Gendered Employment Trends and the Female College Boom

July 9, 2014

Abstract

We ask whether shifting male and female employment patterns can help to explain why the US college boom between 1981 and 2005 was dominated by women. We make three contributions. First, we show that while a massive feminization of high-wage, high-skill occupations plausibly contributed to the female college boom, general, structural movements of labor (undifferentiated by gender) from industrial work into education-intensive services should have encouraged male rather than female college attendance. Previous work has suggested that both types of employment shifts would have contributed to the female college boom. Second, we show that women's occupational upgrading was too large and ubiquitous to be explained by their growing educational advantage. This is consistent with a causal connection running from gendered employment trends to a female college boom. Third, we show that gender specializations in many occupations deepened, with college educated women gravitating towards jobs offering institutionally protected wages.

Keywords: Women, College Premium, Employment, Occupation
JEL Codes: J21, J16, I21, J24

INTRODUCTION

The US college boom has been dominated by women. The share of female workers, aged 25-30 holding college degrees rose rapidly, from 25.6% in 1981 to 37.2% in 2005. Meanwhile, the corresponding male share edged up from 24.3% to 26%. Given that universities charge men and women equal fees, this suggests that demand for college education has grown much faster amongst women than amongst men. With the college wage premium rising for both men and women (Goldin and Katz, 2009), it is useful to ask why women have attended college in such numbers while men have not. Previous studies provide several explanations, which mostly involve gender differences in abilities, familial responsibilities and labor force participation trends.[1] This paper focuses on a different possibility: that shifts of male and female employment across industries and occupations (henceforth, "sectors") may have increased the benefits of college education more for women than for men.

[Figures 1 and 2 about here]

The literature identifies two types of employment shifts that may have had this effect. The first type involves *changes in gender representation* within industries and occupations. The key shift of this type is an increase in the representation of women in high-skill, high-wage occupations (McDaniel et al., 2011). Figure 1 clearly shows that, on average, women have moved into better paying occupations while men have not. Figure 2 shows that this has resulted in a massive feminization of higher-wage jobs between 1981 and 2005: on average, the change in the share of each occupation that was comprised of women increases by 19.5 percentage points with each doubling of the average occupational wage. The second type of shift involves *structural changes*, arising from the growth and decline of employment (not differentiated by gender) in different sectors. For example, deindustrialization and the accompanying shift of workers into

[1]There are three prominent explanations for this. First, women are often better prepared academically and psychologically for higher education than men, which should make their attendance rates more responsive to increases in college premiums (Becker et al., 2010; DiPrete and Buchman, 2013; Goldin et al., 2006; Perkins, 2004). There is also evidence that women's academic advantage has grown in recent decades (Cho, 2007). Second, given that women bear the majority of the cost of raising children post-separation, rising rates of divorce increase the incentives for women go to college to ensure that they will have the means to take care of themselves and their children (Bronson, 2013).Third, improvements in family planning technology have lifted female labor force participation rates (Bailey, 2006), possibly encouraging more women to invest in college in order to take advantage of high labor market returns to education (Goldin et al., 2006).

services may have generated larger incentives for women to attend college, because services tend to employ women and college graduates more intensively than manufacturing. Goldin et al. (2006) argue that shifts in gender representation within sectors and structural employment shifts both contributed to the female college boom.[2] In this study we carefully examine these two explanations.[3]

We will make three contributions to the literature on gendered education and employment trends. The first contribution is to examine, using decomposition methodologies, whether shifts in *pooled* and *gender-specific* sectoral employment shares were large enough and in the right direction to help explain why the college boom was dominated by women. Pooled employment shares are measured from samples that pool men and women, while gender-specific employment shares are measured after splitting our samples by gender. Shifts in pooled employment shares capture structural changes, while shifts in gender-specific employment shares capture the combined effects of structural changes and changes in gender-representation within sectors. Differences in the explanatory power of gender specific and pooled employment trends shed light on the role of changing gender representation within sectors.

We start with standard between-within sector decompositions of the changes in the utilization of male and female college graduates (Katz and Autor, 1999). We find that women have moved into high-skill occupations far faster than men, and that these employment trends account for 45-58% of gender differences in college attainment over time. Next, recalling that women have shifted into higher paying occupations while men have not, we conduct between-within sector decompositions of the shift in the male and female college wage premiums. Similar to the previous exercise, we find that women's occupational shifts were larger than men's and should have done more to lift women's college premiums than to lift men's college premiums. Thus, we

[2] Specifically, they note that one shift since World War II that "greatly increased the pecuniary return to women's higher education… was a large shift in female employment out of the most traditionally female occupations such as teaching and into many previously male-dominated jobs" (p. 151), and that (p. 152) this was "reinforced, first in the 1960s, but especially since 1980, by a rising college wage premium and by secular labor demand shifts favoring occupations and industries disproportionately employing college-educated workers, particularly female college graduates (Katz & Murphy, 1992)."

[3] Cho (2007) shows that aggregate employment shifts across industries cannot explain the female college boom. We go further by analyzing the effects of gendered employment shifts, as well as the role of *occupational* change, and the effects on the college premium of movements of workers between low and high-wage sectors.

argue that gender-specific employment trends went in the right direction to help account for the fact that women attended college in greater numbers than men. On the other hand, both exercises show that pooled employment trends do not shed light on why women went to college more than men. We reconfirm this negative claim using Katz and Murphy's (1992) between-sector demand shift index, which actually predicts a slight male college boom on the basis of pooled employment trends. Deindustrialization reduced demand for high-school educated men, which should have encouraged more men to attend college.[4]

Our second contribution, given that the feminization of high-paying occupations is important, is to ask and answer an obvious question. Couldn't these occupational shifts simply be a consequence of women's growing educational advantage? If this were the case, no causality could run back from shifting gendered employment opportunities to the female college boom. We provide three types of evidence that this is not the case. First, we show that female occupational upgrading and male occupational stagnation are observed even when we limit our samples to workers with exactly the same level of education. Second, a two-stage regression analysis shows that, no matter how occupations' pay-scales are adjusted for the education levels of the workers they employ, higher-paying occupations feminized more rapidly than lower-paying occupations. This trend also is observed within groups of workers with equal education levels. Third, we show that women moved into high paid occupations much faster than their pace of educational advancement would have predicted. Conversely, modest improvements in male educational attainment predict some movement of men into high-wage jobs, but roughly none is observed. Thus, much of the female occupational upgrading is unlikely to be due to educational upgrading. This is consistent with a causal connection running from gendered employment trends to a female college boom.

Our final contribution is to identify the industries and occupations that may have driven the college boom by offering better job opportunities to college graduates. We show that the representation of women in these key sectors grew rapidly, and that some of these changes

[4] Diprete and Buchman (2013) hypothesize that structural shifts should have favored a male rather than a female college boom. Ours may be the first paper to test this idea. Our results complement those from Weinberg (2000) that computerization within sectors would also have encouraged a male college boom by decreasing the demand for male high-school graduates more than for female high-school graduates.

deepened gender specialization in occupations. In particular, we show that while male college attendance was sustained by employment in financial services, healthcare and education played this role for women. Moreover, college-educated women were disproportionately drawn to jobs offering institutionally protected wages, even as men were edged out of them. Thus, we show that men and women have utilized higher education in very different ways in the labor market, and that gender-specific employment trends are potentially useful to consider when attempting to explain why the college boom has been a predominantly female phenomenon.

DATA

Our data come from the Current Population Survey, survey years 1982 and 2006 (King et al., 2010). We created two samples, a count sample to capture total labor supply and a nested wage sample that captures the wages of all full-time workers in the United States. The creation of these samples closely follows the methodology of Katz and Murphy (1992). The count sample includes only workers who have worked at least one week in the preceding year, including immigrants. We calculated an individual's annual hours worked by multiplying weeks worked and usual weekly hours. Starting in 1992, the years of schooling variable was reported in multi-grade brackets. For individuals whose schooling levels are reported this way, we impute years of schooling at the middle grade level of their bracket. We calculate work experience based on schooling and age, and drop workers with more than 40 years of experience.

The wage sample excludes self-employed and unpaid family workers. It includes only full time wage and salary workers who were in the labor force for at least 39 weeks, and worked at least one week in the previous year. We also excluded individuals who did not work part of the previous year due to school, retirement, or military service. Our wage measure is log-weekly wages in 1999 dollars. Top-coded incomes are multiplied by 1.45 following the methodology of Katz and Murphy (1992).[5] Also following their trimming procedures, we dropped individuals

[5] Top-coding occurs only in the 1982 survey, where approximately 1% of the male population had top-coded incomes compared to .04% for the female population. Trimming the wage sample by dropping men/women in the top and bottom 1% of the male/female wage distribution does not qualitatively alter our findings.

who reported a weekly income of less than $115.24 in 1999 dollars (matching their cutoff of $67 a week in 1982 dollars).

COLLEGE ATTAINMENT AND COLLEGE PREMIUMS

[Table 1 about here]

Table 1 shows the percentage of workers with at least a college education, a post-college education, and the college premium by demographic group in 1981 and 2005. We define six demographic groups by sex and three experience levels: low (2-8 years); medium (9-16 years) and high (17-23 years). The attainment rates are calculated from the quantity sample, while the college premium is calculated from the wage sample.

The table shows that the higher-education boom was overwhelmingly female. College and post-college attainment rose far faster amongst women than amongst men in every demographic group. By 2005 low experience female workers were 35% more likely to hold a college degree than low experience men (35.9% vs. 26.5%), and 51% more likely to hold a post-college degree.

We conceive of the college premium as a convenient measure of wage difference between workers who have obtained a college education and those who have not. We define it simply as the difference in average log-wages between workers with a college degree or higher, and workers with only a high school degree. Including workers with graduate education in the pool of college educated workers will allow us to investigate whether the female college boom is related to the growing importance of higher-paying jobs that may require post-college credentials.

College premiums for all three experience groups in 1981 were higher amongst women than men. Amongst low experience workers, the premium increased by a similar amount for both genders. Given that women and men pay the same direct costs for post-secondary education, this shared trend may indicate, consistent with the narrative thread of this paper, that younger women experience fewer social restrictions on their educational and work choices than older women did (Becker et al., 2010). Amongst medium and high experience workers, women also earned a higher premium in 1981, but this difference is completely reversed by 2005. Among

medium and high-experience workers, the college premium increased much more for men than for women. This adds to the mystery of the female college boom – if male and female workers are fairly close substitutes, one might have expected the college boom to be disproportionately male.

The remainder of this paper asks whether shifts in employment across sectors account for gendered trends in college attainment. To keep our tables small, we will present results only for low and high experience workers.[6] The results of all of our analyses for the medium experience workers fall in between those for the low and high experience group, with a tendency to resemble the results for the high experience group more closely. This suggests that our findings are detecting accelerating trends.

BETWEEN-WITHIN ANALYSES

We begin analyzing the relationship between employment trends and the college boom using decomposition analyses with complementary strengths and weaknesses. The first is a standard shift-share analysis of the increase in college attainment (Autor et al., 1998; Berman et al., 1994). The second is a decomposition capturing how changes in employment opportunities should have influenced the college premium itself (Mehta et al., 2013). While the first approach directly accounts for increases in the quantity of college graduates, it does not involve any wage information. It therefore cannot shed light on how employment shifts from low- to high-paying jobs of equal education intensity may have increased the wage incentives to attend college. The latter approach illuminates the connections between employment shifts and incentives, but is mute on how many attend college in response to these changing incentives. In combination, the two approaches carry one robust message: gender-specific employment trends supported a largely female college boom, while pooled employment trends did not. Finally, we will show that a third, influential between-within decomposition of the relative demand for college graduates that suppresses gender differences in employment trends (Autor et al., 1998; Katz and Murphy, 1992) cannot shed light on the gender composition of the college boom.

[6] Tables including results for medium experience workers are available on request.

Effects of employment shifts towards college intensive sectors.

Denote the share of employed workers in some demographic group (defined by age and sex) who have completed at least a college education by γ, the within-sector analog of this share by γ_s, and sectors' employment shares by $P(s)$. Time differencing these variables (Δ), and measuring their levels by the average of their start and end values, the change over time in the employment of college graduates can be decomposed as follows:

$$(1) \qquad \Delta\gamma \equiv \underbrace{\sum_s \gamma_s \Delta P(s)}_{\text{Between Sector Shift}} + \underbrace{\sum_s P(s)\Delta\gamma_s}_{\text{Within Sector Shift}} \equiv \sum_s \theta_s$$

This identity provides an account of how the net influx of college-educated labor was absorbed into employment. Sector contributions to absorbing the net influx (θ_s) are large when a sector is college intensive and grows, (i.e. $\gamma_s \Delta P(s)$ is big), or when it is large and its college intensity rises, (i.e. $P(s)\Delta\gamma_s$ is large). Large between-sector shifts arise when employment in more college intensive sectors grows faster than employment in less college intensive sectors, so that the net influx of college graduates could be absorbed without raising college-intensity within sectors. If between-sector shifts can account for the bulk of the net influx of college graduates in each demographic group this suggests that employment shifts into college-intensive sectors created additional demand for college graduates that can explain rising college attainment in that group. Table 2 shows the between-sector component of decomposition (1) for four demographic groups within the count sample. It provides the between-sector shifts in college attainment under several industrial and occupational classifications, and the total shift to be explained $(\Delta\gamma)$.

[Table 2 about here]

The first four columns calculate between-sector shifts using the employment shifts, $\Delta P(s)$ actually experienced by the demographic group in question (i.e using gender-specific shifts). Three important trends stand out. First, occupational change absorbed many more college-educated women than men at any level of occupational disaggregation. For example, 4.2 out of a 9.4 percentage point gender difference in the increase in college attainment amongst low-experience workers can be attributed arithmetically to gender-specific shifts across ten industries

and 17 occupations. Thus, 45% of the gender difference in college attainment among low experience workers can be accounted for by the fact that women moved into college-intensive sectors faster than men. This figure rises to 58% among high experience workers. In fact, among high-experience males, gender-specific shifts between disaggregated occupation groups would have reduced the employment of college graduates.

Second, amongst young males, between-occupation shifts are approximately as large as the observed increase in college attainment. This implies that male employment shifts between-occupations provide an almost complete account of the male college expansion, leaving little need to invoke within-sector shifts (such as those arising out of skill-biased technological change) to explain why male college attainment rose.[7] Third, between-sector employment shifts account for more than half of the college expansion amongst young women.

The gender-specific employment trends whose effects we have just examined reflect a combination of two sets of changes: structural changes, such as those resulting from deindustrialization and the growth of the services economy, which would result in a general reallocation of workers in some experience group across sectors; and changes in the gender-mix within sectors. The last four columns of Table 2 focus on the former, structural shifts by measuring $\Delta P(s)$ after pooling genders in each experience cohort (i.e. using shifts in the employment distribution of all workers in an experience group, not shifts specific to men and women in that experience group)**.** If the female college boom was driven by a general growth of college- and female-intensive jobs (due to the expansion of services employment, for example), we would expect similar gender differences in the results in the last four columns as in the first four. Instead, the gender differences in the between shifts are conspicuously missing from the last four columns. If anything, they appear to run in the wrong direction: the pooled employment shifts would have absorbed a slightly larger influx of male than of female college graduates.

Together, the results in Table 2 are consistent with the notion that a feminization of education-intensive jobs, not structural change, has supported the female college boom.

[7] One of the few papers providing evidence connecting changes in production technology to the female college boom (Black and Spitz-Oener, 2010) shows that in West Germany computerization changed the task composition of work similarly for men with low, medium and high education levels. This suggests that technology would not have lifted relative demand for highly-educated men. They provide stronger evidence that technology boosted skill demand amongst women.

Effects of employment shifts between low-wage and high-wage sectors.

The preceding approach only considers the effects of rising employment shares of education-intensive sectors on the college boom. However, movements between low- and high-wage sectors of equal education intensity may have played a role as well. Consider, for example, the shift that would have occurred as new cohorts of female college graduates were able to enter supervisory positions, instead of the lower-paying secretarial pool. Other things equal, this would boost the female college premium and the incentive for women to attend college. Yet, if female secretaries and supervisors were equally likely to hold college degrees, a one for one substitution of secretaries with supervisors would not cause a net between-sector shift in identity (1).

We therefore employ a simple thought experiment to examine the effects of such shifts on incentives to attend college. Ignoring the non-pecuniary costs and non-wage benefits of post-secondary education, we consider a potential college attendee who must survey the likely employment landscape and decide whether to go to college or not. Other things equal, they are more likely to do so if it improves their odds of obtaining employment in a high-wage sector, or if, conditional on finding employment in some sector, it raises the wage they are likely to earn. Thus, as employment shifts towards sectors that pay well and favor college-educated workers in hiring, or towards those that pay the college-educated substantially more than high-school graduates, the incentive to obtain higher-education becomes stronger. Given that the direct financial costs of higher education are similar for men and women, we will ask whether the inter-sector employment shifts experienced by men and women of different cohorts were of the right sign and magnitude to have done more to incentivize women than men to attend college.

Denote average log-wages among some group of workers at a point in time by w, employment shares $P(\ )$, and college and high-school by *c* and *h* respectively. Restrict the sample to high-school graduates (*h*, workers with exactly twelve years of school) or with a bachelor's degree or higher (*c*). The college premium in some demographic group $(\beta \equiv w_c - w_h)$ can then be expressed as the difference of the employment-weighted average of the log wages earned in each sector by college graduates $(w_{s,c})$ and high-school graduates $(w_{s,h})$:

$\beta \equiv \sum_s P(s \mid c) w_{s,c} - \sum_s P(s \mid h) w_{s,h}$. Defining the sector-specific college premium, $\beta_s \equiv \left(w_{s,c} - w_{s,h}\right)$, algebraic manipulation yields:

$$(2) \qquad \beta \equiv \sum_s \left[P(s \mid c) - P(s \mid h)\right]\left[w_{s,h} - w_h\right] + \sum_s P(s \mid c)\beta_s \equiv \sum_s C_s$$

This says that a sector's contribution to the college premium $\left(C_s\right)$ will be large if the sector pays high base wages and is more likely to hire a college than a high-school graduate (the first summation), or if it hires many college graduates and offers them much higher wages than it offers to high-school graduates (the second). Growth in the unconditional employment share of such a sector should increase the college premium, other things equal.

To capture this, define a sector's *per-job* contribution to the college premium: $\widetilde{C}_s \equiv C_s / P(s)$. This allows us to express (2) as $\beta \equiv \sum_s P(s)\widetilde{C}_s$. Time-differencing this identity yields:

$$(3) \qquad \Delta\beta \equiv \underbrace{\sum_s \widetilde{C}_s \Delta P(s)}_{\text{Between Sector Shift}} + \underbrace{\sum_s P(s)\Delta\widetilde{C}_s}_{\text{Within Sector Shift}}$$

This says that the college premium increases either due to labor reallocations between sectors towards those offering high per-job contributions, or because of changes in the relative pay and utilization of college graduates within sectors.

[Table 3 about here]

Table 3 presents the between-sector components of identity (3) using several sector classifications. The bottom row presents the observed total shift in the college premium, as reported in Table 1. To allow for gender differences in education levels and pay within sectors, the per-job contributions, $\widetilde{C}_s$, are in all cases estimated for the demographic group in question. As in Table 2, the first four columns of Table 3 provide results when we measure $\Delta P(s)$ using demographic-specific shifts in employment shares across sectors, and the latter four columns provide results when $\Delta P(s)$ is measured for all wage workers in that cohort (i.e. pooling men and women).

The results are similar to those in Table 2. The first four columns show that gender-specific occupational changes would have generated larger increases in the college premium for women than for men, suggesting that gendered employment trends would have increased the incentive to attend college much faster amongst women. Indeed, between-occupation shifts account for between 70% and 84% of the observed shift in the college premium for women, and even shifts between three broad occupation groups can account for around 60% of the rise in the college premium for women of both cohorts. The much smaller between-occupation shifts for men are consistent with the possibility that an inability to shift into high-paying occupations depressed male college attendance rates. Gender-specific occupational changes therefore plausibly increased the incentive to attend college more for women than for men.

Pooled employment shifts predict very similar shifts in the college premium for women and men (the last four columns of Table 3). This again suggests that structural employment trends cannot explain why the college boom was mostly female.

Between-sector shifts in relative skill demand

Katz and Murphy (1992) study the relative supply and demand for skilled workers. To do so, they assume that equally educated and experienced workers earn the same wage in all sectors. This permits them to impute the percentage shift in demand for college equivalent relative to high-school equivalent labor (ΔD) from the percentage shift in the relative supply of college graduates, the percentage shift in the college premium, and the elasticity of substitution between skilled and unskilled labor (σ). Let *E* denote total employment in efficiency units, with labor of two types: college-equivalent (*c*) and high-school equivalent (*h*). Formally, ΔD is imputed as follows:

$$\text{(4a)} \qquad \Delta \ln\left(\frac{W_c}{W_h}\right) \equiv \frac{1}{\sigma}\left[\Delta D - \Delta \ln\left(E_c / E_h\right)\right]$$

The between sector percentage shift in the demand for some subgroup of workers, *k*, identified by experience, sex and education, is defined as:

$$\text{(4b)} \qquad \Delta X_k^d \equiv \sum_s \frac{E_{sk}}{E_k}\frac{\Delta E_s}{E_s},$$

This is the subgroup's employment-share-weighted average of the growth rates of employment in each sector. Demand for subgroup *k* workers grows if sectors that they tend to be employed in grow faster than sectors that they are less frequently employed in. Thus, for example, growth in elementary education boosts demand for female college graduates, and the demise of manufacturing jobs reduces demand for male high-school graduates. We note that wage differences between sectors do not factor into between-sector shifts in this scheme (i.e. replacing secretarial with supervisory work has no effect on demands for college-educated women); and that sectors' employment growth rates $\left(\Delta E_s / E_x\right)$ are only calculated for the overall labor force (i.e. these are not gender-specific shifts).

Proceeding further, between-sector shifts in the demand for subgroups can be aggregated, and these aggregates can then be differenced to yield estimates of the shifts in demand for one group of workers relative to another. Thus, for example, ΔD can be decomposed as:

$$\text{(4c)} \quad \Delta D_t \equiv \underbrace{\sum_s \left[\frac{E_{c,s}}{E_c} - \frac{E_{h,s}}{E_h}\right]\frac{\Delta E_s}{E_s}}_{\text{Between Sector Demand Shift}} + \text{Within Sector Demand Shift;}$$

Under these definitions, shifts between industries and occupations account for roughly 1/3 of the estimated shift in the relative demand for skilled labor in the US between 1967 and 1987 (Katz and Murphy, 1992). Similar figures have been reported from several other countries and time periods (Kijima, 2006; Mehta and Mohr, 2012; Sanchez-Paramo and Schady, 2003). These between-sector shifts are smaller than the increase in the supply of college graduates, so that the college premium would have fallen unless there was some other source of higher skills demand. This type of analysis must therefore invoke large residual within-sector increases in skilled labor demand to explain why college premiums rose rather than fell. [8]

Table 4 updates this exercise for the years 1981-2005.[9] We begin with the relative demand for college graduates of either gender (row 9). Given an approximately 25% increase in the overall

[8] This between-sector index underestimates the true rightwards shift in relative skill demand when applied to a period of rising skill premiums. However, correcting for this movement along the demand curve using typical values of σ does not alter the qualitative results just stated.

[9] We split the workforce in 320 cells defined by sex, four education classes (<12 years of schooling, 12 years, 13-15 years, >=16 years), and 40 experience categories. We then scaled the total hours supplied by

college premium over this period (not shown), 20.3% increase in the relative supply, and the standard assumption that $\sigma = 1.4$, equation (4a) implies a 55.3% shift in the relative demand for college graduates (of either gender). Between-industry shifts in relative demand (21.8%) account for roughly 40% of this increase in relative demand, and shifts between industries and occupations (9.5%) account for less than half that. Once again, this suggests that between sector employment shifts should have raised demand for college education more among men than women.

[Table 4 about here]

Comparing between-shifts in rows 4 and 5 to those in rows 2 and 1 respectively, we find that pooled employment trends should have increased demand for female relative to male workers of both education levels. Employment trends should also have generated sharp reductions in demand for high-school educated men (row 1), but not for high-school educated women (row 4); along with smaller gender differences in the shifts in demand for the college-educated (rows 2 and 5). This decline in demand for high-school educated men should have generated larger increases in the relative demand for college amongst men (row 3), than amongst women (row 6). This finding is consistent with the argument that the demise of high-wage but low-skill, male-dominated manufacturing jobs should have increased the demand for college education more amongst men than amongst women (DiPrete and Buchman, 2013). Gender differences in the between-sector shifts in relative skills demand predicted by structural employment trends go in the wrong direction to account for the female college boom.

To sum up, our results so far are consistent with the possibility that gender-specific employment trends help to explain why the college boom was disproportionately female. Conversely, they show that pooled employment trends cannot account for the increase in relative demand for

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all workers within a cell by the time-averaged relative wages of workers in these cells. We then aggregated these supplies of efficiency labor units up to 8 sex-education supply cells. Next, we measured the time-averaged utilization of labor in efficiency units from each of these 8 aggregated supply cells in 170 industry-occupation cells and the total efficiency labor units utilized in each year in each sector. We used these measures to calculate between sector demand shifts for the 8 supply cells (Equation 4b). We defined high-school as those workers with 12 or fewer years of schooling, and college as workers with 13 or more years of schooling. Table 5 provides the supply and demand shifts by high-school and college, separately by gender and for the entire population.

college-educated labor, and shed no light on why it was overwhelmingly met by women. Thus the female college boom was plausibly driven in part by a more rapid occupational upgrading amongst women than amongst men.

WOMEN'S OCCUPATIONAL UPGRADING CANNOT BE ENTIRELY EXPLAINED BY THEIR GROWING EDUCATIONAL ADVANTAGE.

The results thus far show that gender-specific employment shifts were large, and in the right direction to help explain the female college boom. However, as we have already noted, the direction of causality is unclear. Women may have gone to college because high-wage, high-skill jobs became more open to hiring women. Yet, it is also possible that these jobs opened up to women simply because they pulled ahead of men in educational attainment. While some causality likely runs in the latter direction, this section provides evidence that women's occupational upgrading was far too rapid and too pervasive to be entirely attributed to their growing educational advantage over men. This is consistent with a causal connection running from gendered employment trends to gendered educational trends.

[Figure 3 about here]

We begin by showing that women have moved more rapidly than men into jobs that offer higher wages to *equally educated* workers. Figures 3a-b show that amongst post-college educated workers (those with a Master's, professional or doctoral degree, or with 18+ years of schooling), women moved into higher wage occupations, while men did not. Figures 3c-d show that among college educated workers (amongst those with a Bachelor's degree or 16 -17 years of schooling) women moved into higher-wage occupations, while men moved into lower-wage occupations. Figures 3e-f also show that male high-school graduates moved into occupations that pay high-school graduates less, while the outcomes for female college graduates polarized, with the distribution shifting to the right above the 40^{th} percentile. Thus, female occupational upgrading is observed within every educational class. Changes observed within educational classes are difficult to attribute to educational upgrading.

We now consider the possibility that these shifts in the cumulative distributions were driven by a handful of occupations. We rule out this possibility using several variants of a two-stage regression framework, which shows that the feminization of high-paying jobs is a pervasive and robust phenomenon. In the first stage we use data from 1981, regressing workers' log-wages on a set of up to 254 occupation dummies (excluding the constant term). The dependent variable in the second stage is the change, between 1981 and 2005, in the share of workers in that occupation who are female. We regress this on the occupation wage coefficients from the first stage, and report the results on this coefficient in Table 5. A positive, significant coefficient indicates a greater feminization of higher wage occupations. If the increased representation of women in high-wage occupations was not pervasive, it would be difficult to detect in an analysis in which the unit of the observation is the occupation.

[Table 5 about here]

We experiment with the following variants of this framework to ensure that the finding is robust. Introducing a quartic in years of schooling to the first stage regression changes the definition of a "high-wage" occupation from one that pays well, to one that pays equally-educated workers well. Restricting the first stage sample to male or to female workers allows for the possibility that the occupations that pay women well are not those that pay men well. Weighting by occupations' employment shares in 1981 and 2005 ensures that the result is observed in occupations that were larger in the initial year and larger in the final year. Rows 1-5 of Table 5 indicate that the feminization of higher wage occupations was a pervasive phenomenon, broadly robust to these combinations.

To ensure that women's movement into high-wage occupations was both pervasive and observed within education classes, rows 6-8 of Table 5 present the regression results when the first and second stage samples are limited to workers with exactly high-school, college and post-graduate degrees. We find that the best jobs feminized even amongst groups of workers with the same education level.

[Figure 4 about here]

Finally, we ask counterfactually, *how much* occupational upgrading men and women (separately) should have experienced based only upon changes in their education levels. To simulate these

counterfactuals we assume that the distribution of occupations within education groups for men and women remained as they were in 1981, and project the occupational employment shares predicted by for the observed increases in male and female educational attainment between 1981 and 2005.[10] Figure 4 depicts these counterfactual distributions alongside the actual cumulative occupation distributions observed in 1981 and 2005 (the same ones as appeared in Figure 1).

The counterfactual results show that a large portion of female occupational upgrading is not attributable to educational upgrading. The actual cumulative distributions shifted downwards for women at all levels of the occupational ranking. The proportion of this vertical shift that is not attributable to educational upgrading is 25% for the occupation ranked 100th from the bottom, 45% for the occupation ranked 150th from the bottom, and 65% for the 200th ranked occupation. Thus, the share of female occupational upgrading that cannot be attributed to educational upgrading is substantial, and is larger for higher paying occupations. For men, on the other hand, educational upgrading should have resulted in modest occupational upgrading, but none is observed.

These results indicate that women's more rapid occupational upgrading is partly driven by forces other than their growing educational advantage. We previously demonstrated that gender differences in occupational upgrading can account for much of the female college boom. Together, these results are consistent with a causal connection from rising fale representation in higher paying occupations to the female college boom.

[10] Figure 4 is calculated from the wage sample. We define five education classes by years of schooling: <12, 12, 13-15, 16-17, >17 years. To calculate the 2005 counterfactual share of employment in each occupation, we multiply the employment share of that occupation within each education class in 1981 by the change in the share of all employees belonging to that education class. We do this separately for men and women. Occupational rank is determined by the wage rank of an occupation calculated from the pooled (male and female) sample.

WHICH SECTORS DROVE THE FEMALE COLLEGE BOOM?

Trends

Sector contributions to absorbing the net influx of workers in some group (θ_s) are defined in identity (1). A sector's total contribution to the college premium, C_s, is defined in identity (2). Time differencing (2), the sector's contribution to the shift in the premium is simply the increase in this static contribution.

(5a) $$\Delta\beta \equiv \sum_s \Delta C_s$$

This tells us how much each sector has contributed to the rise in the college premium by creating more and better opportunities for college graduates. Intuitively, the sectors that have played this role are the proximate sources of rising skill demand – they offer the jobs that make it possible for the typical worker to realize a return on their investment in college.

[Table 6 about here]

Table 6 presents the contributions of 7 industries to absorbing the net influx of male and female college graduates and to the increase in their college premiums. The combined services sector absorbed between 86% and 150% of the net influx of college graduates in each demographic group, and this figure is always higher amongst men than women and among younger than older workers.[11] Services also contributed more to the rising premium for men and younger workers. These trends reflect the progressive reduction of employment in the male-dominated agricultural and manufacturing sectors. This hit young men especially hard, releasing young male college graduates to seek employment in the services sector (note the large negative contribution of the manufacturing industry to absorbing young male college graduates).

[Table 7 about here]

Table 7 provides the analogous contributions of 17 occupations. Managerial and professional occupations stand out for being particularly supportive of the college boom. Professional occupations absorbed most of the net influx of young college graduates, and also account for

[11] A sector's contribution can exceed 100% if another sector's contribution is negative.

most of the shift in the premium amongst the young. Managers, officials and proprietors also made large contributions to absorbing and rewarding college graduates. As might be expected, however, this occupation group generally absorbed more of the college influx in the more experienced and male groups. Also, consistent with the weakening of glass ceilings, the gender difference in the absorption of college graduates into management is smallest in the youngest experience group.

The importance of service industries and of managerial and professional occupations is easy to reconcile. Services industries employed 78-93% of managers and professionals in each of our four demographic groups in 2005 (table not shown).

[Table 8 about here]

Table 8 examines gendered occupational changes in further detail. It reveals clearly why these changes should have encouraged women rather than men to attend college. The first four columns depict each occupation's contribution per job to the college premium in 1981. The professional and managerial occupations (with the exception of food & fun professionals), typically offered contributions per job that were much larger than the actual college premium. The next six columns of this table show the occupational distribution of male and female workers in 1981 and 2005. The employment shares of professional and managerial occupations, increased respectively by 10 and 4 percentage points amongst women. This is in contrast to only 3 and 2 percentage point increases amongst men. Because women have shifted into these high-contribution occupations rapidly, and men have not, women have reaped the reward that college education offers through these occupations, and between-occupation shifts account for most of the rise in female premium, and less of the rise in the male premium.

The remaining columns of Table 8 show, for each occupation, the ratio of its employment share amongst women to its employment share amongst men. This ratio is analogous to the revealed comparative advantage index (RCA) in the literature on international trade (Balassa, 1965). It is greater than one when women are specialized in the occupation relative to men, and vice versa.

We will not speculate on the relative importance of the many possible sources of revealed comparative advantages.[12]

The RCAs indicate that the occupations that contributed most to absorbing and rewarding college graduates (professionals, excluding food and fun, and managers) feminized rapidly. This highlights the importance of gendered employment shifts for the female college boom. Moreover, these are not simply shifts towards equal gender representation within occupations. If they were, the RCAs would converge towards 1. Some large traditionally masculine occupations became more masculine (craftsmen, operatives, farm laborers, and laborers) and two traditionally feminine occupations feminized further (teachers and other medical occupations).

Finally, tables 6-8 also reveal large gender differences in the contributions of particular service subsectors to absorbing and rewarding college graduates. To avoid overwhelming the reader, we relegate the discussion of this evidence to the appendix. There are two key findings. First, finance and business services have been more important for men, while medicine and professional services have been much more important for women. Second, one single profession – teaching, can account completely for the fact that older women's college premiums rose almost 9 percentage points more slowly than older men's premiums; and for the fact that this gender difference is not observed amongst younger workers. This is because amongst women the college premium within the teaching professions is large, and the profession's employment share amongst older college-educated women halved.

The role of institutionally protected jobs.

There are many possible reasons for gender specialization in occupations and industries. Two such reasons have been linked to the female college boom: gender preferences of workers or employers (including discrimination); and the varying levels of flexibility offered by occupations and industries in terms of part-time work and time out of the labor force, which accommodate

[12] For example, they could reflect differences in relative labor productivity across occupations (Pitt et al., 2012); preferences for some types of work or work environments over others, gender differences in the importance of scheduling flexibility; risk preferences (DeLeire and Levy, 2004) or gender essentialist beliefs (Charles and Grusky, 2005).

home production and mitigate risks associated with divorce (Bronson, 2013; Charles and Grusky, 2005).

Together, the growing importance of professional upgrading and post-graduate education for women hint at a further possible explanation for the female college boom. Some jobs offer wages that are protected against fluctuations and downwards trends, either because the wages are institutionally determined (e.g. public employees), or because the limited supply of credentials constrains the number of new entrants that are likely (e.g. lawyers). These protections may be more important for women, given that women are more likely to be single parents, and appear to be more risk averse (Bertrand, 2011). There is already evidence that risk preferences influence occupation choice (Bonin et al., 2007), and that women tend to sort into occupations that involve less risk of death (DeLeire and Levy, 2004). Charles and Luoh (2003) suggest that the female college boom occurs partly because college reduces the variance of future incomes more for women than for men – a claim that is consistent with our institutionally protected jobs hypothesis. Several commentators have pointed to problems of weakening overall labor demand due to mechanization, computerization and trade (Brynjolfsson and McAfee, 2011; Spence and Hlatshwayo, 2011), which would deepen the incentives for women to use college to reduce risks in this way.

[Table 9 about here]

To examine this hypothesis, we settle on a set of jobs (defined empirically by a worker's industry, occupation, unionization and public employment status) that are likely to pay institutionally determined wages, or require credentials whose supply is institutionally restricted. Our hypothesis suggests that more of the influx of female than male college graduates should have found work in these sectors, and also that the institutionally protected jobs would have contributed more to lifting the female college premium than to lifting the male college premium. Table 9 confirms both suggestions. Institutionally protected jobs released male college graduates (the combined contribution of these jobs to absorbing male college graduates is negative), who found employment in institutionally unprotected sectors. Meanwhile, institutionally protected jobs absorbed roughly a quarter of the much larger net influx of female college graduates. The institutionally protected jobs also contributed twice as much to lifting the college premiums for low- and medium experience women as for their male counterparts. Finally, their contribution to

lifting the premium increases as we shift attention to lower experience groups, suggesting the growing importance of institutionally protected jobs to the college boom.

DISCUSSION

We have asked whether and which types of employment shifts across industries and occupations could help to explain why the US college boom has been dominated by women. We found that the feminization of good jobs could plausibly have played this role, but that structural employment trends did not favor a female college boom. We have also provided evidence ruling out the possibility that women's higher rate of occupational upgrading was driven solely by their growing educational advantage over men. Finally, we have shown that men and women have capitalized on their college educations in different ways in the labor market, with men relying more on financial activities, and women relying more on jobs in institutionally protected services, particularly in health and education.

These findings could have policy implications. If demand for college comes increasingly from women, and if women are increasingly using college to access institutionally protected jobs, then growth in the demand for college education becomes increasingly intertwined with the growth of such jobs. Rapid growth in institutionally protected jobs seems unlikely, both because of the nature of the protections themselves – credentialing and collective bargaining often restrain job creation in the process of stabilizing wages, and because many of them rely on stretched public budgets. This raises the possibility that demand for college-graduates might grow more slowly in future – a worrying prospect in the presence of rapidly growing student debt.

On the other hand, this cautionary note is countered by trends in the college premium itself, and in student interest in attending college, both of which have continued to grow in recent years. Our results imply that employment shifts can explain some, but certainly not all of this increase in the relative demand for college-educated workers. Technological change within sectors likely explains much of the rest, and technology may continue to boost demand for college graduates. At the same time, more of the increase in the college premium arises due to declining real earnings of high-school graduates than because of rising real earnings of college graduates, and it is possible that as technology advances, it will begin to substitute for both high-school and

college graduates. In the face of this ambiguity on the demand side of the labor market, it will be helpful for economic analyses to keep track of what college graduates of different types do for a living, how much they are paid for doing it, and how those wages are set.

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APPENDIX: A DETAILED LOOK AT SOME KEY SECTORS.

Tables 6-8 capture developments in three sub-sectors. The Finance, Insurance and Business Services sustained male college attendance. Together, expansion and educational upgrading in these industries absorbed 67% of the net influx of male college graduates amongst the young (Table 6), and 105% (not shown) amongst medium experience workers. In contrast, they absorbed no more than 21% of the female influx, regardless of experience group. These industries also contributed 34% of the increase in the young male premium, and only 19% of the young female premium (Table 6). Additionally, professionals in the finance industry also became more masculine (table not shown for brevity).

The medical industry has been far more felicitous of female college graduates. It absorbed 11-19% of the influx of female college graduates (depending on the experience group), but between negative 12% and positive 7% of the net influx of male graduates (Table 6). It accounts for 7% and 18% of the rise in the college premium for younger and older women respectively, but less than 1% of its rise for younger and older men (Table 6). Similarly, our two explicitly medical occupations (Physicians and Other Medical) in combination made robust positive contributions to absorbing the influx and shifting the college premiums of low and high experience women, but made negative contributions on both accounts for men (Table 7). Moreover, both these occupations are feminizing, even though the Other Medical Professions category was already overwhelmingly feminine (Table 8). In contrast with these professional medical occupations, which deliver the medical services, managerial occupations within medicine, which handle the business end of healthcare, contributed positively to the shift in male college premium (table not shown, for brevity).

Jobs in the education sector have been pivotal in accounting for trends in college premiums, especially amongst older women. Amongst high experience workers, the education industry absorbed 8% of the net influx of female college graduates but negative 20% of the male influx (Table 6). It also accounts for around 19% of the rise in the college premium for young men and women (Table 6). As we have noted earlier, the college premium rose 32.7 percentage points for older men and only 24.3 points for older women. Roughly this entire difference can be attributed to the gender differential in the contributions to older workers' college premiums of either the

teaching profession[13] (Table 7) or the education industry (Table 6). This gender differential arises because college premiums within the teaching profession are much higher than those in other occupations for women, but not for men; and because the share of older female college graduates working as teachers roughly halved between 1981 and 2005. This sharply reduced the college premium for older women. The teaching profession accounted for a much smaller share of employment amongst young workers and older men throughout our sample period, and their college premiums have trended similarly. Thus, a declining reliance by women on one profession – teaching – may have eliminated gender differences in trends in the college premium between cohorts.

[13] Arithmetically speaking, the teaching profession lifted the high-experience male contribution by .6 percentage points (=0.017*32.7), and lowered the female premium by 8.3 points, a difference which is 98% of the 8.4 (=32.7-24.3) point differential to be explained.

Table 1: College attainment and college premiums

Experience Group	Sex	College Attainment (%)			Post-College Attainment (%)			College Premium (%)		
		1981	2005	Change	1981	2005	Change	1981	2005	Change
Low	Men	23.21	26.51	3.30	5.92	6.23	0.31	36.41	63.02	26.62
	Women	23.26	35.92	12.66	4.62	9.41	4.79	42.80	68.55	25.74
Medium	Men	28.58	31.70	3.12	10.72	10.42	-0.30	39.01	73.55	34.54
	Women	21.89	39.01	17.12	6.53	13.64	7.11	43.55	69.91	26.37
High	Men	23.88	31.77	7.89	10.71	10.50	-0.21	39.48	72.16	32.68
	Women	16.07	34.59	18.53	4.59	10.78	6.19	44.17	68.44	24.27

Note: College attainment is the percentage of the count sample that holds a college degree or higher. Post-college attainment is the share holding a post-graduate qualification or with 6 or more years of tertiary education. The college premium is calculated from the wage sample, as the difference in log-weekly-wages between workers with at least a college degree on those holding only a high-school diploma or equivalent.

Table 2: Between Sector Absorption of the Net Influx of College Graduates

	Gender-specific Emp. Shifts				Pooled Emp. Shifts			
	Low Experience		High Experience		Low Experience		High Experience	
Classification	Men	Women	Men	Women	Men	Women	Men	Women
3 Industries	2.1	0.8	1.4	0.9	1.6	0.7	1.7	1.0
10 Industries	1.6	1.7	1.4	1.9	2.3	1.8	2.8	1.8
17 Industries	1.5	2.7	0.5	2.5	2.9	2.1	3.6	2.2
66 Industries	2.0	3.3	0.5	2.9	3.2	2.5	3.5	2.2
3 Occupations	3.2	6.3	0.6	5.9	4.8	4.9	4.3	3.9
10 Occupations	3.4	6.5	0.1	6.0	5.0	4.6	4.9	3.6
17 Occupations	2.9	7.0	-0.3	5.6	4.9	4.5	4.8	3.4
10 Occupations, 17 Industries	2.7	6.9	-0.2	5.9	5.2	4.8	5.7	4.1
Shift to be explained:	*3.3*	*12.7*	*7.9*	*18.5*	*3.3*	*12.7*	*7.9*	*18.5*

Note: Calculations use the count sample and the definition of between-sector absorption presented in identity (1) and the text. The shifts in attainment to be explained are defined and presented in Table 1.

Table 3: Between-sector contributions to the shift in the college premium

	Demographic-Specific Employment Shifts				Population Level Employment Shifts			
	Low Experience		High Experience		Low Experience		High Experience	
Classification	Men	Women	Men	Women	Men	Women	Men	Women
3 Industries	4.4	1.8	2.2	2.5	3.4	1.6	3.0	2.8
10 Industries	3.7	4.5	2.1	6.0	2.9	3.3	4.5	6.6
17 Industries	2.6	5.3	3.8	4.4	3.5	3.5	5.8	5.0
66 Industries	5.4	6.3	3.2	5.0	3.6	4.0	3.4	7.2
3 Occupations	7.9	16.6	-0.9	14.4	6.6	6.8	6.7	7.8
10 Occupations	10.5	20.1	0.0	16.6	9.6	8.8	8.8	10.3
17 Occupations	8.3	20.6	0.2	17.1	8.3	8.6	7.0	9.8
10 Occupations, 17 Industries	10.1	21.6	5.0	17.0	9.6	9.9	11.4	13.1
Shift to be explained:	*26.6*	*25.7*	*32.7*	*24.3*	*26.6*	*25.7*	*32.7*	*24.3*

Note: All results from wage sample. Between shifts defined in identity (3) and the text. College premiums defined in Table 1 and the text.

Table 4: Supply and Demand Analysis

				%Δ Demand Between:	
			%Δ Supply	Industries	Ind. & Occ.
(1)	Men	High-school	-8.5	-26.5	-8.2
(2)		College	2.4	6.4	4.2
(3)		*Relative (College: High Schoo*	*10.9*	*32.8*	*12.3*
(4)	Women	High-school	-1.7	13.1	1.2
(5)		College	7.8	16.9	6.0
(6)		*Relative (College: High Schoo*	*9.5*	*3.8*	*4.8*
(7)	Overall	High-school	-10.2	-11.4	-4.6
(8)		College	10.2	10.4	4.9
(9)		*Relative (College: High Schoo*	*20.3*	*21.8*	*9.5*

Note: Supply and demand shifts for each cell are measured relative to the labor force. Quantities are measured in efficiency units. Calculations are explained in detail in section 4c. Between-shifts are calculated using the Katz and Murphy (1992) demand shift index.

Table 5: Feminization of high-wage occupations

			First stage regression Controls		Coefficients, when second stage is weighted by		
	First stage sample	Second stage sample	Years of schooling	Gender dummy	Employment shares in 1981	Employment shares in 2005	No weights
(1)	Both genders	All workers	No	No	0.192	0.187	0.157
					(0.000)	(0.000)	(0.000)
(2)	Both genders	All workers	Yes	No	0.187	0.189	0.158
					(0.000)	(0.000)	(0.002)
(3)	Both genders	All workers	Yes	Yes	0.217	0.204	0.114
					(0.000)	(0.000)	(0.082)
(4)	Men	All workers	Yes	No	0.188	0.174	0.103
					(0.000)	(0.000)	(0.019)
(5)	Women	All workers	Yes	No	0.197	0.196	0.132
					(0.000)	(0.000)	(0.007)
(6)	High school grads, both genders	High-school grads	No	Yes	0.182	0.130	0.148
					(0.000)	(0.020)	(0.021)
(7)	College grads, both genders	College grads	No	Yes	0.221	0.206	0.154
					(0.000)	(0.000)	(0.093)
(8)	Post-graduates, both genders	Post-graduates	No	Yes	0.140	0.099	0.108
					(0.001)	(0.042)	(0.121)

Note: Each coefficient is from a separate regression. P-values in parentheses. See Section 4 for details.

Table 6: Contributions of industries to absorbing college graduates and shifting the college premium

	Contribution to absorbing the net influx of college graduates (percentage points)				Contribution to shifting the college premium (percentage points)			
	Low		High		Low		High	
Industry	Men	Women	Men	Women	Men	Women	Men	Women
Ag & Mining	-28.4	-0.3	-1.9	1.4	-6.3	0.1	-2.1	1.0
Construction	5.8	1.3	11.6	2.1	-2.0	0.5	2.4	0.2
Manufacturing	-27.5	3.5	1.0	10.7	4.8	10.1	17.4	25.1
Services, of which:	150.2	95.5	89.3	85.8	103.5	89.4	82.3	73.8
Finance & Bus. Serv.	67.1	20.1	40.5	19.5	33.7	18.7	35.2	23.9
Education	35.2	21.3	-19.9	7.8	18.7	19.0	1.7	-31.7
Medical	-11.6	10.9	7.7	18.6	1.0	7.0	0.6	18.1
Services (other)	59.5	43.1	61.0	39.8	50.1	44.7	44.8	63.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Net influx or shift in college premium to be explained:	3.3	12.7	7.9	18.5	26.6	25.7	32.7	24.3

Note: Contributions to absorption calculated from the count sample and defined in identity (1). Contributions to shifting the premium calculated from the wage sample and defined in identities (2) and (5a).

Table 7: Contributions of occupations to absorbing college graduates and shifting the college premium

	Contribution to absorbing the net influx of college graduates (%)				Contribution to shifting the college premium (%)			
	Low		High		Low		High	
Occupation	Men	Women	Men	Women	Men	Women	Men	Women
Professionals, of which:	*63.1*	*63.9*	*3.4*	*47.4*	*61.4*	*63.9*	*34.4*	*22.8*
Prof. Tech. (other)	114.2	29.6	30.1	19.1	46.3	23.9	25.8	24.7
Prof. Physicians	-10.2	2.5	-2.8	2.4	-1.1	2.7	-1.4	4.6
Prof. Other Medical	-4.7	5.9	2.3	12.4	1.1	6.3	0.8	13.5
Prof. Teachers (Not Professors)	17.4	12.1	-13.2	2.5	9.2	15.8	1.5	-37.0
Prof. Legal	-20.7	2.7	0.3	2.0	-2.5	3.4	4.7	6.8
Prof. Finance (Accountants)	-7.1	6.4	0.3	5.7	0.9	8.9	3.3	7.6
Prof. STEM	-25.3	4.4	-14.1	4.2	1.1	3.1	-1.3	6.2
Prof. Food & Fun	-0.5	0.3	0.5	-0.9	6.4	-0.4	1.0	-3.7
Farmers	-6.7	-0.3	-0.4	0.2	-0.5	0.0	0.0	0.1
Managers, Officials, and Proprietors	25.1	19.8	45.5	22.4	15.1	20.6	39.9	47.7
Clerical and Kindred	23.9	7.1	13.2	12.5	6.6	11.3	4.1	4.5
Sales Workers	-6.7	8.4	3.6	8.1	11.0	6.6	8.0	13.1
Craftsmen	-9.3	-1.8	12.5	1.3	0.2	-0.5	2.4	2.5
Operatives	-7.2	-0.4	8.7	0.3	0.0	-2.7	0.3	-2.6
Service Workers	19.8	4.2	9.4	7.3	12.1	0.8	5.5	13.6
Farm Laborers	-1.4	-0.1	-0.1	0.0	-2.5	-0.2	0.3	-0.5
Laborers	-0.7	-0.7	4.2	0.5	-3.2	0.4	5.0	-1.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Net influx or shift in college premium to be explained:	3.3	12.7	7.9	18.5	26.6	25.7	32.7	24.3

Note: Contributions to absorption calculated from the count sample and defined in identity (1). Contributions to shifting the premium calculated from the wage sample and defined in identities (2) and (5a).

Table 8: Occupations' contributions per job to the college premium, and their employment shares amongst men and women

	Contribution per job to the college premium in 1981				Men's Occupational Distribution		Women's Occupational Distribution		Revealed Comparative Advantage		
	Low		High								
Occupation	Men	Women	Men	Women	1981	2005	1981	2005	1981	2005	Change
Professionals, of which:					*16.51*	*19.17*	*18.24*	*28.24*	*1.11*	*1.47*	*0.37*
Prof. Tech. (other)	71.3	104.8	51.4	109.1	4.46	8.24	4.05	8.82	0.91	1.07	0.16
Prof. Physicians	133.4	279.8	353.0	432.3	0.93	0.97	0.18	0.48	0.19	0.50	0.30
Prof. Other Medical	88.8	120.9	55.7	110.7	1.09	1.37	4.65	6.55	4.26	4.79	0.53
Prof. Teachers (Not Professors)	30.8	94.5	36.1	176.1	1.86	2.05	4.97	7.26	2.67	3.54	0.88
Prof. Legal	176.5	254.5	194.4	297.6	0.94	0.84	0.19	0.49	0.20	0.58	0.38
Prof. Finance (Accountants)	134.6	88.7	121.6	38.6	1.33	0.92	1.11	1.81	0.84	1.96	1.13
Prof. STEM	114.5	122.4	93.8	94.3	4.79	3.66	1.18	1.38	0.25	0.38	0.13
Prof. Food & Fun	-36.5	62.9	6.9	93.6	1.11	1.12	1.92	1.44	1.73	1.29	-0.44
Farmers	79.5	0.0	7.9	59.9	1.97	0.86	0.31	0.28	0.16	0.32	0.16
Managers, Officials, and Proprietors	83.5	78.5	69.3	22.9	13.27	15.54	6.51	10.82	0.49	0.70	0.21
Clerical and Kindred	21.3	5.8	28.6	1.6	5.96	7.46	33.67	27.93	5.65	3.74	-1.91
Sales Workers	71.4	50.7	44.7	29.1	6.36	6.20	7.25	6.41	1.14	1.03	-0.11
Craftsmen	-5.8	16.2	-9.0	-23.7	20.57	18.23	1.85	1.32	0.09	0.07	-0.02
Operatives	-1.1	4.5	7.1	12.7	17.03	13.87	10.97	5.20	0.64	0.37	-0.27
Service Workers	33.4	47.7	29.3	33.6	9.24	11.12	19.25	18.76	2.08	1.69	-0.40
Farm Laborers	73.1	55.1	52.0	85.0	1.65	0.72	0.69	0.21	0.42	0.29	-0.12
Laborers	23.3	16.3	19.7	34.8	7.43	6.83	1.26	0.85	0.17	0.12	-0.05
Aggregate	36.4	42.8	39.5	44.2	100	100	100	100			

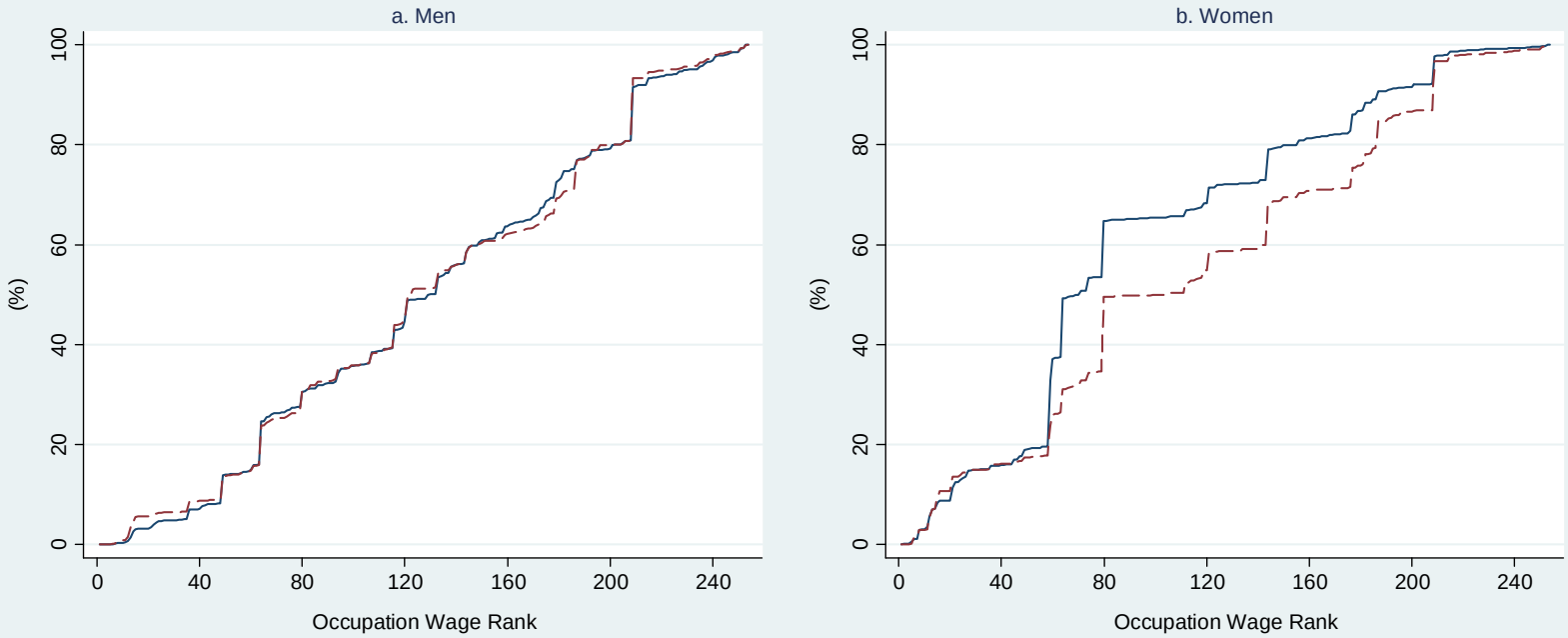
Note: The distributions are calculated for the entire count sample and represent the share of men and women in the workforce in each occupation. The revealed comparative advantage is calculated by taking ratio of women's and men's employment for each occupation.

Table 9: Contributions of institutionally protected sectors to absorbing college graduates and shifting the college premium

	Share of the net influx of college				Share of the shift in the college			
	Low		High		Low		High	
Occupation	Men	Women	Men	Women	Men	Women	Men	Women
Institutionally Protected Sectors, including:	*-25.1*	*25.7*	*-20.6*	*29.2*	*14.8*	*30.7*	*-1.1*	*-0.8*
Dentists	-3.5	1.0	-2.1	0.1	0.8	0.8	-2.0	0.4
Dieticians and nutritionists	0.0	0.1	0.0	0.4	0.0	-0.3	0.0	1.0
Funeral directors and embalmers	-0.4	-0.2	-0.5	0.0	-0.1	-0.3	0.0	-0.1
Lawyers and judges	-21.0	3.0	1.9	1.1	-3.4	3.7	5.8	4.1
Nurses, professional	-0.2	3.2	-0.3	7.7	0.2	4.7	0.9	13.3
Optometrists	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0
Pharmacists	-3.5	0.7	-1.0	0.5	-0.1	0.7	0.8	0.9
Physicians and surgeons	-3.1	1.1	-1.0	2.2	-0.6	0.8	0.1	6.8
Teachers (n.e.c.)	40.1	31.9	11.3	20.3	9.9	30.4	4.4	29.5
Veterinarians	-2.0	0.3	0.3	0.4	0.3	0.6	0.3	0.1
Electricians	-1.9	0.0	0.6	0.0	0.6	-0.4	1.2	0.0
Other Public Employment	-44.0	-23.5	-36.7	-8.5	4.1	-19.5	-13.7	-61.4
Other, non-public, unionized jobs	14.2	8.1	7.0	4.8	3.1	9.5	1.2	4.7
Unprotected sectors	125.1	74.3	120.6	70.8	85.2	69.3	101.1	100.8
Total:	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Net influx or shift in college premium to be explaine	3.3	12.7	7.9	18.5	26.6	25.7	32.7	24.3

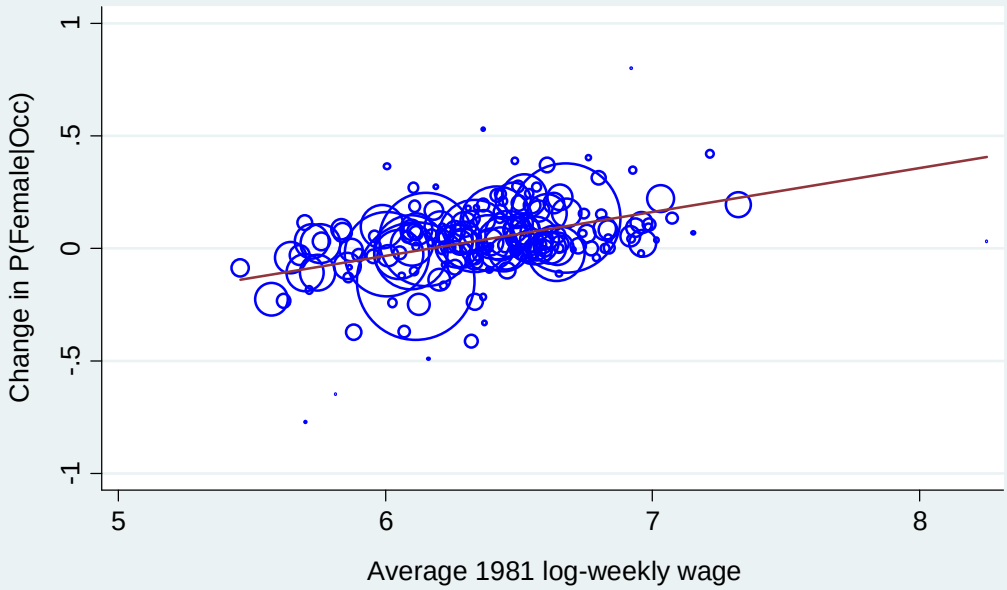
Note: Contributions to absorption calculated from the count sample and defined in identity (1). Contributions to shifting the premium calculated from the wage sample and defined in identities (2) and (5a).

Figure 1: Cumulative Distributions of Occupational Employment by Sex



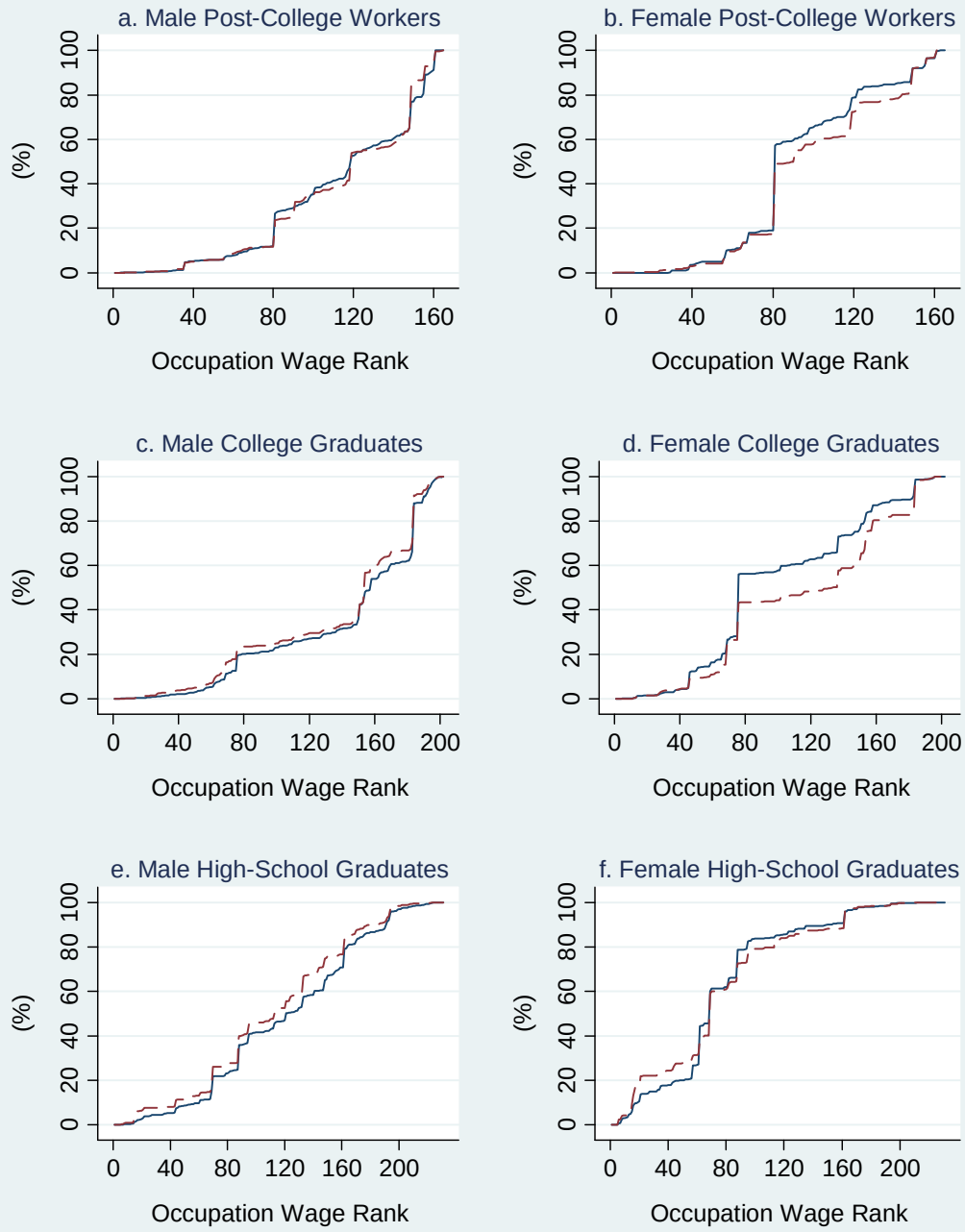
Note: Solid lines depict the distribution in 1981, dashed lines indicate 2005. Occupations are ranked by wage calculated from the pooled (male and female) wage sample. Occupations are ranked from lowest wage (0) to highest wage (254).

Figure 2: The Feminization of High Wage Occupations



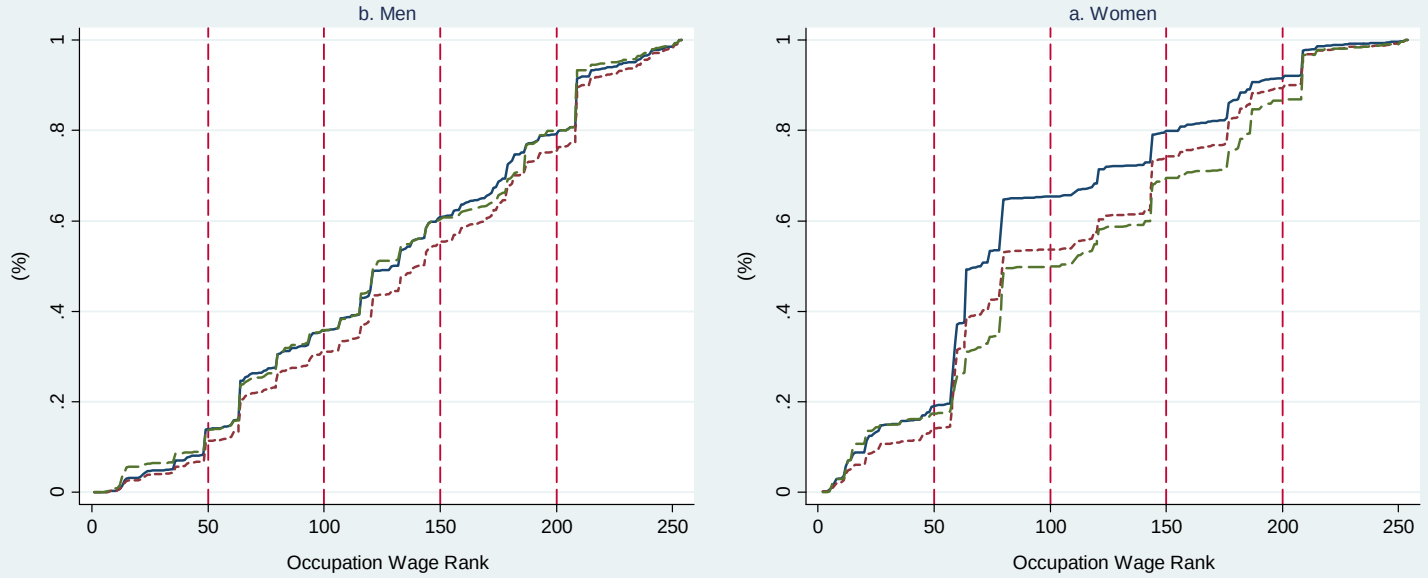
Note: Average wages were estimated using the wage sample across all employees in each occupation in 1981.

Figure 3: Cumulative Distributions of Occupational Employment by Sex and Education Class



Note: Solid lines depict the distribution in 1981, dashed lines indicate 2005. Occupations are ranked by wage within each education class for the pooled sample of men and women in that education class. Occupations are ranked from lowest wage (0) to highest wage(254).

Figure 4: Counterfactual Distributions of Occupational Employment by Sex



Note: Solid lines depict the distribution in 1981, dashed lines indicated 2005. Short dashed lines depict the the 2005 counterfactual distribution. Occupations are ranked by wage calculated from the pooled (male and female) wage sample. Occupations are ranked from lowest wage (0) to highest wage (254).