Is the Gender Pay Gap Largest at the Top? Evidence from College Transcript Records

By Ariel J. Binder, Amanda Eng, Kendall Houghton, Andrew Foote*

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This paper links American Community Survey data and postsecondary transcript records to examine how the gender pay gap varies across the distribution of education credentials for a sample of 2003-2013 graduates. Although recent literature has emphasized gender inequality among the most-educated, we find a smaller gender pay gap at higher education levels. Field-of-degree and occupation effects explain most of the gap among top bachelor's graduates, while labor supply and unobserved channels matter more for less-competitive bachelor's, associate, and certificate graduates. Our results indicate that contemporary gender inequality lacks a unified explanation and requires different policy interventions depending on socioeconomic context.

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* U.S. Census Bureau, Center for Economic Studies. Any opinions and conclusions expressed herein are those of the authors and do not reflect the views of the U.S. Census Bureau. The Census Bureau has ensured appropriate access and use of confidential data and has reviewed these results for disclosure avoidance protection (Project 7527717: CBDRB-FY2023-CES005-020.) Corresponding author: Ariel Binder, ariel.j.binder@census.gov.

In 2022, the average woman in the U.S. workforce earned 18 percent lower hourly wages than the average man (Pew Research Center, 2023). Canonical research has shown that the average pay gap cannot be explained by gender differences in educational attainment (Altonji and Blank, 1999; Bertrand, 2011; and Blau and Kahn, 2017). More recent research has studied gender inequality among graduates from top universities or employees in occupations that require advanced degrees (Noonan et al. 2005; Bertrand et al. 2010; Matsa and Miller 2011; Goldin 2014; Bursztyn et al. 2017; Fernandez and Campero 2017; Wiswall and Zafar 2018; Cortés et al. 2021; Foster et al. 2022; Wasserman 2023). The traditional focus on the average and the newer focus on the elite have generated important findings, but it is unclear how well these findings apply to an increasingly stratified and socioeconomically diverse U.S. population. We take up that question in this paper by studying how the contemporary gender pay gap varies across a wide distribution of education credentials.

Rising U.S. inequality and diversification of the higher education system (Gerber and Cheung 2008; Hoxby 2009; Lovenheim and Smith 2022) suggests a need to move beyond the average gender pay gap to an analysis of how the gap varies across different human-capital and labor-market contexts. On the one hand, high returns to specialized professional skills (Deming and Kahn 2018; Deming and Noray 2020), high returns to intensive hours in certain professions (Goldin 2014), and the male-dominated networks that often persist in these environments, may widen gender inequality at the top of the human capital distribution. On the other hand, exposure to unpredictable shift-scheduling (Schneider and Harknett 2019), lack of employer-provided work-family support, and tenuous childcare arrangements and social-support networks (Su and Dunifon 2017; Harknett et al. 2020; Cortés and Pan 2020) may widen gender inequality at the lower end of the distribution (Binder 2021). While some research has investigated the relationship between overall earnings inequality and the average gender pay gap (e.g. Blau and Kahn 1997, 2000; Mulligan and Rubinstein 2008; Fortin et al. 2017), little work to our knowledge examines gender inequality across an unequal distribution of skills and opportunities.[1]

We develop a dataset that is uniquely qualified for such an analysis by linking 2005-2019 American Community Survey respondents to their postsecondary transcript records, drawing on a partnership between the U.S. Census Bureau and state higher education systems. We observe information on field of degree, occupation, labor supply, earnings, and family structure for a large sample of 2003-2013 graduates, whose credentials range from short-term certificates to bachelor's degrees conferred by highly-selective American colleges. The dataset allows us to examine labor market outcomes up to 15 years following graduation, which is a crucial window during which the gender pay gap evolves considerably (e.g. Manning and Swaffield 2008; Bertrand et al. 2010).

Our analysis generates several findings regarding contemporary gender inequality. First, by one measure, the gap is constant across the distribution of education credentials; by another, the gap falls as degree level rises. Second, field-of-degree sorting explains a substantial portion of the gap at higher levels but is a less-important determinant of the gap at lower levels. Third, field-conditional occupation sorting is an important determinant of the gap at all levels. Fourth, occupation-conditional labor supply differences are an important determinant of the gap at lower

[1] Our paper estimates *conditional average* gender gaps across various levels of pre-labor-market human capital. Some related work has estimated *unconditional percentile* gender gaps across various levels of observed earnings (e.g. Arulampalam et al. 2007, Blau and Kahn 2017) in different contexts and with more-limited education information.

degree levels, but a minor determinant at the top. Fifth, the effects of children on the gender pay gap are similar at both certificate and top bachelor's levels, although they operate primarily through labor supply and residual channels for the former, and through occupation and labor supply channels for the latter. Finally, we confirm the negative relationship between gap magnitude and degree level in a subsample of Business graduates and find uniquely high contributions of occupation effects to the gap among top Business graduates.

Our results indicate that different mechanisms of gender pay inequity are important at different positions in the labor market for recent graduates. While Roy-style models of career selection may generate most observed pay disparities among the highest-educated, frictional models of work-family constraints or discrimination may play an important role among the less-educated. We discuss how some of our headline estimates relate to prior estimates in the early-career gender gap literature. This discussion suggests lower gender inequality in the modern cohorts we consider, as well as a lower (but still first-order important) level of field and occupation segregation among bachelor's graduates. It thus appears that gender inequality continues to fall, albeit slowly. At the same time, remaining inequality eludes a unified explanation across the different contexts faced by differently-trained postsecondary graduates.

The paper proceeds as follows. In the next section, we describe the construction of our dataset and some basic summary statistics. Section III describes our decomposition methodology. Section IV presents and interprets our main gender pay gap decompositions. Section V repeats selected analyses from Section IV on a subsample of Business graduates. Section VI compares our findings to those of related prior studies. Section VII offers concluding remarks and policy implications.

I. Data

We sourced postsecondary transcript records from a subset of the state higher education systems that participate in the Post-Secondary Employment Outcomes (PSEO) partnership:[2] Connecticut State Colleges and Universities, the City University of New York, the Louisiana Board of Regents, the Missouri Department of Higher Education and Workforce Development, the Ohio Department of Higher Education, the State Council of Higher Education for Virginia, the State University of New York, the Texas Higher Education Coordinating Board, and the Utah System of Higher Education. The transcripts we observe are person-degree[3] records that include information on institution, degree type (short-term certificate, 1-2-year certificate, associate, or bachelor's), degree field, and date of graduation. Each graduate is assigned a Protected Identification Key (PIK) by the U.S. Census Bureau's Person Identification Validation System (PVS).[4] These PIKs allow the transcript data to be matched with person-level responses to the American Community Survey (ACS). We observe annual transcript data from most systems beginning in the early 2000s, and ACS data for survey years 2005-2019.

[2] For more information about the PSEO data, go to: https://lehd.ces.census.gov/data/pseo_experimental.html
[3] If an individual earns multiple degrees, there is an observation in the data for each degree earned. We have verified that negligible shares of our sample appear in the PSEO data as both a sub-baccalaureate degree earner and a baccalaureate degree earner.
[4] For more information on PVS, see Wagner and Layne (2014).

A. Main Sample

We used this information to construct a dataset based on the following criteria: individuals who graduated in 2003-2013, who were between the ages of 19 and 42 at graduation, who were between the ages of 19 and 59 when they were sampled by the ACS, and who graduated prior to being sampled by the ACS. Each graduating cohort can be observed for a minimum of six and maximum of 16 years following graduation. Appendix Table A1 records sample counts and cohort coverage by higher education system. Our sample contains approximately 630,000 graduates, nearly 30% of which graduated from an institution in Texas. Approximately 17% of the sample graduated from an Ohio institution, another 17% graduated from a SUNY institution, and 15% graduated from an institution in Virginia. The other five systems comprise the remaining 21% of the sample.

Table 1 presents selected summary statistics of our sample. Women comprise nearly 59% of observed graduates, reflecting known gender differences in degree attainment in the United States and other advanced countries (Goldin et al. 2006; Van Bavel et al. 2018). Most individuals are in their 30s. The average individual graduated in 2008 and is observed six years later, during the 2014 ACS data year. The majority of graduates earned a bachelor's degree, while 31 percent earned an associate degree and the remaining 9 percent obtained a certificate.

Table 1 also records summary information on earnings over the 12 months prior to each individual's ACS interview. The average woman in our sample earned $38,700, while the average man earned $53,200, leading to a gender gap of $14,500, or 27.3 percent of the average man's earnings. We find a similar gap of $13,600, or 26.4 percent of the average man's earnings, when we consider wage and salary earnings only. Despite this substantial gap, there are small differences in labor force attachment: 83 percent of women, as compared with 88 percent of men, earned at least $5,000.

Due to the select geographic and institutional coverage of our sample, it is hard to name a target population that our sample can be considered to represent. However, we achieved reasonable comparisons between our sample and a nationally representative sample of similarly-aged individuals with college education drawn from the 2016 ACS 5-year public-use file. Our sample contains a slightly larger share of individuals identifying as White non-Hispanic and exhibits a slightly smaller baseline average gender pay gap. Appendix Table A2 provides further information.

To distinguish among the wide variety of bachelor's programs in the United States and the investments they make in their students, we merged 2004 Barron's Competitiveness ratings for bachelor's programs onto our dataset at the institution level. Barron's rates programs with competitive admissions policies (i.e. that are not open enrollment), and applies a 1-7 rating scale to the programs it rates. We recoded this to a 1-6 scale, pooling the two least competitive categories (which were small), and assigned a seventh category to programs left unrated by Barron's. This category is small, accounting for under three percent of the full sample.

Appendix Table A3 presents student-weighted average institutional characteristics[5] by Barron's category, along with student and institution counts. The table shows substantial stratification in institutional selectivity, investments, and graduation outcomes across the Barron's categories. For example, while nearly two-thirds of applicants to Most Competitive institutions in our sample are rejected, only 4.6 percent of applicants to Non-Competitive institutions are rejected. Most Competitive institutions spend over twice as much on instruction as do the Less and Non-Competitive institutions. While under 30 percent of students at Non-Competitive institutions graduate in four years, over 90 percent of those at Most Competitive institutions do. Moreover, male graduates from Most Competitive institutions earn 63.2 percent more income on average than do male graduates from Non-Competitive institutions.

Thus, in total, we consider ten different postsecondary *degree levels* in our analysis: short-term certificate, one- or two-year certificate, associate, and the seven levels of bachelor's degrees described above.[6]

B. Subsample to Investigate Effects of Children

To investigate how the presence of children affects the gender pay gap and its underlying mechanisms, we used PIK assignments to merge our main sample to the Census Household Composition Key (described in Genadek et al. 2021). The CHCK file links parents to children based on birth certificate information recorded on the Social Security Administration's Numident file and covers births from 1997-2021. The key advantage of this dataset over the ACS is that the latter can only identify parent-child linkages based on the relationship to household head variable. This makes it difficult to associate parents with children in certain multi-family or multi-generational households, and impossible to associate parents with children who are not coresidents. Moreover, the frequencies of such living arrangements potentially vary across the postsecondary human capital distribution. Using the CHCK eliminates this complication, but at the cost of only being able to observe births since 1997. This means that we cannot observe complete birth histories for individuals that had children at an unusually young age and/or earned a postsecondary degree at an unusually old age.

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[5] We sourced institutional characteristics from the 2004-05 edition of the U.S. Department of Education's College Scorecard database: College Scorecard | College Scorecard (ed.gov).

[6] To measure the extent to which graduates receive additional education following their observation in the transcript data, we provide Appendix Table A4, which restricts our main sample to individuals observed at least two years following receipt of their PSEO degree and records educational attainment information reported to ACS by PSEO degree level. Around 20 percent of individuals who we observe earning a certificate degree in the PSEO report having attained a bachelor's degree in the ACS, and 44 percent of PSEO associate graduates report having a bachelor's degree. Moreover, almost half of Most Competitive bachelor's graduates report an advanced degree (compared to around 22 percent among graduates from Non-Competitive or Unrated bachelor's programs, and 8 percent among associate graduates). One might argue that this phenomenon results in misclassification of our education categories: if so, then our approach is biased *against* finding heterogeneity in the gender gap across degree levels. Nevertheless, comparisons of male postgraduation earnings across PSEO degree levels suggest that our approach produces substantial stratification: the average male graduate with an associate (certificate) degree earned $43,700 ($39,700), or roughly one-half as much as the average male graduate from a Most Competitive bachelor institution. In general, we interpret the attainment of additional education as part of the natural school-work paths our graduates may take following initial postsecondary graduation; these paths, to the extent that they differ by gender, will be reflected in our estimates.

To avoid these censoring issues, we created a subsample of individuals who responded to the ACS during the 2016-2019 survey years and who were no older than 37 when they responded. We also imposed a minimum age limit of 28 to obtain a sample of individuals observed at ages when fertility rates are relatively high. This subsample is about one-fourth as large as the main sample, but we verified that key gender pay gap patterns were quite similar between the two samples.

II. Methodology

We consider two different earnings concepts throughout this paper: total real earnings (including zeros), and the natural logarithm of real earnings from wage and salary employment.[7] We view the two measures as complementary, and do not take a stance on which is preferred. For example, the first measure does not restrict on any definition of formal employment, and thus is as inclusive as possible of differences in paid labor supply. However, it may be sensitive to outlier earners or to transitory swings in self-employment earnings. On the other hand, the second measure excludes self-employment earnings and those without any labor-force attachment, but this results in a comparison of women and men with similar levels of participation in the formal workforce. The log scaling also belongs to the class of Mincer earnings functions commonly used in the labor economics literature.

A. Explanatory and Stratifying Variables

We estimate a series of earnings models in terms of several predictor variables. We consider two different types of variables. Our main variables of interest are *explanatory* variables, i.e., proximate mechanisms of the gender pay gap. We allow for heterogeneity in our estimates by considering *stratifying* variables, wherein we estimate a separate model for each stratum.

- ***Explanatory*** variables:
    - *Field of degree fixed effects*. The PSEO transcripts record six-digit field codes from the Classification of Instructional Programs (CIP). Many of these codes contain small numbers of students or are redundant. To avoid small cells, we aggregated these codes to the two-digit level. Although two-digit codes are the broadest taxonomy of field of study, they still contain detail: we observe 44 distinct codes in our dataset.[8] Moreover, as a robustness check, we reran our main analyses with four-digit codes and found broadly similar results, as we discuss in the next section.
    - *Occupation and industry fixed effects*. We aggregated the 535 ACS occupation codes into 316 different labor market sectors, following the guidance of Foster et al. (2021).[9] We also aggregated ACS industry codes into 18 major industry

[7] Real earnings are expressed in US dollars at 2019 prices.
[8] Example two-digit CIP codes include Education; Engineering; Biological and Biomedical Sciences; Mathematics and Statistics; Physical Sciences; and Psychology. For more details on CIP codes and a full list of the taxonomy, see: https://nces.ed.gov/ipeds/cipcode/
[9] We thank Brad Foster for generously sharing the occupation crosswalk used in Foster et al. (2021), which also appears as Appendix Table A2 of that paper.

codes, related to those commonly used in studies of gender segregation in the labor market (e.g. Schaller at al. 2019).

- *Labor supply*. To allow for non-linear relationships between work intensity and earnings (Goldin 2014), we code labor supply as a flexible categorical variable rather than simply as the number of hours worked during the year. Specifically, we interact six different "weeks worked" bins (1-13, 14-26, 27-39, 40-47, 48-49, 50-52) with eight different "usual hours worked per week" bins (1-20, 21-30, 31-39, 40, 41-49, 50-54, 55-64, 65-99).

- ***Stratifying*** variables:
  - *Degree level*. We estimate separate models for each of the ten levels of degree described above. For ease of exposition, we sometimes aggregate these ten levels to a smaller number or focus on a comparison of certificate degree holders to Most Competitive bachelor's degree holders.
  - *Parental status*. Some analyses estimate separate earnings models for childless individuals and parents. The difference in the results yields a descriptive estimate of how parenthood affects the gender pay gap and its explanatory mechanisms.

B. Decomposition Framework

Within each stratum that we consider, we estimate the total gender pay gap; the portion attributable to each explanatory variable; and the residual portion. We start with the baseline regression model

$$(1) \qquad y_{id} = \alpha_d^0 + \beta_d^0 W_{id} + \varepsilon_{id}$$

where *y* is an earnings outcome, *W* is a binary indicator taking the value 1 if individual *i* is a woman, and *d* is the given stratum (e.g. degree level).[10] When *y* corresponds to earnings in levels, the baseline gender pay gap estimate is $\widehat{\beta_d^0}/\widehat{\alpha_d^0}$, which is the earnings difference between the average woman and average man expressed as a percentage of his earnings. When *y* corresponds to earnings in logs, the baseline estimate is $\widehat{\beta_d^0}$, which has the standard log-point interpretation.

We then sequentially add controls for 1) field of degree, 2) occupation and industry, and 3) labor supply, re-estimating the model each time and tracking how the coefficient on *W* changes. For example, to measure the contribution of field of degree to the gender pay gap, we estimate

$$(2) \qquad y_{id} = \alpha_d^1 + \beta_d^1 W_{id} + \boldsymbol{\gamma_d}' \boldsymbol{F_{id}} + \varepsilon_{id}$$

[10] The baseline regression model controls for survey year and graduation year fixed effects as well. We also non-parametrically control for age by reweighting each degree-level-by-gender subsample so that its age distribution is equivalent to the full sample's age distribution. We provide further information about our estimation strategy in Appendix B.

where $\boldsymbol{F}$ denotes the suite of two-digit CIP code fixed effects. The amount of the gender gap explained by gender differences in field of degree is given by $\widehat{\beta_d^0} - \widehat{\beta_d^1}$, while the remaining gap is $\widehat{\beta_d^1}$. Subsequent iterations yield the amount of the gap explained by occupation and industry differences conditional on field choices; the amount explained by labor supply differences conditional on occupation, industry, and field; and the residual portion left unexplained.

III. Main Gender Pay Gap Estimates

Figure 1 presents gender pay gap decompositions for each of the ten levels of degree. The total height of each bar corresponds to the baseline gender pay gap estimate (i.e., after controlling for age, graduation year, and survey year effects). Green is the portion of the gap explained by gender differences in field of degree. Orange is the portion of the remaining gap explained by occupation and industry differences. Maroon is the portion of the remaining gap explained by labor supply differences. Gray represents the residual portion. In a few cases, controlling for field of degree widens, rather than narrows, the gender pay gap. These cases are captured by green whiskers as opposed to opaque bars.

Although recent literature has emphasized the very top of the human capital distribution, Panel A shows a raw gender pay gap that is consistent across degree types. Panel B, which considers log wage-and-salary earnings, shows a raw gap that generally *falls* as degree level rises. Both panels show that the remaining gap after controlling for field-of-degree sorting is smaller at higher degree levels. Relatedly, we find that field-of-degree sorting contributes importantly to the gender pay gap among those graduating from top bachelor's programs, but has a smaller effect on the pay gap among less-selective bachelor's, certificate, and associate degree holders. In contrast, labor supply differences determine the pay gap to a larger extent at these degree levels.

Table 2 presents decomposition estimates and standard errors to provide precise numbers behind Figure 1. For ease of exposition, we collapse the ten degree levels into six categories. We pool the two types of certificate degrees together, collapse the six bachelor's categories that are not "Most Competitive" down to three categories, and preserve the Most Competitive bachelor's category—which contains around two percent of the sample—given the prior literature's focus on the top of the human capital distribution. For the five other categories, we highlight in bold any point estimate that differs statistically from the corresponding estimate for the top category at the 10 percent significance level or less.

This table solidifies the graphical results. First, for total earnings, the pay gap is quite constant across degree levels; whereas for log wage and salary earnings, the pay gap is noticeably larger at the certificate level than it is at the Most Competitive bachelor's level. Second, field of degree sorting explains 25-43 percent of the gap among Most Competitive bachelor's graduates (depending on earnings measure) but is a less important determinant of the gap at the sub-baccalaureate and less-selective bachelor's levels.[11] Third, occupation sorting conditional on field-

[11] In results not presented here, we examine how our estimates change if we use four-digit as opposed to two-digit CIP codes. While residual gender pay gaps, as well as the portions explained by labor supply effects, remain remarkably similar when we use four-digit CIP codes, the portion of the gender pay gap explained by field of degree increases moderately for certificate degree holders, with an offsetting decrease in the portion of the gap explained by

of-degree sorting is an important determinant of the gender pay gap, explaining 30-40 percent of the gap at all degree levels. Fourth, occupation-conditional labor supply differences are an important determinant of the gap at sub-baccalaureate degree levels, explaining approximately 30 percent of the gap. In contrast, labor supply is a trivial determinant of the gap among Most Competitive bachelor's graduates. Fifth, approximately one-third of the *total* earnings gap remains unexplained at all degree levels; however, the unexplained portion of the *log wage-and-salary* earnings gap falls as degree level rises. Only 7.7 percent of the log wage-and-salary earnings gap among Most Competitive bachelor's graduates is unexplained by field of degree, occupation, and labor supply effects.

A. Estimates for Full-Year Workers

In addition to considering the full population, the gender gap literature often takes interest in the subset of full-year-employed workers. Appendix Figure A1 presents gender pay gap decompositions by degree level for this group. The results are akin to what was shown above, with one exception: the labor supply channel is now estimated to be small at all degree levels, regardless of earnings measure. This suggests that the larger labor supply contributions found at less-selective-bachelor's and sub-baccalaureate degree levels in the full sample are due to gender differences in the extensive margin of labor supply. Nonetheless, both panels show that after controlling for field and occupation effects, the remaining gender pay gap falls as degree level rises (and the raw gap is relatively constant across degree levels).

B. The Role of Children

Considering recent literature showing strong effects of parenthood on the gender pay gap (e.g. Juhn and McCue 2017), we utilize the CHCK subsample to perform gender pay gap decompositions for those without and those with children. The difference between these two provides a descriptive estimate of how children influence the gender pay gap and each of its mechanisms. To keep the number of comparisons manageable and to increase statistical power, we focus on two different degree levels: certificate (formed by pooling all certificate degree earners together), and "Top" bachelor's (formed by pooling Highly and Most Competitive bachelor's degree earners together).

Table 3 presents the results. Panel A shows that the total earnings gap is around 33 percentage points higher for individuals with children; Panel B shows that the log wage-and-salary earnings gap is around 45 log points higher for individuals with children. The small CHCK subsample sizes lead to a lack of precision in some of the estimates, but we still find that children significantly widen the total earnings gap through labor supply and residual channels for certificate graduates, and through occupation, labor supply and residual channels for Top bachelor's graduates. Moreover, the difference in the residual effects of children across degree levels is statistically significant. We find a similar pattern of effects for the log wage-and-salary earnings gap. Overall, these results suggest that children widen gender pay gaps through several different channels, and

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occupation sorting. Field of degree (labor supply) still affects the gender gap substantially more (less) for Most Selective bachelor's programs than for certificate programs, although the field-of-degree comparison loses statistical significance. All other significant statistical comparisons bolded in Table 2 are preserved in the alternate specification.

these channels differ according to degree level. In particular, the greater effect of children on residual channels for certificate graduates could be the result of less access to employer-provided benefits, less access to formal or informal support networks, or more exposure to various forms of discrimination for these workers (see Cortés and Pan 2020 for further discussion). It could also be the result of greater children-induced work interruptions and losses of human capital for mothers (or corresponding gains for fathers), although the finding of smaller children-induced labor supply effects casts doubt on this story.

IV. Pay Gap Estimates for Business Majors

Business is the single largest CIP code in our sample, accounting for roughly 20 percent of all bachelor's graduates.[12] Moreover, business-related occupations are often highlighted as having some of the largest gender pay gaps (see for example, Goldin 2014 and Bertrand, Goldin, and Katz 2010). Our sample affords us a unique opportunity to analyze the career trajectories of Business majors across different degree levels. We compare our findings, both general and Business-major-specific, to related studies in the next section.

Figure 2 repeats the main gender pay gap decompositions presented in Figure 1 for the subsample of Business majors with bachelor's degrees. Because all graduates in this subsample chose the same major, we omit field-of-degree effects from the model. We find a pattern of results that is quite consistent with the findings for the full sample. Specifically, the total earnings gap is constant across Barron's ratings, with some evidence that the residual earnings gap is smallest among Business graduates from Most Competitive institutions. Moreover, the log wage-and-salary earnings gap—both with and without controls for occupation and labor supply—falls as selectivity rises. At the Most Competitive level, the log wage-and-salary earnings gap is approximately 15 log points, and it is *entirely* explained by occupation effects. After controlling for occupation and labor supply, women earn nearly 4 log points *more* than comparable men, although this difference is not statistically significant.

V. Comparison to Related Literature

It is instructive to compare our results to those from selected related studies of gender gaps in the United States. We classify comparisons into two types.

First, some prior work has estimated the contributions of field-of-degree sorting to the gender pay gap. Brown and Corcoran (1997) found, in a sample of respondents to the National Longitudinal Study of the High School Class of 1972, who were surveyed in 1986 when they were in their early 30s, that field of bachelor's degree explained 7.8 log points (37.7 percent) of a total 20.7 log-point gap. We developed a comparable sample of bachelor's graduates observed 7-10 years since graduation and re-estimated our decomposition with log hourly wages as the outcome. We found that field-of-degree effects explained 4.9 log points (27.5 percent) of a total 17.8 log-

[12] Business fields have their own 2-digit CIP code of 52. We also pulled Economics majors out of the Social Sciences CIP code of 45 and pooled them with the Business majors.

point gap. This suggests less—but still substantial—gender segregation of field choice in today's U.S. cohorts as compared to 30 years ago.[13]

More recently, Sloane et al. (2021) examined the contribution of field-of-degree and occupational sorting to the full-time-employed hourly wage gap among college graduates sampled by the ACS in 2014-17. In their sample of 1978-87 birth cohorts (who would have graduated college just a few years earlier than our cohorts on average), field and occupation controls jointly explained 9.0 log points, or 58.1 percent, of the observed 15.5 log-point gap.[14] This estimate exceeds our estimate for less-competitive bachelor's programs but is similar to our findings for more-competitive programs.

Second, several studies have examined the evolution of the early-career gender pay gap. Bertrand, Goldin and Katz (2010—hereinafter BGK) found a large gender pay gap that grew considerably with time since graduation in a sample of University of Chicago MBA grads. It is important to point out that MBA graduates are positively selected relative to the average bachelor's degree holder (Nevill and Chen 2007), and the BGK sample is even more positively selected: Booth Business School consistently ranks among the top 5 MBA programs in the country. Moreover, MBA graduates come from a wide array of undergraduate fields, and business undergraduates are somewhat less likely to attain graduate education compared to other bachelor's degree holders (Nevill and Chen 2007; Altonji et al. 2016). Our samples of Business graduates isolate a different, and potentially more-representative, subset of individuals trained for business-related occupations.

Appendix Table A5 compares main gender pay gap estimates between our samples of business graduates and BGK's.[15] To increase statistical power and keep the number of comparisons manageable, we collapse the top two Barron's categories into a Top Bachelor group and the bottom five categories into a "Non-Top" Bachelor group. We estimate a gap of 6.9 (3.9) log points for Non-Top (Top) bachelor's graduates 0-3 years after graduation, and this gap grows to 30.1 (29.6) log points at 8-11 years after graduation. In contrast, BGK estimated an 18.9 log point gap at 0-3 years and a 44.7 log point gap at 8-11 years after graduation—roughly 15 log points larger than our estimates. Comparing our samples to BGK's by age instead of years since graduation yields smaller but still nontrivial differences. For example, we find a pay gap of 9.8 log points among Top Bachelor's graduates at 4-7 years after graduation, which is 9.1 log points smaller than the 0-3-year gap estimate reported by BGK. The gap for Top Bachelor's graduates grows to 36.3 log points at 12-16 years after graduation, which is 8.4 log points smaller than the 8-11-year gap estimate reported by BGK.

Overall, we take this comparison as evidence that today's typical Business graduates face less-severe gender inequality than that reflected in BGK's sample, particularly at early career stages. However, our finding of an increase in the pay gap with time since graduation matches BGK's and

[13] See Bailey and DiPrete (2016) and Calkins et al. (2023) for further discussion.
[14] Since Sloane et al. (2021) introduced field of degree controls *after* occupation controls in their empirical model, it is impossible to compare their separate estimates of field and occupation effects to ours. They also controlled for field of degree and occupation using a slightly different methodology that emphasizes male returns to those variables, rather than the gender-neutral average returns implied by our fixed effects.
[15] Appendix section C describes how we aligned BGK's estimates with ours.

suggests that the dynamics they emphasize remain relevant for the broader, contemporary population of Business graduates.

VI. Conclusion

In this paper, we leverage a unique dataset of postsecondary transcript records linked to household survey data to provide a novel examination of the gender pay gap across the distribution of pre-labor-market human capital. This analysis expands a literature on gender inequality that has either i) provided population estimates of the gender pay gap along with the contributions of human-capital variables; or ii) analyzed gender inequality in high-human-capital subpopulations. Our study is the first of which we are aware to interact these foci, breaking down a large sample of postsecondary degree earners into more narrowly defined human capital strata, and analyzing variation in the gender gap and its mechanisms across each stratum. We consider individuals that earned their postsecondary degrees in 2003-2013 and were observed up to 16 years following graduation: our results shed light on contemporary early-career gender inequality.

Our approach yields several new findings. First, the gender pay gap is not highest for top postsecondary graduates. The total earnings gap (as a percentage of male earnings) is quite constant across the degree level distribution; the log wage-and-salary earnings gap *falls* as degree level rises. Second, field-of-degree sorting explains a substantial portion of the gap among Most Competitive bachelor's graduates but is a less important determinant of the gap at lower degree levels. Third, field-conditional occupation sorting is an important determinant of the gender pay gap at all levels. Fourth, occupation-conditional labor supply differences are an important determinant of the gap at sub-baccalaureate degree levels, but a less-important determinant at the top. Fifth, the overall effects of children on the gender pay gap are similar at both levels, although they operate primarily through occupation and labor supply channels at the top, and through labor supply and residual channels at the bottom. Finally, these findings generally hold in a sample of Business majors: the log wage-and-salary pay gap is smallest among Most Competitive bachelor's graduates and is entirely explained by occupation effects.

Comparisons of our findings to prior literature suggest that gender inequality has fallen among both bachelor's degree holders as a whole and among those with degrees from top institutions, relative to what has previously been reported. Relatedly, our findings indicate that within highly-skilled occupations, gender-based sorting into higher- versus lower-hours positions is less prevalent in recent cohorts than has previously been emphasized (e.g. Goldin 2014)—at least, at the relatively-early career stage we study. On the other hand, field-of-degree sorting remains an important determinant of the gender pay gap among recent bachelor's graduates, although slightly less important than in Brown and Corcoran's (1997) study. This suggests less, but still substantial, gender segregation in course-taking and completion that disadvantages women now as compared to 30 years ago.

Today's cohorts of postsecondary graduates continue to experience substantial gender inequality in labor market outcomes. We have shown that while the *magnitude* of this inequality does not vary much by level of credential, the *mechanisms* vary more substantially. This indicates the need for a mix of "global" and "human-capital-specific" policies to promote broad-based

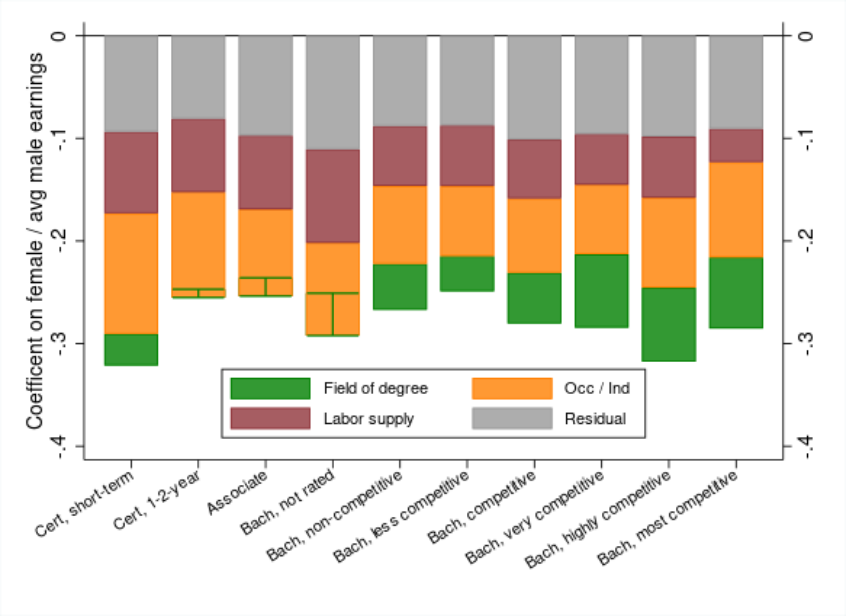
gender equality. Interventions aimed at equalizing the fields chosen by men and women—for example through interventions to the social and learning environments at postsecondary institutions—would significantly lessen the gender gap primarily for graduates from the most selective institutions and only relatively early in their careers. On the other hand, interventions to lessen gender-based occupational segregation—for example by strengthening alumni and other support networks in male-dominated occupations—could have a broad-based effect on gender inequality. Improving the provision of flexibility- and childcare-related benefits would help women maintain full-time labor supply and ensure more equitable treatment from employers upon the transition to parenthood. This would result in lower gender inequality particularly among less-competitive bachelor's and sub-baccalaureate graduates—and would also lower the steep effects of time-since-graduation on the gender gap for top bachelor's graduates. Rather than simply *conditioning* on human capital, as has been the tradition of the literature, *interacting* gender and human capital strikes us as a fruitful approach to maintaining an applicable base of knowledge about the ever-present but ever-changing gender pay gap.

TABLE 1. SUMMARY STATISTICS OF MAIN SAMPLE

Panel A. Demographics			Panel B. Human Capital and Earnings		
	Mean	SD		Mean	SD
Woman	0.59	0.49	Certificate	0.09	0.28
Age at graduation	25.2	5.0	Associate	0.31	0.46
Age	31.3	6.4	Bachelor	0.61	0.49
Graduation year	2008	3.1	Selective Bachelor	0.23	0.42
ACS year	2014	3.7	Total earnings, women	38.7	39.3
White, non-Hispanic	0.71	0.45	Total earnings, men	53.2	56.2
Black, non-Hispanic	0.09	0.28	Wage/sal earnings, women	38.0	38.6
Asian, non-Hispanic	0.05	0.22	Wage/sal earnings, men	51.5	53.9
Other, non-Hispanic	0.03	0.17	Earned < $5000, women	0.17	0.37
Hispanic	0.12	0.32	Earned < $5000, men	0.12	0.32
N = 630,000					

Source: PSEO transcript records linked to the 2005-2019 ACS and the 2004 Barron's Guide.
Note: Sample membership described in Section I.A. "SD" stands for standard deviation. "Selective Bachelor" corresponds to students who graduated from an institution rated as Very Competitive, Highly Competitive, or Most Competitive according to Barron's 2004 guide. Earnings are for the 12 months prior to when the individual responded to the ACS. Earnings are inflated to 2019 prices using the CPI for all urban consumers and are expressed in thousands.

Panel A. Total Earnings



Panel B. Log Wage and Salary Earnings

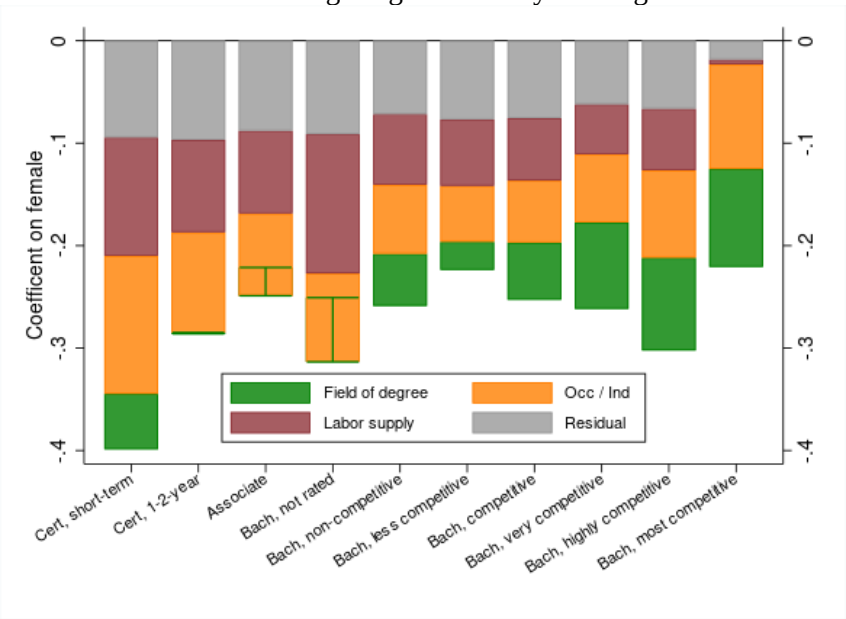


FIGURE 1. GENDER PAY GAP DECOMPOSITIONS BY TYPE OF DEGREE, FULL SAMPLE

Source: PSEO transcript records linked to the 2005-2019 ACS and the 2004 Barron's Guide.
Note: See Section I.A for sample information. "Cert" stands for certificate degrees and "Bach" for bachelor's degrees. "Occ / Ind" stands for occupation and industry effects. Total length of each bar corresponds to the gender pay gap after controlling for age, degree year, and survey year effects. Green is the portion of the gap explained by adding 2-digit CIP code fixed effects to the pay gap regression. Orange is the portion of the remaining gap explained by adding 315 occupation and 19 industry fixed effects. Maroon is the portion of the remaining gap explained by adding 48 fixed effects describing different levels of labor supply (6 weeks worked bins interacted with 8 weekly hours bins). Gray represents the residual portion. In a few cases, controlling for field of degree widens, rather than narrows, the gender pay gap. These cases are captured by green whiskers as opposed to opaque bars.

TABLE 2. GENDER PAY GAP DECOMPOSITIONS BY BINNED DEGREE LEVEL

	Non-Bachelor		Bachelor			
	Certificate	Associate	Not Selective	Selective	Very Selective	Most Selective
Panel A. Total Earnings, Full Sample						
Total gap	-0.288	**-0.236**	-0.257	-0.280	-0.300	-0.284
	(0.008)	(0.004)	(0.005)	(0.004)	(0.005)	(0.016)
Field of degree	**-0.011**	**0.018**	**-0.024**	-0.050	-0.072	-0.070
	(0.012)	(0.006)	(0.007)	(0.006)	(0.007)	(0.023)
Occupation	-0.111	-0.085	-0.077	-0.072	-0.077	-0.092
	(0.014)	(0.006)	(0.007)	(0.006)	(0.007)	(0.023)
Labor supply	**-0.076**	**-0.072**	-0.065	-0.057	-0.054	-0.032
	(0.013)	(0.006)	(0.007)	(0.006)	(0.007)	(0.021)
Residual	-0.090	-0.097	-0.091	-0.101	-0.097	-0.090
	(0.009)	(0.004)	(0.005)	(0.004)	(0.004)	(0.015)
N	54,500	192,000	90,500	150,000	130,000	12,500
Panel B. Log Wage and Salary Earnings, Full Sample						
Total gap	**-0.347**	-0.221	-0.243	-0.253	**-0.279**	-0.221
	(0.009)	(0.005)	(0.006)	(0.005)	(0.005)	(0.019)
Field of degree	**-0.027**	**0.028**	**-0.019**	-0.056	-0.087	-0.097
	(0.015)	(0.007)	(0.009)	(0.007)	(0.008)	(0.027)
Occupation	-0.119	-0.080	-0.068	-0.060	-0.075	-0.102
	(0.016)	(0.007)	(0.010)	(0.007)	(0.008)	(0.027)
Labor supply	**-0.105**	**-0.081**	**-0.079**	**-0.061**	**-0.053**	-0.005
	(0.014)	(0.006)	(0.008)	(0.006)	(0.007)	(0.023)
Residual	**-0.097**	**-0.088**	**-0.077**	**-0.076**	**-0.064**	-0.017
	(0.008)	(0.003)	(0.005)	(0.004)	(0.004)	(0.013)
N	46,000	168,000	81,500	135,000	118,000	11,000

Source: PSEO transcript records linked to the 2005-2019 ACS and the 2004 Barron's Guide.
Note: Ordinary least squares models with robust standard errors appearing below coefficient estimates in parentheses. **Bold** point estimates are significantly different from the estimate for Most Selective bachelor's graduates at the 10 percent level or less.

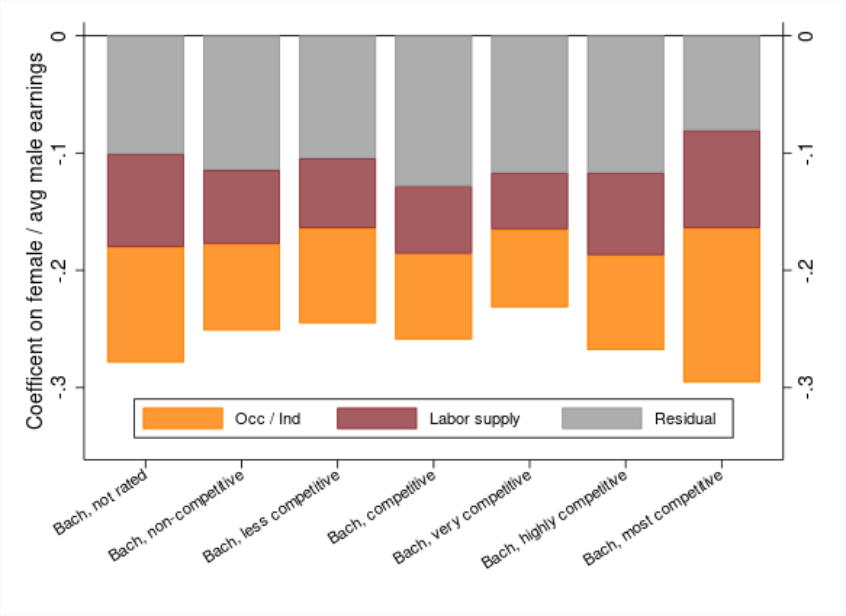
TABLE 3. GENDER PAY GAP DECOMPOSITIONS BY PARENTAL STATUS

	Certificate Grads			*Top Bachelor Grads*		
	With Children	Without Children	Difference	With Children	Without Children	Difference
Panel A. Total Earnings						
Total gap	-0.441	-0.109	**-0.332**	-0.530	-0.199	**-0.331**
	(0.019)	(0.028)	(0.034)	(0.018)	(0.014)	(0.023)
Field of degree	-0.025	-0.007	-0.018	-0.052	-0.059	0.007
	(0.032)	(0.044)	(0.054)	(0.027)	(0.021)	(0.034)
Occupation	-0.115	-0.089	-0.026	-0.163	-0.061	**-0.102**
	(0.038)	(0.048)	(0.061)	(0.028)	(0.021)	(0.035)
Labor supply	-0.125	-0.020	**-0.105**	-0.183	-0.014	**-0.169**
	(0.039)	(0.048)	(0.062)	(0.029)	(0.020)	(0.035)
Residual	-0.176	0.007	**-0.183**	-0.132	-0.065	**-0.067**
	(0.027)	(0.033)	(0.043)	(0.020)	(0.014)	(0.024)
N	6,000	4,400		7,200	13,100	
Panel B. Log Wage and Salary Earnings						
Total gap	-0.580	-0.162	**-0.418**	-0.645	-0.167	**-0.478**
	(0.024)	(0.029)	(0.038)	(0.024)	(0.015)	(0.028)
Field of degree	-0.041	-0.005	-0.036	-0.084	-0.074	-0.010
	(0.042)	(0.045)	(0.062)	(0.036)	(0.022)	(0.042)
Occupation	-0.119	-0.086	-0.033	-0.188	-0.063	**-0.125**
	(0.050)	(0.050)	(0.071)	(0.036)	(0.022)	(0.042)
Labor supply	-0.206	-0.041	**-0.165**	-0.253	-0.008	**-0.245**
	(0.045)	(0.045)	(0.064)	(0.032)	(0.019)	(0.037)
Residual	-0.214	-0.030	**-0.184**	-0.120	-0.022	**-0.098**
	(0.026)	(0.027)	(0.037)	(0.019)	(0.012)	(0.022)
N	5,100	3,900		6,200	12,400	

Source: PSEO transcript records linked to the 2005-2019 ACS, the 2004 Barron's Guide, and the Census Household Composition Key (CHCK). CHCK sample restriction described in Section I.B.

Note: "Top Bachelor" refers to graduates from Most Competitive or Highly Competitive institutions, as rated by Barron's. Ordinary least squares models with robust standard errors appearing below coefficient estimates in parentheses. Estimates in **bold** denote statistically significant effects of children on the gender pay gap or its associated component at the 10 percent level or less.

Panel A. Total Earnings



Panel B. Log Wage and Salary Earnings

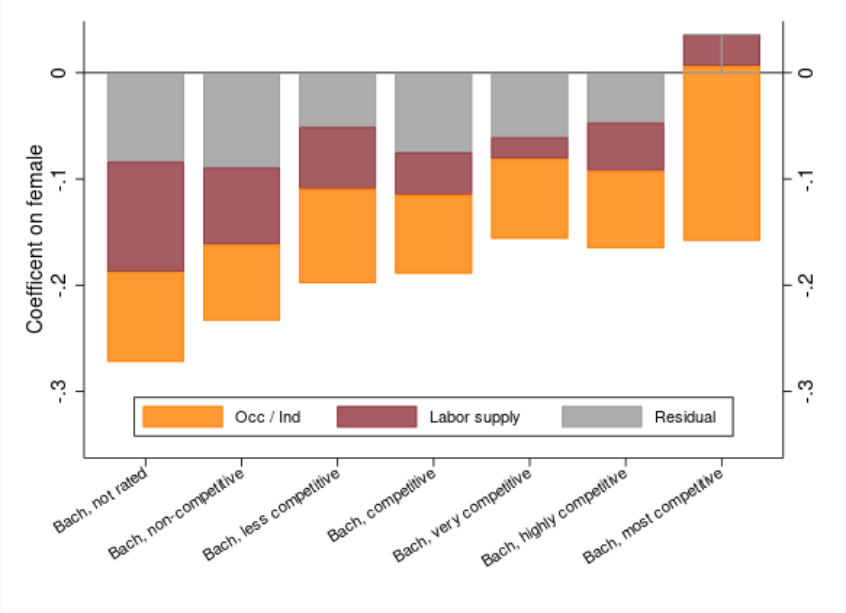


FIGURE 2. GENDER PAY GAP DECOMPOSITIONS FOR BUSINESS MAJORS BY DEGREE LEVEL

Source: PSEO transcript records linked to the 2005-2019 ACS and the 2004 Barron's Guide.
Note: See Section I.A for sample information. Sample restricted to Business and Economics graduates. "Bach" refers to bachelor's degree. See notes to Figure 1 for further information on the bar graphs.

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