics. Goldin, Katz, and Kuziemko (2006) document that among the high school graduating class of 1992, the female advantage in BA attainment was far higher among children of families in the bottom two SES quartiles than among the top two quartiles, and, moreover, the gender gap in the lower two quartiles had risen by substantially more than among the upper quartiles in the prior 20 years.
7. Prevailing gender norms historically inhibited women from attaining education commensurate with their ability. As documented by Goldin, Katz, and Kuziemko (2006) and Fortin, Oreopoulos, and Phipps (2015), U.S. girls outranked U.S. boys in high school grade point averages for many decades. And yet, until the early 1980s, girls were substantially less likely than boys with comparable class ranks or IQ scores to enter and complete college. But the overall relaxation of the gender norms does not immediately explain why the gender gap has reversed to a substantially larger extent among children of minority, low-income, and nonmarried families.
8. These data are also used by Figlio et al. (2014).

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