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**Comment** Cecilia Elena Rouse

This chapter is quintessential Goldin. It begins with an important stylized fact, combines that with an interesting cultural or institutional insight, develops an economic model to explain the fact and insight, and then tops it off by testing the model with previously unknown or original data. In this chapter the stylized fact is that men and women work in different occupations; this was particularly true 50 to 100 years ago but continues today, albeit to a lesser extent. Further, women historically have earned less than men when they do work in the (observably) same occupation. There have been many theories advanced to explain these patterns. Among the best known are differences in human capital (both physical and cognitive) (Becker 1957), statistical discrimination (Aigner and Cain 1977; Phelps 1972; and Arrow 1973), and more recently differences in psychological attributes and preferences and social norms (e.g., Bertrand 2011). Perhaps the best-known, and most widely cited, explanation for true discrimination lies in differences in taste for interacting with members of different groups, originally advanced by Gary Becker (1957). However, Goldin's very important insight in this chapter is that while differences in taste, in particular, may explain racial discrimination, many men like women and live along side of them in so many domains. As such, surely differences in "taste"—in its simplest form—cannot lie at the foundation of gender occupational segregation.

And so Goldin sets out to develop what she calls a "pollution theory" of discrimination. The model is not wholly distinct from other models of discrimination but rather pulls them together in a novel way. Basically, the model posits that differences in taste (distaste) for working with women may arise as a desire by men to protect their occupational status. She then adds in some asymmetric information and, in some cases, differences in human capital, to round it out. At the core of the model is a minimum level of a "skill" (which could be any important productivity-related characteristic such as strength, education, or ability) needed to enter a profession. And society confers greater "prestige" on those occupations that require higher levels of the skill. Further suppose that any worker's ability cannot be perfectly observed, but it is generally known/assumed that the mean for women is lower than that for men. If a woman enters a previously all-male profession, that could arise because either she is qualified or because of an unobserved technological change that has lowered the level of skill required to do the

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job. A lower required skill level would decrease the prestige of the job. The problem is that if members of the wider society cannot distinguish these two explanations, the entrance of women will necessarily decrease the prestige of the occupation. Fearing this outcome, men seek to exclude women from high-prestige occupations.

Goldin then examines potentially testable implications of the model. The first is that men in occupations with a required level of the skill above the median of the female distribution will oppose the entry of women to the occupation, and so if firms want to hire talented women they will create female-only occupations (as an example, men are employed as “accounting clerks” and women as “stenographers”). As a result, one should observe these parallel occupations when high levels of skills are necessary and there are women that possess them. The second, related, implication is that occupational segregation will be nonmonotonic with regard to the skill with higher levels of segregation at the tails of the female distribution in the characteristic and integration in the middle. The third is that the development of credentials and other ways of “verifying” an individual’s qualification for the occupation should increase gender integration and reduce wage discrimination. And, finally, the model implies technological change that reduces the required level of skill and should lessen occupational segregation as well. Goldin highlights the advent of lighter fire hoses that allow more women to be able to work effectively as firefighters as one example and adding machines (and other “calculators”) that do not require one to be able to add large sums of numbers in one’s head as another.

The data requirements to properly test these implications, especially the first two, are numerous: detailed information to allow for precise identification of occupations, information on all relevant qualifications for the job, and information on not only individual workers but also others in the same firm (or relevant wage-setting unit). Most readily available data sets do not typically have such information. Nevertheless Goldin, the consummate historian, pieces together data from different sources to kick the tires of the model. For example, she turns to what is known about occupational segregation in manufacturing at the turn of the twentieth century to document the extent of segregation at the time and to provide some insights into the role of skill differences in “strength” versus “academics” as well as the role of credentialing in the evolution of the distribution of women across occupations. The level of detail she presents tells a compelling story about the potential sources of sex discrimination in some sectors and why it may have evolved in the first half of the twentieth century.

She further tests some of the more subtle implications of the model using a remarkable data set that she put together from archival records at the US Department of Labor from 1940. Specifically, she analyses data on approximately 3,000 clerical and office workers in Philadelphia in which she is able to match individuals to firm-level data (which contain information about

personnel policies—the respondents were quite candid in their preferences for certain types of workers). Using these data she both documents the rather extensive amount of sex discrimination in 1940 and finds some evidence consistent with the model, such as that highly educated women were employed in more segregated occupations as were men.

Further, while not the focus of the chapter, Goldin indulges the many readers who suspect that discrimination still explains part of the wage gap between men and women today and briefly considers the extent to which the model explains today's labor market as well. To do so she turns to the 2009 and 2010 American Community Survey to document the increased presence of women in some of the top-earning occupations, such as physicians, lawyers, and pharmacists, that may be partly due to increased credentialization of women in these fields as hypothesized by the pollution theory of discrimination. That said, she also acknowledges that there may be some remaining occupations with unusual characteristics and skills in which the pollution theory may still apply such as firehouses, police departments, and trading floors. As such the chapter is quite "satisfying": a thought-provoking model, data from a relevant time period to test it, and some consideration of the extent to which it applies today.

However, intrigued by the contrast of the situation of women in the labor market today with that of seventy years ago, I would like to suggest two broad areas in which I believe further work would provide an interesting addition to the literature and perhaps provide us with a better understanding of labor markets more generally.

First, to what extent can one systematically document continued, and perhaps subtle, segregation in "highly prestigious" occupations for which women are beginning to obtain the requisite skills and are therefore segregated into parallel occupations? For example, according to the 2012 Survey of America's Physicians conducted by the Physicians Foundation, 55 percent of family physicians were female compared to only 25 percent of physicians with a surgical specialty. As another example, according to the 2011 National Survey on Retention and Promotion of Women in Law Firms conducted by the National Association of Women Lawyers, 44 percent of seventh-year associates at law firms were female compared to only 15 percent of equity partners. These differences may be due to other characteristics of the subfields, but they may also be related to perceptions of prestige. That said, to convincingly document a relationship would require detailed data from employers along the lines of those collected by the Department of Labor in 1940 (which could potentially come from administrative data from a firm or a special survey) or an experiment carefully designed to elicit beliefs about the prestige of occupations under different assumptions about the required level of skill, the distribution of that skill among women, and the prevalence of women in those occupations. On a related note, one aspect of the model that would be interesting to develop is to more explicitly incor-

porate women's preferences into the model. That is, what do women value? It would be nice to expand the model to incorporate such factors as social norms and multiple dimensions of ability/prestige; such factors may also help us to understand continued subtle occupational segregation such as those in medicine and law.

Second, as discussed above, the pollution theory of discrimination implies processes by which occupations can become integrated, namely through changes in technological change and the development of credentials and licenses that document an individual's level of skill in the occupation. Goldin herself writes, "The model is inherently historical: the past affects the present." (2). As such, it would be intriguing to more generally document the relationship between, say, technological change that reduces the importance of physical strength required for a variety of occupations and any changes in the prevalence of women in the occupation over the entire twentieth century and through today. To document such a relationship may not only provide insights into occupational integration, but also into other effects of technological change on occupational distributions more generally. Similarly, over the past fifty years occupational certificates and licenses have grown tremendously. Kleiner and Krueger (2013) estimate that approximately 29 percent of their surveyed workers were required to have a government-issued license in 2008 while less than 5 percent were required to do so in the 1950s. They also show that there is no difference in the licensing rate by gender. To what extent can the growth in occupational certificates and licenses explain the documented decrease in discrimination and increased occupational integration? As policymakers press for more certification to help employers understand the value of different curricular programs, the impact of these "signals" of skill attainment on occupational segregation may prove an additional social benefit.

In short, this chapter by Goldin is thoroughly intriguing. And while the model is stylized, it will undoubtedly spur others to think along these lines, both empirically and theoretically, thereby advancing our understanding of all kinds of group-based differentials in occupation and earnings.

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