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Researchers have posited various theories to explain supposed declines in teaching quality: the expansion of labor market opportunities for women, low relative wages, compressed compensation structures, and substituting quantity for quality. We synthesize these previous theories and expand on the current literature by incorporating a useful comparison group: the nursing workforce. We document historical trends in skill level, average and relative wages, wage dispersion, unionization rates, and quantity, and find important divergences in the teaching and nursing professions that cannot be explained by previous theories. We posit two new theories that align with our documented trends: technological innovation and occupational differentiation in nursing. We argue that trends in the nursing profession indicate that declines in teaching quality were (and are) not inevitable.

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The Teacher Labor Market in Context: What We Can Learn from Nurses

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Researchers have posited various theories to explain supposed declines in teaching quality: the expansion of labor market opportunities for women, low relative wages, compressed compensation structures, and substituting quantity for quality. We synthesize these previous theories and expand on the current literature by incorporating a useful comparison group: the nursing workforce. We document historical trends in skill level, average and relative wages, wage dispersion, unionization rates, and quantity, and find important divergences in the teaching and nursing professions that cannot be explained by previous theories. We posit two new theories that align with our documented trends: technological innovation and occupational differentiation in nursing. We argue that trends in the nursing profession indicate that declines in teaching quality were (and are) not inevitable.

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I. Introduction

Concerns about the state of the teaching profession are evergreen; for decades, scholars have documented declines in teaching quality and posited various theories to explain these trends (Bacolod, 2007; Corcoran et al., 2004; Hanushek and Pace, 1995; Hoxby and Leigh, 2004; Lakdawalla, 2006; Murnane et al., 1991). The pandemic has only intensified discussions of teacher shortages and decreases in teacher effectiveness, as the abrupt shifts to virtual schooling underscored the difficulty and importance of teaching as a profession (Diliberti and Schwartz, 2022; Kraft and Lyon, 2022). This heightened focus on teaching presents a prime opportunity to revisit historical trends in the labor market from a new perspective, focusing on understanding trajectories and identifying potential policy levers to support teaching.

In this paper, we synthesize previous explanations for trends in the teaching profession. We also expand on the current literature by incorporating a useful comparison group: the nursing workforce. While previous studies focus solely on documenting trends in the teacher workforce, we are able to place these trends in a broader context by seeing how they compare to trends in nursing, a similarly-positioned "semi-profession" (Lortie, 1975).

We argue that nurses are a meaningful comparison group to teachers for a number of reasons. Perhaps most obviously, both fields are historically female-dominated: nearly 70% of college-educated women in the labor force were either teachers or registered nurses (RNs) in 1960, and women continue to dominate these fields today. Both occupations also require some degree of higher education, are part of the "care economy" that was particularly affected by the COVID-19 pandemic, and both are uniquely placed as borderline "professions." Yet, little has been done to assess whether nursing and teaching have faced similar patterns of employment and earnings over the last sixty years. Labor market trends are inconsistently or incompletely

documented in the teaching and nursing literature, and they are rarely synthesized across the two occupations.

Bringing together data from multiple sources and spanning multiple decades, we document important divergences in the teaching and nursing labor markets that provide a more complex picture of the history and current state of the teaching workforce in America. Where the teaching workforce has stagnated, with wages failing to track comparable occupations, the nursing workforce has evolved in meaningful ways: with increasing differentiation within the field, shifts in technology and job tasks, and notable wage growth. These findings have important implications for the direction of future policy aimed at elevating the teaching profession.

Our paper is structured as follows. We first review the relevant literature and outline our data sources. We then frame our main investigation around existing theories about how or why teacher quality has declined, contextualizing these theories with trends in nursing. First, we address the expansion of labor market opportunities for women in the mid-twentieth century (Goldin, 2004; Bacolod, 2007). Second, we turn to compensation broadly, often cited as a key driver in teacher quality trends (Kraft and Lyon, 2022). Third, we review more specific compensation structures, namely, unionization rates and wage compression in teaching (Hoxby and Leigh, 2004). Fourth, we look at potential trade-offs in quantity and quality (Lakdawalla, 2006). We then discuss the implications of putting these historical trends in context. We conclude by using nursing as a guiding framework to posit two new explanations for divergences in trend: technological innovation and occupational differentiation. We ultimately argue that existing theories on teacher trends cannot fully explain the differences between nursing and teaching, and that the changes in the nursing profession suggest that declines in teaching quality were (and are) not inevitable.

II. Background and Relevant Literature

A recent review of the state of the teaching profession by Kraft and Lyon (2022) outlines several explanations for changes in teacher status over the last fifty years. Citing historical fluctuation, the authors argue that it is possible to reverse the recent decline in the state of the teaching profession, and that it has been done before. They present suggestive evidence that teacher compensation best explains the historical trends of the teacher workforce, such that pay may be an important policy lever to elevate the teaching profession going forward.

The belief that changes to the distribution of teacher ability can be attributed to declining relative wages is not a new one. It has been well-documented that the relationship between women and the labor market dramatically changed after 1960 as occupational opportunities for women expanded and labor force participation and college attainment significantly increased (Goldin, 2004). Prior to this, the vast majority of career opportunities available to educated women were in traditionally female-dominated professions, such as teaching, nursing, or secretarial work. As such, economists have hypothesized that the expansion of labor market opportunities for women led to relative wage growth outside of teaching and a decline in relative teacher wages, ultimately resulting in negative selection into teaching (Bacolod, 2007).

Researchers have also presented compensation as a symptom rather than a cause of the current status of teachers. These theories imply that alternative strategies, such as opportunities for professional development or technological innovation, may also be relevant policy levers. Kraft and Lyon (2022) themselves note that, amongst top candidates, professional autonomy, opportunities for career advancement, and job security contribute to the attractiveness of a profession, and these characteristics may be lacking in teaching. Relatedly, Hoxby and Leigh

(2004) propose that the rise in collective bargaining since the 1960s compressed wages, pushing high-skilled workers out of the sector due to a lack of return to skills.

Other research has pointed to explanatory factors outside the teaching profession. Lakdawalla (2006) suggests that the decline in teachers' relative wages is a result of exogenous changes to the price of skill. He argues that skill-biased technological change raised the price of skilled workers outside of teaching, but did not affect teacher productivity. In the face of rising relative wages for skilled workers, schools substituted away from teacher skill and toward teacher quantity. The decline in relative wages for teachers is then arguably a reflection of the decline in teacher quality stemming from a lack of technological progress in the profession.

A common thread in the past teacher workforce literature is that it looks primarily at trends in teaching. While some scholars have introduced comparisons between teaching and other professional occupations, this approach underestimates the idiosyncrasies of the teaching profession. Teaching has been disproportionately dominated by women for over a century (U.S. Department of Labor, 2021) and has a complex history of feminization. It is also one of the largest occupations overall, with over 7% of the college-educated labor force working in K-12 schools (Kraft and Lyon, 2022). Moreover, high quality teachers are uniquely positioned to have economic and social impacts on society as a whole (Chetty, Friedman, and Rockoff, 2014).

Only one other profession shares many of these distinctive characteristics: nursing. Since the 1960s, nursing has been the next most prominent profession for women after teaching. In 2021, 4.3 million women were employed as teachers and over 3.8 million women were employed as nurses. Another 2.9 million women were in related non-professional occupations, such as nursing or home health aides. Further, much like teachers, nurses work directly with the public in the interest of supporting personal growth and improvement (Cohen, 2011; Lipsky,

1980). Both teachers and nurses were on the "front line" of the pandemic, underscoring the societal importance of both roles.

Thus, we contribute to the extensive literature on teacher labor markets by incorporating this relevant comparison group into our analysis of historical trends. Despite the many similarities between the two professions, the nursing labor market today looks remarkably different from the teaching labor market. Unlike teachers, female registered nurses receive substantially higher pay than other college-educated women (Hirsch and Schumacher, 2012), and nurses made significant real and relative wage gains through the late twentieth century (Schumacher, 1997). Existing theories on teacher trends cannot fully explain these divergences, and incorporating nurses into analyses helps us better understand historical trends -- and, potentially, future trajectories -- of the teaching profession.

III. Data & Methods

We compile multiple different data sources on teacher and nursing quality, quantity, education, and compensation.

Ability

We utilize the National Longitudinal Surveys of Young Women (NLS-YW), Young Men (NLS-YM), Youth-79 (NLS-Y79) and Youth-97 (NLS-Y97) to explore trends in teacher and nurse ability over time.[3] Combining these four different surveys allows us to compare cohorts of laborers born in 1941-53, 1957-64, and 1980-84. Crucially, this sample covers the transformation of the labor market in the 1960's. We are also able to expand on the work of Bacolod (2007) by adding the NLS-Y97 data (and thus the 1980-84 birth cohort) to this analysis.

[3] In the NLS-Y79 data, we limit to the regular cross-section and oversamples of Hispanic and economically disadvantaged respondents. This drops the military oversample, which was discontinued after the 1984 survey.

These data all include some measure of standardized test scores, which we use as a proxy for ability or quality. The NLS-YW and NLS-YW include IQ scores, the NLS-Y79 includes scores on the Armed Forces Qualifying Test (AFQT), and the NLS-Y97 includes scores on the Armed Services Vocational Aptitude Battery (ASVAB). Because these scores represent three different tests and cannot be directly compared, we instead calculate the decile within each relative ability measure and birth cohort compare that across cohorts. We argue that using these normed decile measures within birth cohorts allows us to compare relative ability of workers going into nursing and teaching across tests and cohorts.

We extend our analysis of teacher and nurse ability over time by adding data from the following NCES surveys: the National Education Longitudinal Survey of 1988 (NELS) and the Education Longitudinal Study of 2002 (ELS). NELS and ELS provide us with cognitive ability measures for a nationally representative sample of 8th graders in 1988 (birth cohort 1973-74) and of 10th graders in 2002 (birth cohort 1973-74), respectively, as well as follow-up data from students' postsecondary and occupational years. We follow the same sample selection and ability decile approach with the NCES surveys as the NLS surveys described above.

Population

We obtain the number of teachers and student-teacher ratios from an aggregate dataset published by NCES in its *Digest of Education Statistics* (2022). This dataset compiles information from several different NCES surveys over time. For U.S. population data on the number of school-age children and seniors, we use national population estimates from the U.S. Census Bureau's Population Division. For the number of nurses prior to 1997, we use the U.S. Department of Health and Human Services' publications *Source Book, Nursing Personnel* across

multiple years. For data after 1997, we use occupational employment statistics compiled by the U.S. Bureau of Labor Statistics.

Earnings

To identify trends in wages, we use the Integrated Public Use Microdata Series (IPUMS) data from the CPS from 1968-2022.[4] We primarily employ information from the March Annual Social and Economic Supplement (ASEC) survey. These survey data contain detailed information on education, earnings, occupation, labor force status, unionization rates, and demographic characteristics. The size, detail, and breadth of this individual-level dataset allow us to analyze trends in relative wages for specific occupations and within local labor markets.

We restrict the CPS samples to include individuals aged 21 to 60 with positive reported incomes, who are not currently attending school, and who worked for at least 13 weeks. We use the ASEC person weights when calculating aggregate statistics. For analyses related to wage opportunities, we impute wages as 1.5 that of the top-coded value when the maximum allowable value is reported prior to 1995. Beginning in 1996, the Census Bureau replaced all records at or above the top-code threshold with an income value equal to the mean income of other individuals with the same demographic characteristics. In 2011, the Census Bureau switched to a rank proximity swapping procedure in which high reported incomes were systematically swapped amongst one another within a bounded interval. As such, we do not recode high incomes after 1995.

Education

For data on educational attainment, we use IPUMS USA, which collects U.S. census microdata for decennial censuses through 2010 and American Community Surveys (ACS) from

[4] While the IPUMS-CPS dataset begins in 1962, nurses cannot be identified using the available occupational codes until 1968.

2000 to present. We apply the same set of sample restrictions as we describe above for the IPUMS-CPS dataset.

Occupational Codes

Throughout our analysis, a teacher is defined as any individual who reports their occupation as a non-post secondary teacher, including special education and preschool teachers. A nurse is defined as an individual who reports their occupation as registered nurse (RN), a category distinct from licensed practice nurse (LPN), which is not listed as a managerial and professional occupation. Additionally, higher-credentialed, related occupations, such as nurse practitioner or nurse anesthetist, were not unique response options in the occupational classification scheme until 2010. Thus, we are unable to differentiate these specific designations from the occupational title of RN for our analysis sample. We use the terms RN and nurse interchangeably in the text.

We use a broad definition of "professionals" that includes all "managerial and professional speciality occupations" as defined by the occupational coding scheme in the CPS. These professions, outside of teaching and nursing, include accountants, engineers, college professors, doctors, health technicians, managers, officials, proprietors, lawyers, judges, scientists, and various other occupations.

IV. Expansion of Outside Opportunities

It has been well-documented that the relationship between women and the labor market dramatically changed after 1960 as occupational opportunities for women expanded and labor force participation and college attainment significantly increased (Goldin, 2004). Prior to this, wage opportunities for women were starkly limited to select gendered professions, and the majority of educated women became teachers. Thus, economists have argued that the expansion

of labor market opportunities for women is the driving force behind the decline in teacher quality (Bacolod, 2007). To better understand this argument, we consider nurses. Given the fact that nurses comprise the third largest census occupation among women after teachers and secretaries (Schumacher and Hirsch, 1997), we would expect increased opportunities for women to have similarly impacted the teaching and nursing labor markets.

We begin by replicating and extending Bacolod's estimation of negative selection into teaching following the expansion of outside opportunities for women. Figure 1 presents the proportion of female NLS respondents that scored in the top two deciles on either the IQ, AFQT, or ASVAB pursuing teaching, nursing, and other professions. The 1941-45 to 1963-64 birth cohorts were included in Bacolod's initial analysis; we've added the 1980-82 and 1983-43 cohorts from the NLS-Y97. Mirroring previous findings, we show that the proportion of high-ability women pursuing teaching decreases noticeably in the earliest birth cohorts, from roughly 35% in the 1941-45 birth cohort to roughly 15% in the 1963-64 birth cohort. Over this same time period, the proportion of high-scoring women pursuing other professions rose dramatically, from roughly 30% to nearly 60%. Interestingly, when we extend the panel to include the 1980-84 birth cohorts from the NLS-Y97, the proportion of high-ability college-educated women pursuing teaching has increased somewhat in more recent years, though it still does not approach the high of nearly 40% in the 1946-49 cohort.

Overall, the trends suggest that the opening of outside opportunities to women drew high-ability women away from teaching and into other professions. However, adding nursing as a comparison group adds nuance to this seemingly straightforward analysis. Indeed, we see no similar decline in the proportion of high-ability women pursuing nursing. Rather, the proportion of high-scoring women pursuing nursing has remained remarkably consistent over this entire

panel, hovering just below 10% across all cohorts. Adding this additional context calls into question the assertion that outside opportunities alone could explain declines in the teacher workforce: if that were the case, the same declines should be evident among female nurses.[5,6]

While these previous analyses focus specifically on the highest-ability women, we can also look at the *average* ability decile by profession over time. Figure 2 displays the mean ability decile of women pursuing teaching, nursing, and all other professions by birth cohort. In addition to the NLS birth cohorts discussed above, we also include birth cohorts from NELS (1973-74) and ELS (1985-86). We see a small decline in average teacher quality between the 1940s birth cohorts and the 1950s-1960s birth cohorts, though it is much less stark than the drop in high-skilled women pursuing teaching documented in Figure 1. Nursing, on the other hand, follows a quite different trajectory. The average ability of nursing pretty steadily increased from the 1940s cohorts to the cohorts of the 1950s and 1960s.

When looking at more recent cohorts, we note small increases in the average ability of women entering the teaching profession, though overall average ability deciles have hovered around 6.5 for nearly all studied cohorts. This finding challenges the stylized fact that teacher quality continues to decline, aligning with more recent evidence demonstrating gains in teacher academic performance in the last decade (Goldhaber and Walch, 2014). Indeed, we provide

[5] One potential concern may be that education requirements differed for teachers and nurses, such that high-ability women were restricted in their choice of occupation based on their educational attainment. In Appendix A, we discuss these education requirements. We also replicate our analysis restricting the sample of high-ability women to those with at least two years of college. The findings are substantively similar; in Appendix Figure A2, we see a notable decline in high-scoring college-educated women pursuing teaching and a stable proportion of high-scoring college-educated women pursuing nursing over time. Figure A3, while slightly noisier due to smaller sample sizes, similarly shows that the mean ability of teachers has been relatively stable and there has been an increase in the mean ability of nurses even when we restrict the sample to college-educated women.

[6] The relative decline in high-skilled women pursuing teaching could potentially be a symptom of an overall decline in teaching employment among women. We further unpack changes in the quantity of teachers in Section VI and find a consistent increase in the number of teachers over time, so declines in overall teacher employment cannot explain the decline in high-skilled women pursuing teaching.

suggestive evidence that previously-documented declines in teacher ability have not persisted, and may have even reversed, in the most recent birth cohorts of our panel. We see a clearer general upward trend in average nurse ability since the 1963-64 birth cohort, trending from just below 6.5 to consistently above 7 in the most recent cohorts. Notably, in later cohorts, the average ability decile of nurses consistently exceeds that of the average teacher.[7]

One open question is whether and how these test scores translate to on-the-job effectiveness. While there is extensive evidence that commonly measured teacher characteristics, such as educational attainment and certifications, are not predictive of teacher performance (Staiger and Rockoff, 2010), more recent studies have demonstrated the strong predictive power of test scores and cognitive ability (Jacob et al., 2018). There is also evidence that test scores capture at least a modest proportion of valued skills in the nursing labor market (Schumacher and Hirsch, 1997). Thus, we argue that these scores represent not only a laborer's outside value in the labor market, but also serve as an imperfect but useful proxy of the quality or effectiveness teaching and nursing workforces.[8]

Our analysis adds important nuance to the argument that the expansion of outside opportunities for women led to a decrease in teacher quality. First, we find that roughly the same proportion of high-skilled women pursued nursing even as outside opportunities expanded: thus,

[7] These trends could potentially be biased by age effects, as we are necessarily only considering younger nurses and teachers in the most recent birth cohorts. If high-ability women choose to teach in their late 20s and early 30s and then change to a different occupation, we would expect to see a general upward trend over time as we look at more recent cohorts. To check for this potential bias, we estimated these same averages only among women 35 or younger in each dataset. The results are seemingly unchanged, assuring us that age effects are not biasing these findings.

[8] Notably, we know very little about how these relationships differ across the professions, time, or the tests themselves. Differences here could potentially threaten our interpretation of our findings. For example, if testing is more predictive of teaching effectiveness than nursing effectiveness, changes in the average test scores of nurses would be less meaningful than changes of the same magnitude in the average test scores of teachers. Similar statements can be made about differences across the individual tests used or differences across time, as the professions themselves changed. That said, in any given period, the relative value of a test score in the outside (non-teacher, non-nurse) labor market should be equal for potential teachers and potential nurses.

it was likely not purely outside opportunities pulling high-skilled women away from teaching. We also note that, in more recent cohorts, these trends seem to change direction. We document average ability deciles by profession over time and find that the average ability of women entering both teaching and nursing has increased somewhat in more recent birth cohorts. Importantly, we also note that the average ability of nurses is consistently higher than the average ability of teaching in the last several cohorts in our analysis. We also note that, while this line of analysis focuses on women, the same trends hold when we include men in these analyses (see Appendix B).

V. Compensation

Recent literature has argued that teacher compensation is the prominent factor behind changes to the state of the teaching profession over the last 60 years (Kraft and Lyon, 2022). To contextualize this theory within the nursing labor market, we first simply look at average inflation-adjusted wages for all teachers, nurses, and other professionals over time as presented in Figure 3. We find that the difference between average teacher wages and wages of outside professions has been increasing overtime; whereas the difference between average nursing wages and those of outside professions has remained relatively stable. This would align with negative selection into teaching and positive selection into nursing if we assume there is return to skill (Roy, 1951). Importantly, before 1980, teachers' wages were, on average, higher than nurses' wages. Since 1980, however, average nursing wages have surpassed average teaching wages, and this gap seems to be widening over time.

Because these data are cross-sectional estimates of wages, we are wary of potential age or experience biases influencing our findings. For example, if there are returns to experience in a profession, we would find growth in relative wages as the population of laborers in that

profession ages, even if there are no real changes in the quality of the workforce. To address this concern, we estimate relative earnings between teachers and nurses and all other professionals by generating a "local labor market" comparison group for each teacher or nurse, similar to the analyses presented by Bacolod (2007). This allows us to compare wages between laborers of the same race, gender, age cohort, education level, and geographic area. This local comparison, particularly within the same age group, should alleviate any concerns about age or experience bias.

Figure 4 presents relative wages for teachers (compared to all non-teacher professionals), and for nurses (compared to all non-nurse professionals). We see a decline in relative wages for teachers, while the relative wages for nurses have been relatively stable overall, and even somewhat positive. Because these figures are calculated within age cohorts, these findings alleviate some concern about returns to age or experience biasing our previous estimates. Notably, relative wages for nurses remain relatively close to 1.2 for most of the data points presented, suggesting that nursing wages have consistently outpaced the wages of other professions for the past several decades. Teacher wages, however, are not keeping up with other professional wages and steadily dip further below one.

Unsurprisingly, we find that teachers' mean wages have stagnated over time. Nursing wages, however, have kept pace with other professions, and since 1990, average nursing wages have surpassed average teacher wages. These trends in average wages generally align with the trends in average ability presented above: consistently increasing nurse ability was met with consistently increasing wages, while relatively steady teaching ability was met with stagnating wages. Our consideration of local labor markets makes the divergences in the two professions even more stark. Relative nursing wages track and even consistently outpace the wages of other

professions over time, while teaching wages continue to decline relative to outside options, despite the average ability of teachers remaining steady or even slightly increasing over time. Clearly, differences in average wages are a crucial part of the divergences in these two professions. We dig deeper into wage differences in the next section.

VI. Wage Compression

Compression of teaching wages, driven by unionization or the rigidity of public-sector salary scales, is another common explanation for a general decrease in teacher quality (Hoxby, 1996; Hoxby and Leigh, 2004; Lott and Kenny, 2013). Indeed, our analyses above do support the idea that relative teaching wages are declining compared to other professions. Could wage compression be to blame?

In Figure 5, we present the standard deviation of earnings by profession as a measure of wage dispersion. We see that the standard deviation of the earnings distribution has been larger for nurses than for teachers since 2000, and the gap between the two is growing. In other words, while nursing wages and teacher wages have been similarly more compressed than those across all other professions, the difference between nursing and other professions has been declining in recent years. The same cannot be said for teachers.[9] This growing dispersion in nursing likely reflects increased differentiation within the nursing profession, including the expansion of within-career advancement opportunities such as nurse practitioners and nurse anesthetists. These within-career outside opportunities are exceedingly rare in teaching, which lacks standardized career ladders or growth opportunities.

[9] One important consideration when using the standard deviation is that it is sensitive to extreme values. In this case, there may be concern about increases at the top of the distribution for nurses, given the inclusion of higher-wage roles like NPs. In alternate plots not presented here, we assess the extent of this possibility by looking at the inter-quartile range (IQR) over time. The general trends are the same, though the gaps between teachers and nurses are smaller and the growing gaps begin later (starting in 2015 rather than 2005). This underscores that much of the growing dispersion is being driven by wages at the top of the nursing distribution: an important consideration given the lack of high-paying options in the teaching occupation.

High rates of unionization in teaching could potentially explain the differences in the dispersion of wages between teaching and nursing documented in Figure 5. Indeed, Hoxby and Leigh (2004) attribute the decline in teacher quality to a compression of teacher wages from 1963-2000 resulting from a rise in collective bargaining in the sector.

To investigate this, we plot union coverage by occupation in Figure 6. Teacher union coverage rates are much higher than nurse and professional rates, but are generally declining. If unionization was explaining the growing gap in wage standard deviations that we see in Figure 5, we would expect the gap between nursing and teaching unionization rates to grow from 1990 to 2010. However, we do not see evidence of teachers being more unionized relative to nurses over that time period. As such, we argue that, while there are notable differences in wage compression between teachers, nurses, and other professions over time, these differences cannot simply be explained by unionization rates.[10]

VII. Quantity Over Quality

The decline in relative wages for teachers discussed previously is particularly noteworthy given the substantial increase in real per-student expenditures since the 1960s and the rapid rise in the demand for education and educational attainment (Hanushek, 2003). One proposed explanation for this paradox is rooted in the broader context of rising costs for skilled labor (Katz and Murphy, 1992). In response to these growing costs and within the confines of budget constraints, the argument is that schools have opted to increase the number of employed teachers rather than attract and retain highly skilled workers by offering higher salaries. In short, the

[10] Wages could be more compressed simply because teachers, as public employees, are often tied to strict salary pay scales. This could potentially lead to negative selection into teaching if the return to skill is rising in other labor markets. However, Lakdawalla (2006) shows that public sector wage schedules alone cannot solely explain the documented decline in average teacher quality, as teacher quality declined relative to other public-sector skilled workers over the same time period. While all public-sector skilled workers earned relatively lower wages than private-sector skilled workers, teachers still declined in quality even after accounting for this general trend.

sector has traded teacher quality for teacher quantity as quality has gotten more expensive (Lakdawalla, 2006).

When we examine the change in teacher ability and the number of teachers employed over time, the trends do not align with this quantity-quality tradeoff. As shown in Figure 2, the average ability decile of women pursuing teaching has remained relatively steady over time. This trend holds true when we include men as well (see Appendix B). At the same time, there has been a drastic increase in the number of workers employed as teachers both in the absolute sense and relative to the number of school age children. In Panel A of Figure 7, we can see that the relative proportion of employed teachers has roughly doubled between 1960 and 2000. The number of school age children is up roughly 20% from the 1960 proportion, corresponding to the well-known fact that the student-teacher ratio has declined substantially over this period from 26.4 to 15.2 (NCES, 2022).

Furthermore, while the labor-intensive nature of teaching has been cited as a reason for this theorized trade-off, nursing—a field similarly characterized by labor intensity—has in fact seen an increase in *both* quality and quantity. In Panel B of Figure 7, we see that the relative proportion of workers employed as nurses in 2019 is nearly six times what it was in 1960, increasing from about half a million in 1960 to nearly 3 million nurses in 2019. This is a substantial increase even if we consider that the aging population over 65 years is also about three times what it was in 1960, growing from 17 million in 1960 to 54 million in 2019.[11] Despite these dramatic increases in nurse employment, we still do not observe a trade-off in quality. Pointing again to our previous Figure 2, we see that the average ability decile of women

[11] The subpopulation aged 65 years and up is often used as the relevant subpopulation when considering the demand for nursing. This is because the aging population accounts for more than half of total healthcare spending in the U.S. (Ortaliza et al., 2021).

pursuing nursing consistently grew from the birth cohorts of 1946-49 to 1983-84. Appendix B shows that this trend remains true when we look at both men and women. While nursing does not seem to face a quality-quantity trade-off, there still is an open question of why there has not been a notable flow of qualified women into nursing relative to teaching in recent years, given the documented differences in relative wage.

These patterns challenge the notion that compromising quality for quantity is an inherent consequence of the rising price of skill, even in labor-intensive occupations such as teaching and nursing. We find no evidence that either profession suffered a quality-quantity tradeoff, but we do note that nursing has grown steadily in both quantity and quality, while teaching quality has remained relatively steady. The trends in teaching are somewhat surprising given the documented decreases in relative wages, which would theoretically lead to a flow of workers out of the profession. Overall, this analysis implies that other factors beyond this quality-quantity tradeoff are at play in shaping the diverging trajectories of nursing and teaching.

VIII. Discussion

We use nursing as a helpful comparison group to better understand proposed explanations for trends in the teaching profession. We document historical trends and important divergences in these two labor markets. We find that the proportion of high-skilled women pursuing teaching dramatically declined in the mid-twentieth century, but the average ability of women entering teaching has stayed relatively steady over the last several decades. This aligns with trends in average wages, which have stayed steady for teachers for the past several decades (and thus declined relative to other professions). The average ability of women entering nursing, on the other hand, has increased over time, as have average nursing wages. While teachers' relative wages continue to decline, nursing wages have tracked or even surpassed the relative wage

growth in other professions. This may be related to relative increases in the standard deviation of nursing wages, which has not happened with teaching wages, suggesting increased differentiation within the career. Teacher unionization rates cannot explain this lack of differentiation in teaching wages, as both teachers and nurses have faced declining union coverage rates over time, and the decline in rates for teachers was even larger than the decline in rates for nurses. Finally, there has been an increase in the quantity of both teachers and nurses, even when considered relative to student and aging populations, so there is no evidence of a quality-quantity tradeoff in teaching, despite declining relative wages.

What, then, can explain these different trends in two seemingly similar professions? We conclude with two related hypotheses that could potentially explain the trends documented above: technological advancement and occupational differentiation.

The overall lack of change in the day-to-day tasks of teaching (Lortie, 1975; Cohen, 1988), epitomized by the lack of technological change in the profession, could explain the stagnation in teaching quality and wages. Nursing, on the other hand, has changed notably since the mid-twentieth century: innovations such as electronic health records, smart patient monitoring, and automated infusion pumps, have changed the day-to-day work of nurses, streamlining many routine tasks and enhancing nurses' capacity to provide patient care. This form of routine-biased technological change – technological change that replaces routine tasks and complements non-routine tasks (Autor, Levy, and Murnane, 2003; Acemoglu and Autor, 2011; Acemoglu and Restrepo, 2018) – could explain the divergence in skill and pay between nurses and teachers. Acemoglu and Autor (2011) and Autor (2015) note that the employment polarization from technological change can lead to declines in wages for some medium wage

workers (such as teachers) while allowing other middle-skilled jobs (such as nurses) to flourish as the tasks of the jobs themselves develop and are complemented by technology.

The technological advancements in nursing have not only transformed the core skills and daily duties of nurses, but have also expanded their professional horizons through greater occupational differentiation. This transformation is exemplified by the emergence of specialized nursing roles like nurse anesthetists, nurse practitioners, and nurse midwives. These advanced practice nurses require additional education and training, often earning higher wages due to their increased responsibilities and specialized expertise (McBride, 1996). The greater variety in roles also offers both novice and established nurses a wider range of career options and opportunities for career advancement (Koerner, 1992). This diversification within nursing would explain the increasing wage dispersion and variation in educational attainment that we see within the field.

The trend towards differentiated practice in nursing stands in stark contrast to the limited specialization and narrow pathways into and within the teaching profession. Over 80% of teachers enter the profession through traditional pathways, requiring a bachelor's degree and passing a traditional licensing exam (NCES, 2018). Once within the teaching profession, there is no standardized career ladder to allow for development and growth. Indeed, a majority of teachers that leave the classroom are actually still employed by public school districts but working in administrative or other non-teaching positions, underscoring the lack of opportunities for development within the teaching profession (Chingos and West, 2012). The job itself also rarely allows for specialization, with most teachers teaching multiple subjects (Fryer Jr., 2018). Further, teaching salaries are determined almost exclusively by years of experience rather than skill or expertise. In the great majority of classrooms, the teaching job itself looks remarkably

similar to how it looked a century ago: one teacher siloed in one classroom, with the same level of control and specialization (or lack thereof) (Lortie, 1975).

While these patterns suggest that technological change and the subsequent occupational differentiation may explain the diverging labor trends in teaching and nursing, the full extent of the impact of technology on these fields remains an intriguing avenue for future research. Recent studies in labor economics have employed innovative methods, such as patent data analysis and tracking shifts in occupational codes or specific job tasks, to gauge the impact of the evolving technological landscape and its impact on specific industries (Autor, Levy, and Murnane, 2003; Autor et al., 2022).

Documenting and understanding these trends will be even more important as artificial intelligence (AI) rapidly expands and will likely change many aspects of everyday life and, potentially, both of these careers. Previous technological advances have dramatically changed the day-to-day work of nurses, leading to differentiation and specialization which we argue align with relative wage growth and skill enhancement. These developments in nursing underscore the fact that declines in teaching are not inevitable. We see the expansion of AI as a pivotal opportunity to revolutionize teaching, provided it is thoughtfully integrated in ways that advance the professionalization of the field.

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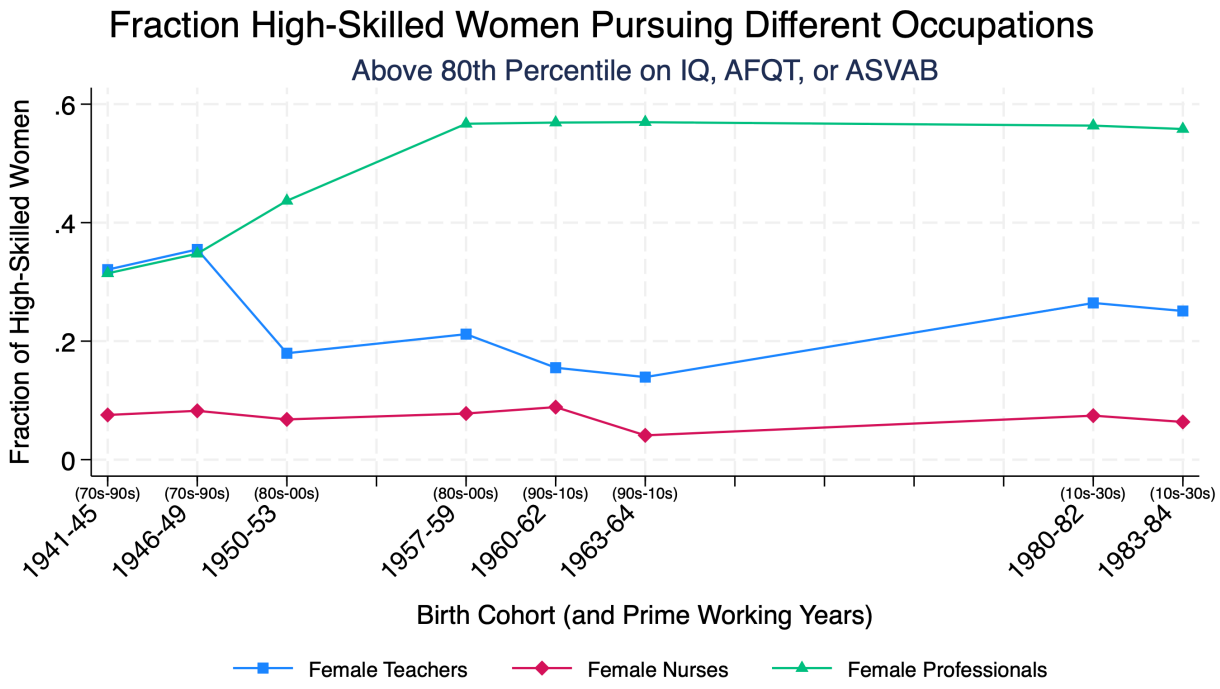
Tables & Figures

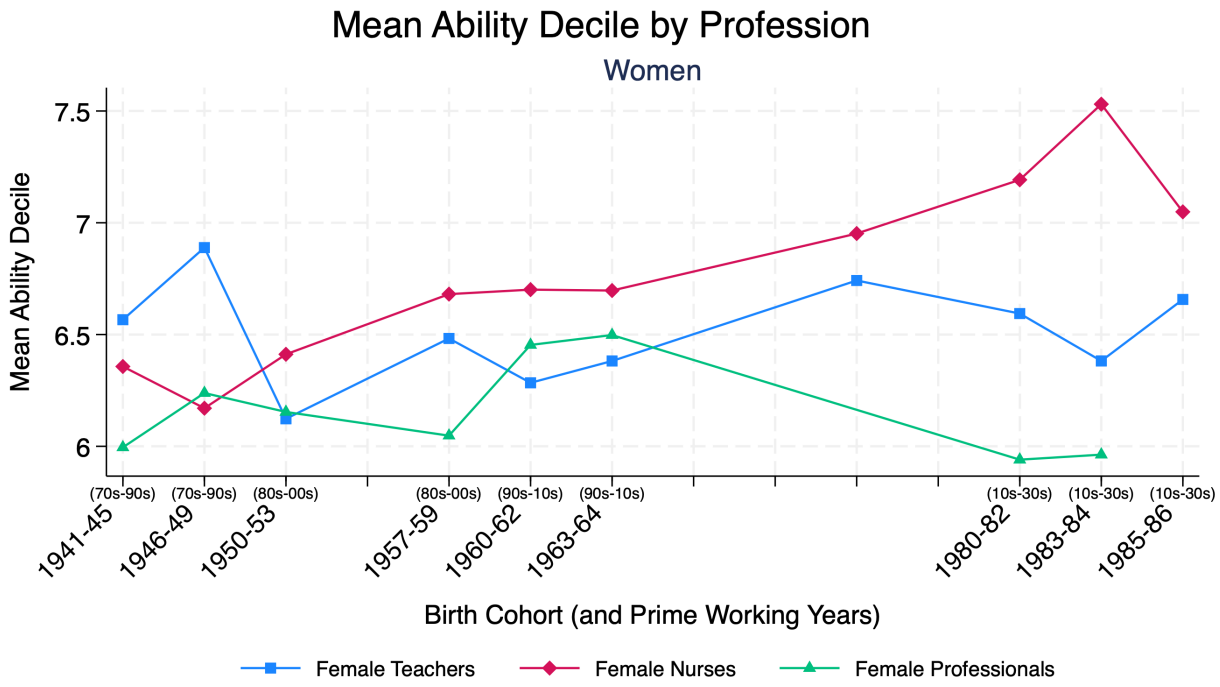
Figure 1: Fraction of High-Scoring Women Pursuing Different Occupations



Notes: Ability deciles are calculated within each birth cohort. Data are limited to female-identifying respondents who scored in the top two deciles of their ability measure. Occupations are assigned based on whether a respondent indicated ever having worked as a nurse, teacher, or other professional. Prime working years are general ranges when individuals would be aged 25-54.

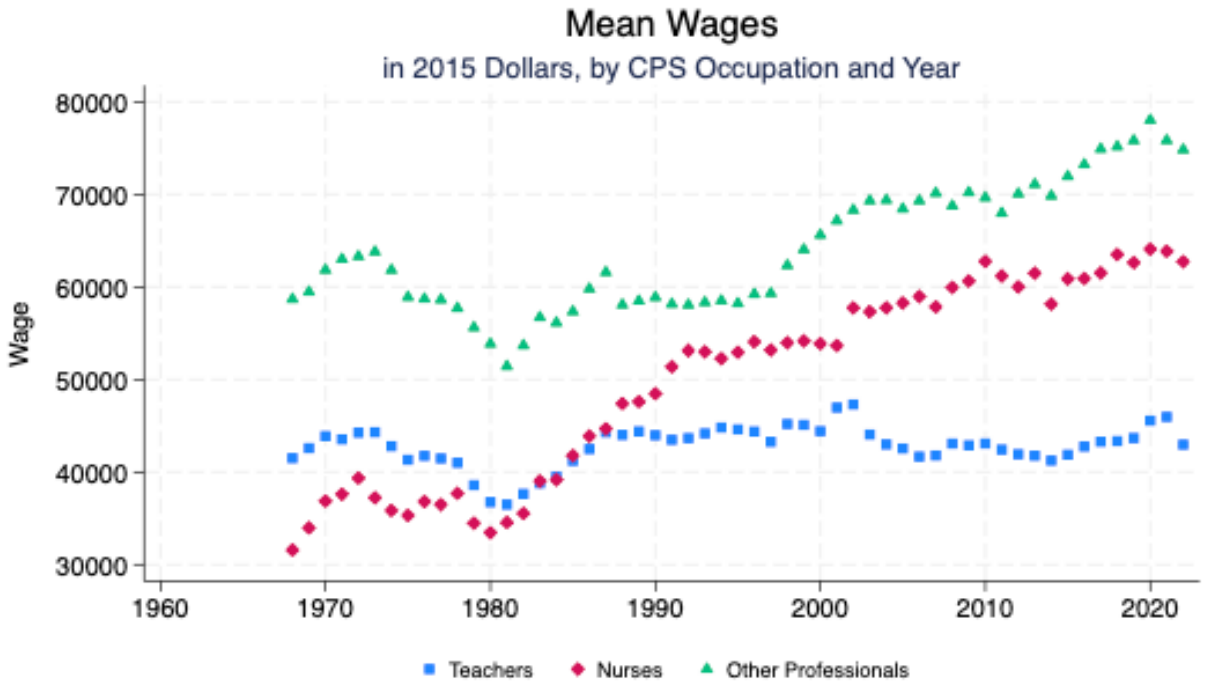
Source: National Longitudinal Surveys of Young Women, Young Men, Youth-79, and Youth-97 (Bureau of Labor Statistics, U.S. Department of Labor).

Figure 2: Average Ability Decile by Occupation for Women



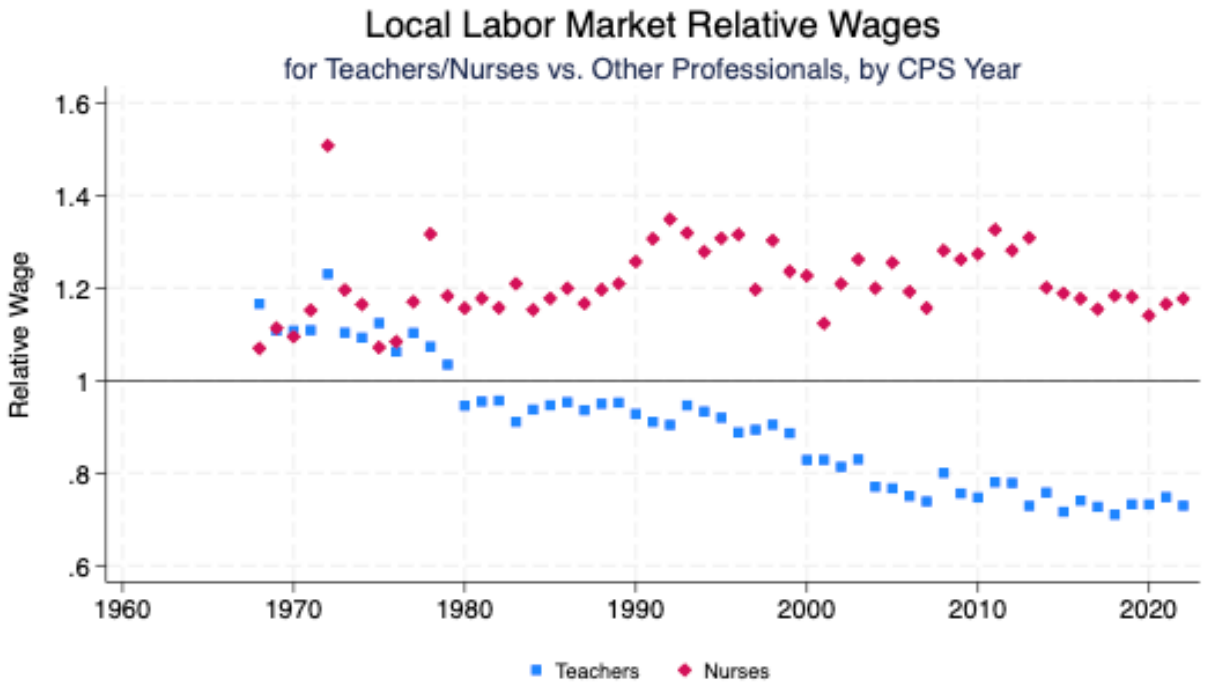
Notes: Ability deciles are calculated within each birth cohort. Data are limited to female-identifying respondents. Occupations are assigned based on whether a respondent indicated ever having worked as a nurse, teacher, or other professional. Prime working years are general ranges when individuals would be aged 25-54.
Source: Data for the 1973-74 birth cohort and the 1985-86 birth cohort are from the National Education Longitudinal Survey of 1988 and the Education Longitudinal Survey of 2002, respectively (National Center for Education Statistics). All other data are from the National Longitudinal Surveys of Young Women, Young Men, Youth-79, and Youth-97 (Bureau of Labor Statistics, U.S. Department of Labor).

Figure 3: Mean Wages by Occupation



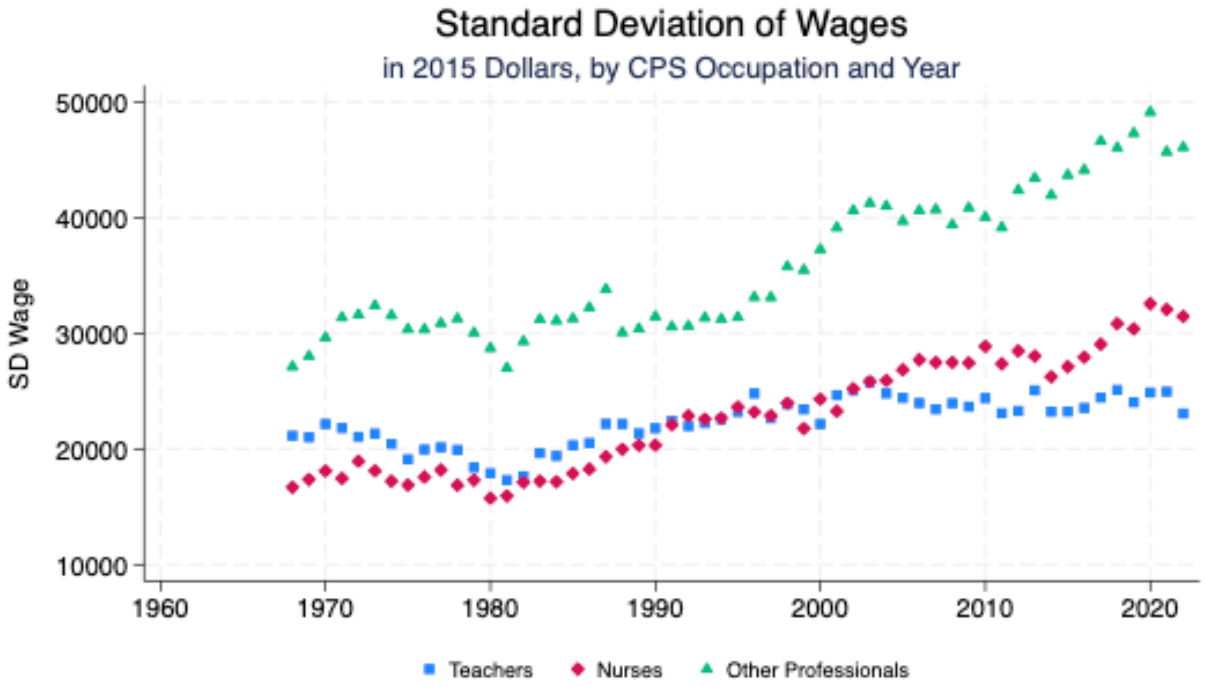
Notes: Data are for 21-60 year-old respondents with a positive reported income, who are not self-employed nor in school, and who worked at least 13 weeks. Wages are respondent's total pre-tax wage and salary income, adjusted for inflation. Prior to 1995, wages are imputed as 1.5 that of the top-coded value when the maximum allowable value is reported. Beginning in 1996, the Census Bureau replaced all records at or above the topcode threshold with an income value equal to the mean income of other individuals with the same demographic characteristics. In 2011, the Census Bureau switched to a rank proximity swapping procedure in which incomes were systematically swapped amongst one another within a bounded interval.
Source: IPUMS-CPS, University of Minnesota, www.ipums.org.

Figure 4: Relative Wages of Teachers and Nurses versus Other Professionals within a Local Labor Market



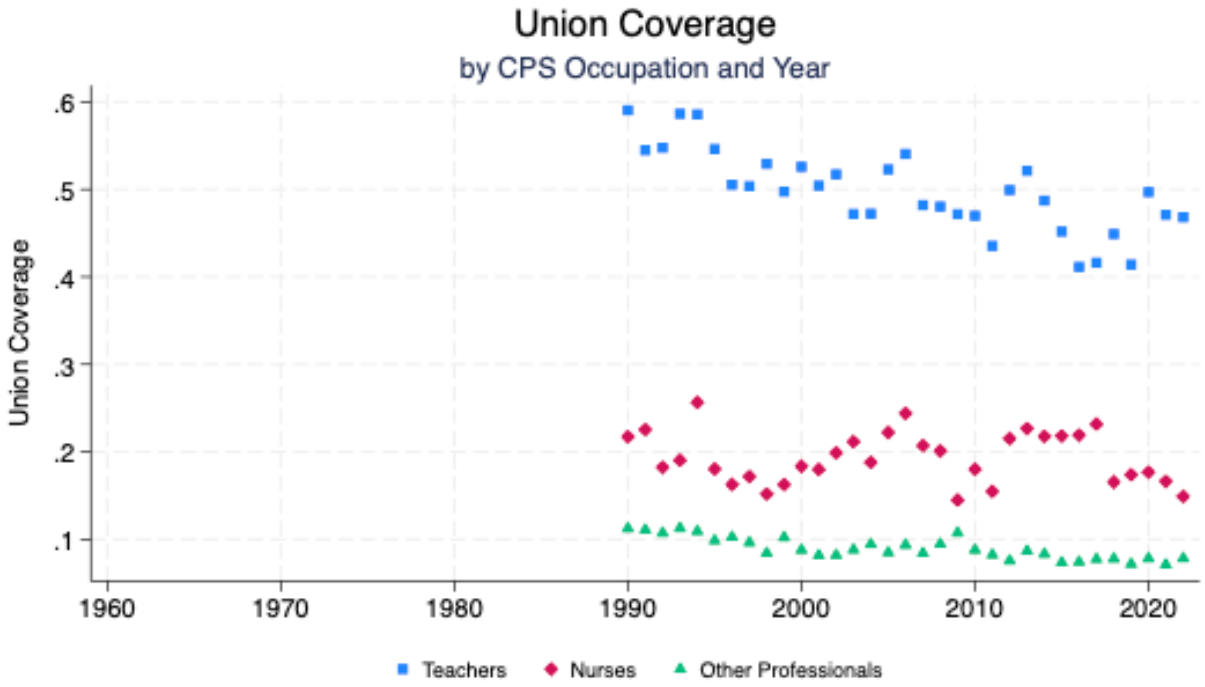
Notes: Relative earnings are calculated as the ratio of teacher or nurse wages to the wages of other professionals who, when available, indicated the same sex, race, educational attainment, age bracket, state of residence, and metropolitan status in the same year. Sample is limited to 21-60 year-old respondents with a positive reported income, who are not self-employed nor in school, and who worked at least 13 weeks. Wages are respondent's total pre-tax wage and salary income, adjusted for inflation.
Source: IPUMS-CPS, University of Minnesota, www.ipums.org.

Figure 5: Standard Deviation of Wages by Occupation



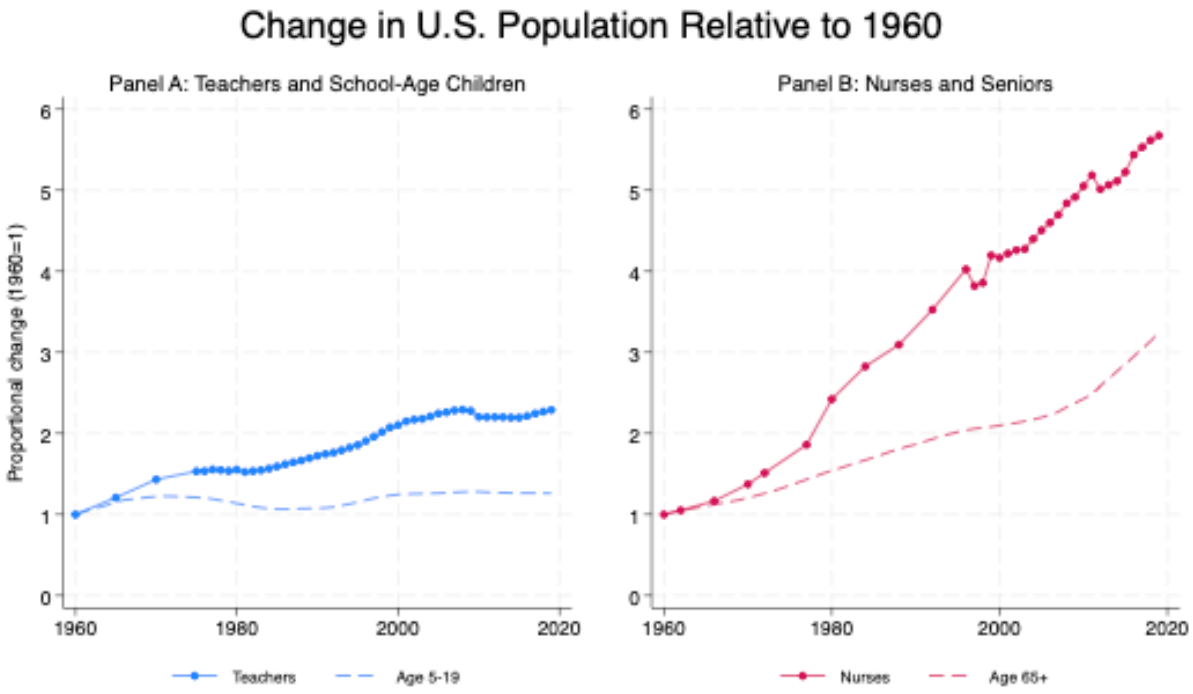
Notes: Data are for 21-60 year-old respondents with a positive reported income, who are not self-employed nor in school, and who worked at least 13 weeks. Wages are respondent's total pre-tax wage and salary income, adjusted for inflation. Prior to 1995, wages are imputed as 1.5 that of the top-coded value when the maximum allowable value is reported. Beginning in 1996, the Census Bureau replaced all records at or above the topcode threshold with an income value equal to the mean income of other individuals with the same demographic characteristics. In 2011, the Census Bureau switched to a rank proximity swapping procedure in which incomes were systematically swapped amongst one another within a bounded interval.
Source: IPUMS-CPS, University of Minnesota, www.ipums.org.

Figure 6: Union Coverage by Occupation



Notes: Data are for 21-60 year-old respondents with a positive reported income, who are not self-employed nor in school, and who worked at least 13 weeks. Union coverage indicates that the respondent was either a member of a labor union or employee association, or not a union member, but covered by a union or employee association contract. Information about union membership was collected in the Annual Social and Economic Supplement of the March Current Population Survey beginning in 1983 but due to errors in the years prior to 1990, IPUMS-CPS only includes data from 1990 forward.
Source: IPUMS-CPS, University of Minnesota, www.ipums.org.

Figure 7: Change in Population Relative to 1960



Notes: Population data are pinned to 1960. In other words, the y-axis indicates the proportional change in each subpopulation relative to 1960. In 1960, the number of school-age children was 49 million and the number of seniors was 17 million. There were 1.6 million teachers in 1960 and 0.5 million nurses.
Source: Teacher data were obtained from NCES's *Digest of Education Statistics*. U.S. population data are from the U.S. Census Bureau. Nursing data are from the U.S. Department of Health and Human Services (prior to 1997) and the U.S. Bureau of Labor Statistics (1997-2019).

Appendix A: Education Requirements

It is important to note that if education requirements for teaching and nursing differed over this time period, these differences could partially explain the diverging trends in average ability and/or average wages between the two occupations. Today, we know that most states set a four-year bachelor's degree as the minimum education requirement for K-12 teachers (Tobin, 2012). We also know that most states require that nurses have an associate's degree in nursing, with New York being the only state that legally requires that nurses obtain a bachelor's (Newland, 2018). Historical education requirements by occupation are less clearly documented. To proxy for trends in educational requirements by occupation, we look at educational attainment in the IPUMS USA U.S. census microdata.

Figure A1 presents these findings for teachers, nurses, and other professionals in Panels A through C, respectively. In Panel A, we can see that through the entire panel from 1960 to 2020, roughly 80% of teachers attended 4 or more years of college, most likely receiving a bachelor's degree or even a master's. The trend in nursing education in Panel B is noticeably less stagnant: nurses from 1960-1980 were much more likely to have attended less than 3 years of college. Even in 1990-2020, roughly half of nurses attended less than 4 years of college, most likely receiving an associate's degree. As for other professions shown in Panel C, we can see that the proportion of workers with at least two years of college has increased from around 50% in 1960 to almost 80% in 2020, with the majority being individuals who likely have a bachelor's degree.

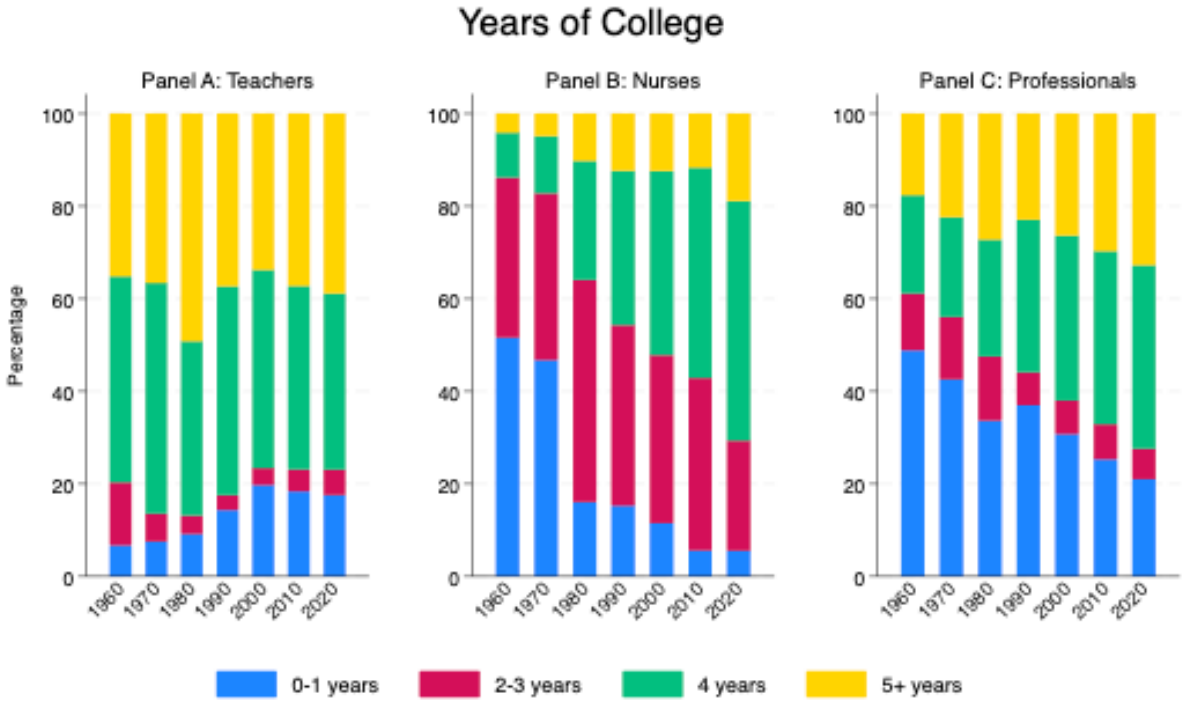
Without specific data on the historical requirements for pursuing nursing and teaching, these findings suggest that the expected education for workers pursuing teaching has held relatively steady over time, since the bulk of teachers over the entirety of this panel seem to have

had at least a bachelor's degree as they do today. The education distribution for nurses conveys a different story. Before 1990, the vast majority of nurses likely did not hold a bachelor's degree, while more recent cohorts are much more likely to have obtained a bachelor's. This aligns with reports that accrediting bodies have been increasingly recommending that the bachelor's degree be the minimum education requirement for entry into registered nurse practice since the 1960s (Ellenbecker, 2010). It also reflects other evidence that the relative proportion of nurses with bachelor's degrees has been rising over time (Buerhaus et al., 2016).

A few observations are worth discussing. First, the trends in educational attainment broadly mirror the trends in mean ability shown in Figure 2 for female nurses and teachers. Specifically, we see that both mean ability and educational attainment have remained stable for teachers, while both have been rising amongst nurses. However, this positive correlation is not a given. For example, we can see that for professionals other than nurses and teachers, the mean ability has been generally declining, whereas educational attainment has been increasing. This likely corresponds to the rising college attendance rates over this time period and the fact that an increasing proportion of jobs in the U.S. have required a four-year degree, with almost 70 percent of job postings requiring a bachelor's degree or higher in recent years (Fuller et al., 2017). Moreover, if we limit the sample of workers reflected in Figures 1 and 2 to those with at least a two-year college degree, we still see that mean ability was rising amongst these college-educated nurses relative to college-educated teachers and that teachers were increasingly less likely to be coming from the top ability deciles (see Appendix Figures A2 and A3). Thus, while it may be true that teachers have mostly always held at least a four-year college degree and an increasing proportion of nurses do, these patterns are not necessarily driving the trends in ability on their own.

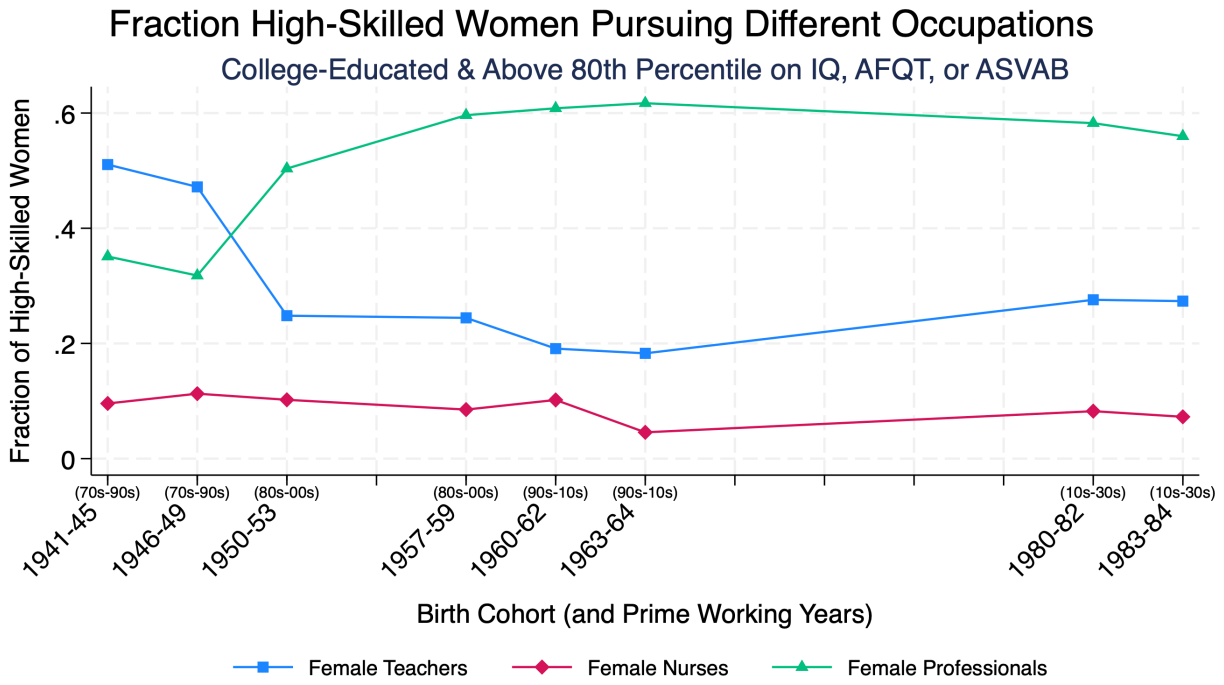
The greater dispersion in nurse education is likely a reflection of the fact that the industry has and continues to have multiple entry points, a characteristic notably lacking in the teaching profession. Entry-level nurses can begin their career after completing a hospital-based licensing program, an associate degree in nursing, or a bachelor of science in nursing, and pay is often commensurate with the level of education (Chi, 2020). This also aligns with the increasing dispersion of wages for nurses relative to teachers that we saw in Figure 5. These various entry points, reflected in the dispersion of educational attainment and the dispersion in wages, again simply reiterate that there has been more occupational differentiation within nursing and more opportunities for growth within the field, especially when compared to teachers.

Figure A1: Highest Level of Education Attained by Occupation



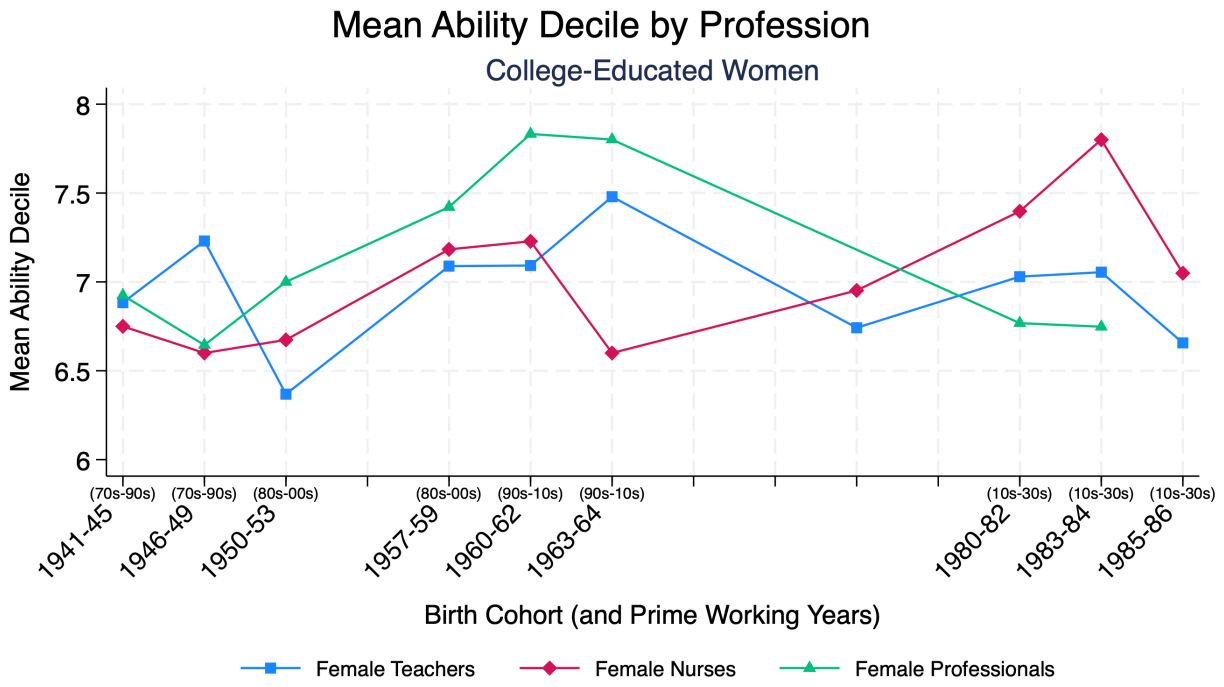
Notes: Data are for 21-60 year-old respondents who are not self-employed nor in school, and who worked at least 13 weeks. The years of college metric reflects respondents' educational attainment, as measured by the highest year of school or degree completed.
Source: IPUMS USA, University of Minnesota, www.ipums.org.

Figure A2: Fraction of High-Scoring College-Educated Women Pursuing Different Occupations



Notes: Ability deciles are calculated within each birth cohort. Data are limited to female-identifying respondents with at least two years of college who scored in the top two deciles of their ability measure. Occupations are assigned based on whether a respondent indicated ever having worked as a nurse, teacher, or other professional. Prime working years are general ranges when individuals would be aged 25-54.
Source: National Longitudinal Surveys of Young Women, Young Men, Youth-79, and Youth-97 (Bureau of Labor Statistics, U.S. Department of Labor).

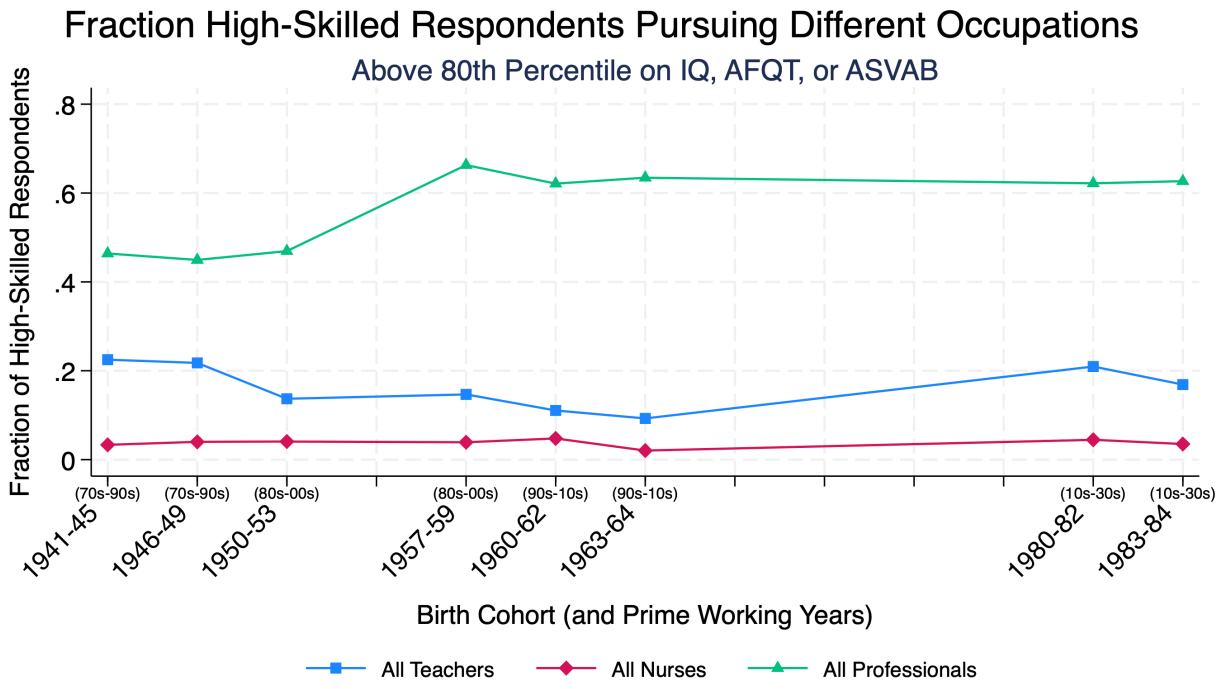
Figure A3: Average Ability Decile by Occupation Amongst College-Educated Women



Notes: Ability deciles are calculated within each birth cohort. Data are limited to female-identifying respondents with at least two years of college. Occupations are assigned based on whether a respondent indicated ever having worked as a nurse, teacher, or other professional. Prime working years are general ranges when individuals would be aged 25-54. *Source*: Data for the 1973-74 birth cohort and the 1985-86 birth cohort are from the National Education Longitudinal Survey of 1988 and the Education Longitudinal Survey of 2002, respectively (National Center for Education Statistics). All other data are from the National Longitudinal Surveys of Young Women, Young Men, Youth-79, and Youth-97 (Bureau of Labor Statistics, U.S. Department of Labor).

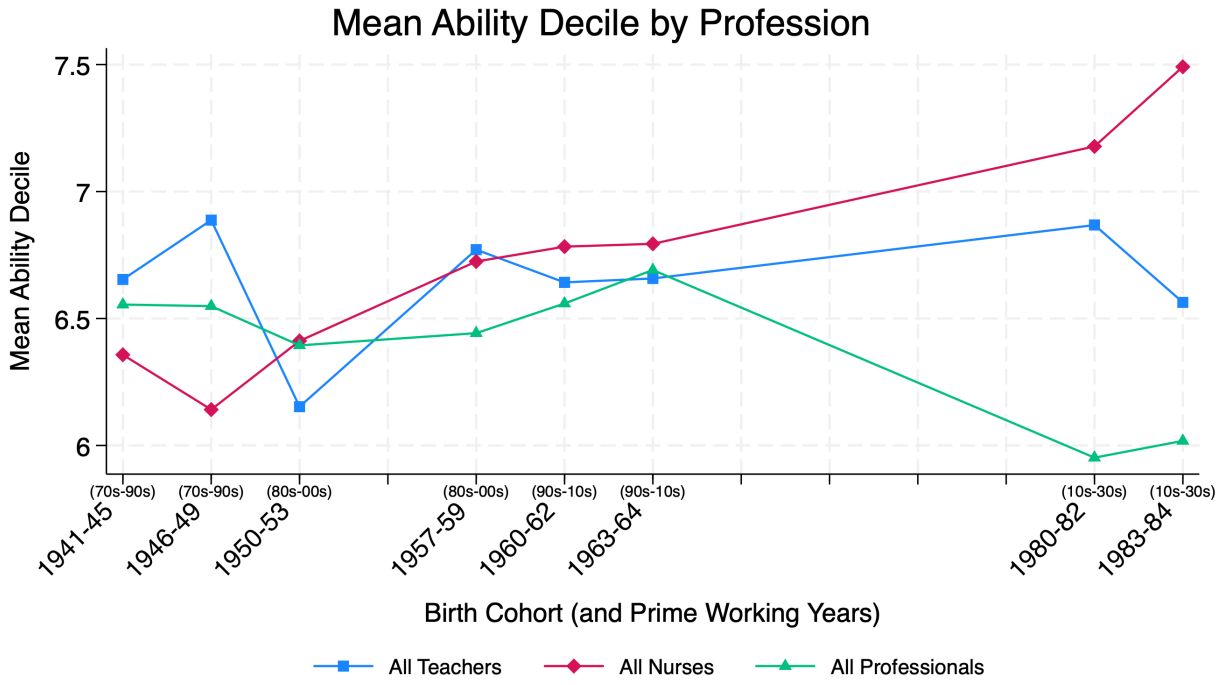
Appendix B: Changes in Ability, Including Men and Women

Figure B1: Fraction of High-Scoring Men and Women Pursuing Different Occupations



Notes: Ability deciles are calculated within each birth cohort. Occupations are assigned based on whether a respondent indicated ever having worked as a nurse, teacher, or other professional. Prime working years are general ranges when individuals would be aged 25-54.
Source: National Longitudinal Surveys of Young Women, Young Men, Youth-79, and Youth-97 (Bureau of Labor Statistics, U.S. Department of Labor).

Figure B2: Average Ability Decile by Occupation Amongst Men and Women



Notes: Ability deciles are calculated within each birth cohort. Occupations are assigned based on whether a respondent indicated ever having worked as a nurse, teacher, or other professional. Prime working years are general ranges when individuals would be aged 25-54.
Source: National Longitudinal Surveys of Young Women, Young Men, Youth-79, and Youth-97 (Bureau of Labor Statistics, U.S. Department of Labor).