Explaining the Sexual Orientation Gap in Educational Attainment

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November 19, 2018

Abstract

This paper uses data from three nationally representative US surveys to confirm previous findings that lesbians and gay men are more educated than heterosexual men and women and to assesses the plausibility of five potential explanations for this difference: highly educated lesbians and gay men are more likely to "come out"; sexual minorities differ demographically, earn higher wage returns to education, or have different expectations about their future partners' income; and education is a gateway to more tolerant workplaces. The only explanation that is supported for both lesbians and gay men highlights a non-pecuniary return to schooling: access to more tolerant workplaces.

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1 Introduction

Education is a key determinant of social and economic status, and differences in educational attainment across demographic groups may improve or depress the relative well-being of minority groups. In this paper, we use three nationally representative datasets to study the educational attainment of a large minority group in the US, lesbians and gay men. Descriptive statistics in the literature on the socio-economics of sexual orientation have often shown that the average lesbian and gay man has more education than the average heterosexual woman and man. This is the first paper to explore the reasons why there is a sexual orientation education gap.

There are several reasons to study the educational attainment of lesbian and gay (LG) people and ask why it may differ from heterosexuals.[1] First, the LG community is a growing subset of the US population (Gallup Poll, 2017), and as with any group with particular social and economic circumstances, it is important to understand how its members experience the economy and society. Second, LG people may be an interesting reference point to see the direction in which the broader population (heterosexuals) is developing in terms of economic behavior. Different-sex couples exhibit patterns on a household division of labor which have become increasingly similar to those of same-sex couples over time (Giddings et al., 2014), and the concept of a "double income no kids" model of family economic life, in which both partners work for pay and reproduction is put off until later in life – as much as this is a standing myth for the broader lesbian and gay population (Badgett, 2001) – is taken up by ever more different-sex couples (Ruggles, 2015; Trimarchi and Bavel, forthcoming).

It is also interesting to study LG education because the educational decisions made by this group may be able to tell us something about educational investments in general. We look for evidence consistent with several hypotheses to explain the sexual orientation education gap, including two based on long-standing mainstream theories of educational investments. The five potential explanations for the educational gap are based on different strands of literature and reasoning. Exploring decisions regarding the investment in education in this multi-pronged way can give important insight into the value that various groups put on obtaining education.

In particular, we assess the extent to which each of the following five issues can help explain the sexual orientation education gap, in the interest of ruling out implausible hypotheses and laying a foundation for future research focused on the most plausible hypotheses. First, we test whether the higher levels of educational attainment for lesbians and gay men are due to selection bias in who "comes out," that is, who reveals their sexual orientation, on survey data. If more highly educated LG people are more likely to come out, perhaps because they are in a more economically and socially secure position to do so, then the gaps we observe are capturing an artifact of a select group, not representative of the entire LG

[1] As we discuss in section 3 below, sexual orientation is a complex concept, and our empirical measures may be both over- and under-inclusive with respect to the lesbian and gay population. For ease of exposition, however, we use the terms "lesbian" and "gay" and the abbreviation "LG" throughout the paper.

population. Second, we assess whether the differences in educational attainment by sexual orientation are driven by differing demographic characteristics across the LG and heterosexual populations. If LG people are younger, for example, and younger birth cohorts are more highly educated, then the sexual orientation education gap could be driven by this fact.

The next two hypotheses are standard in the literature on human capital accumulation. Our third test examines if LG people invest more in their education because they have higher wage returns to their education than heterosexuals. If LG people were paid more for an additional degree or for more years of schooling (perhaps because extra schooling serves as a barrier to wage discrimination for LG people), then it would be no wonder than LG people make higher investments in their education. Fourth, LG people may make their education decisions based on expectations of later household earnings and a household division of labor. Lesbians, knowing that they will partner with a woman and that women earn less than men, may choose to get more education to protect against this lower future household income. Gay men, who will partner with another men, may choose to get less education, knowing that their partner will likely earn more than a female partner would.

Finally, our fifth hypothesis considers the possibility that the returns to education do not only take the form of pecuniary rewards, but that education may also open doors to jobs in workplaces which are more tolerant and accepting of sexual minorities. If more educated people have access to jobs in workplaces with more tolerant co-workers, then LG people would have an incentive to invest more in their education. Especially for sexual minority groups who face discrimination and even the threat of violence (Badgett et al., 2007), access to jobs in which one's colleagues are more likely to be accepting of difference can be very much worth more years in school.[2]

The paper proceeds as follows. In section 2, we discuss previous literature which has examined the educational attainment of LG people and explore the theory behind our five hypotheses. Section 3 describes the data and methods used to test our five hypotheses, and includes an initial test of the existence of a sexual orientation education gap in the datasets employed. Section 4 presents the empirical explorations of our five hypotheses. Finally, we discuss the results and conclude in section 5.

2 Background

Most empirical studies on the economics of sexual orientation have identified an education premium for lesbians and gay men (e.g. Black et al., 2000, 2007; Antecol et al., 2008; Daneshvary et al., 2009; Giddings et al., 2014, among others). However, none of the papers in this literature have explicitly studied potential explanations for *why* LG people are more highly educated than heterosexuals. Some papers make arguments that are somewhat related, though, and these can help make sense of the LG education

[2] A related finding in the literature is that gay men are more likely than heterosexual men to report having had a faculty member or administrator while in college with whom they could discuss a problem (Carpenter, 2009). In this case, higher education institutions could also provide more tolerant environments.

premium. Daneshvary et al. (2009, pp. 433-3), for example, say that "at least part of the lesbian [wage] premium originates from lesbians' relative freedom from constraints associated with marriage and the gender division of labor in traditional households." This "freedom from constraints" could also mean that lesbians have more time to pursue an education. Moreover, Black et al. (2003) theorize that lesbians are less likely to form traditional households than heterosexual women. Heterosexual women are thus more likely to anticipate specializing in household production and therefore invest less in market-oriented skills. This could be a reason why lesbians are more highly educated than heterosexual women, as we discuss below.

In this paper, we look for evidence consistent with five potential explanations of the sexual orientation education premium. The first addresses the possibility that the LG education premium we observe in survey data is simply an artifact of who we can observe in the data. If gay and lesbian people with higher education are more likely to come out, then the education premium we observe only exists because a select group of highly-educated LG people appear in the surveys. This selection bias might occur, for example, if the gain in economic security that education often provides (as in Card, 1999) enables highly educated lesbians and gay men to feel more comfortable coming out. All studies of the socioeconomics of sexual orientation face the possibility of biased samples; we follow the test proposed by Black et al. (2000) to examine if this bias is driving the sexual orientation education gap.

A second possible explanation of the sexual orientation education premium is that LG people have demographic characteristics associated with higher education, and these differences drive the education gap. As an example, people in more recent birth cohorts have higher levels of completed education, on average, than people in earlier birth cohorts (see, for example, figure 2 in Ryan and Bauman, 2016). If lesbians and gay men are disproportionately concentrated in more recent birth cohorts, then their educational advantage may reflect intertemporal change rather than intergroup differences. There are also important differences in educational attainment by family background. People with more highly educated parents tend to get more education themselves (Haveman and Wolfe, 1995). Blacks and Hispanics complete fewer years of schooling, on average, than whites and Asians and are less likely to have a college degree (Ryan and Bauman, 2016), and people from southern states face similar disparities relative to people from northern states (National Information Center for Higher Education Policy Making and Analysis, 2013). If LG people are more concentrated in higher-education groups, then the LG educational premium is related to these characteristics, instead of some mechanism that connects sexual orientation with investments in education directly.

Third, we consider the insights of human capital theory, which says that people pursue education because it yields pecuniary returns in the labor market; we call this the "schooling-raises-wages" theory. According to this theory, educational attainment may differ across demographic groups because the wage returns to education differ. Research on the gender gap in college attainment, for example, has found

that a substantial proportion of women's advantage in educational attainment is explained by the fact that women earn a larger wage premium for college than men (Jacob, 2002).

Lesbians and gay men might earn higher wage returns to schooling than heterosexual women and men for two reasons. First, education helps sexual minorities avoid labor-market discrimination. If discrimination against lesbians and gay men is attenuated in jobs requiring higher levels of education, then any wage penalty sexual minorities experience will be lower in those jobs. Consistent with this possibility, Antecol et al. (2008) show that the relatively high human capital investments of lesbians and gay men are an important minimizing force in sexual orientation wage discrimination.

A second reason why lesbians and gay men may earn higher wage returns to schooling is that they have different characteristics than heterosexuals, such as the presence of children or labor force attachment. Fewer lesbian- and gay-headed households have children, and employers may have lower expectations that a lesbian or gay employee will be or become parents. Lesbians are also more attached to the labor force than heterosexual women (Antecol and Steinberger, 2013), though the evidence on the labor force attachment of gay men compared to heterosexual men is mixed (Black et al., 2007; Orrefice, 2011). Greater labor supply and a lower likelihood of having children means that gays and lesbians could be paid more than heterosexuals for the same investments into education.

A fourth potential explanation for the higher educational attainment of LG people relies on the thinking on household specialization from human capital models. In particular, the labor-market returns to education depend on time spent in the labor market, which depends, in turn, on household roles. Men are more likely to be the higher earner in heterosexual households (though this gap has been closing (Bertrand et al., 2015)) and women more often take on the care- and housework responsibilities (Horne et al., Forthcoming). As there is also a division of labor in same-sex couple households (Giddings et al., 2014), we may expect people to make decisions about their human capital investments based on expectations about a later division of labor and household income.

At the age when young people make decisions about their education – whether to finish high school, for example, or whether to attend vocational school or college – many expect to form a household with a spouse or partner with whom they will divide responsibilities for paid market work and unpaid household and childcare work. Young people who expect to form a household with a high-wage partner may plan to spend less time in the labor market themselves and, consequently, face weaker incentives to invest in education that increases their own wage (Becker, 1991). Within this framework, we would expect lesbians to obtain more education than heterosexual women because they expect to form a household with a woman rather than a man and recognize that women earn lower wages, on average. By the same reasoning, we would expect gay men to obtain less education than heterosexual men because they could expect to form a household with a man rather a woman and recognize that men earn higher wages (Black et al., 2003, 2007).

Finally, we consider the possibility that the LG education premium is driven by other incentives that LG people have to invest in their education. In particular, LG people may pursue more education because education may serve as a gateway to jobs in workplaces with more tolerant co-workers. Workplaces in which employees are more highly educated, on average, may be more tolerant of minority groups, including lesbians and gay men. This potential access to more tolerant workplaces can be thought of as a non-pecuniary return to education; it is a protection from discrimination, as in the theory of schooling-raises-wages, but more from a social rather than economic point of view. The tolerance of one's coworkers is an important workplace amenity for which lesbians and gay men may be willing to get more education to access. Blandford (2003), for example, suggests that some "low skill" (in the sense of not needing formal education) jobs are "macho," and that macho occupations may be less gay-friendly.

To be sure, this paper is certainly not the first to consider the possibility that pecuniary labor market returns are not the only benefit of more education. Michael (1973) started the literature on the non-material returns to human capital investments with a landmark paper modeling the returns to human capital (seen not just as education, but also as good health, knowledge about markets, and so on). These investments, he shows, affect an individual's activities beyond the labor market, such as in his or her voting behavior. More recent literature has continued to follow this thinking. Oreopoulos and Salvanes (2011), for example, show that education increases job satisfaction, improves health, increases family stability, and has consumption value. DiPrete and Bauchmann (2006) and Chiappori et al. (2009) argue that there are important returns to investments in education, especially for women, on the marriage market, such as an increased ability to attract a high-earning partner and/or increases bargaining power in marriage. This paper follows in this spirit of understanding the multitudinous returns to educational attainment, and uses these various dimensions of rewards to education in looking for an explanation of the sexual orientation education premium.

3 Data

Sexual orientation is a complex concept, and employing appropriate data to analyze the circumstances faces by sexual minorities is not a straightforward task. One can understand sexual orientation as comprising three dimensions that do not always overlap: sexual attraction, sexual behavior, and self-proclaimed identity (Laumann et al., 1994). We examine the relationship between sexual orientation and educational attainment using three nationally representative datasets that capture this complexity; each measures sexual orientation in a different way. The three datasets are the 2013-14 samples of the Integrated Health Interview Series (IHIS) from the Integrated Public Use Microdata Series (IPUMS) (Minnesota Population Center and State Health Access Data Assistance Center, 2015), the 2013 sample of the American Community Survey (ACS) from IPUMS (Ruggles et al., 2015), and the 1988-2014

samples from the General Social Survey (GSS). This section describes these data in more detail.

First, the ACS is the largest of our three datasets. The data come from an annual survey conducted by the United States Census Bureau. We use ACS data from 2013 for this analysis. As there are no questions about sexual orientation in the ACS, we identify lesbians and gay men based on the cohabiting relationships within a household. More specifically, if a householder identifies another person of the same sex as their spouse or unmarried partner, we consider these people to be in a same-sex couple and thus lesbian or gay. Because of problems which may exist in the recording of responses on sex or marital status, we drop any couple in which one or both partners have an allocation flag – meaning that the Census Bureau changed the entered response because they had reason to believe that the data entered were not of high enough quality to accept (an unclear mark, for example) – for either sex or marital status. For comparability, we restrict our sample of heterosexual men and women to members of married or cohabiting different-sex couples. Our analysis sample includes 319,125 partnered heterosexual men, 336,094 partnered heterosexual women, 4,348 partnered gay men, and 4,515 partnered lesbians.

Education in the ACS is given in terms of the highest year of school completed if a person did not finish high school and in terms of the highest degree earned if the person is a high school graduate. For the sections of our analysis which investigate years of schooling, we use the data on the highest degree received to create a variable which gives the minimum number of years necessary to complete the degree. Our measure of race includes four categories: black, white, Asian, and other race. Our ethnicity measure is a dummy variable indicating whether or not the person identified as Hispanic.

Our second data source is the 2013-14 samples of the IHIS. The IHIS contains a direct measure of sexual orientation, and we classify people as lesbian or gay if they self-identify as such.[3] Respondents in the IHIS were asked to choose their sexual orientation "identity" from a list of four options ("lesbian or gay," "straight, that is, not lesbian or gay," "bisexual," or "something else," with additional options for "I don't know the answer" or a refusal to answer). Our analysis sample includes 12,390 heterosexual men, 14,842 heterosexual women, 347 gay men, and 288 lesbians.

Education in the IHIS is measured as the highest grade or degree achieved (e.g., "12th grade, no diploma" or "high school graduate"). To calculate years of education, we use the minimum number of years necessary to complete the level of schooling indicated. Our measure of race includes four categories: black, white, Asian, and other race. Our ethnicity measure is a dummy variable indicating whether or not the person identified as Hispanic.

Our third data source is the GSS. The sexual orientation measure in the GSS comes from a question about sexual behavior, which asks the respondent to say how many male and female sexual partners

[3]The IHIS measure distinguishes between lesbian or gay identification and bisexual identification. Previous research on sexual minorities has found that the economic behavior and outcomes of the bisexual population differ in important ways from those of the lesbian and gay population, and preliminary analysis of the IHIS data suggested a similar pattern with respect to education. Unfortunately, the IHIS samples of bisexual men and women are too small to permit separate statistical analysis of these groups, so we exclude men and women who identify as bisexual from our analysis sample.

they had in the last year. There are also behavioral questions that ask about sexual activity in the last five years and since age 18; we choose to use the "in the last year" measure for two reasons. First, one's behavior in the last year could have more impact on their economic circumstances than something they did *at some point* since they were 18, or even in the last five years. Second, the sample size of people who have had only same-sex sex in the last year is larger than that of people who had only same-sex sex in the last five years or since age 18. Our analysis sample includes 4,766 heterosexual men, 6,054 heterosexual women, 204 gay men, and 150 lesbians.

Education in the GSS is measured via a variable for years of schooling, top-coded at 20 years, and a variable for the highest degree earned. The GSS race variable contains three categories: black, white, and other race. We do not include a measure of ethnicity in our GSS analysis because the measure of Hispanic identification is not available before 2000.

In each of these three main datasets, we focus on the experiences of people born between 1955-1985 and who were born in the US (IHIS and ACS) or who lived in the US at age 16 (GSS). Because we are interested in completed education, we further restrict our estimation samples to people who were at least 25 years old in the year they were interviewed. Throughout the paper, we use sampling weights to obtain nationally representative estimates. We also adjust our IHIS estimates for the stratification and clustering of the IHIS sample. Finally, because the GSS sample contains proportionally more people from earlier birth cohorts than the IHIS and ACS samples, we reweight the GSS data to make the weighted distribution of birth cohorts comparable across datasets.[4]

Along with these three main datasets, for some parts of the empirical analysis below, we use data from from the 1978-2003 CPS Annual Social and Economic Supplement (CPS-ASEC), supplemented with data from the 1970 and 1980 United States Decennial Censuses (because the CPS data are not available for all states in all years prior to 1978) to construct estimates of state-year gender wage ratios and state-year proportions of residents with college degrees. Specifically, we use data from the 1970 and 1980 Censuses and estimate values of each variable for the years 1973-77 by linear interpolation. We compute the gender wage ratio as the median female wage divided by the median male wage. The wage measure is annual wage and salary earnings in the year before the survey divided by the product of weeks worked and usual hours worked per week. Our estimation sample for each state-year gender wage ratio is workers age 25 to 55, excluding the self-employed, unpaid family workers and workers with wages less than 3 or greater then 300 in 2000 dollars. We use the person weights from the Census and the CPS-ASEC to obtain nationally representative estimates.

Table 1 presents the mean years of schooling and the proportion of people with a bachelor's degree or more, by sex and sexual orientation, in each of the three main datasets. The results in the table largely

[4]We multiply the GSS sampling weights by a reweighting factor computed as follows: for each birth year between 1955 and 1985, we compute the proportions of the ACS and GSS samples born in that year, and we divide the ACS proportion by the GSS proportion. We normalize the resulting ratios to sum to one over all birth years by dividing the ratio for each birth year by the sum of the ratios.

confirm the findings in previous studies: LG people have higher educational attainment than their same-sex heterosexual peers. In the IHIS, where sexual orientation is measured by self identification, and in the ACS, where it is measured by partnership, lesbians complete more than half of a year more schooling and are 10 percentage points more likely to have a bachelor's degree than heterosexual women. Even more strikingly, gay men complete more than three quarters of a year more schooling and are between 12 and 16 percentage points more likely to have a bachelor's degree than heterosexual men. In the GSS, however, where sexual orientation is measured by sexual behavior, the comparisons in table 1 are mixed. The results for men in the GSS sample are similar but slightly attenuated compared with the results for men in the IHIS and ACS samples. The results for women, however, are different: unlike in the IHIS and ACS samples, lesbians and heterosexual women in the GSS sample have substantively comparable and statistically indistinguishable levels of education.

[Table 1 about here]

The finding that the sexual orientation education gap is larger in the ACS and IHIS data than the GSS data is important. It suggests that the educational advantage of lesbians and gay men is related to elements of sexual orientation that are relatively persistent or public: identity (IHIS) and family structure (ACS). Adopting an LG identity, especially when young, may influence expectations about work and family and corresponding investments in household- and market-oriented human capital. Adopting an LG identity may also encourage openness about same-sex attractions and behavior. Similarly, establishing a household with a same-sex spouse or partner is a non-trivial commitment that may influence time spent in household and market work and signal one's minority sexual orientation to others. The sex of one's sexual partners in the last year (GSS) may be less closely tied to economic behavior and less consequential for economic outcomes.[5]

In the next section, we turn to the tests of our hypotheses to explain the sexual orientation education gap.

4 Results

4.1 Hypothesis 1: More highly educated LG people are more likely to come out on a survey

We begin by testing our first hypothesis regarding why we observe a sexual orientation education gap, namely, that more highly educated LG people are simply more likely to reveal their sexual orientation on a survey. If highly educated sexual minorities are more willing than their less-educated peers to disclose that they identify as lesbian or gay, share a household with a same-sex spouse or partner, or have had

[5]Modifying the measure of sexual orientation to reflect sexual behavior over the last five years, instead of just in the last year, does not substantively alter the results.

same-sex sexual partners, then the lesbian and gay educational advantage we observe may be inflated or spurious.

Following Black et al. (2000), we test for the possibility that more highly educated LG people come out on surveys by examining the relationship between revealed sexual orientation and parental education. The literature on intergenerational mobility shows that the educational attainment of a person's parents is the strongest predictor of the person's own educational attainment (Haveman and Wolfe, 1995). Given the strong relationship between parental and descendant education, if there were selection of more highly educated LG people coming out on a surveys, then we would expect parental education to predict measured sexual orientation. In other words, under the hypothesis that highly educated lesbians and gay men are more willing to disclose their sexual orientation, highly educated parents would be more likely to have their LG children identified as LG in a survey. In this case, we would expect to observe a positive relationship between parental education and measured LG orientation.

We test the null hypothesis that there is no relationship between level of education and coming out on a survey, with its implication of no relationship between parental education and measured sexual orientation, using data from the GSS. While it would be ideal to use data from all three of our surveys, the ACS and IHIS do not ask adults about the educational attainment of their non-cohabiting parents, nor do they contain measures of other background characteristics, such as parental income and wealth, which are similarly strong predictors of educational attainment (Bowles and Gintis, 2002; Rumberger, 2010). An argument against using the GSS data for this analysis is that the GSS is the only dataset which does not show an educational advantage for lesbians. The GSS does show an educational advantage for gay men in terms of years of schooling, however, and there is reason to believe that any selection bias would be stronger for gay men than lesbians. The Pew Research Center (2013) shows that LGBT people themselves perceive greater acceptance of lesbians than gay men.[6] In light of these perceptions, it is likely gay men who would be more hesitant to come out on a survey. Thus, if the analysis does not show selection bias for gay men, we think there is likely less concern for selection bias for lesbians.

To determine whether parental education predicts measured sexual orientation, we estimate a series of logistic regressions, separately by gender. In each regression, the dependent variable is an indicator for lesbian or gay orientation and the independent variable of interest is a measure of parental education: mother's years of schooling, father's years of schooling, an indicator for having a college-educated mother, and an indicator for having a college-educated father. All of the regressions include controls for age, race, year of birth, and region and population density of location at age 16.

Table 2 shows the results of these regressions. For both men and women, the coefficients on the parental education variables have a mix of positive and negative signs, and in no case is the estimated

[6]For example, the study reports that "one-in-four respondents say there is a lot of social acceptance of lesbians, while just 15% say the same about gay men. Similarly, there is more perceived acceptance of bisexual women (33% a lot) than of bisexual men (8%)."

effect of parental education on the probability of appearing as lesbian or gay statistically significant at the 5-percent level. Based on these results, we cannot reject the null hypothesis that parental education is unrelated to measured sexual orientation. We thus conclude that the data do not present strong evidence that more highly educated LG people are more likely to come out on a survey. Thus, our first hypothesis that more highly educated LG people are more likely to come out on a survey cannot explain why we observe a sexual orientation education gap.

[Table 2 about here]

4.2 Hypothesis 2: LG people have higher education because of other characteristics, not because of sexual orientation

We therefore turn to our second hypothesis, namely that the sexual orientation education gap is driven by differing characteristics between LG and heterosexual people. In this case, the question is if lesbians and gay men get more education than heterosexuals not because their sexual orientation affects educational investments, but instead because sexual orientation is correlated with demographic characteristics that affect educational investments.

To test this hypothesis, we estimate a logistic regression for men and women using each of our three datasets, where the probability of having a bachelor's degree or more depends on sexual orientation and a set of demographic characteristics: age and race (IHIS, ACS, and GSS), ethnicity (IHIS and ACS), birth state (ACS), region and population density of location at age 16 (GSS), and parental education (GSS). Table 3 presents results from these regressions. Taken together, the estimates indicate that demographic characteristics account for little to none of the lesbian and gay educational advantage. The estimated effect of being lesbian or gay on educational attainment decreases slightly with the addition of demographic control variables in some samples but increases sightly in others. In the IHIS and ACS, the magnitude of these changes is substantively small relative to the magnitude of the underlying effects. In the GSS, surprisingly, controlling for demographic characteristics increases rather than decreases the estimated effect of being gay on the probability of obtaining a bachelor's degree, but slightly lowers it for lesbians.

[Table 3 about here]

Thus, neither the first nor the the second of our five possible explanations of the sexual orientation education premium have much explanatory power. The next two possible explanations have their theoretical roots in human capital theory, the standard economic approach to understanding investments in education.

4.3 Hypothesis 3: LG people have higher education because they get higher wage returns to their schooling

We test the "schooling-raises-wages" theory as it applies to understanding the lesbian and gay educational premia by examining whether there are differences in the returns to more years of schooling and to obtaining a bachelor's degree by sexual orientation. Specifically, we use data from the ACS to estimate OLS regressions of the log hourly wage on an indicator variable for being lesbian or gay, a measure of education (years of schooling or an indicator variable for having a bachelor's degree or more), and an interaction between sexual orientation and education, controlling for race, ethnicity, and age. Table 4 shows the results of these regressions.

[Table 4 about here]

As is standard in the literature on the wage effects of sexual orientation, we find that gay men face a wage penalty while lesbians face a wage premium, as indicated by the negative coefficient on the gay indicator variable for men and the positive coefficient on the lesbian indicator variable for women (see Klawitter, 2014, for a meta-analysis of the sexual orientation wage gap literature). Both men and women receive a wage boost of over 50 percent for having a bachelor's degree and a boost of approximately 11 percent for each additional year of schooling. In this sense, the standard idea that schooling raises wages is confirmed. However, the last two rows of the table show that more education – be it extra years of schooling or the attainment of a bachelor's degree – does not benefit lesbians or gay men any more than heterosexuals. The coefficients on the interactions between the LG indicator variables and the measures of educational attainment are small and not statistically significant. Thus, the schooling-raises-wages hypothesis does not seem to explain the higher educational attainment of sexual minorities.

4.4 Hypothesis 4: LG people have higher education because of their expectations regarding household specialization

We thus turn to our fourth potential explanation of the sexual orientation education premium, namely, that people's investments in education depend on their expectations of household specialization. As noted above, one prediction of this theory is that young men and women invest more in their education when they expect their future partner to earn less. In the case of sexual orientation, compared to heterosexuals of the same gender, we would expect lesbians to invest more in their own education, because their female partner will earn less than a male partner would, and we would expect gay men to invest less in their own education, because a male partner earns more than a female partner would.

We test this prediction using data from the ACS. Of course, we cannot directly observe the effect of being lesbian or gay on the expectations of young women and men about the earnings of their future partner. Instead, we use the gender wage ratio (median female earnings divided by median male earnings)

as a proxy for these effects. Specifically, we use the gender wage ratio in a person's birth state when s/he was 18 as a proxy for the effect of expecting to partner with a woman versus a man. We expect that, where the gender wage ratio is higher (where women earn more relative to men), lesbians will expect their partner to earn more relative to the partner of a heterosexual woman. Consequently, we expect that lesbians who lived in states with higher gender wage ratios when they were 18 will invest less in their education relative to heterosexual women. By parallel reasoning, we expect that gay men who lived in states with higher gender wage ratios will invest more in their education relative to heterosexual men.

The first two columns of table 5 show coefficients from OLS regressions of years of schooling on a lesbian or gay indicator variable, gender wage ratio in birth state at age 18, and their interaction. The regressions include controls for race and ethnicity and fixed effects for birth state and year when 18. Because the gender wage ratio may be positively correlated with tolerant attitudes towards sexual minorities, which may themselves be correlated with the educational attainment of lesbians and gay men, the regressions also include several measures of tolerance: four measures of the attitudes in a person's birth region when the person was 18, described in detail below; the proportion of residents in the person's birth state when the person was 18 who had a bachelor's degree or more; and the interaction of each of these variables with the lesbian or gay indicator variable. The last two columns of table 5 show average marginal effects from logistic regressions of an indicator variable for having a bachelor's degree or more on the same set of independent variables.

[Table 5 about here]

The results in table 5 are consistent with the theory of household specialization for women. The lesbian educational premium, both in terms of years of schooling and the probability of having a bachelor's degree, is much larger at the 10th percentile of the state-year gender wage-ratio distribution, where women earn less relative to men, than at the 90th percentile, where women earn more. Indeed, at the 90th percentile of the state-year gender wage-ratio distribution, the educational attainments of lesbians and heterosexual women are statistically indistinguishable. This finding suggests that the lesbian educational premium might fade if the wages of women approached those of men.

Perhaps not surprisingly, given that the fact that gay men are more educated than heterosexual men contradicts our expectations based on the theory of anticipatory household specialization (that gay men will be less educated because they expect their partner to earn more), the results in table 5 are weaker for men than for women. Consistent with theoretical expectations, the point estimates suggest that the educational attainment of gay men relative to heterosexual men increases slightly with the gender wage ratio. These increases, however, are not statistically or substantively significant. Taken together, the results in table 5 suggest that the educational premium of gay men is neither caused nor substantially offset by household specialization in the context of gender wage inequality. Thus, our fourth hypothesis that the sexual orientation education gap may be explained by the theory of household specialization

did indeed hold for women, but not for men.

None of the first four potential explanations could explain the education premium for gay men, and only one could be shown to be related to the education premium for lesbians. We therefore now consider a fifth alternative: that LG people pursue more education in an effort to gain access to a job in more welcoming, tolerant workplaces.

4.5 Hypothesis 5: LG people have higher education because education serves as a gateway to more tolerant workplaces

To test this hypothesis, we estimate the effect of education on workplace tolerance. In approximately half of the calendar years (and most survey years) since 1973, the GSS has asked four questions designed to measure attitudes toward sexual minorities. We operationalize workplace tolerance as the proportion of workers in a person's industry of employment who responded positively to four questions about the participation of gay men in society and the morality of same-sex sex. More specifically, three of these questions on tolerance ask about "a man who admits he is a homosexual":

> Suppose this admitted homosexual wanted to make a speech in your community. Should he be allowed to speak, or not?
>
> Should such a person be allowed to teach in a college or university, or not?
>
> If some people in your community suggested that a book he wrote in favor of homosexuality should be taken out of your public library, would you favor removing this book, or not?

A fourth question asks about the morality of same-sex sex:

> What about sexual relations between two adults of the same sex – do you think it is always wrong, almost always wrong, wrong only sometimes, or not wrong at all?

We use responses to these questions to construct four binary measures of tolerance: whether the respondent believed a gay man should be allowed to make a speech, whether the respondent believed a gay man should be allowed to teach, whether the respondent believed a book in favor of homosexuality should be allowed in the public library, and whether the respondent believed same-sex sex is not wrong at all.

Our measures of industry tolerance toward sexual minorities are similar to our measures of region-year tolerance used in table 5 above. For each of the binary measures of tolerance described above, we compute the proportion of respondents in each industry who expressed a tolerant attitude. The industry classification scheme in the GSS has changed over time. From 1972 to 1987, industries were classified using the 1970 Standard Industrial Classification (SIC) codes; from 1988 to 2010, they were classified using the 1980 SIC codes. Within each of these periods, we assign respondents to their detailed SIC code (industry group) if the code contains at least 30 observations and to their general SIC code

(division) if their detailed code contains fewer than 30 observations. Our estimation sample for the measures of industry tolerance includes men and women who might reasonably represent the co-workers of the lesbians and gay men in the 1955-85 birth cohorts: workers who were interviewed between 1977 and 2010, when members of the 1955-85 birth cohorts (although not all cohorts in all years) were in the prime working age range of 22 to 64.

We focus on industries rather than occupations because we are interested in the attitudes of the co-workers with whom a person interacts regularly. Occupations are defined by the activities of the worker, and many workplaces comprise workers performing a wide variety of tasks, so co-workers in the same company often have different occupations. In contrast, industries are defined by the activities of the employer, so co-workers are likely to be employed in the same industry. Co-workers in an office can have very different occupations but will work in the same industry. Since we are interested in the tolerance of one's co-workers – the people with whom they share a work space – we use the industry-level measure of tolerance.

To determine whether education facilitates entry into tolerant workplaces, we regress each measure of workplace tolerance (the proportion of industry coworkers who express tolerant attitudes toward homosexuals) on an indicator variable for having a bachelor's degree or more, controlling for age, race, and region and year of GSS interview. Because we are interested in workplace tolerance as an incentive for sexual minorities to pursue education, we restrict our estimation sample to lesbians and gay men.

Table 6 shows results from the regressions predicting the level of workplace tolerance experienced by gay and lesbian workers, depending on their level of education. To aid in interpreting the coefficients, the table also presents the average value of each industry-level tolerance measure in the sample used to compute the measure.

[Table 6 about here]

Consistent with the idea that college is a gateway to workplaces with more tolerant coworkers, the relationship between having a bachelor's degree and the tolerance of same-industry workers is positive for all measures of tolerance, both for gay men and for lesbians. In particular, the proportion of same-industry workers who expressed a tolerant attitude toward sexual minorities was between 2.3 and 6.8 percentage points higher for college graduates than non-graduates, with six of eight effects statistically significant at the 5-percent level. By way of reference, the average proportion of same-industry workers who expressed a tolerant attitude was between 38 and 40 percent with respect to the morality of same-sex sex and between 78 and 84 percent with respect to the participation of gay men in public life. The only measure of co-worker tolerance which does not vary regardless of the lesbian or gay man's level of education is the idea that "same-sex sex is not wrong at all." Only 37.6% of lesbians' co-workers and 39.6% of gay men's co-workers agreed with this statement to begin with. Given the low acceptance of same-sex sex "not being wrong at all," it is perhaps not surprising that these attitudes do not vary much

across the education level of LG people in different industries.

We thus find support consistent with our fifth and final hypothesis, the the sexual orientation education premium is in part motivated by a desire of LG people to have access to more tolerant workplaces. An important caveat to this interpretation is that a positive relationship between education and workplace tolerance may arise for many reasons. It is possible, for example, that lesbians and gay men pursue additional education not because they seek tolerant workplaces, but because they seek workplace characteristics that happen to correlate with tolerance. The evidence we have presented is consistent with the idea that tolerant workplaces are a benefit of education for sexual minorities and that social considerations could plausibly play a role in their educational investment decisions, but it does not identify the precise mechanism through with education and tolerance are related.

In sum, our empirical tests have shown that none of the first four possible explanations of the sexual orientation education premium held for men, while one held for women. In contrast, the last hypothesis that LG people invest in higher education in order to access more tolerant workplaces could not be rejected.

5 Discussion and Conclusion

In this paper, we have explored the oft-noted but never thoroughly assessed matter of the sexual orientation education premium. In two of the three national datasets employed in this paper, we found that lesbians and gay men have at least one-half more year of schooling and are 10 percentage points more likely to have a bachelor's degree compared to their same-gender heterosexual counterparts. In the third dataset, the GSS, gay men also have higher education rates, though only the results for years of schooling are statistically significant. In the GSS, there is no statistically significant difference in the educational attainment of lesbians and heterosexual women.

We explored five possible reasons why lesbians and gay men may choose to get more education than heterosexuals. We first assessed whether the sexual orientation education premium is driven by selection bias of more highly educated LG people being more likely to come out on surveys. Second, we considered whether the gap is driven by the fact that LG people have different demographic characteristics than heterosexuals that are also associated with higher education. Next, we tested whether two main theories of educational attainment in economics – that schooling raises wages and that investments in education are relative to expected partner earnings – could explain the higher education of LG people. While the household specialization model could say more about lesbians' educational decisions, neither theory could explain why gay men are more highly educated than straight men.

We thus studied a fifth theory, namely that individuals invest in education to receive not only pecuniary benefits, but also in order to access more social rewards. In this case, we considered more tolerant

and accepting workplaces as a reward to higher education for LG people. Indeed, the empirical analysis showed that more highly educated lesbians and gay men are able to work in more tolerant environments.

The findings suggest that LG people may be concerned not just with discrimination in terms of how it will affect their (individual and household) income, but also with respect to how they will be treated by their colleagues at work. Lesbians and gay men do indeed report being very likely to face discrimination at work, sometimes so much so that it affects their job performance and desire to go to work (Badgett et al., 2007). In order to avoid this discrimination, they may obtain more education in order to access jobs in which they are less likely to face discrimination.

While this paper has assessed five potential explanations of the sexual orientation education gap, others are, of course, possible. For example, LG people may invest more in their education because the partnership rates of LG people are somewhat lower, meaning that LG people will be less likely to depend on a partner's earnings (Carpenter and Gates (2008) finds lower partnership rates for LG people in California and Kurdek (2005) finds evidence that dissolution rates are higher for LG partnerships than heterosexual marriages in the US). Another possibility may be that LG people obtain higher education because they face less social pressure to marry and have children, thus giving them more time to pursue an education (as suggested by Daneshvary et al., 2009). These and other hypotheses are difficult to test with survey data, though.

In being the first to formally explore potential reasons for the observed higher education of lesbians and gay men, this paper opens a conversation to understanding how one's sexual orientation may influence their choices about educational attainment. Future research can pursue this topic considering theories and methodologies from other disciplines, such as interviews with younger and older LG people about why they made the educational choices they did.

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Tables

Table 1: Educational Attainment by Sexual Orientation

		Women		Men	
	Data	Hetero-sexual	Lesbian	Hetero-sexual	Gay
Mean years of schooling	IHIS	13.88	14.59*	13.65	14.43*
		(0.03)	(0.22)	(0.04)	(0.25)
	ACS	14.14	14.76*	13.90	14.83*
		(0.01)	(0.05)	(0.01)	(0.05)
	GSS	13.93	14.00	13.86	14.57*
		(0.04)	(0.24)	(0.05)	(0.26)
Proportion with bachelor's or more	IHIS	0.36	0.46*	0.33	0.45*
		(0.01)	(0.04)	(0.01)	(0.04)
	ACS	0.38	0.48*	0.35	0.51*
		(0.00)	(0.01)	(0.00)	(0.01)
	GSS	0.29	0.24	0.30	0.39
		(0.01)	(0.04)	(0.01)	(0.05)
N	IHIS	14,842	288	12,390	347
	ACS	336,094	4,515	319,125	4,348
	GSS	6,054	150	4,766	204

Notes: Estimates computed using sampling weights for all samples and adjustments for stratification and clustering of IHIS sample. Standard errors in parentheses. *Heterosexual and lesbian/gay means are statistically different within sex, $p < 0.05$.

Table 2: Selection analysis

Measure of parental education	Women	Men
Mother's years of schooling	−0.000	−0.003
	(0.002)	(0.002)
Father's years of schooling	0.000	0.000
	(0.001)	(0.001)
Mother has bachelor's degree	0.006	−0.014
	(0.011)	(0.008)
Father has bachelor's degree	−0.005	−0.008
	(0.007)	(0.008)
N	4,244	3,569

Notes: Table presents average marginal effects from logistic regressions of lesbian or gay indicator variable on specified parental education variable and controls for age, race, year of birth, and region and population density of location at age 16. Estimation sample is GSS sample, excluding people with missing values of parental education. Estimates calculated on weighted survey data. Standard errors in parentheses. No estimate is statistically significant at the 5-percent level.

Table 3: Effect of being lesbian or gay on probability of having bachelor's degree or more, controlling for background characteristics

Regressors	Data	(1)	(2)	(3)	(4)
Gay	IHIS	0.121*	0.119*		
		(0.036)	(0.035)		
		[12,737]	[12,737]		
	ACS	0.161*	0.158*	0.154*	
		(0.009)	(0.009)	(0.009)	
		[323,473]	[323,473]	[323,473]	
	GSS	0.086	0.090	0.098	0.130*
		(0.064)	(0.063)	(0.065)	(0.065)
		[3,569]	[3,569]	[3,569]	[3,569]
Lesbian	IHIS	0.102*	0.104*		
		(0.042)	(0.042)		
		[15,130]	[15,130]		
	ACS	0.094*	0.097*	0.092*	
		(0.009)	(0.009)	(0.009)	
		[340,609]	[340,609]	[340,609]	
	GSS	−0.042	−0.048	−0.063	−0.057
		(0.061)	(0.060)	(0.058)	(0.049)
		[4,244]	[4,244]	[4,244]	[4,244]
Demographics[a]			X	X	X
Location when young[b]				X	X
Parental education[c]					X

Notes: Table presents average marginal effects from logistic regressions of indicator variable for having bachelor's degree or more on lesbian or gay indicator variable and specified control variables. Standard errors in parentheses. Sample sizes in square brackets. GSS estimation sample excludes people with missing values of parental education. *Average marginal effect is statistically significant, $p < 0.05$. [a]Demographic variables are age and race (IHIS, ACS, and GSS), ethnicity (IHIS and ACS), and year of birth (GSS). [b]Location variables are state of birth (ACS) and region and population density of location at age 16 (GSS). [c]Parental education variables are mother's and father's years of schooling and indicators for whether mother and father have bachelor's degree or more (GSS). Estimates computed using sampling weights for all samples and adjustments for stratification and clustering of IHIS sample.

Table 4: Wage effects of education, by sexual orientation

	Women		Men	
Lesbian/gay	0.166*	0.107*	−0.168*	−0.082*
	(0.066)	(0.017)	(0.083)	(0.018)
Years of schooling	0.110*		0.105*	
	(0.001)		(0.001)	
Bachelor's degree		0.514*		0.548*
		(0.003)		(0.003)
Lesbian/gay X Years of schooling	−0.005		0.005	
	(0.004)		(0.006)	
Lesbian/gay X Bachelor's degree		−0.002		0.010
		(0.024)		(0.027)
N	248,118	248,118	275,947	275,947

Notes: Table presents coefficients from OLS regressions. Dependent variable is log wage. All regressions include controls for race, ethnicity, and age. Estimation sample is ACS sample, excluding men and women without wage observations. Estimates calculated on weighted survey data. Standard errors in parentheses. *Coefficient is statistically significant, $p < 0.05$.

Table 5: Average marginal effect of being lesbian or gay on educational attainment, by female/male median wage ratio in birth state at age 18

Percentile of birth state at age 18 in state-year gender wage-ratio distribution	Years of schooling		Probability of bachelor's or more	
	Women	Men	Women	Men
10th percentile	1.016*	0.878*	0.169*	0.144*
	(0.088)	(0.089)	(0.016)	(0.017)
50th percentile	0.643*	0.913*	0.099*	0.154*
	(0.049)	(0.051)	(0.009)	(0.009)
90th percentile	0.156	0.959*	0.008	0.168*
	(0.107)	(0.128)	(0.019)	(0.022)
p (10th = 90th)[a]	0.000	0.000	0.670	0.472
N	340,609	323,473	340,609	323,473

Notes: Table presents coefficients from OLS regressions and average marginal effects from logistic regressions of education measures on lesbian or gay indicator variable, gender wage ratio in birth state at age 18, and their interaction. All regressions include controls for race, ethnicity, measures of tolerance towards sexual minorities in birth region and state at age 18, interaction of sexual orientation with tolerance, and fixed effects for birth state and year when 18. Data are from ACS. Estimates calculated on weighted survey data. Standard errors in parentheses, clustered by combination of birth state and year when 18. *Coefficient or average marginal effect is statistically significant, $p < 0.05$. [a]p-value from test of null hypothesis that average marginal effects at 10th and 90th percentiles are equal.

Table 6: Effect of having bachelor's or more on workplace tolerance

	Wrong[a]	Speak[b]	Book[c]	Teach[d]
Women				
Coefficient	0.025	0.038*	0.064*	0.068*
	(0.031)	(0.015)	(0.022)	(0.017)
Average outcome	0.376	0.877	0.783	0.829
	(0.023)	(0.011)	(0.014)	(0.015)
N	123	123	123	123
Men				
Coefficient	0.023	0.031*	0.041*	0.044*
	(0.029)	(0.012)	(0.015)	(0.014)
Average outcome	0.396	0.872	0.795	0.837
	(0.019)	(0.009)	(0.012)	(0.013)
N	164	164	164	164

Notes: Table reports coefficients from OLS regressions of measures of workplace tolerance on indicator variable for having bachelor's or more. Dependent variable in each model is proportion of workers in person's industry of employment who expressed tolerant attitude toward sexual minorities. All models control for age, race, and region and year of interview. Estimation sample is GSS sample of lesbians and gay men who reported an industry of employment. Standard errors in parentheses, clustered by industry. *Coefficient is statistically significant, $p < 0.05$. [a]Dependent variable is proportion who believe same-sex sex is not wrong at all. [b]Dependent variable is proportion who believe "admitted homosexual" should be allowed to make speech in community. [c]Dependent variable is proportion who would not favor removing book in favor of homosexuality from public library. [d]Dependent variable is proportion who believe "admitted homosexual" should be allowed to teach in a college or university.