

DISCRIMINATION WITH CONCEALABLE CHARACTERISTICS: EVIDENCE AND APPLICATION TO SEXUAL ORIENTATION IN THE UNITED STATES

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PRELIMINARY AND INCOMPLETE - PLEASE DO NOT CITE

ABSTRACT. This paper studies discrimination and sexual orientation in the United States using a “concealable characteristics” framework. I present a basic model to formalize this approach with emphasis on the implications for research designs and measurement procedures. Empirical evidence, using a novel instrument for homosexuality, finds that men who are more likely to develop homosexual attraction and are born in more discriminatory areas are less likely to develop same-sex relationships and more likely to make socially conservative identity investments. Large negative mental health penalties accumulate to these individuals; educational attainment is also negatively impacted. Labor market outcomes, however, are relatively neutral across the spectrum of potential discrimination suggesting that disclosure still comes at a price in the labor market.

1. INTRODUCTION

Discrimination is a topic that has long been of interest to economists. From Becker [1957], delineating the theoretical foundations of discrimination, to recent empirical work measuring the magnitude and persistence of discrimination in the United States (see Goldin and Rouse [2000], Bertrand and Mullainathan [2004], Charles and Guryan [2008]), this area continues to be a central topic of research. Research in this tradition has focused on immutable traits such as race, ethnic origin, sex and age. In addition to being static attributes, these characteristics are distinguished by the fact that they are publicly observable.

In contrast to existing research, I propose studying discrimination in relation to an alternative class of traits: concealable characteristics. These attributes differentiate themselves through an individual’s ability to disguise the nature of their endowed preferences when interacting with family, friends and the market.

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The specific application being considered in this paper is *innate* sexual orientation, a concept theoretically distinct from *self-identified* sexual orientation. The former category measures the private sexual desire individuals feel for the persons of the same sex. Self-identified sexual orientation, in contrast, is the product of an individual's choice to hide or reveal their underlying preferences to society, a censored version of same-sex attraction. With sufficient stigma attached to minority identity, rational actors should falsify their public preferences to improve their outcomes. As such, publicly observed sexual orientation will be inconsistent with innate sexual attraction.

Economic research on other topics also bring up the dynamics of a "concealable characteristics" framework. Applications include cultural assimilation for immigrants (Arai and Skogman-Thoursie [2009], Constant et al. [2009]), ethnic identity (Mason [2004]), religious attachment (Chen [2010]), political allegiance (Kuran [1995]) and student ability (Akerlof and Kranton [2002], Austen-Smith and Fryer [2005]). These literatures have developed separately, focusing on the distinct nuances of the specific environment being studied. A general concealable characteristics framework instead can unify these research agendas and provide a framework to focus future work.

The concealability of characteristics complicates the traditional empirical methods for measuring discrimination. Survey respondents who self-identify as being part of a minority class represent the subpopulation of minorities for whom the benefits of revealing their type outweigh the costs, a classic case of selection bias. One potential consequence of this bias, for example, could be that existing estimates based on cross-sectional data underestimate the magnitude of discrimination if those most likely to face worse discrimination conceal their type.

Supposing that econometricians could truly observe innate preferences, the concealment behavior introduces a further complication. Economists often use wage penalties as a focal point for measuring the magnitude of discrimination. The problem with this approach is that if individuals conceal their type from the market, their symptoms will be manifested through nonstandard outlets.

Psychologists have long recognized that there exists numerous channels through which social stigma can impact minorities, particularly homosexuals, a concept formalized as *minority stress*. Herek [2004] focuses on three distinct modes of transmission: *enacted* stigma, *felt* stigma and *internalized* stigma. This formulation distinguishes between prejudicial acts (enacted), fear and anticipation (felt), and self-directed stigma (internalized). Concealment may reduce the chances of experiencing enacted stigma, but may exacerbate felt and internalized stigma exacerbating mental health and anxiety disorders. Additionally, concern has been raised regarding wasted cognitive resources used in maintaining a false identity. Such outcomes will also negatively impact wages, yet the channel through which this operates calls for distinctly different policy prescriptions than a case of pure labor market discrimination.

The aim of this paper is to characterize how concealment alters the nature of discrimination research with particular emphasis on the context of same-sex attraction. A basic model is developed to formalize the concepts. Comparative statistics based on varying the degree of potential discrimination costs are derived.

Original empirical analysis is presented to illustrate how potential concealment shapes life cycle outcomes using data from the National Longitudinal Survey of Youth 1979. To measure innate same-sex attraction rather than self-identified sexual orientation, the study leverages the fraternal birth order (FBO) hypothesis from developmental psychology. As will be discussed in greater detail in the following sections, the FBO hypothesis is the culmination of numerous studies that have consistently found that men with more older brothers are more likely to identify as homosexual. This proxy for same-sex attraction is used in conjunction with individual-specific measures of discrimination costs to study how trajectories change in response to increasing motives to conceal one's type.

This paper contributes to several literatures. First, it establishes a unifying framework for research on discrimination in relation to concealable characteristics. Second, it presents the first plausible evidence regarding the outcomes of men who experience homosexual attraction but never self-identify as gay. Third, it explores the underlying dynamics that result in non-standard demographic characteristics observed for self-identified homosexuals. Lastly, it presents empirical evidence on the dynamics of identity management in the presence of competing traits.

It is important to note the limitations of this paper. First, this paper does not seek to explain why discrimination against the lesbian, gay, and bisexual (LGB) community exists, nor why discriminatory attitudes change over time (see Kuran [1995]). Additionally, it does not seek to develop a theory of identity formation and management (see Akerlof and Kranton [2000], Benabou and Tirole [2011]). Those questions are beyond the scope of this study.

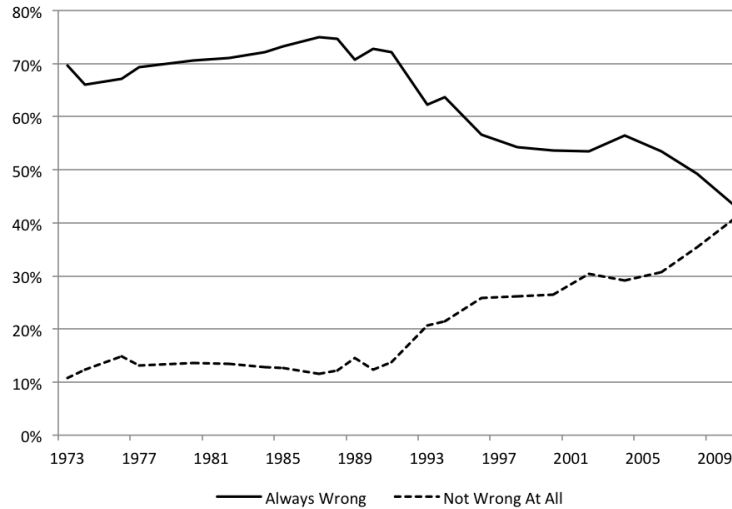
This paper is organized into seven sections. Section 2 further motivates the application being considered in this study. Section 3 presents a theoretical framework to consider discrimination in the context of concealable characteristics. Section 4 describes the empirical research design being leveraged in this project. Section 5 presents the empirical results. Finally, Section 6 provides some concluding remarks.

2. MOTIVATION

Homosexuals have long been a highly stigmatized group in the United States. Figure 1 shows public opinion polls from the General Social Survey. Throughout the 1970's and 1980's roughly 70 percent of the United States thought that sexual relations between adults of the same sex was "always wrong." In fact, Moore [1993] found that 37 percent of Americans preferred that homosexuals not publicly disclose their sexual orientation. Recent decades have witnessed improving attitudes towards homosexuals, yet these changes have generally not translated into the equal treatment of homosexuals with regard to public policy initiatives nor abatement of social stigma and harassment.

Federal equal employment opportunity laws, including the Equal Pay Act of 1963, Title VII of the Civil Rights Act of 1964, the Civil Service Reform Act of 1978, and the Civil Rights Act of 1991, do not recognize sexual orientation as a protected class. At this time, in the absence of federal protections, only twenty states have adopted state-level employment protections in the private and public sectors for homosexuals. While counties

FIGURE 1. Attitudes towards sexual relations between two adults of the same sex in the United States, 1973-2010



Source: General Social Survey

also can pass directives when states do not, most counties in states currently without anti-discrimination legislation have chosen not to.¹ The end result is that most employers can legally discriminate against homosexuals without fear of repercussion.²

Studies seeking to measure the extent of employment discrimination generally find negative wage impacts for homosexuals (see Badgett et al. [2007] for review of this literature). Conditional on human capital and family structure, gay men earn roughly 10 to 32 percent less than similarly qualified heterosexual men. Lesbians, however, have more mixed evidence, sometimes showing no difference with similarly qualified women, sometimes earning a positive premium over similarly qualified premium. Audit studies and other experimental techniques, in contrast, consistently show large negative biases against homosexuals, including both gay men and lesbian women (see Tilcsik [2011], Hebl et al. [2002], Jones [1996], Walters and Curran [1996]).

The impacts of stigma and prejudice against homosexuality, however, extend beyond just labor markets. Homosexuality has also been associated with elevated rates of violence

¹County-level anti-discrimination legislation was the original focus of the gay rights movement during the 1970's and 1980's (see Button et al. [2000]). The shift of focus to the state and federal-level only began in earnest during the early 1990's. Most counties that were early adopters of anti-discrimination legislation are also covered by state-level protections at this time.

²The most glaring examples of such discrimination can be found in the active pursuit and dismissal of homosexual members of military and government employees during the latter half of the 20th Century (see Shilts [1993], Johnson [1994-95]).

and fear of victimization (see Herek [1991], Dunbar [2006], Harris Interactive [2006]). Researchers have also found homosexual youth are more likely to report physical, verbal and sexual abuse in schools (Bochenek and Brown [2001], OShaughnessy et al. [2004], Kosciw et al. [2008], Saewyc et al. [2006]). In spite of these trends, twenty states have not adopted hates crimes legislation inclusive of sexual orientation.

Considering the evidence on violence, it is unsurprising that epidemiologists and psychologists have consistently linked homosexuality with elevated rates of suicide (Gibson [1989], Meyer [2003], King et al. [2003]), substance abuse (Marshal et al. [2008]), and mental health disorders (Cochran et al. [2003]). To quantify these relationships, King et al. [2008]’s meta-analysis of 28 population-based studies found that members of the lesbian, gay and bisexual community were 2.5 times more likely to attempt suicide (4.3 among gay men), 1.5 times more likely to have depression or other anxiety disorders, and 1.5 times more likely to abuse alcohol or other substances. While the earliest work on homosexuality believed same-sex sexual behavior was a symptom or type of a mental health disorder, psychologists for several decades have thought the relationship had the reverse causal direction, specifically that negative mental health outcomes observed for homosexuals reflect a psychological response to the animus and prejudice faced by homosexuals in everyday life (Meyer [2003]).

Without sizable benefits to disclosure, homosexuals should be rationally incentivized to conceal their type to avoid the negative repercussions. Supporting this concept, Badgett et al. [1992] estimate that between 28 and 72 percent of self-identified gay men and lesbian women actively conceal their sexual orientation to some degree to avoid discrimination.³ Because this estimate is based on a convenience sample of individuals who self-identify as homosexual to some degree, it is hard to say whether or not rates of concealment in the overall population should be higher or lower. Given that this estimate cannot address individuals who experience homosexual attraction but do not self-identify as homosexual, it may be appropriate to consider it a rough lower bound.

Yet, despite these potentially high rates of concealment, some gay men and lesbian women still choose to live openly. This suggests that there are benefits to disclosure and costs to nondisclosure. Goffman [1963] discusses the active effort require to maintain a secret or manage a stigmatized identity for homosexuals, attenuating the productivity and effectiveness of “closeted” individuals. Case studies of homosexuals (Weinberg and Williams [1974], Schneider [1986], Hall [1989], Woods [1993], Friskopp and Silverstein [1995]) provide tentative evidence regarding modes of concealment and the repercussions of nondisclosure in the work setting. Findings from this literature indicate that homosexuals actively engage in identity management to avoid disclosure including avoidance of social situations as well as figurative and concrete expressions of heterosexual identity. The corresponding impacts on productivity have not been firmly established.

A related literature in Health Psychology has studied the relationship between nondisclosure of sexual orientation and the corresponding impacts on physical health. Cole et al.

³See also Francis [2008] for analysis of the impact of the AIDS epidemic on the sexual identity of men and women in the United States.

[1996b] found that among a sample of healthy HIV-seropositive gay men, individuals who reported concealing their identity experienced an accelerated course of HIV infection. Individuals were followed for nine years, and impacts were measured on CD4 T lymphocyte levels, time to AIDS diagnosis and time to AIDS mortality. Impacts were strongest for those who reported the highest degree of concealment, even when controlling for demographic characteristics, health and sexual practices, as well as mental health status. Recent work in Strachan et al. [2007] supports these conclusions, finding that disclosure of sexual orientation improved CD4 T lymphocyte levels. In another sample of HIV-seropositive gay men, Cole et al. [1996a] found elevated rates of cancer and several infectious diseases among those who concealed their sexual orientation. Given the overall link between HIV infection and development of other health conditions (including cancer and infectious diseases), it remains unclear whether nondisclosure has an independent effect on health beyond progression of HIV infection.

The studies discussed in this section provide an overview of the challenges faced by homosexuals in the United States. Recent work on measuring discrimination and other stigma-related outcomes has relied on representative samples instead of convenience sampling reducing biases that plagued earlier efforts on this topic. Some researchers have sought to go beyond this work through documenting when and why homosexuals conceal their sexual orientation, and what the implications of their concealment strategies are. This line of research, however, has entirely relied on case studies and convenience sampling raising concern about bias arising from sample selection. Additionally, analysis of self-reported concealment behavior may be inherently flawed through contamination of omitted variables bias.

A broader issue within the literature is the fundamental lack of knowledge regarding individuals who experience homosexual attraction but do not report their minority status. Existing empirical work relies on individuals self-identifying their sexual orientation or having a same-sex partner in their household. This raises the question of the extent to which researchers should rely on self-reported or revealed identity when attempting to measure the impacts of discrimination. To the extent that researchers can try to measure sexual orientation through non-disclosed means, the literature will be better able to capture the broader dynamics associated with stigma, prejudice and life cycle choices.

3. DISCRIMINATION WITH CONCEALABLE CHARACTERISTICS

Incorporating concealability into traditional discrimination models requires enabling identity choice for individuals. The relevant choice model for this feature depends on whether society discriminates based on true underlying preferences or just the expression of underlying preferences. For underlying preferences, signaling models are more appropriate. For behavior-based discrimination, discrete choice analysis is sufficient.

In this work, I focus on behavior-based discrimination both for its simplicity as well as its relevance to the application. As a departing point, I draw on two fundamental models: Becker [1957]’s model of taste-based discrimination, and Akerlof and Kranton

[2000]’s model of identity economics. To start, let us consider a basic setup with employer taste-based discrimination.⁴ The generic firm j maximizes the following profit function:

$$\max_{N_{j,M}, N_{j,m}} p \times F(N_{j,M} + N_{j,m}) - w \times N_{j,M} - \tilde{w} \times N_{j,m} - d_j \times N_{j,m}$$

where p is the price level, F is the production function, $N_{j,M}$ is the number of majority employees employed at firm j and $N_{j,m}$ is the number of minority employees. Firms exhibit a taste parameter d_j , reflecting animus towards minority employees. When $d_j > 0$, employers will only hire minority employees at reduced wages of $\tilde{w} = w - d_j$ since the true cost to firm of hiring the minority employee is $w + d_j$.

Given heterogeneity in d_j , the standard results show that the marginal discriminating employer determines the equilibrium level of wage penalties for minorities. In fact, without a sufficient proportion of discriminating firms, no wage penalties should be incurred and the market will be segregated. Additionally, if the marginal employer is discriminatory, they should be eliminated from the market in the long run by free entry of competition.

These conclusions have been challenged by a variety of authors. Charles and Guryan [2008] summarize the reasons identified in the literature why discriminatory tastes may still result in persistent wage gaps in spite of sorting. These include allowing for imperfect information (Black [1995]), imperfect competition, adjustment costs (Lang et al. [2005]) or nepotism (Goldberg [1982]). For the purpose of this exercise, any of these possible mechanisms could be in operation.

To put this taste-based model into a “concealable characteristics” framework, I reformulate it in terms of a modified Akerlof and Kranton [2000] identity model. The sequence of moves in the game are presented in Figure 2. In the first stage, nature determines whether employees are truly minority members (\mathbf{m}) with probability p or majority members (\mathbf{M}) with probability $(1 - p)$. In the second stage, individuals decide whether to present themselves to employers as minority (m) or majority (M). Finally, in the third stage employers can choose to punish minority employees.

The standard utility payoffs and associated identity penalties have been modified to include the relevant factors of the Becker framework. In the model, employers seek to maximize profit, receiving the difference between the marginal product and marginal cost of potential employees. Employers can transfer the cost of their distaste for employees minorities by punishing their wages.

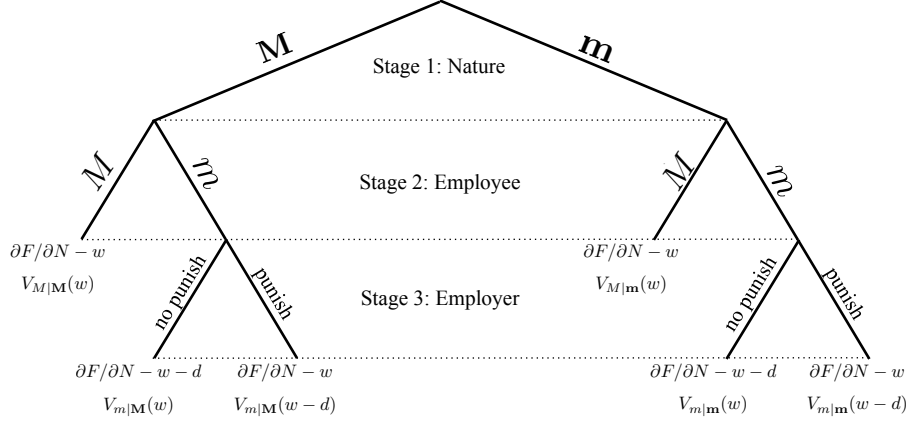
Simultaneously, employees aim to maximize their utility through maximizing their indirect utility function V . This function is affected by not only the employees wages, but also the combination of private types endowed by nature and the public type adopted by the employee.

I make two main assumptions. First, I assume

$$(1) \quad V_{M|\mathbf{M}}(\bar{w}) = V_{m|\mathbf{m}}(\bar{w})$$

⁴It is worth noting that despite modeling this as an employer-employee relationship, there are many other instances that this could be applied to: parents and children negotiating over child type and bequests, insurance through social networks, etc.

FIGURE 2. Discrimination and Concealment



which I interpret to mean that there is no inherent difference between being type M or m given the same level of income.

Second, I define:

$$(2) \quad \psi \equiv [V_{M|m}(\bar{w}) - V_{m|m}(\bar{w})] = [V_{m|M}(\bar{w}) - V_{M|m}(\bar{w})] < 0 \quad \forall \bar{w}$$

This second assumption is important and I call it the *costly concealment* assumption. What this says is that even if an individual faces the same budget constraint, the maximum potential utility when he conceals his true type is lower than if he does not conceal. This assumption could be justified as the result of a mental health strain, psychic cost, or a resource drain due to costly investments to signal heterosexuality.

These assumptions are in-line with the existing literature in psychology. Researchers note that concealing homosexuality utilizes cognitive resources, which can have a corresponding negative impact on well-being (Pachankis [2007], Smart and Wegner [2000] and Lewis et al. [2006], and may be manifested through psychological distress and other physical health problems (Cole [2006], Morris et al. [2001], Strachan et al. [2007], Ullrich et al. [2003]).

Assuming $d > 0$, the sub-game perfect equilibrium is that employers will always choose to punish conditional on observing a minority type. This gives minorities the trade-off between $V_{M|m}(w)$ and $V_{m|m}(w-d)$, which can be broken into two components:

$$V_{M|m}(w) - V_{m|m}(w-d) = \int_{w-d}^w V_{m|m}(x) dx - \psi$$

The first term on the right side of this equation is the utility gain from expanding the budget set through avoiding punishment. The second term is the countervailing loss due to concealment costs.

The optimal concealment choice depends on the relative magnitude of ψ and d . Given dispersion in potential discrimination, it is possible that ψ may be heterogeneous and may covary with d . A threshold level of d^* will exist for which $\int_{w-d^*}^w V_{m|m}(x) dx = \psi$ assuming

that:

$$(3) \quad \frac{\partial^2 V}{\partial w^2} < 0$$

$$(4a) \quad Cov(\psi, d) \leq 0, \quad \text{or}$$

$$(4b) \quad Cov(\psi, d) > 0 \quad \text{and} \quad \frac{\partial^2 \psi}{\partial d^2} < 0$$

Equation 3 is a standard assumption that the indirect utility function is concave in income. The interpretation of Equation 4a is that concealment costs are independent of or diminish with potential discrimination. This would hold, for instance, if individuals experience less guilt about concealment when revealing one's type has greater consequences consequential. The interpretation of Equation 4b is that concealment costs grow with discrimination, but at a rate that is slower than penalty growth rate. This would hold if individuals experience increasing anxiety when faced with more potential discrimination, but the negative effect asymptotes to a maximum upper bound.

If a threshold can be established, then minorities facing discrimination of degree $d > d^*$ will conceal their type at a cost to avoid the wage penalty. When they face $d < d^*$, they will opt to reveal their minority status and take the corresponding punishment. Empirical estimates using the realized distribution of wages for revealed minorities will correspondingly underestimate the true level of discrimination in the market.

The opposite conclusion is found if

$$(4c) \quad Cov(\psi, d) > 0 \quad \text{and} \quad \frac{\partial^2 \psi}{\partial d^2} > 0$$

In this situation, concealment costs outgrow discrimination penalties, giving minority members facing the highest degree of discrimination the highest likelihood of revealing their type. While this is theoretically possible, given the cross-sectional and time series evidence on the relationship between discrimination and concealment, these assumptions are highly unlikely.

Without making additional assumptions beyond Equation 3, the model can yield multiple ranges over d in which individuals will choose to reveal their type. The specific ranges will depend on the function form of $\psi(d)$, but generally speaking over some spans of d , concealment costs may grow faster than the discrimination penalty encouraging more minority members to reveal their type. If the growth rate of ψ relative to d decreases, however, other spans of d may encourage minorities to conceal. The resulting population would exhibit pockets of individuals concealing their type along the distribution of d .

An additional complication is presented if we allow ψ to covary with the marginal productivity of labor. To explore this issue, I introduce worker quality q . Workers now produce q units of production in a period, and employers pay them their marginal productivity. Minority employees still have their wages discounted by the discrimination parameter d_j .

This scenario can easily be motivated by allowing both ψ and q to be functions of a hyperparameter μ_i , which could represent a vector of personality characteristics. The implication of this for measuring discrimination depends on the relationship between $\partial q / \partial \mu$ and $\partial \psi / \partial \mu$.

If $Cov(\psi(\mu_i), q_i(\mu_i)) < 0$, for instance, then the incentive to conceal diminishes with worker quality because concealment costs grow with ability. The impact of this negative correlation is that wage penalties for minorities will be again underestimated as minorities facing the lowest wages will conceal their type. The realized wage distribution for revealed minorities will be shifted higher compared to the universe of majority members.

If $Cov(\psi(\mu_i), q_i(\mu_i)) > 0$ the choice to conceal depends the relative value of $\partial V(w)/\partial\mu$ and $\partial\psi/\partial\mu$. When $\partial V(w)/\partial\mu > \partial\psi/\partial\mu$, the value of wage growth exceeds that of than concealment costs. This means that along the distribution, if any workers reveal their type, it is more likely to be the higher quality workers compared to the lower quality workers. This setting also will generate an underestimate of market discrimination faced by minorities.

The final case is that $Cov(\psi(\mu_i), q_i(\mu_i)) > 0$ and $\partial V(w)/\partial\mu < \partial\psi/\partial\mu$. In this scenario, concealment costs grow at a faster rate than the value of wages making the incentive to conceal relatively stronger for high skill individuals. When high quality minorities conceal their status, it will shift the realized distribution of wages for revealed minorities lower. Thus, the estimated wage penalty for minorities will be artificially high.

This analysis provides two important conclusions. First, cross sectional wage penalties may be upward or downward biased due to endogenous identity selection. Depending on the covariance between concealment costs and discrimination tastes as well as marginal productivity, the sign of this bias can be determined. Many plausible scenarios lead to an underestimate of market discrimination when using the realized wage distribution of revealed minorities.

Second, despite the fact that two areas observe the same wage penalty, it would be incorrect to conclude that both exhibit similar distributions of d_j . Instead, the concealment option imposes a floor on wage penalties indicating that individuals are incurring incremental gains in discrimination through alternative channels rather than wage rates. One such outlet could be negative impacts to mental health.

4. EMPIRICAL RESEARCH DESIGN

The empirical research design leverages two broad sources of variation to demonstrate how discrimination against concealable characteristics generates non-standard results. First, I proxy same-sex attraction using the fraternal birth order effect, which has its origins in developmental psychology and microbiology research. The empirical relationship on which this is based is the consistent finding that men with more older brothers are more likely to express same-sex attraction and identify as homosexual. There is no effect of older brothers on women, and there is no effect of sisters or younger brothers on men or women. The evidence on this finding is presented in Section 4.1.

In addition to the fraternal birth order effect, I have generated an index quantifying the relative friendliness of counties in the United States to homosexuals. The goal of this index is to identify respondents who experienced more and less discriminatory attitudes towards homosexuals during their childhood. This additional degree of variation should encourage some homosexuals to conceal their type to avoid alienating friends and family as well as

experiences outright discrimination. Detailed description on the generation of the index is described in Section 4.3.

To conduct my analysis, I use the National Longitudinal Survey of Youth 1979 (NLSY79) panel data files linked to the confidential location geocodes through a special agreement with the Bureau for Labor Statistics. This data is one of the few instances in the United States where I observe birth order information with sex of siblings identified, location of birth and extensive information on adult outcomes over the lifecycle.⁵

The NLSY79 started in 1979 with a sample of over 10,000 unique respondents between the ages of 12 and 18. Survey participants were reinterviewed on an annual basis until 1994 and a biannual basis thereafter. Data collection is still ongoing. Information was collected on a variety of life-cycle issues, with particular emphasis on adolescent transition to adulthood during the early years. I am forced to remove approximately 1,200 respondents from my analysis for two reasons: first, I restrict my analysis to respondents who have a valid U.S. state and county for place of birth, location at age 14 or in 1979; second, respondents were required to participate in their 1993 interview when sibling composition was collected.⁶ My final base sample is 8,763 unique respondents.

4.1. Fraternal Birth Order Effect. The epidemiological relationship known as fraternal birth order effect can be illustrated in Figure 3. This figure shows that men who identify as homosexual are much more likely to have more older brothers than older sisters. This empirical relationship has been documented in numerous studies (see Blanchard (1997) for review). Consistently, they find that each additional older brother for men increases the odds of homosexual identity by 25 to 33 percent.

The dominant hypothesized mechanism (known as the Maternal Immune Hypothesis⁷) is that male-specific, Y-linked minor histocompatibility (H-Y) antigens form in the mother's body after exposure to male tissue (e.g., blood) during the pregnancy and childbirth of a male child (see Müller [1996] for review of H-Y antigens; see Blanchard [1997] for complete discussion of biological hypothesis). This tissue would be considered foreign to the mother's body and would generate an immune response. The mother's antigens would then remain in the mother's immune system and affect the development of future male children. It could be either that each successive male child increases the number antigens circulating thereby increasing the odds of abnormal development or instead each successive male child increases the probability of antigens ever forming in the first place.

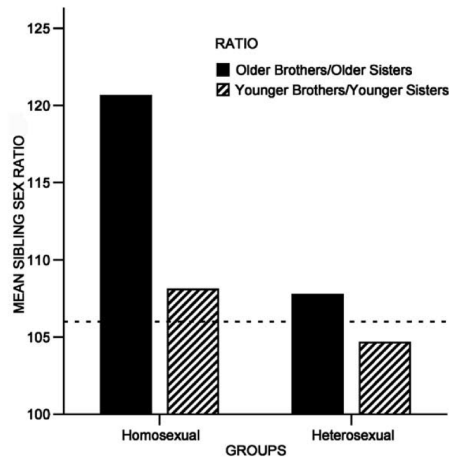
Researchers point to several types of evidence to support this specific mechanism (see Blanchard and Klassen [1997]). First, epidemiologists have long understood that male

⁵The only other sources of this information I could identify were the ADD Health dataset which started in 1994 and the National Longitudinal Survey of Youth 1997 contain sibship composition, geographic information and adult follow up. I focus on the NLSY79 due to the greater amount of life cycle information. I analyze outcomes through age 45 in the NLSY79, the corresponding maximum age in ADD Health is 28 and for the NLSY79 is 24.

⁶The majority of excluded cases were removed due to non-interview in 1993 rather than missing place of birth information.

⁷The origins of this theory come from MacCulloch and Waddington [1981]'s work, except for the fact these authors focused on fetal testosterone rather than H-Y antigens.

FIGURE 3. The Fraternal Birth Order Effect



Source: Blanchard (1997)

fetuses are more antigenic to human mothers than female fetuses leading to more maternal immune reactions (Gualtieri and Hicks [1985], Komlos et al. [1990]). Studies of tissue localization indicate that the H-Y antigen is strongly represented on the surfaces of brain cells, and therefore may play an active role in brain development. Finally, animal research suggests it is plausible that H-Y antibodies could be present in sufficient quantities to affect sexual differentiation in the fetal brain, without also affecting the development of the genitalia. Singh and Verma [1987] found that male offspring of mother mice immunized against H-Y prior to pregnancy were much less likely to mate successfully with receptive females compared to a control sample.

The most popular rival hypothesis to explain the fraternal birth order effect is based on a postnatal, psychosocial channel rather than a prenatal, biological channel. Researchers from this perspective argue that a boy's chances of engaging in same-sex sexual interaction with older males increases in proportion to the number of his older brothers (Bern [2000], Bern [1996]; see Blanchard [1997] for complete discussion of all psychosocial hypotheses). This argument posits that increased same-sex sex-play during childhood increases a boy's probability of developing a homosexual orientation later in life (Slater [1958]).

Research disputes the logic in Slater's argument. In contrast to what Slater would expect, Wellings et al. [1994] found that boys attending all-male boarding schools were more likely to have homosexual experiences as adolescents compared to those attending co-ed schools, yet no difference was observed in later life sexual identification.

Several studies have sought to further test the biological rather than social nature of this relationship. The best piece of evidence is in Bogaert [2006] which finds that in sample of complex families (e.g., children from multiple parents, divorced parents that

separate children, etc) the number of biological older brothers (i.e. not step siblings) was the only significant predictor of homosexuality. Furthermore, the amount of time spent with specific siblings during childhood (biological/non-biological, male/female) did not significantly predict the sexual orientation of a child.

Finally, critics of the fraternal birth order effect point to lack of national, population-based evidence that support the empirical relationship being observed. Almost all studies that find the fraternal birth order hypothesis utilize convenience sampling of college students and openly gay individuals, sex offenders, or representative surveys of specific metropolitan areas (Bogaert [2005]). Attempts at nationally representative population-based studies find weakened statistical relationships. For instance, Francis [2008]’s study of ADD Health data finds a positive but marginally insignificant coefficient on older brothers and homosexuality.⁸

4.2. Family Composition and Birth Order Literature. The findings of Butcher and Case [1994], Black et al. [2005] and related literature should raise caution when considering use of birth order and sibship information to proxy for sexuality. Butcher and Case [1994] found that women’s educational choices varied systematically with the composition of her siblings while men’s did not; having an older brother significantly increased women’s education. Using Norwegian data, Black et al. [2005] found that later born children complete fewer years of education, with corresponding negative impacts on adult earnings and employment, particularly for women.

The potential bias incurred from alternative channels through which fraternal birth order may affect outcomes is important to acknowledge. However, given the state of the birth order literature, I can attempt to identify the sign of the bias in my estimation. The details of my econometric specification are discussed later in this section, but generally speaking I seek to examine the relative impact of older brothers on men and women. The Butcher and Case findings would tend to negatively bias any coefficients on human capital accumulation due to women’s relative gain from older brothers. Positive impacts on human capital would therefore be a lower bound.

The Black et al. [2005] results present the opposite issue. While their finding that children systematically suffer worse educational and employment outcomes from higher parity births should be addressed by comparing relative outcomes for men and women with more older brothers, what poses a greater problem is that women’s outcomes tend

⁸I believe my work can reconcile these conflicting results. The FBO literature draws a sample of individuals who are not hitting a binding constraint of switching to concealment. Out of the fact that they study individuals attending college or living nearby, they observe a population for which self-identified sexual orientation and same-sex attraction are highly co-linear.

In contrast, population-based studies broaden the sample to individuals facing high discrimination costs, thereby weakening the relationship between self-identified sexual orientation and innate same-sex attraction. This interpretation is consistent with my findings that men with more older brothers are more likely to have same-sex, unrelated adults in their households rosters through age 45, but those facing higher discrimination costs back away from these “relationships” enough so that more than half of the country would be indistinguishable from heterosexual respondents.

to suffer more relative to men's outcomes. This creates a positive bias in human capital accumulation.

4.3. County Index of Discrimination. Given the potential bias presented by confounding birth order dynamics, I add an additional layer of variation into the empirical analysis. I estimate a index of local discrimination based on the timing of adoption of various pieces of homosexual-focused public policy initiatives at the city, county and state-level as well as a variety of community characteristics measured at the county level. The measures of homosexual protections and exclusions as well as community characteristics are merged using principle component analysis, with the first factor representing cross-sectional variation in homosexual discrimination across counties in the United States.

This measure of local discrimination is mapped onto individual observations based on their county of birth.⁹ If sexual orientation is biologically determined, information about county of birth is unlikely to be correlated with underlying homosexual preferences. County information should, however, provide a measure of the attitudes that families and friends have towards homosexuality. Despite the fact that respondents may migrate away from these specific counties, the index will capture the lasting cost of alienating family and friends.

Comparing the relative impact of the fraternal birth order effect in more and less discriminatory areas should isolate the variation arising from shifts in revealing one's sexual orientation. If there are differential birth parity effects that happen to covary with the discrimination environment, I should observe differences in parental presence or investment in outcomes that predate the onset of puberty. To verify this is not the case, I present formal robustness tests in Section 4.5

The variables that I use in the factor analysis are based on local adoption of homosexual-related public policy and community characteristics that have been linked to homophobic attitudes. The public policy measures include the year of adoption of anti-discrimination legislation for private employment and public employment, the first year of formal recognition of same-sex relationships¹⁰, the first year domestic partner benefits were offered from county government, the first year of hates crime legislation inclusive of sexual orientation, the first year civil union or same-sex marriage was offered, the first year same-sex marriage was banned at the state-level by constitutional amendment or legislation, and the earliest adoption of other homosexual protections¹¹. In addition, I also construct indicator variables to measure whether localities have never adopted each of these policies as of the end of 2012.

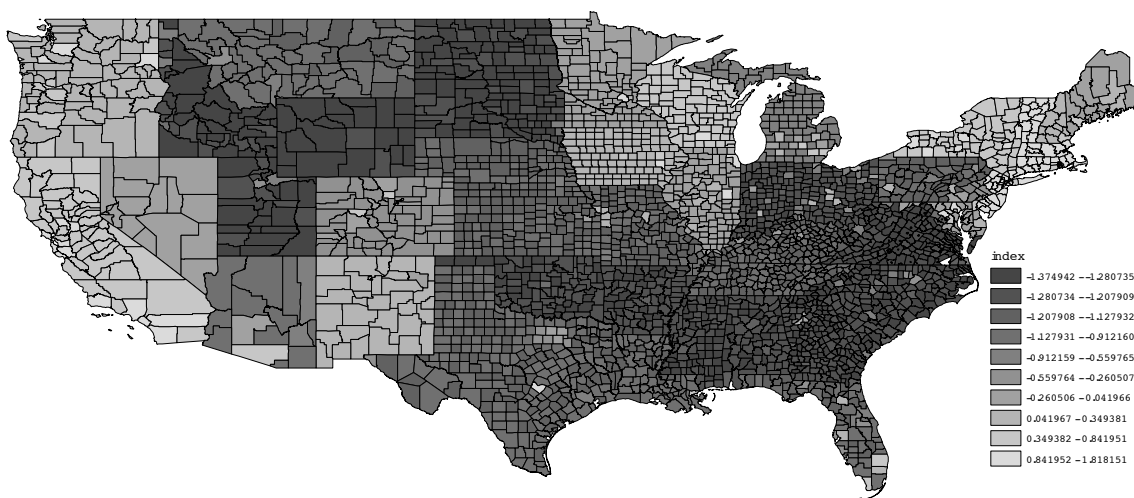
The timing of policy adoption was collected from several sources. Reports compiled by the Lambda Legal, the National Gay and Lesbian Task Force and the Human Rights

⁹When county of birth is not observed or not located in the United States, I use the respondent's U.S. county at age 14 or U.S. county in 1979 depending on which first identifies individuals living in the United States.

¹⁰This includes domestic partnership registries, civil unions and same-sex marriage

¹¹These include credit, housing, union, education and public accommodation protections

FIGURE 4. Map of County-Level Index Scores in the United States



Campaign served as the foundation of this information. When the timing of adoption conflicted between sources, dates were verified directly with counties.

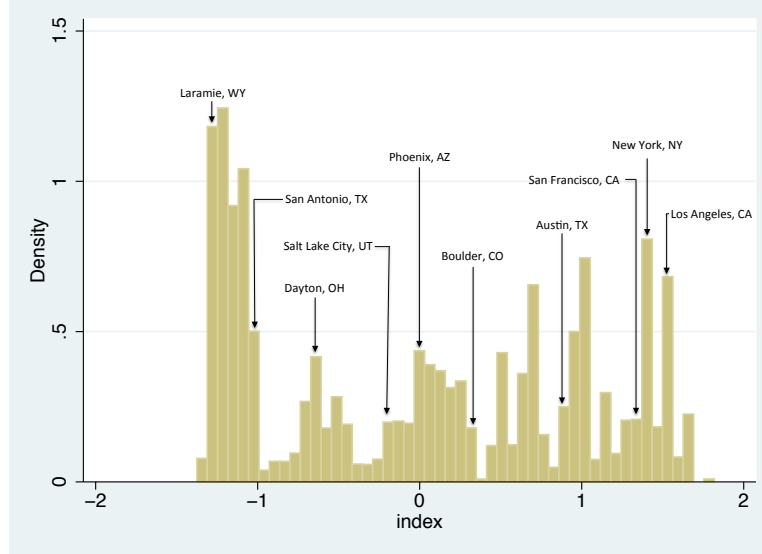
The county-level community characteristics used in the factor analysis include the Republican vote share, the percentage of residents identified as religious adherents, the log population density (measured as persons per square mile), the percent of residents who have graduated from college, and the percent of land identified as urban. The Republican vote share is gathered from the Congressional Quarterly's *Voting and Elections Collection*.¹² The per capita rate of religious adherents is estimated using the *Churches and Church Membership in the United States* collected by the Glenmary Research Center.¹³ All other variables are collected from the United States Census.

The results of the factor analysis are presented in Figure 4. This figure presents a mapping of the predicted first factor, which I interpret as an index of the discriminatory environment faced by homosexuals in United States counties. The index has been normalized to a mean of zero and standard deviation of one using total population per county in 1970 as weights. The average individual would thus be exposed to an index score of zero. Counties that have positive index scores are shaded light gray and are relatively more protective of and friendly to homosexuals. Lighter hues reflect even more favorable counties. In contrast, dark gray counties have negative index scores and are more antagonistic towards homosexuals.

¹²To focus on social conservative Republicanism, I average over Republican vote share in a county between 1992 and 2008

¹³To minimize statistical noise in this data, I average over membership data from 1971, 1980, 1990 and 2000.

FIGURE 5. Distribution of Index Scores



Regional trends are apparent; Southern and Midwestern states tend to have the least favorable climate towards homosexuals, while New England and Western States tend to be more favorable. Inclusion of regional controls or state fixed effects will thus be important. Despite strong regional trends, however, state also observe a fair amount of within-state variation. Counties that include major metropolitan areas or college communities to be more favorable for homosexuals.

Figure 5 shows a histogram of population exposure to various index values. Several cities are highlighted along the distribution to help quantify the meaning of standard deviation change in the index. The distribution is not unimodal; there is a larger percentage of the population concentrated at the lower tail of the distribution. This trend reflects the fact that most counties have not enacted any protections for their homosexual citizens.

4.4. Econometric Specification. The sources of variation discussed above motivate a quasi-triple differencing strategy in the econometric specification. Intuitively, I examine how men with more older brothers facing different discrimination costs compare to women with more older brothers facing different discrimination costs.¹⁴ Since women's sexuality does not to respond to the number of her older brothers, this should allow us to identify the impacts of same-sex attraction and its interaction with increasing discrimination. This is summarized in the following equation.

$$y_{i,t} = \alpha_{0,t} + \beta_t X_i + \delta_{1,t}[ob_i \times m_i \times \iota_i] + \delta_{2,t}[ob_i \times m_i] + \delta_{3,t}[ob_i \times \iota_i] + \delta_{4,t}ob_i + \delta_{5,t}m_i + \delta_{6,t}\iota_i \\ + \gamma_{1,t}[ts_i \times m_i \times \iota_i] + \gamma_{2,t}[ts_i \times m_i] + \gamma_{3,t}[ts_i \times \iota_i] + \gamma_{4,t}ts_i + e_{i,t}$$

¹⁴Estimates using only the male sample are consistent with what is presented in the body of the text. See appendix for specific results.

In this equation, ob_i is the number of older brothers, m_i is sex is equal to male, and ι_i is the index. To guarantee that my estimates are not contaminated a differential effect of family size on men and women in more and less discriminatory areas, I also include interactions with total siblings ts_i . Likewise, I include the total number of older sisters, younger sisters and younger brothers as well as additional controls through X_i in the analysis. While not explicitly specified, I also include state of birth fixed effects.

The coefficient of interest from this equation is $\delta_{1,t}$. It should estimate the effect of decreasing discrimination faced by individuals more likely to experience same-sex attraction. The coefficient is indexed on t to account for the fact that the correlations may evolve over time as the individuals age. Respondents in NLSY79 started out between the ages of 12 and 18, and in the most recent data available are in the 45 and 51 age range. My analysis focuses on outcomes observed between the ages of 18 and 45 for all respondents to maximize the overall sample.¹⁵

There are clear advantages to performing an instrumental variable regression over the reduced-form specification outlined above. Because the aim of this research is to study to how concealment of underlying preferences that are not observable in the data impacts life-cycle behavior, this is not possible.

4.5. Robustness Check. To rule out systematic bias in my econometric specification, I test a series of robustness checks to confirm that my identification is uncorrelated to factors which pre-date the onset of puberty and sexual maturation. Tables 1 and 2 present these results.

In Table 1, I test whether parents' characteristics at birth and during the respondent's childhood are correlated to the explanatory variables of interest. The dependent variables are: mother's age at respondent's birth, mother's educational attainment, whether the respondent lived with their biological mother at birth and age 5, whether the mother was reported to be working when the respondent was 14 years old, father's age at respondent's birth, father's educational attainment, whether the respondent lived with their biological father at birth and age 5, and whether the father was reported to be working when the respondent was 14 years old. The coefficient of interest ($\delta_{1,t}$) is presented in the first row of the table. There is no systematic correlation observed between the triple interaction and maternal or paternal characteristics.

In Table 2, I consider whether children's characteristics that pre-date the development and expression of sexual attraction covary with the triple interaction of older brothers, male and the index. I test whether there is a significant relationship with preschool attendance, presence of a foreign language spoken at home during childhood, whether the respondent reported being shy at age 6, household receipt of magazines/newspaper at age 14, household having a library card at age 14 and whether the household lived in an urban area when the respondent was 14 years old. These tests show no statistically significant relationship between the key independent variable and pre-pubescent respondent characteristics. This

¹⁵When pooling observations from across multiple surveys, I cluster my standard errors at the individual-level i .

TABLE 1. Robustness Check: Pre-existing Parental Characteristics

Variables	Mom Age at Birth	Mom Educ.	Lived with Mom at: Birth	Mom at: Age 5	Mom Worked (Age 14)	Dad Age at Birth	Dad Educ.	Lived with Dad at: Birth	Dad at: Age 5	Dad Worked (Age 14)
# Older Brothers × Male	0.0584	-0.0834	0.00313	0.00411	0.00125	0.0837	0.0226	0.00399	0.0117	-0.00350
× Index	(0.138)	(0.0775)	(0.00346)	(0.00495)	(0.0119)	(0.170)	(0.0986)	(0.00793)	(0.00932)	(0.0503)
# Older Brothers × Male	-0.149	0.107**	-0.00178	0.000755	-0.00250	-0.165	0.0770	-0.00658	-0.00786	0.0550
	(0.0908)	(0.0534)	(0.00252)	(0.00371)	(0.00836)	(0.116)	(0.0689)	(0.00557)	(0.00649)	(0.0349)
# Older Brothers × Index	-0.0894	0.182**	-0.000323	0.00558	0.00633	0.0745	0.224**	0.00546	0.00855	0.00509
	(0.138)	(0.0777)	(0.00344)	(0.00491)	(0.0123)	(0.171)	(0.0968)	(0.00773)	(0.00925)	(0.0499)
Male × Index	0.0370	0.0461	0.00751	-0.00568	0.0303	0.0587	0.229	0.00447	-0.00146	0.0282
	(0.246)	(0.128)	(0.00871)	(0.0103)	(0.0202)	(0.299)	(0.160)	(0.0138)	(0.0163)	(0.0798)
# Older Brothers	3.271***	-0.214***	0.00191	-0.00283	0.00487	3.249***	-0.177**	0.00218	0.0109	-0.0375
	(0.101)	(0.0596)	(0.00284)	(0.00395)	(0.00968)	(0.130)	(0.0756)	(0.00606)	(0.00742)	(0.0394)
Index	0.603***	0.139	-0.00454	0.00609	-0.0244*	0.753***	0.221*	0.00223	-0.00267	-0.0584
	(0.175)	(0.0914)	(0.00636)	(0.00758)	(0.0143)	(0.213)	(0.115)	(0.0101)	(0.0118)	(0.0563)
Male	0.681***	0.0819	-0.0113	0.000339	-0.0178	0.715**	-0.0513	0.00642	0.0114	0.00230
	(0.250)	(0.128)	(0.00905)	(0.0105)	(0.0206)	(0.303)	(0.160)	(0.0140)	(0.0166)	(0.0802)
Total Siblings × Male	0.00950	-0.000546	-0.00172	0.000476	-0.0108*	-0.0592	-0.0616	-0.00256	-0.00548	-0.0210
× Index	(0.0716)	(0.0408)	(0.00225)	(0.00287)	(0.00598)	(0.0887)	(0.0517)	(0.00407)	(0.00484)	(0.0251)
Total Siblings × Male	-0.0384	-0.0424	0.00171	-0.000699	0.000143	-0.0604	-0.0121	0.00410	0.00613*	-0.00749
	(0.0496)	(0.0287)	(0.00172)	(0.00214)	(0.00423)	(0.0622)	(0.0373)	(0.00291)	(0.00342)	(0.0177)
Total Siblings × Index	-0.161**	-0.0371	0.00255	-0.00103	0.000880	-0.261***	-0.0173	-0.00389	-0.00494	0.00567
	(0.0722)	(0.0417)	(0.00234)	(0.00289)	(0.00621)	(0.0897)	(0.0520)	(0.00415)	(0.00493)	(0.0255)
Total Siblings	-1.292***	-0.390***	0.00334	0.00452	-	-1.082***	-0.568***	0.000586	-0.00694	-
	(0.0692)	(0.0412)	(0.00222)	(0.00292)	0.0420***	(0.0901)	(0.0530)	(0.00430)	(0.00517)	0.0706***
Constant	25.18***	12.61***	0.958***	0.935***	0.662***	28.06***	13.20***	0.885***	0.825***	0.243***
	(0.174)	(0.0889)	(0.00638)	(0.00760)	(0.0145)	(0.211)	(0.113)	(0.0101)	(0.0119)	(0.0574)
Observations	8,046	8,296	8,485	8,487	8,788	7,327	7,479	8,478	8,460	8,788
R-squared	0.371	0.111	0.008	0.005	0.023	0.304	0.116	0.005	0.004	0.009

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 2. Robustness Check: Pre-existing Child Characteristics

	Attend Preschool	Foreign Lang. at Home	Shy at Age 6	Rec'd Mag- azines (Age 14)	Rec'd Newspaper (Age 14)	Library Card (Age 14)	HH in Ur- ban Area (Age 14)
# Older Brothers × Male	0.00736	0.0110	-0.0145	0.00596	-0.0123	-0.0113	-0.00318
× Index	(0.0112)	(0.0101)	(0.0245)	(0.0117)	(0.0110)	(0.0110)	(0.00907)
# Older Brothers × Male	-0.00628	-0.00821	-0.0201	-0.00786	0.00985	0.00787	-0.00419
	(0.00767)	(0.00701)	(0.0168)	(0.00817)	(0.00768)	(0.00754)	(0.00624)
# Older Brothers × Index	-0.00268	0.00156	-0.00978	0.000827	0.00139	0.00546	0.00972
	(0.0113)	(0.0105)	(0.0253)	(0.0120)	(0.0110)	(0.0111)	(0.00941)
Male × Index	-0.00416	-0.0312*	-0.0549	0.0110	-0.00307	0.0377**	0.0151
	(0.0198)	(0.0169)	(0.0425)	(0.0198)	(0.0177)	(0.0182)	(0.0157)
# Older Brothers	0.00540	-0.0230***	-0.0178	0.0219**	0.0195**	-0.00205	-0.00169
	(0.00884)	(0.00831)	(0.0200)	(0.00939)	(0.00862)	(0.00857)	(0.00742)
Index	0.0154	0.0682***	0.0158	-0.00162	-0.00972	0.0322**	0.0656***
	(0.0141)	(0.0121)	(0.0305)	(0.0139)	(0.0125)	(0.0126)	(0.0109)
Male	0.0103	-0.0113	0.0302	0.00691	-0.0209	-0.0394**	-0.00652
	(0.0200)	(0.0175)	(0.0435)	(0.0200)	(0.0176)	(0.0185)	(0.0163)
Total Siblings × Male	0.00409	0.000902	0.0101	-0.00153	0.00222	-0.00256	-0.00300
× Index	(0.00575)	(0.00520)	(0.0128)	(0.00592)	(0.00561)	(0.00569)	(0.00467)
Total Siblings × Male	-0.0107***	0.0110***	0.000879	0.00672	0.00368	0.00767*	0.00562*
	(0.00406)	(0.00366)	(0.00887)	(0.00412)	(0.00395)	(0.00393)	(0.00325)
Total Siblings × Index	-0.00147	-0.000338	-0.0205	0.00179	0.00995*	-0.00216	-0.00218
	(0.00586)	(0.00554)	(0.0132)	(0.00610)	(0.00571)	(0.00582)	(0.00490)
Total Siblings	-0.00550	0.0454***	0.0755***	-0.0710***	-0.0561***	-0.0317***	-0.000486
	(0.00612)	(0.00575)	(0.0137)	(0.00633)	(0.00593)	(0.00599)	(0.00514)
Constant	0.303***	0.153***	-0.129***	0.746***	0.893***	0.822***	0.811***
	(0.0142)	(0.0123)	(0.0311)	(0.0142)	(0.0125)	(0.0127)	(0.0114)
Observations	8,639	8,991	8,692	8,943	8,965	8,958	8,995
R-squared	0.005	0.066	0.011	0.056	0.038	0.051	0.044

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

provides the most concrete evidence that $\delta_{1,t}$ is not biased by the birth parity and parental investment issues considered in Butcher and Case [1994] and Black et al. [2005].

5. RESULTS

In this section, I present the results of my empirical analysis. The aim of the section is twofold. First, I seek to provide documentation that concealment actually occurs in my data. Second, given the concealment behavior, I want to document how this impacts life-cycle outcomes. The results are separated by broad categories, including: (1) relationship and family formation, (2) migration and identity, (3) mental health, mental outlook and substance abuse, and (4) educational attainment and employment.

5.1. Relationships and Family Formation. I begin my analysis by looking at relationships and family formation. While the National Longitudinal Survey of Youth 1979 (NLSY79) does not have any survey questions asking respondents to self-identify their sexual orientation or to report same-sex domestic partners, I proxy for sexual preference through observing same-sex, unrelated roommates appearing on the respondent's household rosters over time. Complementing this analysis, I also consider marital and parenting status.

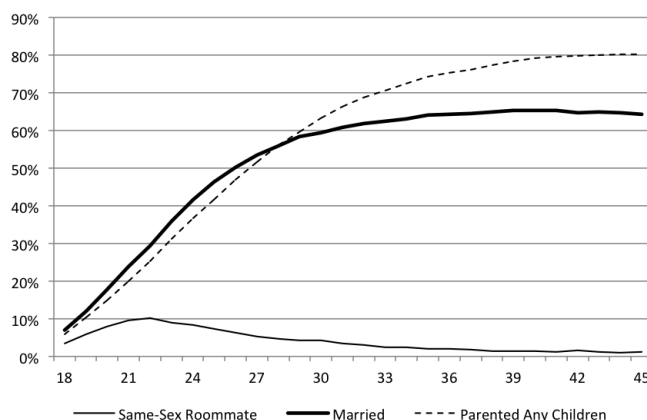
Clearly, not all individuals with same-sex roommates are homosexual. Figure 6 shows the trends in these variables in the NLSY79 sample over the age range of 18 to 45. Having a same-sex roommate peaks when respondents are in their early 20's, and declines to roughly 2% during later years. The strength of this proxy as a measure for sexual orientation will be weakest when respondents are in their late teens and early 20's when having a roommate is a standard practice related to educational attainment and cost savings. In later years, however, having a same-sex roommate is likely a better approximation of homosexuality.

Table 3 reports the coefficients for the triple interaction from regressions considering respondents relationships and family formation behavior between ages 18 and 45. The table is split into three panels. The first considers the presence of same-sex, unrelated adult roommates on the respondent's household roster. The second examines being married and the third reports on whether respondents have ever parented a child. The regressions are split into four distinct age bins: 18 to 24, 25 to 30, 31 to 37 and 38 to 45.

In the first panel, we observe evidence that both the fraternal birth order effect is operating in the NLSY79 sample and that discrimination discourages disclosure. As expected, regressions considering respondents between ages of 18 to 30 are noisily estimated and not statistically significant. The large number of heterosexual respondents making use of platonic roommates for cost savings purposes biases the results in earlier years towards zero. In later years, when heterosexual individuals cease having same-sex roommates, there are a statistically significant coefficients of 0.00958 (ages 31 to 37) and 0.00868 (ages 38 to 45).

One interpretation of these results is that for each standard deviation increase in the index (which is normalized to mean of zero and standard deviation of one), the fraternal birth order effect is strengthened by 0.91 percentage points. For men born in San Francisco County, CA, which has an index score of 1.39, this would translate into a 1.27 percentage point relative increased likelihood of having a same-sex partner for each older brother.

FIGURE 6. Time of Relationships and Family Formation



Conversely, for men born in Mobile County, AL, which has an index score of -1.21, this would translate into a -1.1 percentage point relative decline in having a same-sex partner for each older brother. The coefficient $\delta_{2,t}$ (not reported in Table 3) measures the average impact of older brothers for men in the sample across all discrimination environments. During the later period, average effect is measured as -0.000155 (0.00286) for ages 31 to 37 and -0.000829 (0.00911) for ages 38 to 45. The resulting total effect of $\delta_{1,t}$ and $\delta_{2,t}$ is close to zero or negative for many counties in the United States, which may help explain why developmental psychologists have had difficulty in replicating the fraternal birth order effects using nationally representative samples.

To put the magnitude of the results in perspective, I consult existing estimates in the fraternal birth order literature. The fraternal birth order effect is traditionally measured as an increase in the odds rather a linear increase in probability, with most authors reporting an increase between 25 percent to 33 percent for each older brother for men. In order to translate the results from the literature into comparable statistics for this analysis, one needs to identify an overall prevalence rate of homosexuality in the United States.¹⁶ Assuming that 5 percent of the male population is homosexual, the estimates in the literature translate into about a 1.07 to 1.33 percentage point increased probability of homosexuality among men for each older brother.

Before turning to other results, an additional source of downward bias needs to be addressed. Homosexual men exhibit strikingly low partnership rates in the general population. These individuals, who opt against cohabitation, will show no measurable response in the data to changing levels of discrimination even though true expression of sexual identity may still be impacted. Black et al. [2000] report that among men in the General Social Survey or the National Health and Social Life Survey who had same-sex sex in the last

¹⁶Researchers have suggested the prevalence of homosexuality in the United States ranges between 2 percent and 10 percent of the overall population

TABLE 3. Relationships and Family Formation

Variable	Average Outcome in Age Range			
	18 to 24	25 to 30	31 to 37	38 to 45
	Same-Sex, Unrelated Adult in Household Roster			
# Older Brothers \times Male \times Index	0.00582 (0.00468)	0.000363 (0.00464)	0.00958** (0.00387)	0.00868*** (0.00318)
N	54,614	58,766	34,124	25,524
	Married			
# Older Brothers \times Male \times Index	-0.00389 (0.00911)	0.00315 (0.0119)	0.00123 (0.0127)	-0.00949 (0.0126)
N	54,621	59,333	38,189	30,965
	Parented Any Children			
# Older Brothers \times Male \times Index	-0.0178** (0.00891)	-0.00451 (0.0121)	-0.0120 (0.0128)	-0.00391 (0.0123)
N	54,896	60,230	38,386	30,973

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

year, only 28.6 percent were currently cohabitating with a domestic partner. Partnership rates by age group are not reported making it difficult to determine the proper scaling of the coefficients by age bin. Using 28.6 percent would suggest a scaling of 3.497 to the coefficients. A more conservative partnership rate of 40 percent would translate to scale factor of 2.5. The resulting scaled coefficient for individuals over 30 years old would be 0.02275, which I will use as my best approximation of a “first stage” in interpreting the magnitude of impacts on other results.

The second and third panel consider secondary indicators of concealment behavior: marital and parenting status. Neither show strong correlations with the the triple interaction. This suggests that homosexuals concealing their sexual orientation are not systematically entering into heterosexual unions. The prevalence of single, heterosexual bachelors through age 45 may make marriage an unnecessary signal for successful concealment.

5.2. Migration and Identity. Another interpretation of the results in Table 3 is that homosexuals from discriminatory areas do not have the opportunity to match with same-sex partners. Given recent interest in spousal matching behavior and marriage premiums among economists, this is another interesting possibility.

To distinguish between these two potential theories, I test whether the triple interaction term is correlated with migration behavior and identity expression. If homosexuals from discriminatory areas cannot match to sexual partners in their hometowns, they face the highest incentive to migrate away to more favorable counties. Likewise, these individuals would exhibit a relatively larger gap in measures of conservative identity (e.g., religiosity and gender ideology) compared to heterosexual individuals born in the same county.

TABLE 4. Migration

Variable	Average Outcome in Age Range			
	18 to 24	25 to 30	31 to 37	38 to 45
	Migrated from County from Age 14			
# Older Brothers \times Male \times Index	0.0209*	0.00997	-0.00437	0.00842
	(0.0119)	(0.0134)	(0.0147)	(0.0147)
N	50,295	55,180	35,858	29,488
	Index			
# Older Brothers \times Male \times Index	0.00617	0.0398**	0.0250	-0.000920
	(0.0175)	(0.0201)	(0.0216)	(0.0228)
N	52,051	57,229	37,273	30,401
	Standardized Republican Vote Share			
# Older Brothers \times Male \times Index	-0.0431**	-0.0504**	-0.0498**	-0.0507*
	(0.0219)	(0.0239)	(0.0249)	(0.0264)
N	52,050	57,229	37,273	30,401

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

Tables 4 and 5 show the opposite conclusions. Men with more older brothers from more favorable counties are more likely to move away from their county of residence at age 14 between the ages of 18 to 24. There is no significant difference in migration rates during later years. I interpret this result as indicating that men who are able to express their sexual identity are more likely to accelerate their first move away from home.

There is also evidence that men with more older brothers from less discriminatory areas migrate to even more favorable locations. In the second panel of Table 4, I report the correlations between the triple interaction and the index score of their new destination counties after migration. Between ages 25 and 30, I see a significant correlation of 0.0398 indicating that men with more older brothers who are born to more favorable locations choose to migrate to even more accepting counties. Similarly, across all age bins I observe a negative correlation between -0.0431 and -0.0504 for the triple interaction and the standardized Republican vote share in the destination county. Republican vote share is measured as the average percent of votes cast for Republican presidential candidates in a given county between 1992 and 2008, which is then demeaned and divided by the standard deviation. Given a “first stage” of 0.02275, the interpretation of this result is that homosexual men opt to move to counties that are 1.74 standard deviations more favorable towards homosexuals and about 2 standard deviations less likely to vote for Republican presidential candidates for each 1 standard deviation increase in the acceptance of homosexuality in their county of birth. This consolidation of homosexuals in the least discriminating areas may help explain why large gay communities developed in a few isolated locations.

TABLE 5. Identity Investment

Variable	Attends Religious Services Weekly ^a	Gender Ideology Score ^b
# Older Brothers × Male × Index	-0.0148* (0.00758)	0.0189** (0.00846)
N	25,524	33,678

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1.

^aReligiosity was measured by the NLSY79 in 1979, 1982 and 2000.

^bGender ideology was measured by the NLSY79 in 1979, 1982, 1987 and 2004.

I also consider measures of conservative identity formation in Table 5 through looking at whether respondents report attending religious services a weekly basis or more as well as their self-reported views on gender and the role of women in society. Attendance to religious services was asked to respondents in 1979, 1982 and 2000. The gender ideology score was collected in 1979, 1982, 1987 and 2004. The gender ideology score was created using a battery of questions on the role of women in society. Respondents are asked to report how much they agree or disagree with seven separate statements like, “A woman’s place is in the home, not the office or shop” or “It is much better if the man is the achiever outside the home and the woman takes care of the home and family”. The responses were aggregated such that a higher score reflects more progressive views of gender, and then were standardized to a mean of zero and a standard deviation of one.

The results in Table 5 suggest that homosexuals from more favorable locations are least likely to embrace social conservatism. For each standard deviation change in the index, men with more older brothers are 1.48 percentage points less likely to attend religious services weekly and score 0.0189 standard deviations higher on the gender ideology spectrum. Scaling by the “first stage”, these results indicate that homosexuals from areas with a one standard deviation increase in index observe a 65 percentage point decline in likelihood of attending weekly religious services and a .83 standard deviation increase in gender ideology score.

These results are inconsistent with the hypothesis that homosexuals from discriminating counties are not concealing their identity, but instead simply cannot match to a partner. Men with more older brothers from conservative localities are move away from their home county later in life to locations that are relatively more conservative. Compared to their peers, they are more likely to invest in social conservative signals as measured by religiosity and views on gender. Instead, these results seem more consistent with the hypothesis that these men are exerting extra effort on signaling heterosexuality to mask their underlying desire.

5.3. Mental Health, Mental Outlook and Substance Abuse. I now turn my focus to considering what the implications are of concealment on life-cycle outcomes. As the

TABLE 6. Mental Health: Rosenberg Self-Esteem Scale and Center for Epidemiological Studies Depression Scale (CES-D)

Variable	Standardized Score		
	Overall	1980 ^a	1987 ^a
# Older Brothers \times Male \times Index	0.0468** (0.0185)	0.0610** (0.0288)	0.0801*** (0.0307)
N	45,441	8,593	8,390
	1992^b	1994^b	2006^a
# Older Brothers \times Male \times Index	0.0495* (0.0295)	0.0234 (0.0292)	0.0383 (0.0317)
	8,759	8,713	7,205

Robust standard errors clustered at the respondent level in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

^a Standardized Rosenberg Self-Esteem Scale

^b Standardized Center for Epidemiological Studies Depression Scale

theory in Section 3 suggests, minorities may opt to absorb the impact of discrimination through indirect channels, mainly negative mental health shocks. To test this concept, I study the relationship between the triple interaction and several measure of mental health and outlook. The NLSY79 collected several rounds of mental health assessments allowing one to observe respondents' self-esteem and depression symptoms almost every 5 years. The two main instruments used by the NLSY79 were the Rosenberg Self-Esteem Scale and the Center for Epidemiological Studies Depression (CES-D) Scale.

The Rosenberg scale is designed to measure self-esteem through asking respondents to report to what degree they agree or disagree with a variety of statements. Examples of these questions include, "I am a person of worth, at least on an equal plane with others" and "On the whole, I am satisfied with my life." The Rosenberg scale was administered in 1980, 1987 and 2006. The CES-D scale collects information on both negative symptoms (e.g., feeling lonely, depressed, poor appetite, etc.) and positive symptoms (e.g., feeling happy) and aggregates the information into a composite score. Symptom severity is measured by asking the frequency of occurrence of each item over the preceding week, with responses ranging from 0 (rarely or none of the time/1 day) to 3 (most or all of the time/5-7 days). The CES-D scale was administered in 1992 and 1994. I standardized each mental health score to mean zero and standard deviation one to make results comparable. I also normalized the scale so that a higher score indicates a better outcome. Table 6 presents the results.

Point estimates consistently show a positive correlation between the triple interaction and measures of mental health; statistically significant results are observed in 1980, 1987 and 1992. The Rosenberg scale and the CES-D scale both find strikingly similar magnitudes. Men with more older brothers experience a 0.0468 standard deviation improvement in mental health outcomes between 1980 and 2006 for each standard deviation increase in the index. Given the "first stage," these results indicate that homosexual men's mental

TABLE 7. Mental Outlook: Rotter Locus of Control and Pearlin Mastery Scores

Variable	Standardized Score		
	Overall	1979 ^a	1992 ^a
# Older Brothers × Male × Index	0.0313 (0.0212)	0.0334 (0.0280)	0.0302 (0.0284)
N	17,622	8,902	8,720

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1

^a Standardized Rotter Locus of Control Score

^b Standardized Pearlin Mastery Score

health improves by 2.06 standard deviations for each 1 standard deviation improvement in the index of their county of birth.¹⁷

In addition, two measures of mental outlook were collected in the NLSY79. In 1979, respondents completed the Rotter Internal-External Locus on Control questionnaire, and in 1992, they also completed the Pearlin Mastery survey. Both of these instruments aim to measure how much respondents believe they have control over their own outcomes. As in the previous analysis, I have standardized the scores to ease interpretation with a higher score indicating respondents experience a greater sense of control over one's life. Table 7 shows the results.

I find $\delta_{1,t}$ is consistently positive when regressing mental outlook on my specification. The results are not statistically significant, but are consistent with the previous findings regarding mental health. The interpretation of the coefficients is that men with more older brothers from more favorable birth counties are more likely to identify self-motivation and self-determination as the primary factor affecting their outcomes instead of chance or luck. The pooled regression coefficient is 0.0313. Scaling by the "first stage," homosexuals observe a 1.37 standard deviation improvement on the mental outlook score for each 1 standard deviation increase in the birth county index.

The last set of outcomes I consider in this section relate to alcohol use patterns. I consider impacts on binge drinking (days spent consuming six or more alcoholic drinks in a day) and reported feelings of aggression while drinking in the past month. Table 8 shows the results of this analysis. I find suggestive evidence that men with more older brothers in the most discriminatory areas may have elevated rates of alcohol abuse. In 2002, the $\delta_{1,t}$ is negative and significant with a coefficient of -0.0658. Smaller, negative coefficients are reported for other time periods. Stronger results are observed for expression of aggressive emotions during consumption of alcohol. These results suggest that alcohol may serve as a coping mechanism to deal with the mental health impacts of concealment.

¹⁷The large magnitude observed in Table 6 suggest that the coefficients from Table 3 perhaps should be scaled at a higher rate. This would increase the size of the "first stage" and spread the reduced form effect across a larger set of individuals.

TABLE 8. Alcohol Use Patterns

Variable	Days Consumed 6+ Alcoholic Drinks			
	1982	1988	1994	2002
# Older Brothers \times Male	-0.00190	-0.0289	-0.00760	-0.0658*
\times Index	(0.0508)	(0.0462)	(0.0462)	(0.0340)
N	7,972	8,112	7,072	7,551
Variable	Experienced Aggressive Emotions while Consuming Alcohol			
	1984	1985	1988	
# Older Brothers \times Male	-0.0331***	-0.0234**	-0.00595	
\times Index	(0.0108)	(0.00967)	(0.0100)	
N	8,268	8,712	8,113	

Robust standard errors clustered at the respondent level in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

5.4. Educational Attainment and Employment. The sizable effects on mental health suggest that concealment should also impact human capital accumulation and labor market experience. It Table 9 shows the impacts on AFQT scores, highest grade completed by age 30 and college graduation rates. AFQT scores and educational attainment are demeaned and standardized by dividing by their standard deviation to make the coefficients more comparable. The results show that men with more older brothers born in more favorable counties exhibit relatively better educational attainment across all three measures. The estimated coefficients are 0.0479 (AFQT), 0.0651 (years of education) and 0.0258 (college graduate); all are statistically significant.

The magnitudes of these coefficients are similar in size to the result observed for mental health outcomes. Interpreting these results in a quasi-instrumental variable context suggest impacts ranging from 2 to 3 standard deviations in AFQT scores and educational attainment for homosexuals for a 1 standard deviation change in birth county index. Probability of college graduation increases by 113 percent points. These exceedingly large magnitudes may be exaggerated by a conservative estimate of partnership rates for homosexual between the ages of 31 to 45 used in scaling the first stage. If I revise the first stage to scale by the 28.6 percent cohabitation rate reported in Black et al. [2000], the impacts would be scaled down to 1.48 to 2 standard deviation increases in AFQT and years of schooling and 80 percent point increased likelihood of graduating from college.

Table 10 shows the reduced form impact on employment, income and career advancement. Given the previous results on mental health and educational attainment, there are very few statistically significant impacts observed. There is a small negative coefficient on employment in the early age bin of 18 to 24, most likely related to pursuit of post-secondary education. Positive, significant impacts on log income and occupational status are observed between the ages of 38 to 45. In spite of large effects on mental health and educational

TABLE 9. AFQT Score and Educational Attainment

Variable	Standardized Score		
	AFQT Score	Years of Schooling	Graduate College
# Older Brothers \times Male \times Index	0.0479** (0.0240)	0.0651*** (0.0248)	0.0258** (0.0110)
N	8,561	8,990	8,990

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1

TABLE 10. Employment and Income

Variable	Average Outcome in Age Range			
	18 to 24	25 to 30	31 to 37	38 to 45
	Employed			
# Older Brothers \times Male \times Index	-0.0138* (0.00816)	-0.00596 (0.00798)	-0.0118 (0.00888)	-0.00297 (0.00931)
N	54,629	59,339	37,704	25,878
	Log Income			
# Older Brothers \times Male \times Index	-0.0113 (0.0286)	0.0211 (0.0236)	0.0173 (0.0272)	0.0781*** (0.0294)
N	20,654	38,468	24,131	19,344
	Occupation = Managerial or Professional Specialty			
# Older Brothers \times Male \times Index	-0.00219 (0.00645)	0.00412 (0.00882)	0.0179 (0.0111)	0.0411*** (0.0125)
N	30,703	50,070	32,629	27,208

Robust standard errors clustered at the respondent level in parentheses; *** p<0.01, ** p<0.05, * p<0.1

attainment, however, no significant effects are observed in earlier years. This may reflect wage penalties from market discrimination for homosexuals who choose to reveal their type.

6. CONCLUSION

This paper presents a framework to study discrimination in the context of concealable characteristics. I highlight two important implications of concealability: first, estimates of labor market discrimination are likely upward biased, and second, the symptoms of discrimination will be manifested through nonstandard channels. I present evidence that concealment in the context of homosexuality responds to heightened discrimination risks.

The results show the first plausible evidence identifying men who experience homosexual attraction but never state or self-identify these feelings. It also follows the behavior of these men to observe the choice to conceal impacts a variety of life-cycle outcomes. Impacts on migration and identity investments provide complementary evidence that concealment is the operating mechanism in the results on relationship formation. The concealment behavior is linked with negative impacts on the mental health of respondents and educational attainment. Income and career progression, however, show weaker correlations relationships suggesting that disclosure may come at a cost of labor market discrimination. Data limitations prevent analysis of the externalities of concealment on friends and family. But, the high levels of negative mental health outcomes and substance abuse patterns raise the potential for substantial negative externalities for innocent bystanders to concealment activity.

This work suggests the importance of incorporating sexual orientation into public policy initiatives, particularly anti-discrimination legislation. Providing protections for homosexuals may help reduce the costs of discrimination and decrease rates of concealment. Given that many homosexual men and women may already be living under concealment with spouses and children, it will be important to anticipate the implications of changing attitudes towards homosexuals as these individuals potentially transition out of concealment and disrupt the family unit.

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