The Rise of Female Professionals: Are Women Responding to Skill Demand?

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For years, college-educated women were limited mainly to lower-paying, female-dominated professions such as teaching and nursing. Over the past several decades, however, there has been a remarkable increase in the percentage of college-educated women in higher-paying, "traditionally male" professional occupations. In 1967, the fraction of college-educated women working in these occupations was less than 20 percent. By 1997, this number had increased to almost 40 percent. This increase is particularly striking when compared to the slightly declining trend among college-educated men.

What can explain this increase in female professionals? There are a number of possible explanations. One explanation is a demand shift favoring women over men in these highly skilled occupations. While the notion of a "gender-specific" demand shift is compelling in the case of high-school-graduate men and women, who work in very different industries and occupations, the story is much less convincing for the college-educated group. College-educated men and women work in more similar occupations and are presumably closer substitutes for each other. To the extent that they are different, the available evidence suggests that this may have worked to the disadvantage of women (see Francine Blau and Lawrence Kahn, 1997).

Another explanation, and the one we focus on in this paper, is that college-educated women have responded to the rise in overall skill demand, a phenomenon which has characterized the U.S. labor market during the 1980's and perhaps even as early as the 1970's. An important margin of response for these women may have been labor-market participation. In 1970, less than 60 percent of college-educated women were working. The economy-wide rise in skill demand may have attracted educated women not only from other occupations, but from nonparticipation as well. Since virtually all college educated men work, labor-market participation is less likely to be a factor for men.

While we postulate that the overall increase in skill demand played an important role, we are also aware that this is not the only explanation. Within these high-wage professional occupations, women's wages rose relative to male wages even as women increased their share. This suggests to us that declining discrimination (which both made it easier for women to enter these occupations and resulted in wage convergence vis à vis the male workers) or unobserved skill upgrading also may have played a role. In addition, the spread of more effective birth-control devices, *Roe* v. *Wade,* and no-fault divorce laws, just to name a few of the factors which changed marriage and fertility patterns of women, also most likely contributed to women's willingness and ability to invest in "career jobs" (see Claudia Goldin and Lawrence Katz, 2000).

I. The Rise of Female Professionals and Managers

We use the March Supplement to the 1968–1998 Current Population Surveys (CPS), with earnings and employment data covering the years 1967–1997. We limit the sample to individuals aged 25–64 to avoid many of the issues related to the completion of schooling and retirement. When examining wages, we focus on wages and salaries of full-time workers who worked at least 40 weeks during the previous year. Our wage measure is weekly wages calculated as earnings in the previous year divided by weeks worked in the previous year. Individ-

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uals must be earning at least half of the weekly equivalent of the minimum wage to be included in the wage sample.[1]

We focus on professionals as a share of total population, defined by gender and education. Thus, our main variable of interest can be interpreted as "participation in professional occupations," which reflects both labor-market participation decisions and occupational choice.[2]

The top panels of Table 1 document the rise in professionals, first among all women and then among college women. In 1967, approximately 9 percent of women were working as professionals and managers and less than 5 percent were employed in professional occupations, excluding teachers and nurses. Recently, the fractions of women in these occupations have increased to 29 percent and 22 percent, respectively. We also see a large increase when we look at college-educated women only.

Figure 1 shows the fractions of professional college women indexed to their 1967 values. As the figure illustrates, the changes are particularly pronounced for our alternative definitions of professionals that either exclude teachers and nurses or that are defined as "high-wage" based on male wages.[3] The fraction of broadly defined professional women increased slightly while the fraction of college women who are in professional occupations (excluding teachers and nurses) increased by a factor of 2.5 and the fraction of college women in high-wage male occupations increased almost threefold. We focus on the professional share that excludes teachers and nurses, since this category exhibits dramatic changes and yet is fairly straightforward to calculate. We will refer to this category as "traditionally male" professional occupations. In sharp contrast to the rising share of female professionals, there has been a declining trend for men. The share of college-educated men in professional occupations declined slightly from approximately 66 percent to 62 percent (see last row of Table 1).

Figure 2 illustrates the share of college-educated women working in "traditionally male" professional occupations disaggregated by birth cohort. We can roughly identify three groups of cohorts, which exhibit very different patterns. The oldest generation, women born before 1930, exhibit little increase in participation in "traditionally male" professional occupations.

TABLE 1—PROFESSIONALS AS SHARE OF POPULATION OVER TIME

	Year			
Sample	1967	1977	1987	1997
All women				
Professionals	0.089	0.130	0.213	0.286
Professionals excluding nurses and teachers	0.049	0.080	0.154	0.219
Professionals in high-wage occupations	0.034	0.041	0.081	0.109
College women				
Professionals	0.442	0.483	0.554	0.592
Professionals excluding nurses and teachers	0.158	0.222	0.329	0.397
Professionals in high-wage occupations	0.080	0.104	0.186	0.235
All men				
Professionals excluding nurses and teachers	0.256	0.271	0.285	0.296
College men				
Professionals excluding nurses and teachers	0.656	0.630	0.617	0.620

Notes: A worker is defined as being a professional if he or she is classified as a manager or professional in the previous year. The high-wage-occupations variable represents the number of women employed in the occupations with the highest average male wages (see text for details).
Source: Current Population Survey, 1968–1998.

[1] In addition, we adjust for top-coded earnings by gender and impute weeks worked within brackets for 1967–1974. Details are available from the authors upon request. A key limitation of the CPS data is the omission of actual labor-market experience. We use potential experience calculated as age minus years of schooling minus 6 to proxy for labor-market experience.

[2] We focus on professionals as a share of population rather than the employed population because we believe that, for many college women, the decisions to enter the labor market and to enter a professional occupation are inextricably linked. For this reason, we also use changes in the level of professional wages for women, rather than relative wages, later in our regressions. To align our employment variables with the earnings information, we calculate the fraction of the population who are professionals by dividing total professional weeks worked by total potential weeks worked last year (52 × number of individuals).

[3] More precisely, we rank occupations at the three-digit SIC level based on male wages (corrected for experience) and select the highest-wage occupations in which 20 percent of the men are employed. While coding changes make it difficult to hold this definition constant across all years, we fix the top occupations over the following periods: 1967–1969, 1970–1981, and 1982–1997.

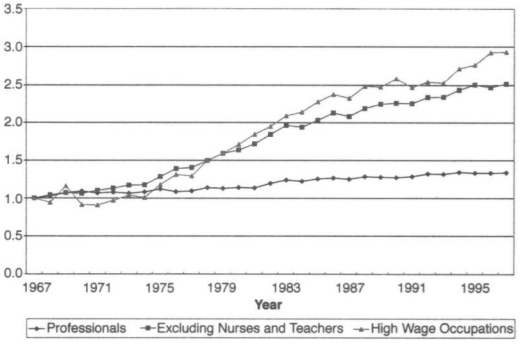

FIGURE 1. PROFESSIONALS/POPULATION, COLLEGE-EDUCATED WOMEN (INDEXED: 1967 = 1)

Notes: See text for details.
Source: Current Population Survey, 1968–1998.

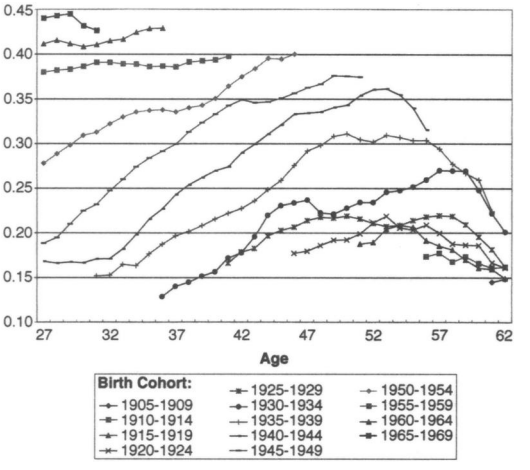

FIGURE 2. PROFESSIONALS/POPULATION, COLLEGE-EDUCATED WOMEN

Notes: See text for details.
Source: Current Population Survey, 1968–1998.

While these women increased their labor supply overall, they appear to have predominantly located to less-skilled occupations.

The second group of women, women born between 1930 and 1955 significantly increased their participation in professional occupations over their lifetimes.[4] Interestingly, a large fraction of these women began their careers with high participation rates in teaching and nursing occupations (the very occupations we excluded in the previous figure) and decreased their participation in these occupations over their lifetime. For example, among the cohort born in 1945–1949, 33 percent were employed in teaching and nursing at age 25–29. At age 40–44, only 27 percent were employed in these occupations, while 35 percent were employed in "traditionally male" professional occupations. This suggests that there are changes in the composition of employment, even within cohorts, for these women.

The final group of women, the group born after 1955, *begin* their careers at high levels of participation in "traditionally male" professional occupations. The absence of aging effects for these women is quite striking. While further investigation is needed, we surmise that these are the generations of women who chose the "career, then family" path documented in Goldin (1997). There are two opposing effects that tend to cancel each other as these women age. On the one hand, accumulation of experience, completion of training, and promotions will increase the fraction in high-wage professional occupations. On the other hand, these women are also reducing their labor supply as they invest in family and children, which tends to decrease the fraction working in professional occupations. We do indeed find that the employment–population ratio among women born in 1960–1964, for example, declined from 84 percent at age 25–29 to 77 percent at age 30–34.

II. College Women and Skill Demand

We next examine whether the rising share of women in "traditionally male" professional occupations is related to the recently documented increase in demand for skill. We postulate that women, and particularly college-educated women, are likely to have a more elastic response to increased skill demand relative to their male counterparts. As mentioned before, an important margin of response available to women but not to men (who are all already in the labor force) may be labor-market participation. This argument holds not only for rising professional share *within* cohorts, but also for the rising share *across* birth cohorts. Since these

[4] This is the case even when we allow for aging and experience effects based on male professional participation rates.

high-wage professional occupations most likely involve "career" investments in human capital which can only be recouped by working for many years, the recent increase in skill demand may have attracted women from a "career" of nonparticipation as well as careers in less skill-intensive occupations.

We first examine within-cohort growth in professional share and its relation to rising skill demand by estimating the following equation:

$$(1) \qquad P_{at} = \beta w_{at} + \delta_a + \tau_c + \varepsilon_{at}$$

where P_{at} is the fraction of the population of age a and at year t working in "traditionally male" professional occupations, w_{at} is the average log wage of individuals of age a and at year t working in these occupations, δ_a refers to age effects captured by a quartic function in age, τ_c refers to cohort effects and ε_{at} refers to the error term. We aggregate data up to the age-by-year cell and then run weighted least-squares regressions where the weights are the number of individuals in each cell. There are 1,240 observations that differ by 40 single years of age (25–64) and 31 years (1967–1997). To distinguish between effects of skill demand and changing discrimination (as well as to correct for endogeneity of wages), we instrument wage growth with the level of real merchandise imports and its interactions with age variables in some of the specifications.[5]

Table 2 reports the estimates of within-cohort professional (partial) labor-supply elasticities for women. The top panel reports the results for college-educated women, while the bottom panel reports the results for all women. Columns (i), (ii), (v), and (vi) do not instrument for the wage, while columns (iii), (iv), (vii), and (viii) use the level of real merchandise imports and interactions with the age variables as instruments for the wage. The table shows that, overall, the within-cohort correlations are more positive and robust for all women than for college women and more robust when we specify ten-year cohort dummies than five-year cohort dummies. In fact, when we look only at college women, specify five-year cohort dummies, and instrument for the wage, the coefficient is actually negative (−0.29) and marginally significant. We also ran corresponding regressions for all men and for college-educated men and found the estimates to be generally insignificant or negative.[6]

TABLE 2—WITHIN-COHORT ESTIMATES OF PROFESSIONAL-LABOR-SUPPLY ELASTICITIES FOR WOMEN

A. *College-Educated Women*

	Specification			
Variable	(i)	(ii)	(iii)	(iv)
Partial elasticity	0.004	0.046	−0.291	0.332
	(0.012)	(0.013)	(0.149)	(0.127)
Five-year cohort dummies	yes	no	yes	no
Ten-year cohort dummies	no	yes	no	yes
Instrument for wage	no	no	yes	yes
N:	1,240	1,240	1,240	1,240
R^2:	0.797	0.749	0.705	0.654

B. *All Women*

	Specification			
Variable	(v)	(vi)	(vii)	(viii)
Partial elasticity	0.015	0.058	0.354	0.527
	(0.006)	(0.008)	(0.098)	(0.094)
Five-year cohort dummies	yes	no	yes	no
Ten-year cohort dummies	no	yes	no	yes
Instrument for wage	no	no	yes	yes
N:	1,240	1,240	1,240	1,240
R^2:	0.941	0.891	0.795	0.593

Notes: Standard errors are in parentheses. The dependent variable is the fraction of the respective population who are professionals (excluding teachers and nurses). The independent variable is the average wage of professionals (excluding teachers and nurses). All specifications include a quartic in age as well as the reported cohort effects. Instrumented regressions use the level of real merchandise imports and its interactions with age variables.

The fact that the estimates in Table 2 are more positive when we use broader categories of cohorts (thereby allowing some between-

[5] Our methods and instruments are similar to those employed by John Pencavel (1998).

[6] The results are available from the authors upon request.

cohort variation) is instructive. The results in Table 2 suggest that, while women's response to rising skill demand may be greater than men's, the within-cohort response to rising skill demand is limited, and much of the response we are attempting to capture is exhibited *across* birth cohorts. While we are hindered by lack of a convincing measure of skill demand over this extended period, we examine the correlations of predicted lifetime professional wages and predicted lifetime professional participation rates across different cohorts of college women in the following section.

To obtain predicted lifetime professional participation rates and wages for each birth cohort, we use the following predicting equation:

$$(2) \qquad P_{at}, w_{at} = \delta_a + \tau_c + \varepsilon_{at}$$

where P_{at} refers to the fraction employed in "traditionally male" professional occupations, w_{at} is the average log weekly wage in these occupations, δ_a refers to a quartic in age as well as cohort-specific age splines for ages 25–29, and τ_c now refers to the set of single-year cohort dummies. We predict P_{at} and w_{at} for each single-year birth cohort from 1915 to 1969 at each age and average across ages to obtain the predicted "lifetime" participation in professional occupations and predicted "lifetime" professional wages.[7]

Figure 3 graphs these variables by birth cohort for college-educated women. There is clearly a strong positive relationship between these two variables, reflecting the strong upward trend in both wages and participation of college-educated women. The positive correlation persists even when we control for a trend. The positive correlation in the detrended series appears to be driven by below-average growth rates for the older cohorts and above-average growth rates for the recent cohorts. The positive correlation across cohorts suggests that college-educated women have moved into high-wage professional occupations in response to increasing opportunities in these professions. Since we are examining actual wages rather that wages that are correlated with overall skill demand, it is less clear that these increasing opportunities were directly related to skill demand rather than reductions in discrimination. We do not think it is entirely a coincidence, however, that discrimination against educated women lessened during a period of rising skill premiums. An interesting contrast is the evolution of race and ethnic differentials which, unlike differences across gender, have widened in the recent period.

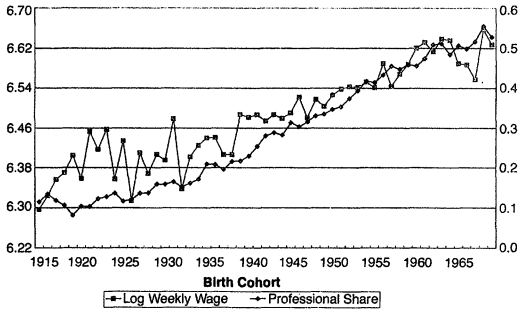

FIGURE 3. PREDICTED LIFETIME PARTICIPATION (RIGHT-HAND AXIS) AND WAGE (LEFT-HAND AXIS) IN PROFESSIONAL OCCUPATIONS, COLLEGE-EDUCATED WOMEN

Source: Current Population Survey, 1968–1998.

III. Conclusion

In this paper, we first document the rise in female professionals and managers in the recent decades and then examine to what extent this increase is associated with rising skill demand in the 1980's and the 1990's. Overall, we find that college women's participation in high-wage professional occupations is positively correlated with wages in these professional occupations and our proxy measures for skill demand. However, these positive correlations are more robust across different birth cohorts than within cohorts. For college-educated men, we find a negative or no relationship both within and across birth cohorts. Our analysis offers some evidence that college-educated women entered high-wage professional occupations in response to the recent increase in skill demand. Our analysis also confirms the view that career and participation decisions of women are com-

[7] This method produced very similar results to the alternative method of extracting the coefficients on cohort dummies, controlling for a quartic function in age.

plex and that no single explanation is likely to account for the recent changes.

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